IICA

II Interamerican Meeting of Directors of Animal Health

San Jose, Costa Rica

8 – 12 September 1980

Informes de Conferencias, Cursos y Reuniones No. 204

INFORME

SEGUNDA

REUNION DE DIRECTORES DE SALUD ANIMAL

San José, Costa Rica – 8 – 12 Setiembre de 1980

IICA

INSTITUTO INTERAMERICANO DE CIENCIAS AGRICOLAS (IICA)

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

REDISA2 (Esp)
8 setiembre 1980
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PRESENTACION DEL DOCTOR JOSE EMILIO G. ARAUJO

SEGUNDA REUNION INTERAMERICANA DE DIRECTORES DE SALUD ANIMAL

SAN JOSE, SETIEMBRE 8 - 12, 1980

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Señor Ministro, Señores Directores y Representantes de Organismos Internacionales, Observadores, señoras y señores

Decíamos en la Primera Reunión de Directores de Sanidad Animal, que celebramos en esta Sede del IICA en agosto del año pasado, que esperábamos que ella fuera el comienzo de una serie periódica en la que, junto al placer de vuestra presencia, tuviéramos la oportunidad de exponer el progreso y sus consecuencias, los obstáculos y sus alternativas, en todos los aspectos de nuestra labor en que el prolongar la vida de los seres humanos depende esencialmente de la producción y de la productividad agrícola y ganadera, de la investigación, y de la formación de recursos profesionales y técnicos. Así vuestra versada experiencia nos serviría de guía para perfeccionar el ejercicio de nuestras responsabilidades.

En consecuencia, venimos hoy a dar cuenta de nuestra labor en la configuración y desarrollo del Programa de Salud Animal del IICA y de nuestra función como asesores de los Gobiernos en la aplicación racional del conocimiento existente, en la dilucidación de incógnitas de significado inmediato, en el perfeccionamiento de los recursos humanos y en la modernización de la compleja tecnología que requiere un proceso de tanta importancia como es el control y la erradicación de las enfermedades de los animales y su significado para la salud, la economía y bienestar de nuestros pueblos.

Hablamos hoy de décadas más que de siglos; tal es la velocidad con que suceden los acontecimientos y su magnitud. Como estamos mejor informados que en el pasado, nos atrevemos a predecir el futuro con mayor seguridad. Que hubo hechos trascendentales en el decenio iniciado en 1970 que han dejado huellas en las Américas, no se discute. Hay quienes dudan si los pronunciamientos políticos y las iniciativas a que dan lugar aclararán los objetivos esperados, es decir, si hubo éxito o fracaso. Parece un tanto peregrino querer transformar un continente en una década, pero es lógico -y así ha ocurrido- querer modificar profundamente el curso de acción de los países que lo integran. Más que toma de conciencia, se han producido reacciones que justifican el optimismo de algunos para los 10 años que se inician con el actual.

En vuestra reunión del año pasado se analizaron los lineamientos generales para formular el Programa de Cooperación Técnica en Salud Animal del IICA. En base a estas recomendaciones hemos establecido la estructura mínima del Programa tanto a nivel de la Sede como de la Zona de Trabajo del Instituto. En este sentido me es grato informarles que precisamente en las últimas semanas hemos completado el cuadro de profesionales médicos veterinarios contemplados en el programa de presupuesto del IICA para 1980.

Se convino en vuestra primera reunión que para llevar a la práctica una verdadera política de Salud Animal en las Américas era necesario desarrollar y reforzar los servicios médicos veterinarios dedicados a la lucha contra las enfermedades; aplicando métodos modernos de análisis de sistemas y control de gestión; mejorando los servicios de información y documentación; analizando el costo-beneficio de las inversiones en los

programas sanitarios; propugnando y coordinando los Institutos y laboratorios veterinarios de diagnóstico e investigación; estableciendo servicios de vigilancia, que cuenten con los recursos y personal que les permita actuar en forma efectiva en situaciones de emergencia. Podemos afirmar que no hay servicios viables, cualquiera sea su naturaleza, sin una infraestructura estable. Los componentes fundamentales de esta última son los recursos humanos, materiales y financieros; la programación, administración y evaluación de las acciones, como un proceso, y la investigación básica y operativa.

Hay concenso en los gobiernos en la necesidad de identificar los problemas, darles un orden de importancia de acuerdo con determinados criterios, establecer para cada cual objetivos medibles y las técnicas y procedimientos para alcanzarlos, e invertir de acuerdo con los mismos. Se crea así un sistema cuya evolución, periódicamente evaluada, conduce a la solución, parcial o total, de cada etapa y al enunciado de las siguientes.

La forma y el contenido de la planificación dependen primordialmente de la decisión política; sin ésta no tiene sentido. El plan revela -o debería revelar- lo que es posible científicamente y lo que es factible económicamente dentro de un mismo marco conceptual.

No es por coincidencia que el Programa de Salud Animal del IICA está incorporado a su línea prioritaria de trabajo de producción y productividad. Siempre hemos considerado que las acciones de Salud, en los animales destinados a la alimentación del hombre, constituyen parte integral de la producción animal. Precisamente en las palabras que pronuncié en la reunión RIMSA celebrada en Washington en el pasado mes de abril decía ..."Desde hace largos años el IICA ha tenido vinculación con los temas de Salud Animal por su natural

incidencia en los aspectos de la producción ganadera y del desarrollo agropecuario con los que tratamos a diario". He solicitado a la Dirección del Programa de Salud Animal para que, a partir de 1981 ampliemos nuestras actividades de cooperación técnica en el campo de la producción animal, coordinando las acciones que ya realiza el Instituto en este campo, y estableciendo nuevos proyectos, de acuerdo con la solicitud de los Gobiernos.

Esperamos en esta REDISA 2a. un amplio debate sobre los temas que hemos consignado en la agenda y que reflejan las recomendaciones de vuestra primera reunión, así como aquellos problemas que son del mayor interés y prioridad para los países de la Región.

Vamos a escuchar, en esta reunión, un importante panel sobre la babesiasis y la anaplasmosis del ganado. Contaremos con la versada opinión de distinguidos investigadores de las Américas que nos presentan el progreso alcanzado en las actividades de control de estas enfermedades en función de parámetros epidemiológicos razonables y asequibles, los avances logrados en la inmunización contra estos parásitos y las perspectivas y necesidades futuras en su investigación y dominio. Con estos hemoparásitos que presentan una plasticidad tan excesiva en la naturaleza, no podemos confiarnos exclusivamente en la inoculación de un agente inmunizante por muy probada que sea su eficacia. Tendremos que adoptar medidas de prevención conforme a las características en que estas enfermedades se revelan en cada ambiente, especialmente en lo que se refiere al control del vector de las mismas, <u>la garrapata</u>. Esto está en estrecha relación con las ideas que me he permitido manifestar, sobre principios y métodos de planificación, organización y administración de programas de Salud Animal.

Conoceremos los importantes progresos que han ocurrido en el proceso de la erradicación del Gusano Barrenador en los Estados Unidos de Norte América y en México, así como la factibilidad de un ataque integral contra esta enfermedad en los países de Centroamérica y Panamá.

Hemos querido esencialmente incluir en esta oportunidad la presentación de temas de gran trascendencia en el Continente como es la erradicación de la Peste Porcina Africana infortunadamente introducida en años recientes en algunos países del Hemisferio, y así escucharemos un informe del exitoso programa que viene desarrollando la República Dominicana. Las autoridades de Salud Animal de Chile, que en forma exitosa han completado la erradicación de la Fiebre Aftosa constituyendo el primer país del área infectada del Continente que lo logra; iniciarán en breve un programa de erradicación de la Peste Porcina Clásica y cuyo programa nos será presentado en esta Reunión.

Hay conciencia hoy en la necesidad de formar los recursos humanos de acuerdo con los rasgos culturales y estilo de vida de cada sociedad, la naturaleza de los problemas y la posibilidad de resolverlos progresivamente. Con otras palabras, el proceso de enseñanza y aprendizaje debería incluir los planes, programas y proyectos para cada disciplina en cada sector del desarrollo. Así debe ocurrir en las ciencias de la Salud Animal, de ahí la inclusión en el temario del posible desarrollo de un "Programa de Capacitación en Salud Animal". Igualmente los procesos patológicos que obstaculizan el desarrollo ganadero, sólo pueden estar bajo un efectivo control cuando es posible disponer de infraestructuras avanzadas, unidas a recursos humanos altamente calificados. Me refiero por supuesto, a la necesidad y posibilidades de la "Coordinación de los Institutos y Laboratorios Veterinarios de

Diagnóstico e Investigación en el Hemisferio", también señalado en vuestro programa de trabajo. Esperamos que la consideración detenida por esta Reunión de ambos temas, nos sirva de guía para nuestra labor de cooperación con los gobiernos y Universidades del Hemisferio.

Tendremos en la Sede de nuestro Instituto una unidad a cargo de la cooperación en Servicios de Información en Salud Animal, que así mismo establecerá un banco de datos, y publicará un boletín informativo, en cooperación con otras Divisiones y Servicios del IICA. Podremos en esta forma orientar y sistematizar mejor nuestra cooperación en problemas que, por su naturaleza y sus consecuencias, figuran entre los esenciales.

Nada parece imposible hoy en las Américas y esta es la lección más positiva de lo ocurrido en el decenio de 1970. Lo expresó Albert Camus en forma mucho más poética al decir que tenemos que volver a coser aquello que se ha desgarrado, hacer nuevamente concebible la justica en un mundo tan evidentemente injusto, hacer que vuelva a adquirir significación la felicidad para los pueblos envenenados por la infelicidad del siglo. Por cierto que se trata de un cometido sobrehumano. Pero el caso es que se llaman sobrehumanas aquellas tareas que los hombres cumplen en muy largo tiempo; he ahí todo.

Finalmente quiero reiterar una vez más, Sr. Ministro y Representantes, nuestro total compromiso de unir nuestras fuerzas con las de otros organismos internacionales, regionales, sub-regionales y nacionales, en forma tal, que la acción coordinada nos permita actuar eficazmente en el mejoramiento de la Salud Animal del Hemisferio y por ende en el bienestar y desarrollo de nuestros pueblos.

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS
II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH
San Jose, Costa Rica, 8-12 September, 1980

REDISA 2
5 de setiembre, 1980
Original: Español/English

LIST OF DOCUMENTS

1.	Provisional Agenda	REDISA 2/1
2.	Working Program	REDISA 2/2
3.	Report on the Development of IICA's Animal Health Program	REDISA 2/3
4.	Epidemiology of Bovine Babesiosis and Anaplasmosis	REDISA 2/4
5.	Review of immunization technics againsts Babesiosis and Anaplasmosis	REDISA 2/5
6.	Immune responses to _B. bovis_	REDISA 2/6
7.	Bovine babesiosis immunization outlook and future needs for research	REDISA 2/7
8.	Epidemiologices and feasibilities studies in Costa Rica	REDISA 2/8
9.	Screwworm Erradication. The U. S. Experience	REDISA 2/9
10.	Screwworm Erradication. Mexican Experience	REDISA 2/10
11.	The feasibility of erradicating Screwworm from Central America	REDISA 2/11
12.	Program for erradication African Swine Fever from the Dominican Republic	REDISA 2/12

13.	Program for erradicating Hog Colera from Chile	REDISA 2/13
14.	Coordination of Veterinarian Institutes and Laboratories for Diagnosis and Research in the hemisphere	REDISA 2/14
15.	Recommendations of the Firts Meeting of the Director of Animal Health REDISA	REDISA 2/15
16.	Provisional List of Participants	REDISA 2/16
17.	Recommendations of Meetings for Planning and Coordination in the countries	REDISA 2/17
18.	Final List of Participants	REDISA 2/18
19.	Presentation International Organizations	REDISA 2/19
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INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

REDISA2/1 (Ingl)
August 25, 1980
Original: Spanish

PROVISIONAL AGENDA

Item 1. Report on the development of IICA's Animal Health Program. Action on the recommendations of the first meeting. Proposals for the 1981 program and budget.

Item 2. Panel discussion on Babesiosis and Anaplasmosis of cattle.
- 2.1 Epidemiology
- 2.2 Progress in immunization
- 2.3 Immune responses to *B. bovis*
- 2.4 Outlook and future needs for research
- 2.5 Epidemiological and feasibility studies in Costa Rica

Item 3. Program for eradicating screwworm.
- 3.1 The experience in the United States of America
- 3.2 The experience in Mexico
- 3.3 The feasibility of eradicating screwworm from Central America

Item 4. Program for eradicating African Swine Fever from the Dominican Republic.

Item 5. Program for eradicating Hog Cholera from Chile.

Item 6. The Need and Potential for Coordinating Veterinary Institutes and Laboratories for Diagnosis and Research in the Hemisphere.

Item 7. Report on Agreements and Recommendations of International Animal Health Meetings of interest to the Americas.

Item 8. Meeting for Planning and Coordination in the Countries:
- Northern and Central American Region
- Caribbean Region
- South American Region

Item 9. Animal Health Training Program.

Item 10. Other business. Agenda, date and place for REDISA III, 1981.

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

Agenda Item No. 2

REDISA2/2 (Ingl)
August 25, 1980
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WORKING PROGRAM

Monday, September 8

8:30 am	Registration and distribution of documents
9:00 am	Election of President, Vice-President and Rapporteur
9:30 am	Opening session:
	- Address by IICA Director General
	- Address by the Minister of Agriculture of Costa Rica
10:15 am	Coffee Break
10:30 am	Agenda Item 1
	"Report on the development of IICA's Animal Health Program"
	Document REDISA2/3 — Dr. Francis Mulhern
11:30 am	Action on the recommendations of the First Meeting (1979) and projections for the 1981 Program and Budget. — Dr. Francis Mulhern, Dr. Pedro N. Acha
12:15 am	Discussion of Agenda Item 1
1:00 pm	Lunch
2:30 pm	Agenda Item 2
	"Panel Discussion on Babesiosis and Anaplasmosis of Cattle"
	2.1 Epidemiology
	Document REDISA2/4 — Dr. Ronald Smith
	2.2 Progress in Immunization
	Document REDISA2/5 — Dr. Kenneth Kuttler
	2.3 Immune responses to *B. bovis*
	Document REDISA2/6 — Dr. Miguel Osorno
4:00 pm	Coffee Break

4:15 pm	2.4 Outlook and future needs for research	
	Document REDISA2/7	Dr. Andrew Carson
	2.5 Epidemiological and feasibility Studies in Costa Rica	
	Document REDISA2/8	Dr. Manuel Guardia
5:00 pm	Discussion of Agenda Item 2	

Tuesday, September 9

9:00 am	Agenda Item 3	
	"Program for eradicating Screwworm"	
	3.1 The experience in the United States of America	
	Document REDISA2/9	Dr. E. Meadows Dr. Norman Meyer
	3.2 The experience in Mexico	
	Document REDISA2/10	Dr. Nazario Pineda
10:15 am	Coffee Break	
10:30 am	Discussion of Item 3	
11:30 am	"The feasibility of eradicating screwworm from Central America"	
	Document REDISA2/11	IICA
12:25 pm	Discussion	
1:00 pm	Lunch	
2:30 pm	Agenda Item 4	
	"Program for eradicating African Swine Fever from the Dominican Republic"	
	Document REDISA2/12	Dr. Orlando Sánchez
3:00 pm	Discussion of Agenda Item 4	
3:30 pm	Agenda Item 5	
	"Program for eradicating Hog Cholera from Chile"	
	Document REDISA2/13	Dr. Jorge Benavides
4:00 pm	Coffee Break	
4:15 pm	Discussion of Agenda Item 5	

4:45 pm	Agenda Item 7 "Report on Agreements and Recommendations of International Animal Health Meetings of interest to the Americas"	Dr. Pedro N. Acha
5:00 pm	Discussion	
6:00 pm	Reception sponsored by IICA	

<u>Wednesday, September 10</u>

9:00 am	Agenda Item 6 "The Need and Potential for Coordinating Veterinary Institutes and Laboratories for Diagnosis and Research in the Hemisphere" Document REDISA2/14	Dr. Carlos Arellano
10:15 am	Coffee Break	
10:30 am	Status report on laboratories	Dr. Pedro N. Acha
11:00 am	Discussion of Agenda Item 6	
12:00 m	Draft recommendations	
1:00 pm	Lunch	
2:00 pm	Agenda Item 8 Meetings for Planning and Coordination in the Countries: - Northern and Central American Region - Caribbean Region - South American Region	
4:00 pm	Coffee Break	
4:15 pm	Continue country meetings	

<u>Thursday, September 11</u>

9:00 am	Agenda Item 9 "Animal Health Training Program"	Dr. Pedro N. Acha
9:30 am	Discussion of Agenda Item 9	
10:00 am	Coffee Break	
10:15 am	Continue Agenda Item 8: Meetings for Planning and Coordination in the Countries	
1:00 pm	Lunch	

2:00 pm	Draft Resolutions and Recommendations
	- General
	- Specific
4:00 pm	Coffee Break
4:15 pm	Agenda Item 10
	- Agenda, date and place for REDISA III, 1981
	- Other Business. Animal Health Data Bank

Friday, September 12

9:00 am	Continue Agenda Item 10
	- Other Business
10:15 am	Coffee Break
10:30 am	Closing Session:
	- Reading and approval of the Final Document
	- Message from the IICA Representative
	- Message from the President
12:00 m	Lunch by invitation of Costa Rican Animal Health Officials

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

Agenda Item No. 1

REDISA2/3 (Ingl)
September 6, 1980
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REPORT ON THE DEVELOPMENT OF IICA'S ANIMAL HEALTH PROGRAM

Dr. Francis J. Mulhern
IICA
Director of Animal Health

REPORT ON THE DEVELOPMENT OF IICA'S ANIMAL HEALTH PROGRAM

It is indeed a real pleasure for me to appear before you today as the Director of Animal Health for IICA. As many of you are aware, I became the Director on March 3, 1980.

Prior to that time, I had expressed great concern about the need for a well coordinated Animal Health Program for all the countries of the Hemisphere. As the world and our Hemisphere literally shrinks our interrelationship become that much more important to all of us.

I recognize the progress that we as a profession have made in the past, but we must make greater strides to reduce the losses caused by animal diseases and pest in order to increase the food production of our countries.

First, I would like to express my appreciation to the Director General, Dr. José Emilio G. Araujo, and his top staff, as they have gone far beyond what was expected of them to support the activities of Animal Health programs of the organization. It is my conviction that they will continue to do this and that is why I am optimistic about reaching the goals that we set.

You notice that I said "We set". Dr. Acha and I have stressed that the Directors of Animal Health of the countries of this Hemisphere have ample imput into any programs that we propose. You recall that a year ago this past August, a meeting was held here in San José to ask you for your recommendations that we should consider as projects for the future.

The purpose of these meetings is for reporting past progress or problems encountered and planning for the future. It gives an opportunity for us to suggest proposals to you and to receive your response and also to hear suggestions from you that we have overlooked as to how we can improve our Animal Health programs.

Goals have been set for Animal Health programs of IICA for 1980 and 1981. I would like to present them to you as well as what progress has been made towards their achievement and what we are planning for 1982.

1980

ORGANIZATION

1. My headquarters is here in San José.
2. Dr. Pedro Acha, Adviser to the Director General for Animal Health programs is headquartered at the IICA Office in Washington.
3. The following specialists for Animal Health are being assigned:
   - Northern Area, Dr. Thomas Murnane, stationed at Mexico City.
   - Antillean Area, Dr. Franz Alexander, stationed at Georgetown, Guyana.
   - Southern Area, Dr. Ruben Lombardo, stationed at Brazilia, Brazil
   - Andean Area, Dr. German Gómez, to be stationed at Bogotá, Colombia.

   These specialists will be contacting each of you in the very near future to review in more details the projects we are presenting at this meeting.

Dr. Acha and I have visited many countries in our efforts to introduce the Animal Health programs of IICA and wish to express appreciation for the support that we have received.

As proposed, a group of technical experts on screwworm eradication visited all the countries of Central America and Panama to determine the technical feasibility of moving the biological barrier presently being moved to southern Mexico by the Mexican-United States campaign to the Panama-Colombia border. Their report is contained within the documents and will be presented later. Since it was favorable, it will be necessary for us to train at least one specialist in each of the countries involved to work with a project development group to determine the logistics involved in moving the barrier southward. We hope to do this before the end of the year.

Also, we have a Consultant from the USDA N.A.L. currently here working with CIDIA specialists in computer services, as the first steps towards developing the criteria for what will eventually be a comprehensive data bank on Animal Health for this Hemisphere.

Ticks are a high priority for most of our countries. I was especially pleased to see the center for tick research, control and eradication that is about to be inaugurated at Cuernavaca, Mexico. It is a center in which Mexico and the BID can be very proud of their achievement.

In my visit, Dr.de la Rocha, the director of the center, expressed great interest in working with IICA in order that the institution can be as much help as possible to the other countries of the Hemisphere. Mexico has had a nationwide tick eradication program underway for several years and we can all benefit from their experiences in this area. The center can be very valuable to all of the countries from a trainig standpoint.

The importance of ticks to most of our countries is the reason that the topic has been selected as a major item as this year's agenda. It is our intent to see that this meeting each year will provide an agenda so that you can hear and participate in discussions considered to be of the highest significance to the animal health in this Hemisphere.

IICA has provided funds to support a tick research project on epidemiology in Costa Rica. The BID also provided money to initiate and develop this project. At this time the lab has been relocated and the government of Costa Rica offered for it to be used in a regional project.

We plan to develop before the end of 1980, the criteria and methods for rating animal health diagnostic laboratories throughout the Hemisphere. We will call on the expertise of those countries that have progressed in this area to gain the benefits of their experiences.

In the Caribbean or Antillean Area, Dr. Acha, Dr. Alexander and I visited Haiti to determine what can be done to help them eradicate African Swine Fever. IICA sent a technical group made up of representatives of Canada, United States and Mexico, to study the feasibility of an eradication program there. Presently, we are in the process of developing a program with Haiti that will have a good chance for success. Once that is done it will be necessary to determine what Haiti can contribute to the operations of the program and what other countries and organizations can provide. This has our number one priority at this time.

I cannot leave this topic without commending the fine work being done by the government of the Dominican Republic in the eradication of African Swine Fever. The contributions of the United States and FAO have helped them considerably but the commitment of the government to achieve the eradication goal is one that should gain the respect and admiration of all of our countries.

We also wish to commend for Cuba, who has apparently eradicated African Swine Fever twice. As long as the disease exist in one of our countries, it is a threat to all of us.

A seminar on "The Concepts of Animal Disease Control and Eradication" developed by Auburn University School of Veterinary Medicine, was sponsored jointly by IICA and PAHO. It was held at the new training facilities, located at Georgetown, Guyana. Directors of Animal Health from the English speaking countries of the Caribbean attended the course. In addition, a working plan was developed for veterinary diagnosis and quarantine services in the area. I was pleased to see how effectively the veterinarians of both organizations worked together.

In the southern area, the National Veterinary Research Laboratory INTA-CASTELAR, received assistance in preparing a project for reorganizing and expanding its activities and those of the chain of veterinary diagnosis laboratories in the country. The project proposal will be presented to the INTA Administration and the government in the next few weeks, to be considered for national fund allocation and international credit assistance. IICA helped with the scientific programming and the economic analysis of the preliminary draft.

In a joint effort with the Director of the Alumnae Department from the School of Veterinary Sciences at the University of La Plata, a project is being designed for establishing a regional Animal Health training center. It would receive funding from the University of La Plata, the University of Buenos Aires, the Argentine Veterinary Diagnosis and Research Centers, and financial contributions made by the Banco de la Nación and the Banco de la Provincia de Buenos Aires. At the present time, negotiations are underway with national authorities for formalizing a project and an operational agreement between the government and IICA.

In the Andean Area we plan to provide direct and administrative assistance to Chile for formulating a project for the eradication of hog cholera to be launched in 1981.

In Peru, at the request of the government, a technical review was made of the program for the eradication of hog cholera and the prevention of African Swine Fever.

1981

At this time, the veterinary specialists will be located in each area and more frequent contacts will be made with your offices during the year. At least one meeting with all the Directors of Animal Health of each area will be held by the veterinary specialists to provide a forum for discussing animal disease and pests problems from a regional standpoint. I intend to delegate authority and responsibility to them for the animal health programs.

Major Program Projects will be:

1. Initiate a program for the control and eradication of African Swine Fever in Haiti.
2. Establish animal disease and pest emergency fund. It could be used when a disease or a pest that is known to have major economic or public health significance, has been recently introduced into a country and it is not in a position to respond because of the lack of funds.
3. Continue the necessary planning and evaluation in preparation of moving the screwworm biological barrier from southern Mexico to Panama.
4. Provide training on broad aspects of tick control utilizing Mexico's Center.
5. Initiate a data bank on Animal Health utilizing IICA's computer services.
6. Establish a veterinary position at IICA's headquarters to administer the emergency fund, establish monitor and keep current the data bank and will be a special laison on tick research control and eradication activities.
7. Work with the country of Argentina in the reorganization and expanding the activities at CASTELAR to improve veterinary diagnostic laboratories of the country.
8. Do what can be done to have the University of La Plata in Argentina become established as a regional training center.
9. Provide a Consultant to Chile when requested by them to monitor their hog cholera eradication program.

10. Provide a Consultant to Argentina when requested by them to monitor their aftosa eradication program.
11. Provide a Consultant to Brazil when requested to monitor their African Swine Fever Program.
12. Review the Animal Health activities of EMBRAPA project based on the veterinary consultants evaluation and recommendation.
13. Hold the annual meeting of the Directors of Animal Health.

1982

In this year the basic programs of IICA Animal Health Programs as far as diseases and pests are concerned, should be fairly well established and recognized. What new projects in this area to be developed for implementation in 1982 will largely depend on the discussions that take place here. Surely, reviews and evaluation of Brucellosis programs should be one for consideration, not to mention hog cholera and screwworms in the countries of the Caribbean.

We have received several inquires about IICA's role in Animal production. We believe we should expand in that area and develope a few programs of greatest importance to all of our countries. In fact, we are considering the feasibility of placing one veterinary in each of the areas who would be an animal production specialist. As I said earlier, the purpose of this meeting is to seek your inputs and so we are looking forward to your suggestions.

Finally, this concludes my report. I believe quite a bit has been accomplished in a relative short time and this is largely, due to the support of IICA, the help of many of you and to other organizations that recognize the importance of animal health and have supported them. Its still only the beginning and a great deal more needs to be done. Please take our challenge to you seriously. Identify clearly what more we should be doing and how we should go about it. If our actions to date have not been satisfactory, tell us how we can do it better.

I have attended this meetings in the past as a country representative such as you. It was my conclussion that just a few members gave the groups the benefits of their thinking. We would like to see maximum participation. We hope that you will look forward to these meetings being of extreme importance to you as the Directors of Animal Health of your countries. However, only your participation and involvement will make it so.

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EPIDEMIOLOGY OF BOVINE ANAPLASMOSIS AND BABESIOSIS

Dr. Ronald Smith
College of Veterinary Medicine
University of Illinois
Urbana, Illinois 61801
U. S. A.

EPIDEMIOLOGY OF BOVINE ANAPLASMOSIS AND BABESIOSIS

Dr. Ronald Smith

Ticks and tick-borne diseases have long been incriminated as major obstacles to efficient livestock production. This is particularly true for grazing animals such as cattle, sheep, and goats. Vast areas of grazing land, not generally acceptable for cultivation and presently occupied by more resistant, indigenous breeds, could yield greater quantities of animal protein were it not for the continual threat posed by blood-sucking ticks to the importation of improved, exotic breeds.

Although workers in the field of tick-borne diseases agree that losses occur, it has been difficult to accurately assess their extent monetarily. This is an obstacle to animal health personnel who wish to convince their respective governments or international donor agencies to invest the large sums of money necessary for control or eradication programs. Even when sufficient funding is available, incomplete knowledge of tick distribution, ecology and disease relationships often make it impossible to implement effective control measures.

Vector-Parasite-Host Relationships. The list of important tick-borne diseases of food producing animals is rather short and restricted largely to cattle, although sheep, goats, and horses are occasionally afflicted in certain geographic regions. Vector ticks for these diseases are members of

the family Ixodidae, or hard ticks, as opposed to the family Argasidae, or soft ticks. Though a few members of the latter group are serious parasites of livestock and domestic fowl, the hard ticks are by far of greatest economic importance. Bovine anaplasmosis, babesiosis, and theileriosis account for most of the reported losses occasioned by tick vectors. Anaplasmosis and babesiosis are found throughout the world whereas the theilerioses are restricted to Africa and the Middle East. Heartwater, or cowdriosis, causes considerable losses among African cattle. Rickettsial parasites of the genus Ehrlichia and Cytoecetes cause disease in herbivores and carnivores. To date only E. equi, isolated from horses in California, and E. canis of dogs have been found in the Americas. In light of the absence of the theilerioses, heartwater, and ehrlichioses from domestic ruminants in the Americas, it is important that veterinary health officers be aware of their potential introduction through importation of domestic or wild herbivores and/or their ticks.

Two bovine hemotropic diseases are of immediate concern in the Americas: bovine babesiosis and anaplasmosis. Bovine babesiosis, caused by Babesia bovis and B. bigemina, is transmitted by the one-host tick Boophilus spp. within which the protozoan parasites must undergo a complex developmental cycle. The developmental cycle of Babesia in the vertebrate and invertebrate hosts provides a useful model for examination of factors which affect the infection of vector ticks by these parasites and their subsequent transmission to cattle.

Boophilus is a one-host tick meaning that all stages (larva, nymph, adult) occur on the same host. Boophilus microplus is more common in warm, humid,

tropical regions whereas Bo. annulatus prefers a somewhat drier climate. Boophilus annulatus was the principal vector of Texas Cattle Fever (babesiosis) in the United States. Successful cyclical transmission of Babesia requires that female ticks imbibe a sufficient quantity of blood to become infected and that tick-phase babesiae gain access to the developing embryo so that babesiae will be transmitted to the bovine host by the next generation. Female ticks are most commonly infected with babesiae during the last 24 hours of the 21-day feeding period, a time of rapid engorgement. Ingestion of high parasitemia blood prior to this stage seldom results in tick infection, nor does engorgement on the blood of clinically recovered cattle, despite the presence of parasites in the blood. This "threshold" phenomenon accounts for the fact that only a very small proportion of larvae, as few as 1 in 2500, harbor infective parasites in the field.

Female ticks may also become infected when feeding on cattle during parasite recrudescenses in carrier cattle. Although recovered cattle are solidly immune to disease caused by the homologous species of Babesia, they experience periodic relapse parasitemias associated with antigenic variations of the parasites that they harbor or from superinfections with heterologous strains. Cattle that are no longer exposed to babesial infections continue to experience parasite recrudescences for up to 4 years with B. bovis but only 6 months with B. bigemina.

Although B. bovis and B. bigemina frequently occur in the same geographic area, host susceptibility, animal husbandry practices, and the virulence of local strains influence the relative importance of each species in a given endemic zone. Prior infection with B. bigemina or B. bovis does not significantly reduce the susceptibility of cattle to tick-borne infection and

disease caused by the heterologous species. This finding is supported by serologic studies which demonstrate that serological cross-reactivity is restricted to the period during and shortly following recovery from infection. The mechanism for this cross-reactivity is not clear but does not indicate that a close antigenic relationship between the two species exists.

Despite the greater prevalence of B. bovis parasitemia within herds, B. bigemina appears to be the predominant parasite among field tick populations. This is due to the fact that B. bigemina exhibits a greater reproductive potential within ticks than does B. bovis. Thus, a greater proportion of tick offspring acquire B. bigemina infections than B. bovis infections. It is clear that animals can be tick infested without contracting babesiosis, but it is impossible to have babesiosis without ticks. Babesia bovis is transmitted by larvae of Boophilus spp. whereas B. bigemina is transmitted by the nymphal and adult stages.

Anaplasmosis is caused by the erythrocyte-inhabiting rickettsiae Anaplasma marginale, Paranaplasma caudatum and A. centrale parasitizing cattle, and A. ovis in sheep. Anaplasma centrale was first described in South Africa as the cause of a mild infection in cattle, and it has been used in many countries, including Central and South America, for immunization against the more virulent A. marginale. Paranaplasma caudatum is a morphologic, and apparently antigenic variant of A. marginale first described in the Northwest United States. Anaplasmosis is worldwide in distribution.

The dynamics of anaplasma transmission are more complex than babesia. However, the pattern of infection within susceptible herds is probably similar for bovine anaplasmosis and babesiosis. Anaplasma marginale is transmitted cyclically by ticks and mechanically by biting flies and veterinary procedures.

Several species of North American ticks have been shown to be potential vectors of the organism in the field, although the simultaneous presence of biting flies in tick-infested areas often obscures the relative role played by each vector. Although A. marginale has been detected in the organs of ticks feeding on parasitemic blood, no one has been able to trace the developmental cycle of the organism in ticks.

The situation regarding field outbreaks of anaplasmosis in tropical and subtropical regions is also confusing. Among the tick species that have been incriminated as vectors are the one-host ticks Bo. annulatus and Bo. microplus. As all feeding stages occur on the same individual, these ticks must transmit A. marginale transovarially. However, transovarial transmission of A. marginale by Boophilus spp. has rarely, if ever, been demonstrated.

In contrast, transstadial transmission of A. marginale by Boophilus spp., and intrastadial transmission by males, may be more significant. Under conditions of stall confinement these supposedly one-host ticks do in fact transfer from one animal to another and are able to carry A. marginale. The extent to which Boophilus spp. transfer from one host to another under field conditions has not been clarified.

In light of the above discussion, it is tempting to conclude that biting flies are more important than ticks of the genus Boophilus in anaplasmosis epidemiology. However, field data clearly show that anaplasmosis outbreaks are preceded by population increases of Boophilus spp.

Circumstances that Lead to Outbreaks of Anaplasmosis and Babesiosis. In general terms there are 2 situations in which outbreaks of "tick fever" may occur.

(1) Due to the untimely exposure of a population completely susceptible to disease: This situation can occur when ticks spread to areas that are normally free of them, whether due to the movement of infested cattle or to climatic variations that are temporarily favorable for them in areas adjacent to a tick-infested area. More frequently, exposure to ticks occurs when susceptible cattle are moved into a tick-infested region. This may occur from movement of cattle within a country, i.e., from tick-free highlands to the tropical lowlands, or through the importation of cattle from temperate zone countries into the tropics.

(2) Due to "enzootic instability": The term enzootic instability is used to describe the situation in which some animals in a herd do not become infected with *Anaplasma* or *Babesia* until long after birth, even though they may have been exposed to ticks. The concept of enzootic instability is useful for explaining why outbreaks of anaplasmosis and/or babesiosis occur within herds that have been infested with ticks for a long period of time. In this regard, geographic areas where babesiosis occurs have been identified as either "enzootic" or "marginal". Enzootic zones typically have a rather stable population of ticks whose numbers are sufficient to ensure exposure of calves to *Babesia* spp. prior to 9 months of age. Colostral antibodies and/or age resistance protect calves thus exposed from developing severe reactions and a state of premunition, or infection immunity, ensues. A relatively heavy tick infestation is required to maintain this enzootic stability as only a small percentage of ticks in the field actually transmit *Babesia*. It has been estimated that 12 tick bites/animal/day are required to ensure that most calves within a herd are infected by the time they reach 9 months of age.

This number of tick bites has been calculated from data obtained from *Bos taurus* cattle. It is possible that a greater number of tick bites would be required for a herd of *Bos indicus* cattle.

Marginal zones, in contrast, experience significant variations in vector tick numbers over seasons or years with the result that some animals escape exposure to tick-borne babesiae until after 9 months, and sometimes until 2 years of age or more. Infection at this time results in a more severe reaction and death may occur. The severity of reactions on a herd basis is directly related to the proportion of susceptible animals, i.e., those which were not exposed to infected ticks as calves. It is important to note that stable, enzootic regions may be converted into unstable, marginal areas through the use of acaricides. If the tick population is artificially reduced for a number of months or years and then is allowed to increase to earlier levels, a very real probability of epidemic babesiosis exists.

A state of relative enzootic stability exists when the population of ticks is very low. In this situation *Babesia* is transmitted very infrequently, if at all, due to the low vector density. Within a herd few calves will be infected by the time they reach 9 months of age and therefore the majority of the cattle will be susceptible. Despite this, very few adult cattle will experience severe babesiosis due to the almost complete absence of transmission.

Although the concepts of enzootic stability and instability are based upon studies with *B. bovis*, the same principles probably apply to infections caused by *B. bigemina* and *A. marginale*. In Australia, for example, *B. bigemina* is widespread in areas infested with ticks, but it rarely causes disease. This

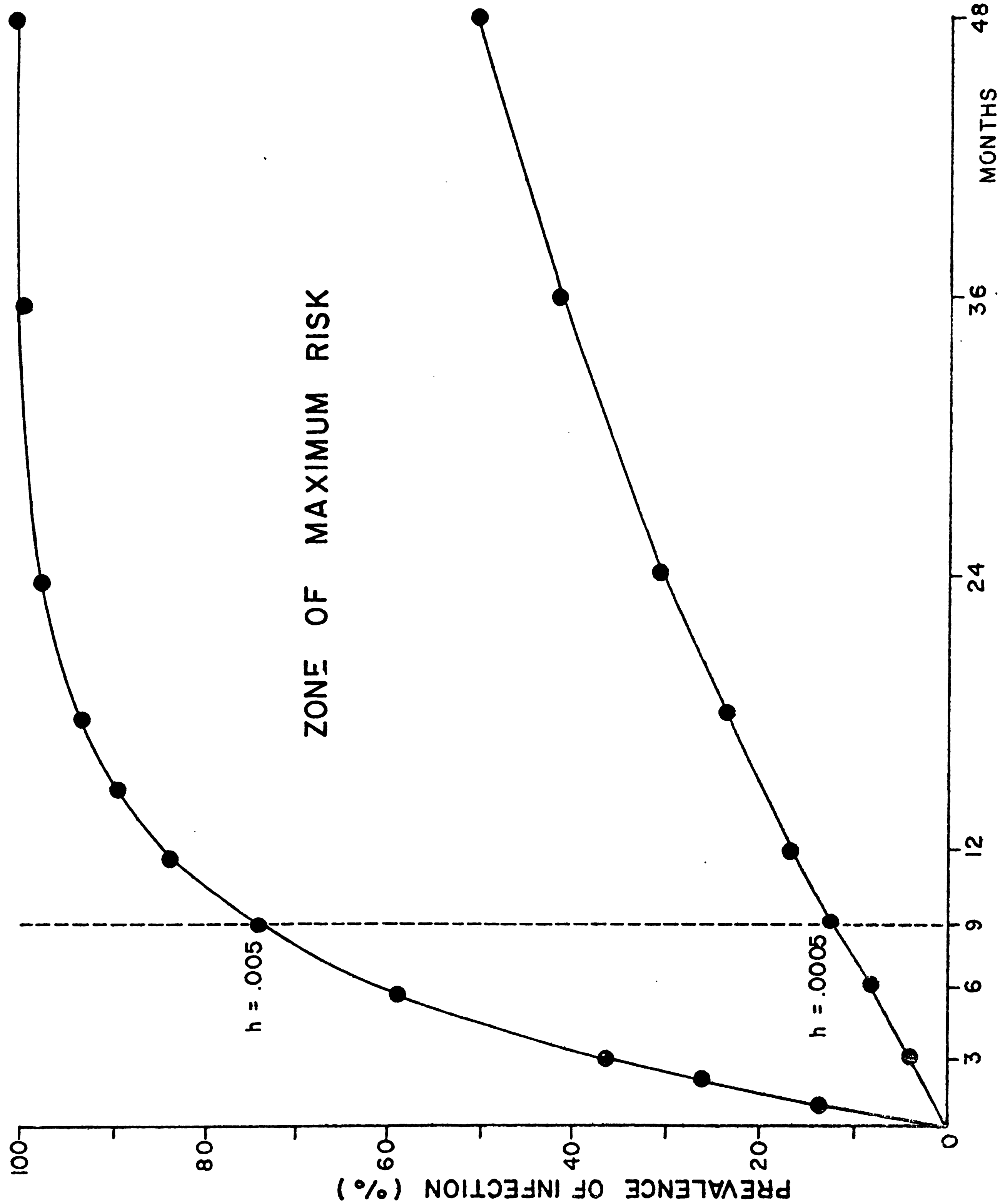
may be due to the fact that the majority of cattle are infected, and therefore immunized, before calfhood resistance disappears. Recent studies have shown that, in tick-infested areas, a high proportion of calves are also infected with *A. marginale* within the first 9 months of life without showing clinical signs and symptoms of the disease. As in the case of babesiosis, outbreaks of anaplasmosis occur much more frequently in cattle older than 9 months, suggesting that calfhood resistance plays an important role in the epidemiology of anaplasmosis.

Definition of the Risk of Anaplasmosis and Babesiosis Outbreaks. Outbreaks of "tick fever" can be caused by any one of the 3 pathologic agents, *B. bovis*, *B. bigemina*, and *A. marginale*. Before a decision can be made on the measures required to protect animals at risk, information must be obtained on the prevalence of the 3 parasites and on the incidence of disease caused by each of them. This information may be obtained in 2 ways: (1) by measuring the incidence of disease during a certain period of time or (2) by carrying out serologic tests on cattle that, at the time, may not be clinically ill.

The proportion of a herd that is susceptible to infection can be determined serologically. Serological testing can also be used to calculate the probability that experimental cattle will contract *Anaplasma* or *Babesia* infections within a given period of time. This probability is expressed as the "inoculation rate" and may be defined as "the daily probability of infection of any member of a herd during 1 day." The epidemiologic significance of the inoculation rate may be visualized in Fig 1.

Inoculation rates equal to or greater than 0.005 result in approximately 75% of the herd becoming infected by 9 months of age and almost 85% at 1 year of age. These early infections would probably provide lifelong immunity.

Fig 1. Effect of inoculation rate (h) upon serological prevalence of <u>Babesia</u> <u>bovis</u> infections over time.



Thus, only a small proportion of the herd would become infected at an age when clinically severe disease is common. Outbreaks would be unlikely.

At inoculation rates equal to or below 0.0005 outbreaks of babesiosis or anaplasmosis would be unlikely to occur because of the infrequency of infections. However, in large herds the number of clinically severe reactions may justify the use of preventive measures (immunization, tick control) on a herd basis.

The maximum risk of outbreaks is associated with inoculation rates between 0.0005 and 0.005. Under these conditions between 12% and 75% of calves become infected before 9 months of age, with a variable proportion of the remaining animals reacting thereafter. The yearly increase in new infections is high resulting in severe outbreaks of babesiosis among older animals. Disease control is easily justified under these circumstances, as is routine serological testing to identify animals which are at risk.

Inasmuch as the inoculation rate is an expression of the average daily probabilty of an animal being bitten by an infected tick, it is possible to convert this probability into the equivalent number of daily tick bites per animal. If we assume that the proportion of ticks infected with B. bovis under field conditions is on the order of 0.0005, then the number of tick bites per animal and the corresponding inoculation and infection rates at 9 months of age would be as appear in Table 1.

TABLE 1. RELATIONSHIP AMONG TICK INFESTATION, INOCULATION RATE AND INFECTION RATE IN *BOS TAURUS* CATTLE EXPOSED TO *BABESIA BOVIS*-INFECTED *BOOPHILUS MICROPLUS* TICKS[A]

Tick Bites/Animal	Inoculation Rate*	Percentage of Animals Infected by 9 Months of Age
1 per 5 days	.0001	2.7%
1 per day	.0005	12.6%
2 per day	.001	23.7%
10 per day	.005	74.1%
20 per day	.01	93.3%
100 per day	.05	100.0%

(A) Adapted from Mahoney & Ross, 1972; Mahoney, 1977.

* Assuming a tick infection rate of .0005 and successful transmission by a single infected tick bite.

Epidemiology of Anaplasmosis and Babesiosis in the Americas. Very little data exists on the prevalence of anaplasmosis and babesiosis in the Americas. Serological studies on the prevalence of babesiosis were conducted on 2 of the experimental farms belonging to the Instituto Nacional de Investigaciones Pecuarias (INIP) in Mexico. "Las Margaritas", located in Hueytemalco, Puebla, shows marked seasonal fluctuations of rainfall and temperature. The mean monthly temperature is below 20 C during 5 months of the year. Tick and babesial multiplication are hindered under these environmental conditions and only 25% of locally born and raised animals are exposed to *B. bovis* before 12 months of age. Tizimin, Yucatan is the site of another ranch where seasonal variations of rainfall and temperature occur but where the mean monthly temperature never falls befow 20 C. Approximately 50% of cattle are exposed to *B. bovis* by the time they are 12 months of age. Both ranches may be considered to reside within marginal zones of babesiosis.

A serologic survey of anaplasmosis and babesiosis in Colombian cattle suggested that regions and even ranches could be designated as enzootic or marginal based upon the age and herd incidence of complement fixing (CF) antibodies, and their relationship to tick distribution and clinical outbreaks of the diseases.

Seasonal climatic variations are sufficiently great in Uruguay to create unstable populations of *Bo. microplus*. For this reason the entire country is considered a marginal area of anaplasmosis and babesiosis. A tick eradication program was initiated in that country in 1940, directed primarily at *Bo. microplus*. Although the actual prevalence of *B. bovis*, *B. bigemina* and *A. marginale* are not known, national and international movement of the exclusively *Bos taurus* cattle has made an official vaccination program utilizing *A. centrale*, *B. bovis* and *B. bigemina* necessary. However, outbreaks among

vaccinated cattle are not uncommon, indicating that a more thorough understanding of local epidemiologic conditions and better immunization procedures are necessary. Repeated use of the same needles during foot-and-month disease vaccination campaigns has been implicated as a cause of outbreaks of anaplasmosis.

The Role of Epidemiologic Principles in the Control of Anaplasmosis and Babesiosis. Although chemotherapeutic drugs effective against anaplasmosis and babesiosis are commercially available, treatment must be initiated early in the course of these diseases to be effective. Therefore, prevention is the only practical means of disease control. Tick eradication is possible in few, if any, areas and the effect of anti-tick measures upon anaplasmosis would depend upon the relative importance of other vectors. Furthermore, haphazard tick control may convert an enzootically stable area into an unstable one, thus worsening the disease situation. If an inexpensive, safe and effective vaccine were readily available for these diseases then vaccination could be practiced on a large scale and anaplasmosis and babesiosis brought under control. Such a vaccine is not available and existing immunization schemes with live agents must be exercised with care. Therefore, epidemiologic data are necessary for safe and effective application of available control measures.

Prior to the initiation of a disease control program, government authorities should (1) determine the incidence and economic importance of anaplasmosis and babesiosis and the regional prevalence of infections, (2) conduct a comprehensive tick survey, identify vectors, and define population dynamics and (3) design a comprehensive plan which incorporates epizootiologic data and defines the means that will be used to achieve control. Serologic surveys for

babesiosis and anaplasmosis may be conducted in conjunction with serologic surveys for brucellosis, leptospirosis, vesicular stomatitis and other diseases.

Any disease control program must include legislation to enforce application of control measures and adequate funding over the long period of time that may be necessary.

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REVIEW OF IMMUNIZATION TECHNIQUES FOR ANAPLASMOSIS AND BABESIOSIS

Dr. Kenneth Kuttler
U. S. D. A.
Beltsville, Maryland
U. S. A.

Review of Immunization Techniques for Anaplasmosis and Babesiosis

Kenneth L. Kuttler

Anaplasmosis and babesiosis, caused by intraerythrocytic hemoparasites (Anaplasma marginale, Babesia bigemina, and B. bovis) and transmitted by a variety of arthropod vectors, are worldwide in their distribution and are often associated with severe cattle losses under some conditions. Generally the clinical signs, associated with the resulting hemolytic anemias characteristic of these diseases, are less severe in young animals, becoming progressively more severe in older animals. Efforts to control these infections and subsequent losses have included a number of approaches ranging from complete disease eradication to a policy of doing nothing and relying on infection to occur in calves while they are reasonably resistant, thereby conferring a high level of immunity. The use of vaccines or other methods to induce immunity are not new to either of these infections. Under proper control and use they can become effective, but often they are misused and then become associated with adverse reactions, or inadequate protection. An ideal vaccine has yet to be developed. However in recent years significant progress has been made in this area.

Anaplasmosis:

A year after Theiler discovered A. marginale in 1910 he described a mildly pathogenic Anaplasma, which he called A. centrale.[1,2] This organism was subsequently used as a vaccine to prevent death losses associated with A. marginale. Premunition or carrier infections induced using A. centrale do not confer absolute immunity against A. marginale challenge, but do induce a relatively high level of protection which is usually sufficient to prevent death or serious production losses. The serologic and immunologic similarities of A. marginale and A. centrale have been described in some detail, and are found to be very closely related.[3,4] Even today premunition with A. centrale

is practiced in Asia, Africa, Australia and in some parts of South America. The use of A. centrale in lactating dairy cows, or in cows in the last trimester of pregnancy, may produce severe reactions associated with abortion, loss of production and even possibly death if left untreated. This vaccine is more often recommended for use in young animals.

In the absence of A. centrale, fully virulent A. marginale organisms have been used to premunize calves. This technique, involving the injection of blood from a carrier cow to young animals, has in some instances been successful,[5] but is not recommended for a number of reasons. There is always the possibility of transmitting other bovine pathogens, the possibility of severe debilitating reactions even in young animals, and the maintenance and perpetuation of reservoirs of virulent A. marginale. With the discovery of tetracycline and other effective chemotherapeutic agents, it became more feasible to premunize with virulent organisms, even in older animals.[6] By monitoring the course of an induced infection, treatment can be given at the appropriate time, before packed cell volumes drop below 22-28%. Treatment under these conditions is usually effective in moderating the course of infection, but it is necessary to observe older animals very closely and treat at the right time if losses are to be prevented.

A modification of virulent premunition, involving the use of frozen stabilates, has recently been successfully used in fairly large numbers of cattle in Colombia.[7,8] This technique involves the passage of field A. marginale isolates in splenectomized calves and harvesting the blood during the acute infection when the A. marginale parasitemia is high, processing this blood with a cryoprotectant and freezing the infected cells in liquid nitrogen.[9] These infected cells remain infective for at least two years and probably much longer. The stabilate is then thawed, titrated by making serial dilutions, and injecting calves by the intravenous injection of 1 ml of various dilutions. By so doing the stabilates are

demonstrated free of other bovine pathogens, desired dilutions can be selected for use in susceptible cattle, and the incubation or prepatent period accurately predicted.[10] If thawed, diluted, and used within 20-30 minutes the prepatent period can usually be predicted within 1 or 2 days. In the case of young calves not requiring treatment this is not so important, but in older animals this is useful information, especially if the laboratory competency is not available for accurately monitoring the course of infection. The use of frozen stabilates is economical in that usually a 1:100 or 1:1000 dilution is selected. Theoretically 50,000 doses of vaccine could be produced from one liter of blood prepared into a stabilate, with a titer of 1:100. In practice this is much less, but in general the cost factor is low.

Premunition with virulent, homologous _A. marginale_ produces the highest level of protection now available against anaplasmosis.[6,11]

The use of a mild or attenuated _A. marginale_ to induce immunity has been shown effective and much safer than the fully virulent organism. Comparisons of the level of immunity produced by premunition using a mild _A. marginale_ (of U.S. origin) and that produced by _A. centrale_, followed by a challenge of virulent _A. marginale_ (of African origin), showed a greater degree of protection in those animals receiving the mild _A. marginale_.[4] The premunizing reactions of the mild _A. marginale_ and _A. centrale_ were essentially the same.

In recent years a virulent _A. marginale_ has been altered by irradiation and serial passage in sheep,[12] resulting in an isolate that produces mild reactions in cattle similar to that produced by _A. centrale_, but with immunizing properties more like _A. marginale_.[13,14] This organism has been and is being marketed in some countries of Latin America. When prepared and use properly

it is generally safe and effective as an immunizing agent. Like A. centrale it should be used with caution in lactating dairy cows and in animals in the last trimester of pregnancy. In recent field trials in Colombia the attenuated A. marginale was compared with virulent stabilates (as described) and with a supposedly mild Colombian strain in 7-11 month old Normandia calves.[10] The vaccination reactions were much less severe in animals receiving the attenuated organism. Treatment to moderate the course of infection was required in those cattle receiving the "mild Colombian" isolate, but no treatment was required in animals receiving dilute stabilate. Field challenge revealed that those animals receiving the "stabilate" or the "mild Colombian" were more solidly protected as reflected in the lower drops of packed cell volume (PCV) associated with Anaplasma challenge, but the attenuated organism was also highly protective, and no death losses occurred among any of the vaccinated groups.[11] This was in contrast to severe drops in PCV and a 17% death loss among the nonvaccinated control calves.[11]

A nonviable vaccine is marketed in the U.S., which consists of a blood base antigen combined with an oil adjuvant*.[15] This product has been successfully used in the U.S. for a number of years. It does not prevent infection but moderates the severity of infection. The repeated use of this vaccine and its use in cows late in gestation has been associated with neonatal isoerythrolysis and mortality in calves.[16] Field trials in Colombia showed that the level of immunity was well below that of premunition. This vaccine is not recommended for use in the tropics where year-round transmission occurs.[17]

Table 1 summarizes the author's experience in using various systems of anaplasmosis immunization.

* Anaplaz, Fort Dodge Laboratories, Fort Dodge, Iowa

Babesiosis (piroplasmsois):

Soon after discovering the cause of Texas fever, or redwater, the technique of Babesia premunition was found useful. Often ticks would be collected from an area known to be infected, and placed on susceptible cattle, which were then treated when they showed a febrile reaction. For years trypan blue was the only drug, and it was only effective against B. bigemina , not B. bovis. If the animal survived, and young cattle usually did, then a firm, lasting immunity occurred. Babesiosis in the Western Hemisphere is believed to be transmitted almost entirely by Boophilus ticks. A tick eradication program, conducted over a 20 year period in the U.S., was outstandingly successful in eradicating these ticks in the early 1940's. This achievement was accompanied by the complete eradication of cattle babesiosis. Tick eradication, however, is not practical in many areas of the tropical world, so the emphasis has long been on tick control, chemotherapy and vaccines.

Probably the first successfully produced and marketed babesiosis vaccines, and the ones still in use, are those developed in Australia.[18] These vaccines rely on premunition, using both B. bovis and B. bigemina organisms that have been attenuated by passage through splenectomized calves. The vaccines are distributed as fresh blood, collected from splenectomized calves showing a high parasitemia.[18,19] The Babesia premunizing dose is quantified to contain the desired number of organisms (1×10^7) in a given volume by adding normal cells to the infected ones. The vaccine must be kept cool and used within a few days.

The methods developed in Australia of serial passage of B. bovis in splenectomized calves to attenuate the organism are easily accomplished, and hence there are numerous similar vaccines being produced and used in other areas.[7] Babesia premunition, like Anaplasma, is highly effective in preventing

losses. Again these vaccines are recommended for young animals, with some caution advised in older animals. Chemotherapeutic agents (Ganaseg, Diampron, Acaprin etc.) should be available in the event they are needed in premunizing older cattle.

With the development of blood based adjuvant, nonviable Anaplasma vaccines,[15,20] considerable interest has occurred in similar products for Babesia. The size of the Babesia parasite and the antigenic mass suggest that such a vaccine would be practical. Even though there are no commercial adjuvant Babesia vaccines presently available, there has been considerable research activity, which has resulted in a number of reports of successful nonviable Babesia vaccines.

A recent trial, using B. bigemina in splenectomized calves and mature cows, resulted in excellent protection.[21] A blood based B. bigemina antigen was combined with Freund's complete adjuvant and injected twice at a 3 or 4 week interval, which produced a high level of protection in both groups of cattle when challenged 33-67 days after vaccination with fully virulent infected blood.

The recent in vitro cultivation of B. bovis on erythrocyte cultures has led to antigen collection and purification with subsequent vaccine production.[22,23] A recent trial has been completed by the author at Beltsville in which a B. bovis vaccine, consisting of a surface coat soluble antigen prepared from blood cultures, combined with a saponin adjuvant was used. This vaccine was provided to us by Drs. Levy and Ristic (University of Illinois), and was used in three adult Holstein cows, and 8 yearling Aberdeen Angus, unbred, heifers. These animals were given 1 ml of the vaccine subcutaneously twice at a three week interval and challenged approximately four weeks after the last vaccination by inoculating 1×10^8 B. bovis organisms intramuscularly. Three nonvaccinated adult Holstein cows, two adult Holstein cows previously premunized with an

attenuated *B. bovis* vaccine (as previously described), and eight nonvaccinated Aberdeen Angus heifers of comparable weight and age, were similarly challenged by inoculating 1 x 10^8 *B. bovis* intramuscularly. The results are presented in Figures 1-4 and Tables 2 and 3. A marked and significant level of immunity was detected in both the adult cows and the yearling heifers. All vaccinated animals reacted to challenge, showing parasitemia, fever, and drop in PCV. As measured by several parameters (see tables and figures), these reactions were significantly less severe in vaccinated cattle. Animals having been previously premunized (six months before challenge) were solidly immune and showed no diagnostic signs of challenge infection. As with anaplasmosis, this once again confirms that the premunizing vaccines will produce a higher level of immunity. The nonviable vaccines, however, have the distinct advantage of being more safely used with practically no chance for adverse reactions, and the possible need to resort to chemotherapy. If the level of immunity, as measured in these trials, is persistent for a sufficient period the nonviable vaccine could well be practical for future use.

There is a critical need for safe, effective immunizing agents for anaplasmosis and babesiosis. Presently the livestock producers do not have an available product that will accomplish the required goal, but recent research has shown a number of viable options, and hopefully as future field studies confirm the present favorable evidence of vaccine efficacy these agents will become more readily available to prevent livestock losses from these hemoparasitic diseases.

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TABLE 1

SYSTEMS OF ANAPLASMOSIS IMMUNIZATION

Method	Calves < 8 mo.	8 mo. to 2 years	Cattle > 2 yrs.	Relative efficacy
Virulent field *A. marginale*	Safe N.R.	Not safe N.R.	Not safe N.R.	++++
Virulent field *A. marginale* with therapy	Safe N.R.	Safe N.R.	Not safe N.R.	++++
Dilute stabilate	Safe R.	Safe N.R.	Not Safe N.R.	++++
Dilute stabilate with therapy	Safe R.	Safe R.	Safe R.	++++
Attenuated *A. marginale*	Safe N.R.**	Safe R.	Safe R.*	+++
Anaplasma centrale	Safe R.	Safe R.	Safe R.*	++
Killed vaccine	Safe N.R.	Safe N.R.	Safe N.R.	+

* Not recommended for lactating dairy cattle

** The mildness of this organism is such that a satisfactory replicating infection is not always produced in calves of this age.

R. Recommended for use in the tropics

N.R. Not recommended for use in the tropics

++++ Maximum protection against needle and field challenge

+++ Solid protection against needle challenge - variable response against some field challenges

++ Partial protection against both needle and field challenge. Prevents death losses by either challenge.

\+ Partial protection against needle challenge, and questionable protection against field challenge as tested in Colombia. Has a short acting immune response which limits its effectiveness in areas of year-round vector problems.

Table 2

Response of Vaccinated and Nonvaccinated Heifers to a Challenge with 1×10^8 *Babesia bovis* Organisms

	Weight gains (Kg) (1)	Avg. Pre-Challenge PCV %	PC - Low PCV %	PC - Percent Reduction in PCV %	PC - Low Hemoglobin gms/100ml	Duration of Anemia (2) Days	Day of 1st Parasitemia PC	Persistence of Parasitemia (3) Days	Avg. Max. Temp. C	Deaths
Group I	7.1	41 ± 2.0	24 ± 4.1	41 ± 9.7	8.7 ± 1.6	3.0	8 ± 2.5	3.5 ± 1.3	41.0	0
Group II	-0.77	42 ± 3.1	14 ± 4.0	66 ± 8.4	5.4 ± 1.8	10.3	6 ± 0.9	5.7 ± 1.2	41.4	2
Significance		NS	P < 0.01	P < 0.01	P < 0.01	P < 0.01	NS	P < 0.01	NS	
Group III	17.0	41 ± 4.5	38 ± 4.7	7.5 ± 3.0	14.1 ± 1.3	NA	NA	NA	39.7	0
Significance	NS	NS	P < 0.01	P < 0.01	P < 0.01				P < 0.01 DRS=0.70	

Group I : Challenged vaccinates (8 Aberdeen Angus heifers)
Group II : Challenged nonvaccinated controls (8 Aberdeen Angus heifers)
Group III: Non-challenged nonvaccinated controls (4 Aberdeen Angus heifers)
(1) Weight gains calculated for a 26 day period, the last 14 days of which were after challenge
(2) Number of days PC that PCV were 60% or less of normal pre-challenge values
(3) Number of days on which *B. bovis* parasitemias were detected
PC Post-challenge
± Standard deviation
NA Not applicable
DRS Difference required for significance

Table 3

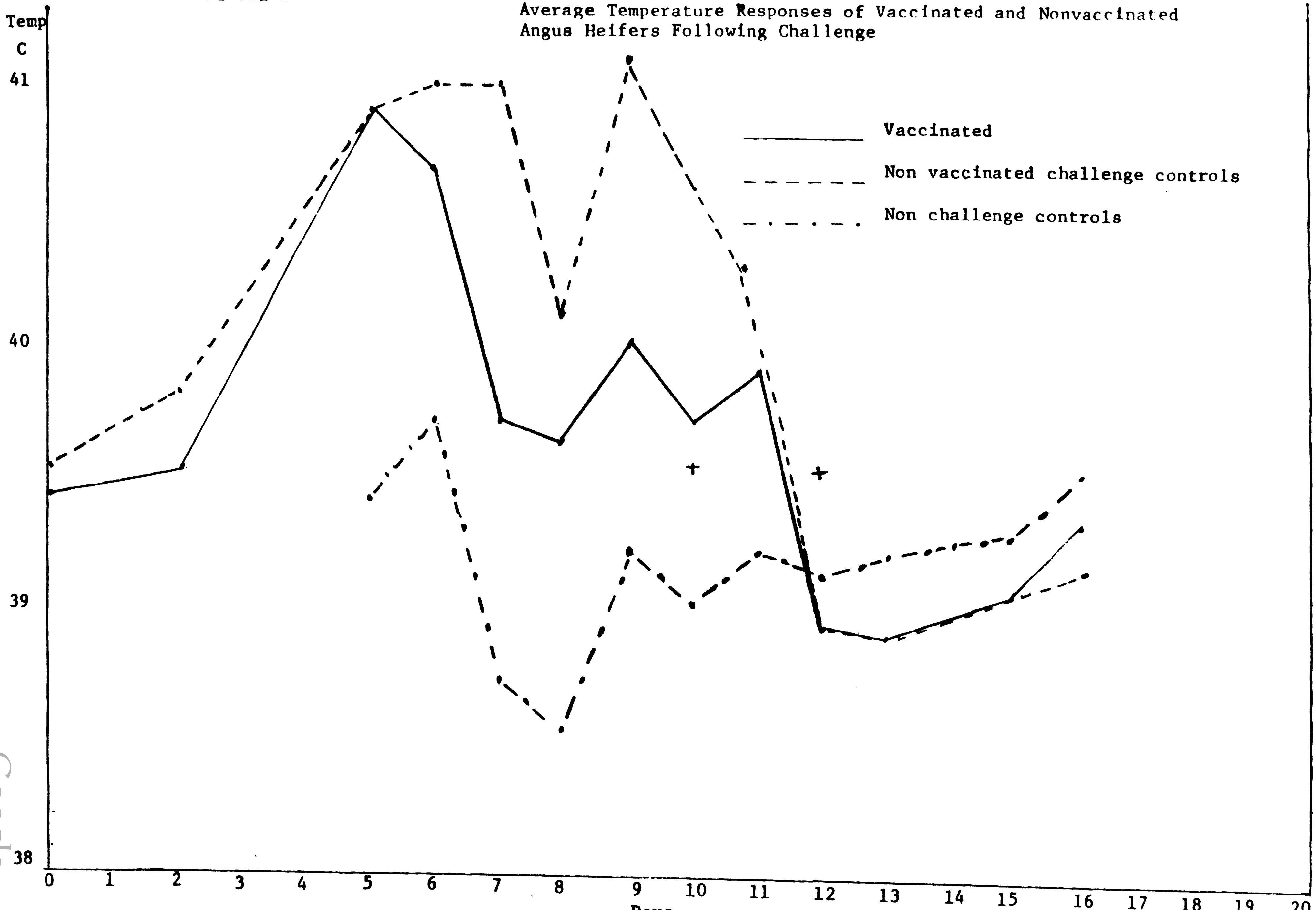
Response of Vaccinated and nonvaccinated Adult Cattle to a Challenge with 1×10^8 Babesia bovis Organisms

	No. of Animals	Avg. Pre-Test PCV %	PC - Low in PCV %	PC % Drop in PCV %	Duration of Anemia (da)[1]	Day of 1st Parasitemia PC	Avg. Max. Temp. C	Duration of Febrile Reaction (da)[2]	Deaths
Group IV	3	38 ± 3.5	23 ± 4.0	41 ± 7.5	3.7 ± 4.7	10 ± 1.5	40.1 ± 0.52	5.0 ± 3.0	0
Group V	3	36 ± 3.6	18 ± 5.5	51 ± 10.5	7.3 ± 4.7	10 ± 1.2	40.6 ± 0.30	7.0 ± 2.6	2
Group VI	2	34	30	14.4	0	0	39.2 0	0	0

Group IV: Three Holstein Cows challenged 27 days after vaccination
Group V : Three control, nonvaccinated cows challenged on the same date as group IV
Group VI: Two Holstein Cows challenged 197 days after premunition with an attenuated B. bovis
PC Post challenge
1 Number of days PC that PCV values were 60% or less of normal values
2 Number of days PC that animal temperatures were 1 degree above the normal determined for each animal prior to challenge
± Standard deviation

FIGURE 1

Average Temperature Responses of Vaccinated and Nonvaccinated Angus Heifers Following Challenge

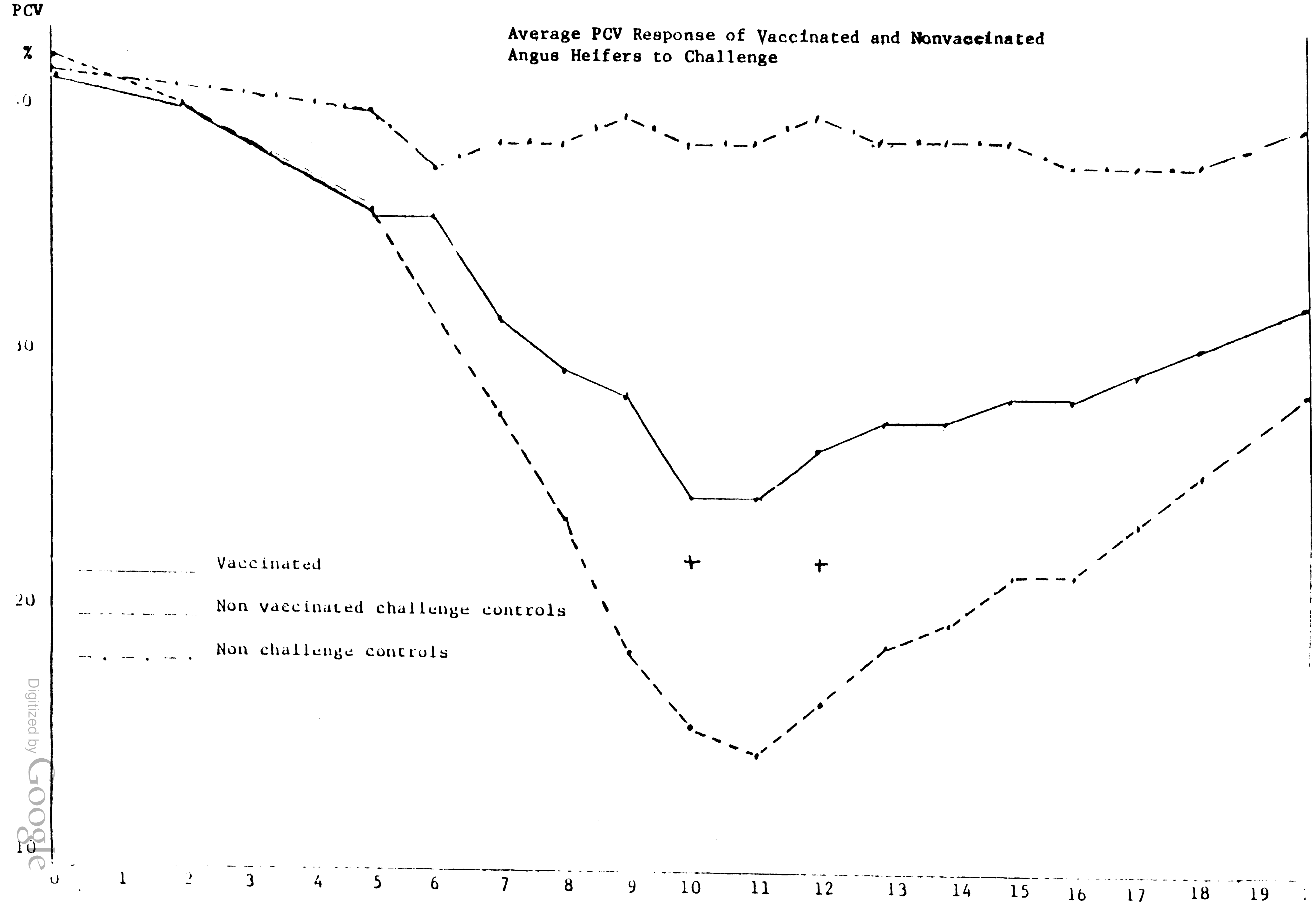


Day of challenge = Day 0

Challenge = 1 x 10^8 <u>B. bovis</u> organisms intramuscular

+Deaths among the nonvaccinated controls

Average PCV Response of Vaccinated and Nonvaccinated Angus Heifers to Challenge

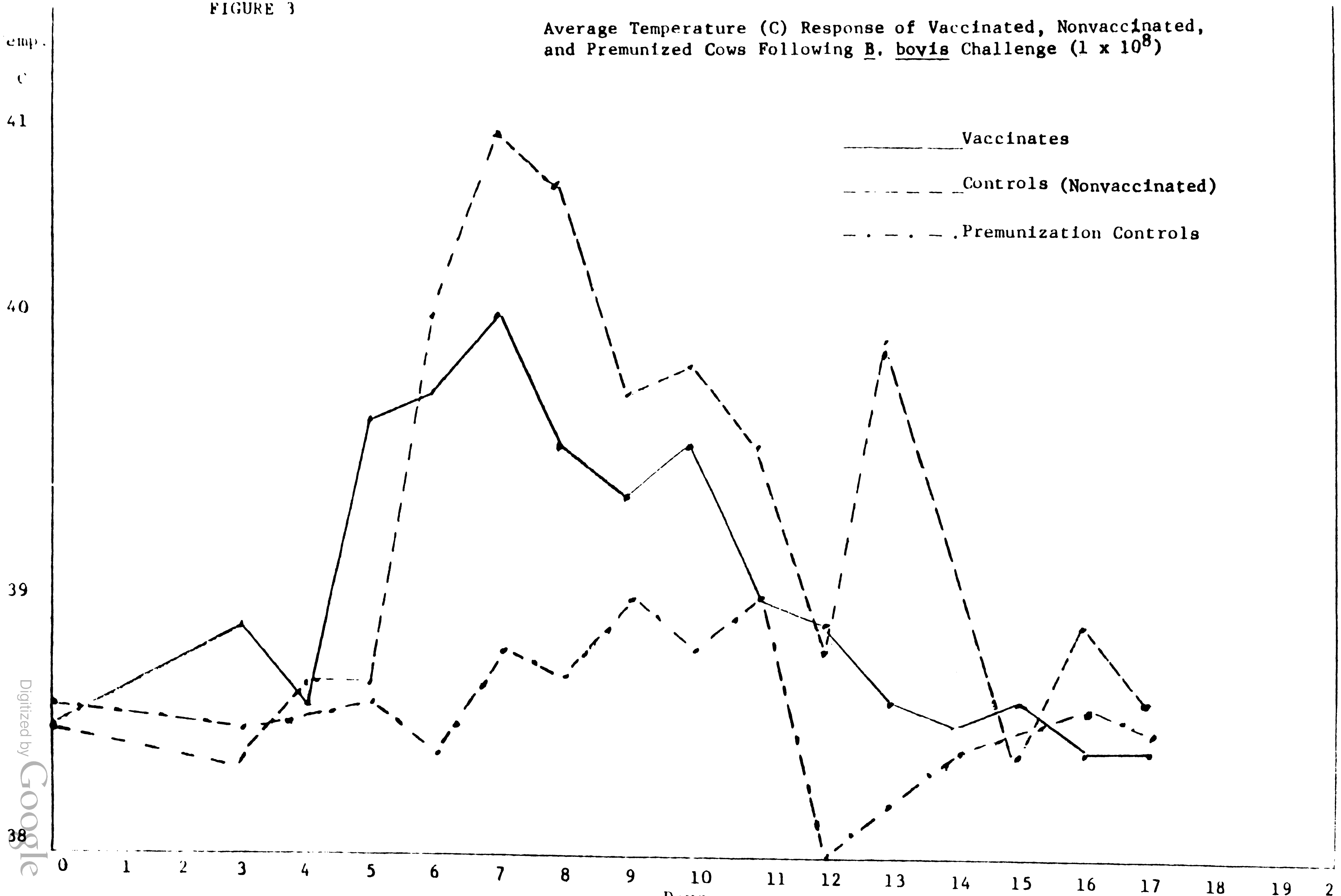


Day of challenge = Day 0
+ Deaths among the non-vaccinated controls

Challenge - 1 x 10^8 B. bovis organisms intramuscular

FIGURE 3

Average Temperature (C) Response of Vaccinated, Nonvaccinated, and Premunized Cows Following B. bovis Challenge (1×10^8)



Day of challenge - Day 0

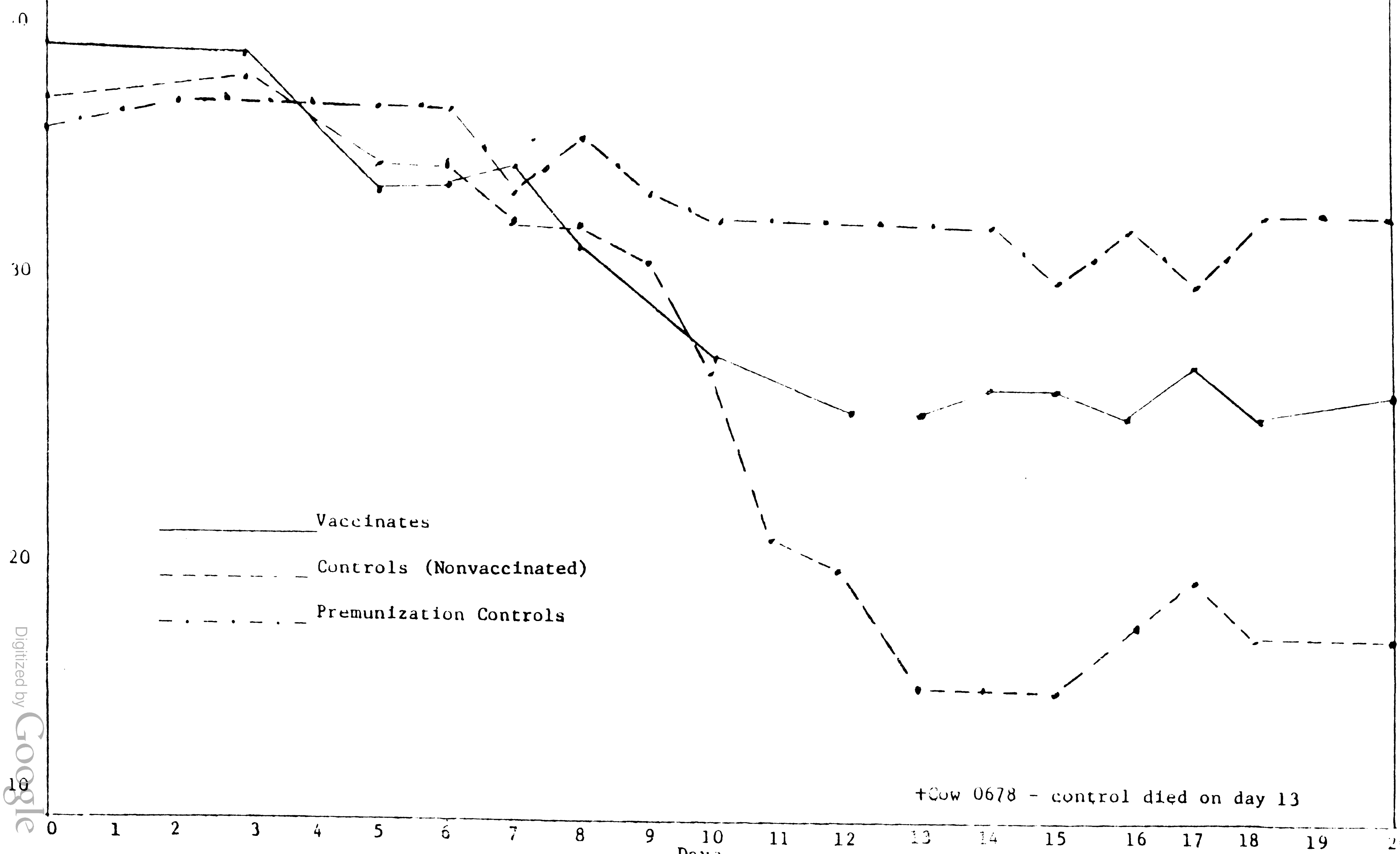
Challenge = 1×10^8 B. bovis intramuscular

\+ Cow 0678 - Control died on day 13

\+ Cow 3078 - Control died on day 28

FIGURE 4

Average PCV Response of Vaccinated Nonvaccinated, and Premunized Cows Following *B. bovis* Challenge (1×10^8)



Day of challenge = day 0

Challenge = 1×10^8 *B. bovis* organisms intramuscular

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

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ESTUDIO ANTIGENICO E INMUNOGENICO DEL ANTIGENO SOLUBLE DE *BABESIA BOVIS* EN MEXICO

Dr. Miguel Osorno
Proyecto Investigación Babesiasis
Instituto de Investigaciones
Pecuarias
Palo Alto, México

ESTUDIO ANTIGENICO E INMUNOGENICO DEL ANTIGENO SOLUBLE DE *BABESIA BOVIS* EN MEXICO

La inmunidad en la babesiosis ha sido frecuentemente asociada con el principio de la inmunidad-infección, indicando que la formación de una inmunidad sólida depende de la presencia del organismo babesial en la sangre del animal infectado. Esta persistencia indica el estado de infección crónica que normalmente dura varios meses o años dependiendo de la frecuencia de las reinoculaciones.

Se han estudiado algunos métodos para prevenir la babesiosis en condiciones de campo y de laboratorio. Los productos utilizados han sido vacunas inactivadas y atenuadas. Las vacunas inactivadas son hechas a partir de sangre infectada conteniendo antígenos corpusculares y solubles, que han sufrido algún proceso de purificación por parte de los investigadores. Estas vacunas son congeladas y más tarde utilizadas mezclándolas con algún tipo de adyuvante para estimular una mayor respuesta inmunológica. Algunas de estas vacunas han sido probadas en Australia en donde se ha indicado que éstos productos inducen cierta resistencia a la babesiosis con desafíos homólogos. En este tipo de vacunas se recomienda la revacunación de los animales susceptibles por lo menos dos veces al año. Las vacunas inactivadas tienen el inconveniente de inducir la isoeritrolisis de los recién nacidos, además de la baja protección que confieren. En el caso de las vacunas vivas los animales reciben sangre conteniendo el organismo virulento, mismo que se reproducirá rápidamente en los animales susceptibles, induciendo la presentación de babesiosis aguda con índice de mortalidad superiores al 60%.

Otro sistema de vacunación es el de atenuar la patogenicidad al irradiar la sangre infectada , en este caso dosis muy pequeñas pueden no afectar el organismo y dosis muy altas lo inactivan completamente. Esta práctica de irradiación de sangre infectada tampoco ha ofrecido los resultados esperados, ya que solo protege eficientemente a los animales vacunados cuando se desafían con cepas homólogas, además la irradiación necesaria para atenuar las cepas de trabajo variará en relación a la virulencia de la cepa. Existe otro tipo de vacuna viva denominada atenuada en donde la cepa de

B. bovis ha sido modificada por medio de pases rápidos de sangre completa infectada en becerros esplenectomizados, esta vacuna atenuada ha ofrecido buenos resultados en la exposición con cepas patógenas sin embargo, tiene el gran problema que los animales vacunados actúan como reservorios de la cepa patógena de B. bovis misma que al ser transmitida por artrópodos o por inoculación a otro animal susceptible, la enfermedad se desarrolla en forma clínica. Esto nos indica que el agente inmunizante no es una mutante estable.

Estas vacunas vivas presentan el problema potencial de transmitir otras enfermedades tales como: leucosis bovina, anaplasmosis, etc., además, promueve la diseminación de cepas de B. bovis en las distintas áreas de un país.

ESTUDIO DEL ANTIGENO SOLUBLE DE BABESIA BOVIS EN LA PREVENCION DE LA BABESIOSIS.

Recientemente se ha desarrollado un sistema de cultivo in vitro que ha resultado exitoso. Este sistema fue iniciado en México en el I.N.I.P., en el año de 1976 por los grupos de investigadores de la Universidad de Illinois y del Instituto Nacional de Investigaciones Pecuarias.

El sistema original consistió en cultivar la babesia por el método de movimiento contínuo, este ha sido modificado en 1979 en la Universidad de Illinois manteniendo los eritrocitos infectados en cultivo estático en donde se ha encontrado que se obtiene una mayor producción de antígeno soluble.

CULTIVO:

De un animal esplenectomizado e infectado con B. bovis se obtiene sangre completa cuando esta muestra una parasitemia de 0.1% a 0.2%, esta sangre se desfibrina y se centrifuga a 400 xg durante 20 minutos a 4°C. Los eritrocitos infectados se suspenden en medio 199 a una dilución final de 9.1% agregando a esta solución 40% de suero bovino, penicilina, estreptomicina y HEPES para prevenir contaminaciones y estabilizar el pH. Estos cultivos son incubados a 37°C en una atmósfera de 5% de CO_2. Cada 24 horas se cambia el medio de cultivo y se ajusta el pH. El sobrenadante de este cultivo se le denomina antígeno soluble de B. bovis. Este antígeno antes de ser utilizado es filtrado por una membrana de 0.45 mm. y más tarde liofilizado.

A fin de estudiar la respuesta antigénica e inmunogénica se establecieron las pruebas de: indirecta de anticuerpos fluorescentes (IAF) y la de Hemoaglutinación indirecta (HI).

A.- Análisis del antígeno soluble por medio de cromotografía en gel y Electróforesis.

1.- El antígeno completo se filtró en Sephadex G-15, G-25, G-50 y G-75. Cada uno de estos geles produjo 2 fracciones detectables por medio del espectrofotémetro, cuando se usó Sephadex G-100 se obtuvieron 3 fracciones y con Sephadex G-150 y G-200 se obtuvieron 4 fracciones.

2.- Electroforesis en Cellogel.- Cuando el antígeno soluble fue comparado con antígeno obtenido de cultivos normales y con el suero normal de bovino no se observó ninguna diferencia en las bandas de migración obtenidas, cada uno de los antígenos produjo 4 bandas. Cuando se estudiaron las fracciones obtenidas del antígeno infectado y separado en una columna de Sephadex G-200 se determinó que las fracciones I, II y III producen 2 bandas de migración mientras que la fracción IV sólo se observó una. El peso molecular de la fracción I se determinó por cromatografía en gel utilizando Sephadex G-25. El resultado de èste estudio nos indica que la fracción I (la única antigénica e inmunogénica del antígeno completo), tuvo un peso molecular de 1,000,000 de daltons.

B.- Estudios Antigénicos:

1.- Termoestabilidad.- El antígeno completo se mantiene activo en la prueba de hemoaglutinación indirecta después de haber sido expuesto a las temperaturas de 37°C, 50°C, 65°C y 97°C (punto de ebullición del agua en la ciudad de México) durante 30 minutos.

2.- Sensibilidad enzimática.- El antígeno fue tratado con las siguientes enzimas: alfaamilasa, lipasa, papaina, pepsina y tripsina. Estas enzimas se utilizaron a una concentración de 1 y 2 mg por cada 100 mg de antígeno. En la prueba de HI la concentración de 1:100 no afectó actividad de antígeno, mientras que la concentración 2:100 las enzimas lipasa y amilasa, destruyeron totalmente la actividad antigénica.

3.- Estabilidad a 2-mercato-etanol. El tratamiento del antígeno completo con 0.1 M, 2-ME a 37°C. durante 30 minutos destruyen la antigenicidad del antígeno en la prueba HI.

C.- Inmunogenicidad del antígeno completo:

1.- El antígeno completo no se afectó cuando se expuso a las temperaturas mencionadas (B-1), ya que los animales inoculados con los antígenos tratados produjeron niveles de anticuerpos similares al grupo testigo que recibió antígenos no tratados.

2.- Sensibilidad enzimática: El grupo de animales que recibió el antígeno con alfa amilasa no produjo respuesta humoral mientras que el resto de los antígenos tratados con las otras enzimas (pepsina, tripsina, papaina, y lipasa) no afectaron el antígeno ya que se detectaron títulos de anticuerpos en contra de la babesiosis. La concentración de 1 mg. de enzima por 100 de antígeno fue la utilizada en estos trabajos.

D.- Inmunogenicidad de las fracciones antigénicas:

Con las cuatro fracciones obtenidas del antígeno soluble completo de *B. bovis* se estudiaron sus características inmunogénicas inoculando bovinos. Como resultado de este estudio se determinó que la fracción I induce a una respuesta humoral. Esta respuesta fue evidente a las tres semanas de la inoculación.

E.- Estudio anamnésico del antígeno completo:

El antígeno soluble es diluido en agua destilada y mezclado con saponina como adyuvante. La inoculación es por vía subcutánea utilizando 0.333 mg. de antígeno crudo y liofilizado por dosis. Para este estudio se inocularon 30 bovinos Hereford adultos. Se administró una revacunación a los 21 días posteriores a la primera inoculación. Se realizaron muestreos serológicos para la determinación de anticuerpos por medio de la prueba de IAF mensualmente. Se determinó el peso individual de los animales cada 28 días, así como se establecieron los valores hematológicos. Como su resultado se encontró que la respuesta humoral se inició durante el 1er. mes después de la inoculación desapareciendo entre el quinto y sexto meses post-inoculación. Se

seleccionó un grupo de animales inoculados que resultaron negativas a las pruebas serológicas al sexto mes post-inoculación. Este grupo al ser revacunado produjo una respuesta anamnésica muy rápida alcanzando títulos de 1: 40,000 en menos de 15 días.

F.- Prueba inmunogénica del antígeno completo al desafío natural:

Se seleccionaron 50 animales los que se dividieron en 5 grupos de 10 animales cada uno. Estos animales son de la raza Hereford de 14 a 16 meses de edad y se localizaban en la región limpia de garrapatas en el Estado de Coahuila.

El grupo I recibió solamente el antígeno crudo de B. bovis. El grupo 2 recibió el antígeno crudo de B. bovis, y la vacuna de Anaplasma marginales. El tercer grupo sólo recibió la vacuna de Anaplasma marginale. El cuarto grupo actuó como testigo sin vacunaciones. 45 días después de que los grupos 1, 2 y 3 fueron vacunados el quinto grupo recibió la vacunación doble (igual que el grupo 2); esta vacunación coincidió con el traslado de los 50 animales a la zona del desafío natural en Soto la Marina, Tamaulipas. Esta zona está identificada como endémica a la anaplasmosis y babesiosis en la República Mexicana. Cuaranta y cinco días después de la introducción de los animales experimentales a la región endémica se observaron los primeros signos de babesiosis en varios animales. La presencia de un brote de babesiosis en los animales experimentales fue observado durante las siguientes cuatro semanas. El examen de los frotis sanguíneos de los animales infectados y de las hemolinfas de las garrapatas colectadas revelaron la presencia de B. bovis. Todos los animales del grupo testigo mostraron signos y síntomas de la babesiosis. Un promedio de 4 Kg. de peso corporal se perdió en comparación con el peso registrado el mes anterior a la presentación del brote. Al finalizar la cuarta semana del brote 6 animales testigos habían muerto. A la necropsia se encontró hemoglobinuria y cantidades masivas de eritrocitos parasitados en los capilares del cerebro. Ocho de los diez animales que sólo recibieron la vacuna de anaplasmosis desarrollaron signos clínicos agudos de babesiosis, y dos de estos animales murieron. El resto de los animales que enfermaron fueron tratados para evitar la posibilidad de más muertes innecesarias.

Los grupos menos afectados durante el brote fueron el grupo I que recibió la vacuna de B. bovis tiempo antes de la introducción a la zona endémica, el grupo 2 que recibió la vacunación doble antes de la exposición y el grupo 5 que recibió ambas vacunaciones al momento del arribo a la zona endémica.

Se observó la reducción del hematocrito, fiebre y parasitemia en los tres últimos grupos descritos, sin embargo, estas presentaciones no afectaron en gran medida el consumo de alimentos ya que los animales continuaron incrementando su peso.

A la terminación del brote se observó una gran diferencia entre los pesos corporales de los animales de los grupos 1, 2 y 5 vacunados con B. bovis y los grupos 3 y 4 que no la recibieron.

Todos los animales experimentales mostraron respuesta inmunológica al desafío natural demostrando incremento de anticuerpos en la prueba de IAF. Estos títulos se incrementaron en forma considerablemente mayor entre los animales previamente vacunados que en los no vacunados. El promedio de la respuesta de anticuerpos en los animales vacunados 30 días después del desafío fue de 1: 10,240 mientras que los títulos de los no vacunados fue de 1:1280.

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS
II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

Agenda Item No. 2 (2.4)

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IMMUNIZATION AGAINST BOVINE BABESIOSIS

Dr. Andrew Carson
College of Veterinary Medicine
University of Missouri
Columbia, Missouri
U. S. A.

Immunization Against Bovine Babesiosis

C. A. Carson

I. Historical Summary

II. Available Control Measures

A. Vector control

B. Vaccines
1. Live Immunogens
2. Inactivation by Irradiation
3. Soluble or Particulate Antigen

c. Use of Various Adjuvants

III. Efficacy of Vaccination

A. Prevalence of Infection

B. Classes of Cattle Requiring Protection
1. Young cattle in enzootic zones
2. Susceptible cattle moved from free areas to enzootic zones
3. Cattle moved between areas where there are strain differences

IV. Projections and Recommendations

I. Historical Summary - Early observations indicated that cattle were immune to challenge after having had clinical babesiosis. It was widely known that cattle became "carriers" after initial infection and believed that immunity persisted as long as the host continued to harbor the agent. Deliberate injection of blood from recovered animals into young animals (premunization) was used as a way of insuring early exposure at a time of relative resistance. This procedure is not without risk, however, since the inoculum may induce clinical babesiosis and the chance of spreading contaminant or extraneous organisms (e.g. *Anaplasma marginale* and bovine leukosis virus) is real. Variability of donor blood with respect to virulence of organisms, number of parasites present, and differences in prepatent period complicate the procedure.

Rapid passage of virulent *Babesia bovis* (*B. argentina*) in splenectomized calves has been noted to select for avirulent parasites.[1] Parasitemias become higher and virulence for non-splenectomized cattle decreases. After several years of passaging the organisms are apparently no longer transmissible by tick vectors. Since no change in immunogenicity occurs this method has been used for vaccine production in various countries throughout the world.

Vaccines used widely in Australia, South Africa and in some Central and South American countries sometimes produce severe reactions, requiring chemotherapy, and some animals fail to become immune.[2] In one protocol a standard dose of 10^7 parasites is administered. The vaccine is chilled to $4^{\circ}C$. on collection from donors and stored up to 1 week. To overcome the death of infected parasites during storage the proportion of infected blood in each dose is increased by a factor

of 1.5 per day.

II. Available Control Measures

A. Vector control - This procedure will undoubtedly be addressed by other speakers. It is appropriate to emphasize, however, that an ambitious campaign to control ticks can be an effective means of disease prevention. Such a program tends to establish a highly susceptible population of animals which have very little resistance to babesiosis and are fully dependent on perpetuation of this artificial barrier against infection.[3] Therefore, the value of maintaining a low level of tick vectors in the environment, to insure enzootic stability, has been introduced.[4] A combination of vaccination and vector control may be advisable in some instances.

B. Vaccines - An immunogen useful in establishing protection against challenge must a) immunize without producing a severe disease, b) elicit a protective response which lasts as long as the situation requires - depending on time until challenge and c) initiate a level of protection adequate to withstand the demands of vector infestation. Time to exposure varies widely depending on the conditions of challenge and relates for example to cattle in an area of instability or movement of animals from a "free" area to an enzootic zone.

1. Live immunogens - The following are examples: Vermicules - prepared by isolating babesia parasites from infected ticks[7]. This parasite is immunogenic but noninfectious. Results have not proven that this method produces adequate protection against laboratory challenge.
   Avirulent organisms - selected by rapid passage in splenectomized calves produce an acceptable degree of protection against field challenge. Methods used, however, present problems with respect to possible pathogenic contaminants.
2. Inactivation by irradiation - The following are examples:
   Sporozoite vaccines - patterned after work done with Plasmodial organisms.[5,6]

Blood phase vaccines - Animals have been partially protected against homologous challenge by immunization with irradiated B. bigemina[8], B. bovis[9,10], and B. rodhaini[11]. Irradiated B. rodhaini infected erythrocytes were much more effective immunogens than an equivalent number of parasites killed by exposure to beta propriolactone (BPL). If the irradiated parasite is metabolizing but non-dividing it could provide a greater antigenic stimulus than that produced by a dead parasite. This could be due to the gradual release of metabolic products from the irradiated parasite or less destruction of parasite antigens compared to the effect of BPL.

A preliminary experiment with B. major in splenectomized calves indicated that irradiation of parasitized erythrocytes at doses of approximately 30 krads may result in attenuation of parasites without loss of immunogenic properties[2]. Exposure of cattle to similarly irradiated erythrocytes infected with B. divergens resulted in mild reactions with substantial protection against clinical disease resulting from field challenge.

3. Soluble or particulate antigens - Partial protection has been produced in splenectomized calves immunized with plasma from calves infected with B. bovis[12]. Soluble antigens[13,14] from the surface coat of merozoites have been prepared from in vitro cultured[15] B. bovis parasites. The procedure is similar to that described using Plasmodial organisms in which the surface coat contains protective immunogens[16]. Preliminary results using a fraction of the surface coat from B. bovis merozoites indicate that protection is afforded against homologous challenge[17]

C. Use of Various Adjuvants - Soluble antigens of B. bovis have been used as immunogenic material mixed with saponin[17]. Preliminary results obtained by two injections of vaccine followed by homologous needle challenge after approximately 30 days have produced promising results. Cattle have also been immunized with a killed antigen derived from erythrocytes infected with B. bovis mixed with Freund's complete adjuvant[18]. Challenge with a heterologous B. bovis isolate indicated that a level of immunity had been established.

III. Efficacy of Vaccination

A. Prevalence of Infection - The value of initiating vaccination programs in many areas endemic for anaplasmosis and babesiosis is unknown. It is recognized that young animals are naturally exposed to virulent field strains early in life and become immune carriers. The number of calves that succumb after initial exposure or survive as marginally productive animals is also poorly defined although isolated studies give clues to the answers.

A study done in the Llanos Plains of Colombia[19] showed that nearly 42% of serum samples from calves between 1 and 3 months of age reacted positively in the complement fixation test for B. bigemina while 65% of samples from calves between 4 and 6 months of age were positive. In the North Coast of Colombia the mean age of initial infection of calves with B. bigemina was 11 weeks (range from 2 to 34 weeks). In the Cauca Valley of Colombia 94% of all cattle more than 24 months of age were positive in the CF test for B. bigemina. Since the CF test may become negative 4 months after exposure a large percentage of older cattle could be undetected carriers.

There is more to be learned about strain differences, antigenic variation between isolates, and the nature of protection against heterologous challenge. One prime example involves the relationships between two strains of *B. bovis* isolated from widely separated areas of Australia. It was observed that there was no cross-protection afforded by passive transfer tests but infection with one strain conferred active protection against the other[20].

B. Classes of cattle requiring protection - Due to wide variation in animals, regional conditions, virulence and strain of organisms, and fluctuation in vector numbers, prophylactic methods may vary. However, the following situations would generally require the initiation of some method of disease control.

1. Young cattle - In enzootic zones it is not well resolved whether young cattle should be vaccinated at an early age. Conditions that may affect the need for prophylaxis are related to vector numbers and enzootic stability, relative virulence of the field strains of Babesia and passive immunity transferred by the dam.
2. Susceptible cattle moved from free areas to enzootic zones - Highly susceptible cattle which are transported from countries free of babesiosis are placed in a position of maximum stress as they enter a tropical zone where babesiosis is enzootic. Especially in the initial period of exposure to high temperature, humidity, and dietary change, hemotropic disease can be devastating.
3. Cattle moved between areas where there are strain differences - During the process of grazing or marketing, cattle may be moved to high risk areas. The new environment may have a variant strain of *Babesia* or a different *Babesia* species to which the transported cattle are not immune. The stress

of shipment is also a factor that can cause recrudescence of disease.

IV. Projections and Recommendations - Recent progress in immunization procedures to protect cattle against bovine babesiosis has provided cause for significant optimism. The development of *in vitro* systems for growth of *B. bovis* in erythrocyte culture now offers a nearly limitless source of both live and killed immunogens produced under controlled conditions without extraneous contaminants.

Separation of individual parasite derived immunogens and use with adjuvants is definitely a promising area. The culture systems could also become useful in the search for avirulent or attenuated organisms necessary for producing a live vaccine.

There may never be a single product with all-inclusive capability. Variation in strains and the existance of more than one important *Babesia* species may dictate the need for multivalent vaccines or use of more than one product. Provided that vaccinated cattle are challenged after a short post-vaccination period, killed preparations may prove entirely acceptable. Variation in natural resistance between cattle indigenous to enzootic areas and exotic breeds originating from babesia free zones may also become important factors to be considered in selecting an immunogen of choice. Ultimately a cost/benefit analysis must be done to determine the feasibility of vaccination.

Many practical questions remain unanswered. We are not certain of the optimal age at which calves should be vaccinated under enzootic conditions. Early vaccination may be advisable since an initial level of vaccine-induced immunity may preclude the cyclic recrudescence of *Babesia* parasitemia commonly precipitated by stress or variation of vector

populations.

In summary it appears that we are entering a period of fruitful research. We must not lose sight of the fact that requirements may vary from case to case or country to country. Ultimately all of the data will be compiled and only careful analysis will elucidate the total nature of problems and solutions.

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INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

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San Jose, Costa Rica, 8-12 September, 1980

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DRAFT FEASIBILITY STUDY FOR TICK CONTROL

Compiled by:
Dr. Freddy Ramírez
Ministry of Agriculture
and Livestock
Animal Health Office
San José, Costa Rica

EPIDEMIOLOGICAL AND FEASIBILITY STUDIES FOR TICK CONTROL IN COSTA RICA

1. DESCRIPTION OF THE AREA

Ecological zones:

The total land surface area of Costa Rica is 51,260 km^2, measuring approximately 100 km. wide and 500 km. long. It is a part of the Central American Isthmus and is located between 8° and 11° latitude north of the Equator. It is bordered by the Pacific Ocean on the West, the Atlantic Ocean on the East, Nicaragua on the North, and Panama on the South.

The mountain range crossing central Costa Rica from North to South forms three physical regions: the Pacific Seaboard, the Central Plateau, and the Atlantic Seaboard. By ecological zones (traditionally classified as tropical, subtropical, temperate, and cool), the area measures: tropical, 36,370 km^2; subtropical, 9,810 km^2; and temperate, 5,080 km^2. There is no cool zone.

The three phisical regions are characterized by the following ecological macrozones:

(a) Central and Southern Pacific Zone: This area is tropical-humid, with flat relief, and with altitudes of 0 to 500 meters above sea level. The temperature is over 24°C., and precipitation ranges from 2,500 to 3,500 mm/year, with an average of three dry months per year and a relative humidity of 81%.

(b) Northwestern Pacific Zone: This is a dry tropical area of primarily flat relief. Temperatures range from 24°C. to 30°C., with precipitation from 1,500 mm to 2,500 mm per year. There are five dry months (December-April), and relative humidity is 78%.

(c) Central Plateau Foothill Zone: This is located between the Atlantic Seaboard and the Central Plateau. It is typical of the humid subtropics, with altitudes of over 600 meters above sea

level. The topography is irregular, with a grade of over 20%. Temperatures fluctuate between 18°C. and 24°C., and precipitation is from 2,500 to 4,500 mm/year, with two to four dry months. Relative humidity is 93.5%.

(d) Northern and Atlantic Zone: It is tropical, humid, and flat in most areas, with altitudes of up to 500 meters above sea level. It extends to the Nicaraguan border. Temperatures in the zone are over 24°C. Precipitation varies from 2,500 mm/year to 5,100 mm/year, with approximately one month of drought and a relative humidity of 81%.

(e) Central Plateau: This is a temperate zone with highly irregular topography. The elevation ranges from 1,700 to over 3,000 meters above sea level. The southern part of this zone has the highest elevations and the most irregular surfaces. In the temperate areas, the temperature fluctuates between 14°C. and 18°C., and in the "cool temperate" areas, between 10°C. and 14°C. At altitudes of over 3,000 meters, the temperatures fall below 10°C. Precipitation in the Central Plateau varies from 1,500 mm/year to 3,500 mm/year. Relative humidity is 85%, and there are from one to four months of drought per year.

It is generally acknowledged that anaplasmosis and basesiosis are present over large areas of Costa Rica, but very little epidemiological information is available. Several limited studies have been conducted on the individual farm level. Information is needed on the incidence, prevalence, and distribution of babesiosis and anaplasmosis, their endemic zones, the areas in which they are reaching epidemic levels, and whether or not so-called marginal areas exist. Knowledge must be acquired on the population and distribution of carriers and potential carriers. With this basic information at hand, effective measures can be adopted for the prevention and control of anaplasmosis and babesiosis.

Two epidemiological situations are common in countries or areas where

Boophilus ticks and Babesia carrier animals are found: endemic stability and instability of Babesiosis.

In a situation of endemic stability, all animals in the herd have acquired high levels of immunity, and when ticks introduce the infection, no clinically appreciable levels of the disease are felt. On the other hand, in cases of endemic instability, if a number of non-immune animals are in the herd, they can fall clinically ill if ticks transmit the disease.

A critical factor for the production of endemic stability is called the rate of innoculation against the parasites that cause the tick disease. This rate is defined as probability that any one host in a population will receive an infection on any given day. It is based on a number of ticks available for transmitting. If the rate is high enough to guarantee that the disease will be transmitted to all calves while they are still protected by defenses acquired from the mother, stability is produced. All possibilities and variations of stability and instability are present in Costa Rica, and they depend basically on the number of ticks available for transmitting. The tick is influenced by environmental factors, especially average temperature. When it is too cold, the tick does not survive. Tick-free zones exist at elevations of over 2,000 meters, where diseases are not transmitted and animals are free of babesiosis and anaplasmosis, although they are highly susceptible to these diseases because they have not acquired immunity. In certain very hot areas, the ticks prosper and the rate of innoculation is very high. As a result, all animals are infected while young, and become highly immune. Between these two extremes-neither hot nor cold are zones where the ticks exist, but not in large numbers. They are insufficient to effect high rates of innoculation, and as a result, a certain number of animals always reach adulthood without achieving immunity through natural processes. These are the zones of endemic instability, perpetually prone to clinical disease problems.

E. Pérez, Leroy, and J.M. Carrillo, in an epidemiological study

conducted at the Los Diamantes Experimental Station in the Northern Atlantic Zone, tried to establish the possible existence of an area of epidemiological instability produced by overcontrol of carrier ticks, and the importance of bio-ecological information on such ticks for the implementation of control systems.

Chart I and Tables 1 through 5 give the findings of the tick population count held on the field level and in blood tests.

Due to ecological, temperature, and precipitation factors, Los Diamantes appears to be an area in which ticks are active throughout the year. Higher levels of anaplasmosis were reported in June, July, November and December, which does not concide with the peak periods of the tick population (see Cobal graphs 1, 2 and 3).

The Los Diamantes Station appears to be susceptible to problems of epidemiological instability, possibly caused by the overcontrol of ticks through the use of acaricides. It would be a good idea to try to reduce the frequency of dipping, which could perhaps be done every 21 or 42 days. It should be recognized that total eradication of the tick, would be impossible.

CHART 1

Epidemiological Study

Uncontrolled Tick Reproduction

"LOS DIAMANTES" EXPERIMENTAL STATION

MARCH-SEPTEMBER, 1977

Total ticks and identified species:

1. Number of animals studied 9 (8 after July)
2. Number of animals examined 121
3. Total ticks counted 3,026
4. Overall average of ticks measuring at least 4-5 mm. per animal 25.00 (0-184) with a $\pm$ 8.1 confidence limit.
5. Tick identification

No. of animals examined 121

Boophilus microplus

No. of animals with positive findings: 26.

S_o = 31.69 Standard deviation or standard variation, calculated with the same formula, but using "n" instead of "n-1" due to the large size of the sample.

$\pm Zx/\frac{So}{2\sqrt{n}}$ = Confidence interval or limits (here, too, confidence was set at 25%). We use "Zx/s" instead of "tx/2", due to the large size of the sample. (Poisson's Law) Zx/2-2.81.

Animal No.	n	Σx	$\bar{x}$	S_o	$\pm tx/2 \frac{So}{\sqrt{n}}$
866	9	509	56.25	54.68	44.58
847	14	389	27.78	24.08	13.90
887	14	294	21.00	24.24	13.99
885	14	615	43.92	44.19	25.51
879	14	560	40.00	35.21	20.32
892	14	213	15.21	15.65	9.03
857	14	114	8.14	6.79	3.91
843	14	69	4.92	5.91	3.41
867	14	263	18.78	24.36	14.08

n = Number of times ticks over 4-5 mm were counted on the animal

Σx = Total number of ticks over 4-5 mm counted on the animal.

$\bar{x}$ $\frac{x}{n}$ = Average number of ticks over 4-5 mm per animal

$\pm tx/2 \frac{So}{\sqrt{n}}$ = Confidence limits or interval (taken here as 95% confidence)

$$So = \frac{x_i^2 - (x_i)^2}{n - 1}$$ = Standard deviation or standard variation.

TABLE # 2

EPIDEMILOGICAL STUDY OF ANAPLASMOSIS

CATTLE BLOOD TEST - SAMPLE USED

Los Diamantes Experimental Station, August, 1977

Category	Total Cattle	Total Bled	Sample needed (1)	Difference
0-3 months 4-6 months	90	39	11	+ 28
7-12 months	77	40	10	+ 30
11-24 months	139	39	24	+ 15
- 24	324	36	40	4
TOTAL	684	154	85	----

(1) Calculations of sample size were used for studies of prevalence, under the assumption of homogenous distribution, according to the different accepted estimates and margins of error. For this case, 95% confidence was used, as we 1 as 20% error and an estimated prevalence of 50%. Adjustments were made for a finite universe.

TABLE 3

Epidemiological Study of Anaplasmosis
"Card Test" Findings
Los Diamantes Experimental Station
August, 1977

Category	Total livestock	Total tested	Total positive	% Reactors
0-6 meses	90	39	33	84.6
7-12 meses	77	40	33	82.5
13-24 meses	193	39	33	84.6
+24 meses	324	36	34	94.4
Total	684	154	133	86.4

TABLE 4

Epidemiological Study
Findings of I.F.A. Babesia bovis Test
Los Diamantes Experimental Station
September, 1977

Category	Total tested	Total positive	% Reactors
± 10 meses	64	59	92%
12-24 meses	20	16	90%
+24 meses	66	65	98.5%
Total	150	140	93.3%

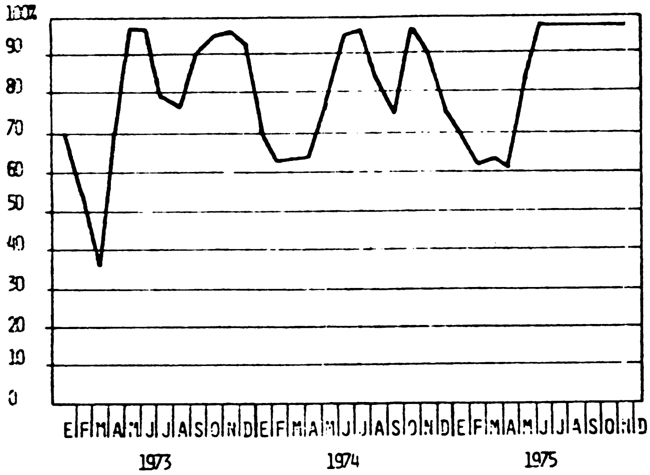
TABLE 5

Estimated Tick Population
Los Diamantes Experimental Station

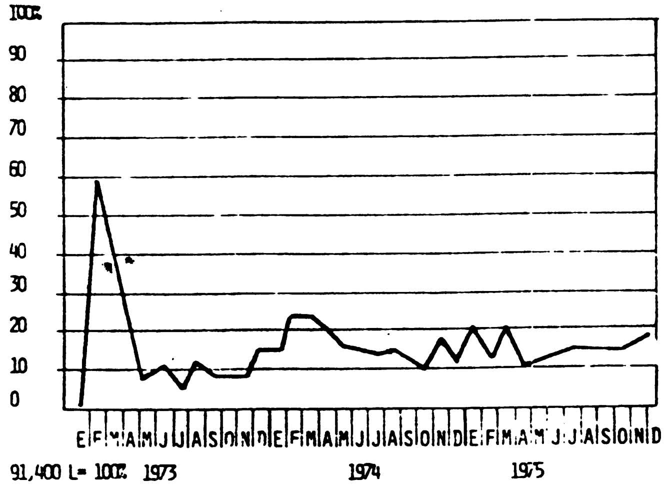
This estimate of the number of ticks measuring at least 4-5 mm covers livestock (Brahman hybrid). It was done by close-range visual estimates on both sides of each animal.

Ticks per animal	No. of animals observed	$\bar{x}$	Total ticks
0			
1-5	87 (90.63%)	3	261.5 (26.2%)
6-10	--	-	-
11-15	--	-	-
16-20	--	-	-
21-30	2 (2.08%)	25.5	51 (5.1%)
31-50	2 (2.08%)	40.5	81 (8.1%)
51-100	2 (2.08%)	75.5	151 (15.2%)
101-200	3 (3.13%)	150.5	451.5 (45.4%)
Total	96 (100%)		996,1 (100%)

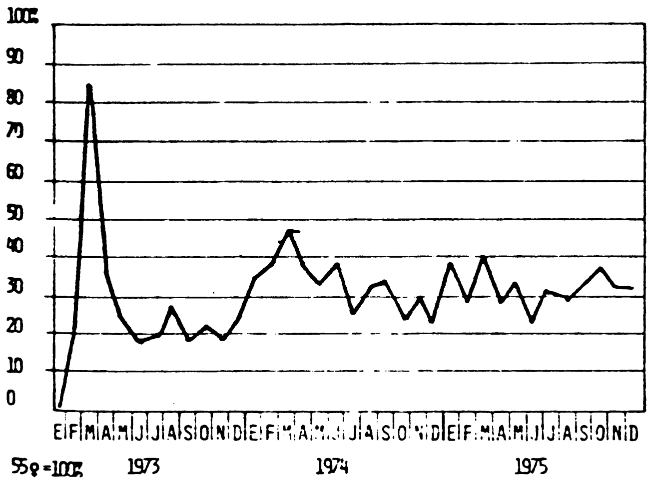
Graph 1
Birth (hatching)
Cobal (zebu stock)



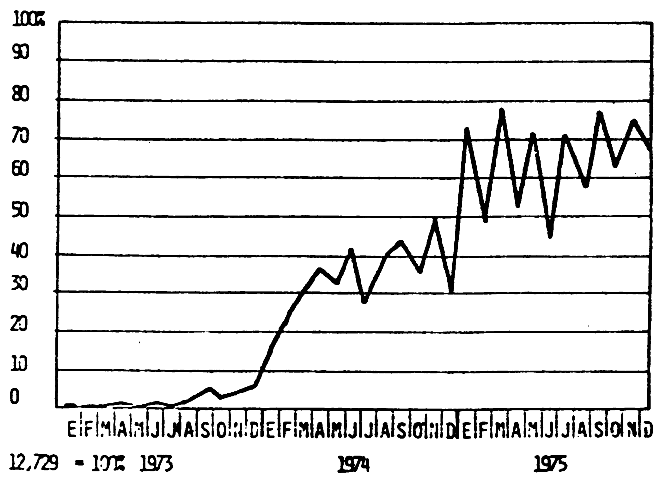
Graph 2
Number of larvae in stockyards
Cobal (zebu stock)



Graph 3
Number of female animals
Cobal (zebu stock)



Graph 4
Number of female animals
Cobal (zebu stock)



2. BIO-ECOLOGY OF TICKS IN COSTA RICA

Tick Sampling:

Maps prepared by the National Institute of Geography were used as reference materials for initiating the sample. The Institute is an Agency of the Ministry of Transportation in San José, Costa Rica and the maps were prepared with the use of stereophotogrammetry, on the basis of air photographs taken in 1945 and 1946 by the Inter-American Geodesic Institute, with a scale of 1:50,000.

These maps provided a fixed reference point, and it was possible to divide the entire national territory into zones for sampling. The map was divided into quadrants, which in turn were subdivided into 20 squares measuring approximately 25 km^2, to give a meaningful sample.

At least one livestock operation was sampled in each 25 km^2 square, for a total sample of 668 farms covering an area of 16,700 Km^2. This represents 32.8% of the national territory (50,900 km^2), and 62% of the land being used for livestock (26.795 Km^2).

The operations sampled were selected randomly, proportionally, and as representative of each square. Wild animals were also sampled. A questionnaire was used for obtaining the basic information, and it is shown in the appendix of this report. Horses and dogs were examined on each ranch chosen for sampling, and tick specimens were taken from the following regions: head, ears, axilla, perineum, groin, and caudal region.

In order to take the sample, the tick was carefully and gently removed to avoid breaking the mouth parts. Males and females were taken in the adult, nymph, and larval stages, and they were placed in hermetically sealed jars containing 70% alcohol and 7% glycerine. The tick samples were later identified in the Project Laboratory.

The sampling and collection system was not ideal, especially in view of the fact that Costa Rica is practically a country of micro-climates. The collection process should have taken place twice-once

in the dry season and once in the rainy season. It is also felt that a collection on the basis of one farm for every 25 km^2 was not necessarily the best system. Data was omitted on elevation, rain, and vegetation. Nevertheless, the data that was collected is considered valuable.

Findings:

The following species were identified on host animals:

Boophilus microplus: This is the only species of economic importance, in terms of transmitting to cattle such diseases as anaplasmosis and babesiosis. It is found throught the country at elevation up to 2,000 meters and temperatures of up to 13°C.

Amblyoma cajennense: This is also economically significant, not in terms of the transmission of diseases that cause losses, but because of blood-sucking and hide damage. It is distributed around the Northern Pacific Zone, Guanacaste, and Nicoya. It also occurs in the Southern Pacific Zone in Parrita, Canoas and Laurel, and the Atlantic Zone in Cahuita, Amubri and Río Banano.

Anocentor nitens: This is found throughout the country, especially in Guanacaste and the Barranca Zone. It has a heavy impact on the horse population of the country, as it transmits Babesiosis to horses.

Amblyomma maculatum: This is found in Upala, Medio Queso and Cahuita.

Ixodes boliviensis: This is found in Las Juntas, Barva, Carrillo, Tapantí, and La Unión.

Amblyomma sanguineus: This is found in Matapalo, Belén, Río Agrio, and Miramar.

Species by species, the following ticks were found:

Bos indicus and Bos taurus	Canis familiaris
Boophilus microplus	Rhipicephalus singuineus
Amblyomma cajennense	Boophilus microplus
Amblyomma maculatum	Ixodes boliviensis
Ixodes boliviensis	Amblyomma cajennense
Anocentur nitens	Amblyomma auricularium

Amblyomma auricularium
Amblyomma inornatum

Equus caballus (Horses)

Amblyomma cajennense
Amblyomma maculatum
Amblyomma parvum
Amblyomma ovale
Anocetor nitens

Turtles

Amblyomma testudinis

Amblyomma ovale

Two-toed sloth

Amblyomma varium

Anteater

Amblyomma nodusum

Boa (constrictor)

Amblyomma dissimile

Tapir (Kinosternun sp)

Boophilus microplus.

Maps:

The findings were used to draw up a map showing the geographic ∅ location of ticks, as well as transparencies of the maps for each species, drawn to the same scale, to be superimposed on an ecological map, thus showing the influence of the various species.

3. SERUM SAMPLES:

The findings of a serum sampling are used for epidemiological research. In this particular case, efforts were made to establish a rate of prevalence of babesiosis and anaplasmosis in three ecological areas of the country and three age groups of the cattle pupulation. At the same time, efforts were made to find data correlating variables connected with the handling and use of acaricides, presence of carrier animals, time of year, etc. With this information, high-risk (instability) areas will be traced, and the population subject to risk will be estimated.

The patterns of anaplasmosis and babesiosis in the bovine population of any given area, under natural conditions, is entirely dependent on the frequency with which these hematozoons are transmitted. This, in turn, depends on the numerical proportion between ticks and

livestock in a given environment. It is important to establish these and other numerical ratios in order to calculate the possibility that out breaks of these diseases will occur under different conditions. Two important factors are the probability of infection of the host, which determines the rate of spread of the new infection, and the size and age of the two segments of the population under study: the infected animals and the uninfected animals. In order for the disease to occur, the bovine population must have a susceptible segment of animals which have never been infected. Herd stability thus means that the herd is free of the disease, while area stability means that a more extensive area of a given geographic extension with certain uniform ecological characteristics is free of the disease. In these herds and in these areas, the calves are exposed to at least one infection during the time they are receiving resistance passively, through the colostrum (1).

This situation is considered stable because the disease does not break out in spite of the fact that the causal hematozoon is widely distributed. When the probability of infection of the host is low, epidemiological instability occurs because the non-infected segment is large (unprotected calves and adult animals that are totally susceptible or that have lost their active immunity due to the long intervals that pass between natural infections). In the case of arthropod-borne diseases, the probability of infection of the host is known as the rate of innoculation, defined as "the daily probability that any member of a host population will be infected". In other words, it is the daily probability of infection, and it depends on several concrete factors in the case of anaplasmosis and babesiosis, including the number of ticks that could bite the animal per day, the proportion of ticks infected with anaplasma and babesia, and the proportion of infected biting ticks that are capable of transmitting the disease-causing organisms.

(1) MAHONEY, D.F., (1972) Babesiosis of cattle. Australian Meat Research Review. No. 12. June.)

Many of the problems of controlling these tick-borne diseases involve the concept of epidemiological stability. This in turn, depends largely on the rate of innoculation. Therefore, it is essential to determine the rate of innoculation in order to conduct an epidemioligical evaluation of the population. Measuring the rate of innoculation is a difficult task, subject to a number of influencing factors, and it can best be carried out indirectly. The rate of infection of calves is calculated with the use of a sensitive, specific serum test (*) and a known age factor. By using a table that has been completed through a process of experimentation, the rate of innoculation can be obtained directly (1)

The research that produced this table led to the conclusion that the rate of innoculation is less than 0.005 (or 12 bites a day per tick/animal, or the work of 6 full ticks). These figures refer to B. taurus cattle (1).

These concepts were then used for analyzing the table of findings from the serum survey. The blood sampling of antibodies against anaplasma and babesia in cattle showed that in the lowest zones (200 m). 50% to 85% of the cattle were positive, while in the higher zones, relatively free of the Boophilus tick, locally born and raised livestock are highly susceptible to anaplasmosis and babesiosis. Unless they are vaccinated these animals become clinically ill when transferred to other areas.

Once the rate of infection has been determined, the population can be divided into two known segments: infected and non-infected. This is useful for the young population (under 12 months). As the exact age in months does not appear on the forms, we have assumed that part of the antibodies in the calves originate in the colostrum. However, for

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(*) Methods used: I.F.A.
Card Test for Anaplasma.

(1) MAHONEY, D.F., ROSS D.R. (1972). Epizootilogical Factors in the control of Bovine babesiosis. Aust. Vet. J. 48:292.)

the calculations, the ratio was not taken into consideration. In the majority of cases, these calves had not been weaned, and it should be assumed that their age varies from 6 to 9 months. In accordance with the tables quoted by Mahoney, the expected rate of infection for maintaining endemic stability should be between 55% and 70% (rate of innoculation 0044-0045).

Table 1 shows that in the province of San Jose the rate of infection among calves (under 12 months) was 25% for anaplasma and 30% for babesiosis, for a rate of innoculation of .0016- .0011. Even assuming that this rate is caused by exlusively by infection, the values obtained are very low, and this population in the sampled districts should be subject to high risks of disease. If we add to this the fact that, in the 12-24 month age group, the infection rates reach 60% for anaplasma and 40% for babesia, it appears that transmission levels are high enough for the disease to occur, but too low to maintain epidemiological stability. This could possibly become an area of clinical disease and outbreaks, a postulate that can be easily corroborated if we note that the rate of anaplasmosis infection in the group of animals over 24 months old is 20.4%. This indicates a possible overuse of medications for treating the disease. It would appear that overcontrol of ticks and possible overtreatment of disease are being praticed in this area.

The problem appears to be different on farms sampled in the province of Cartago. Increases in the rates of infection in the age groups are evenly spaced, which seems to show that the environment is not ecologically suited to <u>B</u>. <u>microplus</u>.

Tables 4 and 5 show the percentage findings of reactor animals in ecological zones II and III, at elevations of up to 1,600 m., but with two different levels of precipitation (over 2,500 mm. and under 2,500 mm.) These two zones appear to be free of epidemiological instability, with the exception of the province of Cartago, which appears to be having serious problems. The rate of infection ranges from 5.9% in

calves under 12 months of age to 71.4% in the 12-24 month group. Outbreaks are inevitable under such conditions. It is assumed that the problem of anaplasmosis and babesiosis is serious and that the zone is unstable.

TABLE 1

ECOLOGICAL ZONE I (elevation over 1,600 m.)

% of reactor animals per age group

Province	% positive animals *A. marginale*			% positive animals *B. bovis*		
	(12	12-24	)24	(12m	12-24	)24
San José	25.0%	60%	20.4%	30.0%	40%	73.5%
Cartago	13.0%	13.9%	40.4%	41.4%	48.3%	64.1%
Heredia	- -	- -	83.3%	66.6%	-- --	66.6%

TABLE 2

Positive samples

Province	No.Farms	Total Samples	Positive samples *A.marginale*	Positive samples *B. bovis*
San José	9	74	18	44
Cartago	41	283	73	149
Heredia	2	9	5	6
TOTAL	52	366	96	199
%			25.8%	53.3%

TABLE 3

ECOLOGICAL ZONE II (elevations under 1600 m., Prec. over 2,500)

Positive samples (by province)

Province	No. Farms	Total Samples	Positive samples *A. marginale*	*B. bovis*
San José	12	117	72	92
Alajuela	59	591	508	555
Cartago	3	26	19	17
Heredia	8	70	57	58
Guanacaste	18	212	205	208
Puntarenas	40	459	368	407
Limón	18	205	173	188
TOTAL	158	1680	1402	1525
%			83.45%	90.7%

TABLE 4

ECOLOGICAL AREA II

% of reactor animals

(by province and by age group)

Province	% positive animals *A. marginale*			% positive animals *B. bovis*		
	12	12-24	24	12	12-24	24
San José	40.0	66.6	73.2	60.0	83.3	68.7
Alajuela	78.5	94.8	89.2	91.0	94.8	95.7
Cartago	60.0	- -	81.5	30.0	-.-	87.5
Heredia	65.2	88.2	90.0	100.0	82.4	70.0
Guanacaste	90.9	100.0	100.0	96.4	100.0	100.0
Puntarenas	57.0	92.5	87.2	79.0	92.5	91.8
Limón	87.2	80.0	84.4	84.6	93.3	93.4

TABLE 5

ECOLOGICAL ZONE III (elevations under 1,600 m., prec. under 2,500)

% reactor animals

(by province and by age groups)

San José	80.7	50.5	73.9	73.1	68.7	80.0
Alajuela	61.1	85.7	93.1	66.6	80.9	88.5
Cartago	5.9	71.4	89.5	47.1	71.4	73.7
Heredia	75.0	-.-	100.0	100.0	-.-	71.4
Guanacaste	76.8	94.7	90.8	87.7	98.5	93.6
Puntarenas	68.5	95.9	83.0	80.3	87.8	89.1

TABLE 6

ECOLOGICAL AREA III

No. Positive samples

	No. farms	Total Samples	Positive samples A. marginale	Positive samples B. bovis
San José	14	115	83	89
Alajuela	34	278	217	217
Cartago	5	43	23	27
Heredia	1	15	13	13
Guanacaste	127	1062	921	980
Puntarenas	38	359	286	308
TOTAL	219	1872	1543	1634
%			82.4%	87.3%

TABLE 7

Positive samples

(by ecological zones)

	No.farms	Total Samples	% Positive samples			
			A. marginale		B. bovis	
			Total	%	Total	%
Zone I	52	366	96	26.0%	199	54.4%
Zone II	158	1680	1402	83.4%	1525	90.7%
Zone III	219	1872	1543	82.42%	1634	87.3%
TOTAL	429	3924	2863		3334	

TABLE 8

% Positive samples

(by zone, province and age group)

	No.farms	No. Samples	N°positive samples					
			Anaplasmosis			Babesiosis		
			(12	12-24	) 24	(12	12-24)	24
ZONE I								
San José	9	74	5	3	10	6	2	36
Cartago	41	283	16	4	53	51	14	84
Heredia	2	9	-	-	5	2	-	4
TOTAL	52	366	21	7	68	59	16	124
%			14.4	20.6	36.6	40.4	47.0	66.7

	No.farms	No. Samples	N° positive samples					
			Anaplasmosis			Babesiosis		
			(12	12-24)	24	(12	12-24)	24
ZONE II								
San José	12	117	16	4	52	24	5	63
Alajuela	59	591	164	55	289	190	55	310
Cartago	3	26	6	-	13	3	-	14
Heredia	8	70	15	15	27	23	14	21
Guanacaste	18	212	50	19	136	53	19	136
Puntarenas	40	459	65	37	266	90	37	280
Limón	18	205	34	24	115	33	28	127
TOTAL	158	1680	350	154	898	416	158	951
%			71.4	88.2	82.9	84.9	90.0	93.2
ZONE III								
San José	14	115	21	8	54	19	11	59
Alajuela	34	278	77	18	122	84	17	116
Cartago	5	43	1	5	17	8	5	14
Heredia	1	15	6	-	7	8	-	5
Guanacaste	127	1062	268	126	527	306	131	543
Puntarenas	38	359	87	47	152	102	43	163
TOTAL	219	1872	460	204	879	527	207	900
%			70.4	90.3	76.2	80.7	84.1	90.6

4. COSTS AND BENEFITS:

Costs:

It is difficult to estimate how much money is currently being spent on tick control in the country.

The costs of the current control system are borne exclusively by the livestock association and can be classified under the economic heading of "externals", or the costs or benefits that decision-makers (in this case, those involved with tick control) impose on others, but for which they neither receive compensation nor incur penalties.

Depending on the intensity of control measures applied by a rancher, the benefits or costs will be felt by neighbors as well as the individual, however, as there are no technical or legal norms governing tick control, ranchers cannot request compensation for the benefits produced. Nor will they be penalized for any costs incurred by their neglect of control measures.

The costs of control can be increased by the ranchers' unfamiliarity with methods. They may be using inappropriate levels of control products, thus actually increasing losses, as well as encouraging the potential appearance of tick strains that are resistant to the acaricides.

The relevent Government agencies have not participated in control operations, except on a very minimal level (registration of products). This means that no informational efforts are being made, which could be helping to increase costs by causing many erroneous strategies and methods to be used.

There is no question that tick control reduces costs. However, for a number of reasons, the magnitude of the savings is not clear.

For all these reasons, the current costs of control are practically impossible to calculate, and we will limit ourselves to estimating the value of acaricide imports, the cost of labor for dipping operations, and possible production, losses.

a) Value of acaricide imports:

In accordance with the system of customs classification (the Nauca Code), all insecticides (including tick poisons) are listed under a single heading. For this reason, information available from the Ministry of the Economy, Industry, and Commerce does not indicate the annual volume or value of acaricide imports in Costa Rica.

Research was done among major importers of these products, with due consideration for commercial reserves. It was found that the cost of importing tick poisons ranges from US$ 325,000 to US$ 500,000 per year. The cost of dipping (operation, labor, equipment, etc.) should be added to these totals.

At the Los Diamantes Experimental Station, dipping operations using a motor-driven pump cost an estimated one colon (₡ 1.00) per head/dip. Of this cost, an estimated 16% corresponds to the acaricide and the balance includes operational costs, labor, wear and tear on equipment, etc.

On the basis of data from the 1973 Agricultural Census, 96% of the farms in Costa Rica are located at elevations of less than 2,000 m.,with varying levels of annual precipitation. Over 97% of the country's livestock population is included on these farms which, for ecological reasons, are assumed to be infested with ticks.

Assuming that these percentages have been maintained, and using projections made in 1979 by the National Council of Production, the cost of tick control has been estimated as follows:

Population of dipped livestock-average 6 dips per year	2,031,900 head
Acaricides	₡ 3,440,000
Labor, operational costs, equipment, etc.	10,240,716
Total	13,680,716

If these figures are accurate, the country is paying an average of ₡ 6.75 per animal per year in the infested areas for controlling ticks with the use of acaricides.

b) Possible production losses:

These are indirect costs, and they are extremely difficult to determine because of the lack of information. The heading includes losses of meat and milk, costs of disease, deaths, hide damage, etc.

b.1 It was estimated that some 251,116 cattle in the country were hosting over 50 full ticks each, which is considered the critical level. Assuming that on the average, two ticks per animal per day cause a loss of 1 kg. of weight gain per animal per year, annual weight losses would total 6.276,900 Kgs. per year, at an average price of ₡ 3.50 on the hoof, for a final loss of ₡ 53,353,650.

b.2 Among milk cattle, 30% were infested with over 50 full ticks each. cutting their milk production by 20%. Data from a document entitled "Desarrollo Agropecuario" indicate that median milk production on the Central Plateau is 7.2 liters per day for milk cows and 500 liters per year for all-purpose cows.

Estimated losses would thus be:

	No. INFESTED COWS	20% LOSS (LITERS)	VALUE at ₡ 1.50 Lt.
Milk cows	22,856	10,038,355	15,057,532
All-purpose cows	8,711	871,100	1,306,650
TOTAL ...	31,567	10,909,455	16,364,182

b.3 A study was made of the volume of hides (1) in leather industries.

It is estimated that losses caused by ticks reach ₡ 4.00 per hide. Data from the National Council on Production show 410,198 animals slaughtered in 1978, for a total loss of ₡ 1,640,792.

(1) BRENES, G.F. and MEZERVILLE, C.H. (1970) Estudio de la calidad de las pieles destinadas a la industria del cuero en Costa Rica. Revista Universidad de Costa Rica, No. 40. 15-21.

SUMMARY

ESTIMATED LOSSES CAUSED BY TICKS IN INFESTED AREAS

Current Cost of Control	
Acaricides	¢ 3,440,000
Labor, operational costs, equipment, etc	10,240,716
Production losses	
Meat loss	¢ 53,353,650
Milk loss	16,364,182
Leather loss	1,640,792
TOTAL...	¢ 85,039,340

Benefits:

The benefits for participating producers can be calculated as follows:

a. Increase in milk and meat production when the incidence of disease is reduced.

b. Reduction of losses caused by the death of adult animals.

c. Reductions in the cost of treating diseased animals.

d. Effective application of acaricides. Producers would also benefit from the drop in milk and meat production costs.

Other accounting benefits would derive from economies in labor costs.

5. FEASIBILITY STUDY:

5.1 Developing improved immunization agents:

There has been some success with the use of immunization by premunization (deliberate infection of young animals) and attentuated commercial vaccination. However, problems of disease and loss have sometimes emerged from the vaccination process itself, as a result of poor immunization. There is thus a need for improved vaccines (immunization agents) adapted to the anaplasma and babesia strains found in Costa Rica. The

development of such vaccines would probably also benefit other Central American countries. Laboratory work has begun on the feasibility of tick control, and the outlook is good for the production of immunization agents and improved antigens for diagnostic procedures.

5.2 Control with acaricides:

The success of efforts to limit and control ticks in the warmer areas of Costa Rica depends on the extermination of ticks from cattle, with the use of sprays or immersion of the animals. This procedure is widely accepted throughout the world, although certain extra measures, such as forage rotation, are used in countries where the success of tick control depends on effective acaricide applications at intervals appropriate for the type of tick involved. It is recognized that B. microplus is the most important and most common tick in the herds of Costa Rica, as well as the primary carrier of hemoparasitic diseases. Experiments conducted around the world have clearly shown the effectiveness of acaricides and have indicated the concentration that should be used and the frecuency of application for the various species of ticks. Surveys conducted by the MAG/BCIE/FAO team in Costa Rica have found that A. cajennense is widespread in the warmer areas of the country. However, they did not show whether it is extensive enough to cause real problems. As long as no special treatments are proven necessary for controlling this strain, the methods proposed for B. microplus should be sufficient to keep the A. cajennense species from reaching dangerous levels.

Although the Government can guarantee that only effective acaricides reach the market, there is no way of forcing private ranches to make effective and proper use of these products. One method of achieving this would be to set up official ranches as demonstration areas and use extension and information services to help ranchers learn to use the acaricides correctly.

The goal of tick control efforts has been to avert severe infestations of ticks while maintaining continuous or cyclical infestations on a lower level , in order to produce and retain immunity to tick-borne diseases. This ideal level of infestation has been calculated at a steady count of approximately 20 adult ticks per animal. (1)

(1) Mahoney, D.F. (1974) The application of epizootiological principles in the control of babesiosis in cattle. Bull off int Epiz. 81 (1-2) 123-138.

In practice it is impossible to achieve and maintain such a precise number of ticks, and therefore, ranchers dip whenever they notice that ticks are becoming too numerous, generally at one-month intervals. The level of ticks drops to almost nothing after dipping, but fluctuates as high as several hundred after four weeks.

5.3 The use of resistant cattle:

Costa Rica must seek low-price and effective methods to limiting the number of ticks. As a first step, the varieties of cattle can in themselves act as a control on the number of ticks. (1) For example, *Bos taurus* hosts many more ticks than *Bos indicus*; but some *Bos taurus* animals are more resistant than others, and it would be possible to make a genetic selection of those animals that are tick resistant. However, in Latin America purebred tick-resistant strains are not yet commercially available. The greatest incentive for ranchers to select tick-resistant *Bos taurus* animals is the possibility of associating the resistant genetic factor. In Australia, considerable progress has been made in developing the A.I.S. strain with high levels of resistance to ticks. (2)

In Costa Rica, dairy stock should either be purebred *Bos taurus*, or possess a high percentage of *Bos taurus* blood. These animals are more appropriate for the temperate zones, where tick control is easier and total eradication of the tick is conceivable. If ranchers in the hotter and more humid areas are set on establishing herds of purebreds or of animals with a high mix of European strains, proper tick control will be more expensive and more difficult. Purebred *Bos indicus* animals, and probably creole stock generally have high levels of resistance to ticks, but reactions even among these breeds vary widely, and herds can be greatly improved simply by eliminating the most susceptible animals. Crosses between *Bos indicus* and *Bos taurus* are almost as tick resistant as *Bos indicus* itself if over 50%

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(1) HEWETSON, R.W. (1972) The inheritance of resistance by cattle to cattle tick. Aust. Vet. Journal 49:200-303

(2) SEIFERT, G.W. (1971) Variations between and within breeds of cattle in resistance to field infestation of the cattle tick *B. microplus* Aust. J. Agri. Res. 22:159.

of the blood is *Bos indicus*. As in the former case, herd resistance can be increased by selection. *Bos indicus* animals are highly adaptable to tropical conditions, and this breed has become very widespread as a meat producer in Costa Rica. It is estimated that 90% of the cattle in this area is a cross of this breed, and although many herds have very few ticks in spite of minimal levels of acaricide treatments, many ranchers seem to be unaware of the fact that the herd itself is controlling the ticks. Under optimal conditions for the development and survival of ticks, certain zebu stock could come down with enough ticks to cause weight loss, but they would need much less treatment than purebred animals or beef cattle with over 50% of *Bos taurus*. It is probable that many ranchers with zebu herds are overcontrolling ticks with the use of acaricides, for random blood tests have shown that many animals lack antibodies against anaplasmosis.

Losses caused by tick induced reductions in weight gain can be ameliorated through improved nutrition. Available figures relating these losses to the number of ticks are few and contradictory, but a survey in Australia produced a figure of 6.8 kilos per animal per year. The daily load was almost 20 ticks per day as considered necessary to maintain herd immunity. It is evident that if the fear of tick disease could be overcome, tick control would be more efficient, and greater weight gains could be produced. The cost-effectiveness of this improved control would have to be evaluated.

5.4 Use of bio-ecological data on *B. microplus*:

This method of reducing acaricide treatments requires an understanding of tick biology. The passage of the seasons causes natural fluctuations in the productivity of female ticks, in the hatching of eggs, and in the survival of larvae. The effects of colder temperatures at higher elevations have been documented, but drought and high temperatures also affect tick eggs and larvae on the ground. These factors can greatly reduce the number of tick larvae available on grazing lands during certain times of year. Rigorous control of ticks during the most adverse period can reduce the tick population so severely that the process of population recovery would be very slow, and much fewer acaricide treatments would be

needed during the remaining months of the year. The reaction of ticks to climatic change can be roughly predicted with the use of climatological data, and the C.S.I.R.O. in Australia is developing a mathematical model for predicting the behavior of B. microplus.

5.5 State supervision and assistance for tick control:

In the introduction to this chapter, it was suggested that localize eradication programs could be established in the higher zones, and with the all-important initial voluntary cooperation of the ranchers.

If the ranchers can be convinced that an eradication campaign will provide them with financial benefits, they will be willing to accept the inconveniences and restrictions that inevitably go along with any control efforts. However, obligatory programs that the ranchers do not feel are logical or productive will inevitably fail.

At the present time, no program should be considered for covering the entire country, and the vast, detailed planning measures needed for each program will not be discussed at this time. However, the State can help ranchers control the number of ticks at levels that are safe for the livestock, through:

a) Adopting legal measures for the sale of acaricides:

Acaricides should be neither imported nor sold unless authorities are fully convinced that the product is appropriate. This decision can be made on the basis of broad-scale technical data, especially related to the potency of the product and its viability and stability in immersion dips and sprays.

There is probably no need for the Government of Costa Rica to conduct its own tests of spray and immersion compounds before approving the sale of acaricides, as such data can be provided by sales agents submitting requests to import and sell a product. Practice in the use of the dips, however, is an essential part of training for veterinary and extension personnel who will be working in the Office of Agricultural Development. This training should be given in a special section of one of the experimental stations of the Ministry of Agriculture and Livestock.

b) Surveys on tick reactions to field acaricides, and search programs for suspected resistance to acaricides.

This should be one of the essential activities of the Tick Control Program of the Animal Health Office. At the present time, there appear to be no records or reports of the existence of tick strains resistant to the acaricides currently in use, but it is difficult to believe that there is no level of resistance to the organo-phosphorus compounds. The information should come from supply companies and ranchers, in the form of user complaints suggesting the possibility of resistance.

The Project has set up a samll laboratory for testing resistance to tick poisons with the use of the Shaw Test (1).

Because there are no reports of serious failures to control ticks with organo-phosphorus and carbamat sprays, it would appear that the ressistance of ticks to these compounds has not reached important levels. For this reason, it would be unwise to permit the use of formamidines and similar compounds except as a last resort if it is found that other products are failing to control ticks.

5.6 Advisory and extension services.

This Feasibility Study should provide information on the possibility of using strategic immersion dips. It should also indicate when this information will be ready for distribution among the ranchers, through Extension Services.

The information should be evaluated in terms of the costs and characteristics of available acaricides, so the ranchers can have objective information on the advantages and disadvantages of the various products, as well as the comparative cost of treatments.

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(1) SHAW, R.D. (1965). Culture of an organo-phosphorus-resistant strain of *B. microplus* (Can) and an assesment of its resistance spectrum. Bull. Ent. Res. 56:389.

It may be unnecessary to conduct tests with acaricide products before they have been registered, but because the extension agents should have more practical experience than the ranchers they will be teaching, it would be essential to set up a unit in charge of evaluating the application of spray treatments, personnel with enough experience to workinan advisory capacity.

5.7 Ranchers who manage their own control programs.

To date, no state control policies have ever existed, and this situation may well continue unless clearly-defined policies can be adopted, based on this Feasibility Study. Ranchers have a solid understanding of diseases and general tick control procedures. Most of them would be grateful to receive technical information on the comparative costs of available acaricides and on the resistance of ticks to the acaricides. They want information on recent discoveries concerning ticks and tick-borne diseases. They would also appreciate the protection provided by strict state-enforced measure to control the effectiveness of vaccines and chemical and therapeutic products introduced commercially into the country.

5.8 General control.

8.1 The need for legislation

Ticks, as ectoparasites, are among the so-called farm-external diseases, which means that they are problems common among livestock. For this reason, the State must take action to draw up control policies, and regulations must be established for controlling ticks through provisions of the General Law for Animal Health. These provisions would cover acaricide import and control, mobilization of animals, dissemination of information, etc.

5.9 These are essentially quarantine measures and could be common to several health programs. The MAG/IDB Animal Health Program plans to establish four fixed control stations for transporting animals, as well as two mobile stations strategically situated at the intersections of the busiest highways. It would be a mistake to duplicate efforts in the early stages of

a potential tick control program, and it is recommended that the infrastructure to be created by the MAG/IDB Program be used.

The goal of controlling the movement of animals in tick control programs is to prevent the introduction of infested animals into tick-free areas,and to avoid bringing acaricide-resistant B. microplus strains into infested areas. This second objective can be met with the use of the station to be installed by the MAG/IDB Program. The achievement of the first objective will not present major problems because the regions free of ticks are benefitting from ecological factors. As the proposed program would not seek total eradication, there will be no need to establish strict health measures.

6. RECOMMENDATIONS

On the basis of this report, and as a result of the achievements made during the Feasibility Study for the Tick Control, it is clear that there are still a number of gaps that could not be closed during the brief period of time allocated for the preparation of the study (30 months). It is still necessary to complete the basic information on establishing a control program that would be useful for the countries of the tropical and subtropical areas.

At the same time, once the basic material and human elements were ready, this project could be incorporated into other research projects already in existence in Mexico (INIP) and the United States (Universities of Illinois and Missouri).

The gaps in this study include:

a) Extending the ecological studies of Boophilus microplus into three different ecological areas.

b) Conducting research of immunization agents for plasmosis and Babesiosis.

c) Disseminating information on acaricides and how to use them.

d) Conducting research on the resistance of ticks to commonly used acaricides.

e) Implementing a control system in a pilot area, as a result of information collected during this project, in order to conduct an economic evaluation.

This project will be economically justified by measuring its effects on tick-caused losses and tick-borne diseases of cattle, as well as the need to expand existing knowledge on the relationships between the distribution and ecology of carriers and the diseases they cause.

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Progress in Screwworm Eradication

Facts About Screwworms

Screwworms, the larvae or maggots of the screwworm fly *(Cochliomyia hominivorax)*, attack all warmblooded animals, including humans, wildlife and pets. The worms feed on healthy flesh in open wounds, unlike blowfly maggots which feed only on dead or diseased tissue. Screwworm infestations can seriously injure, maim or kill infested animals, particularly if wounds are left untreated and become reinfested. Economic losses—from death, crippling, weight losses, increased susceptibility to diseases and labor costs to inspect and treat animals—can be great.

The screwworm fly is about twice the size of a common housefly. It has orange-colored eyes and a bluish-green body with three dark stripes along the back. The fly is rarely seen except around animal wounds.

The female screwworm fly usually mates only once in her lifetime. This mating fertilizes all her eggs, which she lays in batches of up to 400 along the edges of open wounds. Within 12 to 24 hours, the eggs hatch into tiny larvae which burrow deep into the wound to feed. The larvae are difficult to detect in a wound at this stage, since only their posterior ends protrude. With their rasping mouthparts, the larvae tear at the wound and feed on the fluid exudate.

As the worms feed, they increase the size of the original wound, which in turn attracts more female screwworm flies. These multiple infestations can cause death in the host animals if left untreated. Grown steers have been killed in 10 days.

The worms grow to about one-half inch in length after 5 to 7 days of feeding. When fully developed, they drop from the wound, burrow into the soil and form brown, tough-shelled puparia (cocoons) which protect the developing flies. The screwworm fly emerges from the pupal casing after about a week in warm weather (as long as 65 days in cold weather). After 3 days it is ready to mate. The screwworm life cycle averages about 3 weeks.

Weather is an important factor in the location, spread, and severity of screwworm infestations. Warm, humid weather encourages screwworm development and activity while extremely high or low temperatures and drought tend to limit populations and movement.

As screwworms cannot survive extreme cold, their overwintering areas (areas where the fly can survive year round) are normally confined to tropical and subtropical regions. A mild, moist winter usually contributes to greater spread and more danger of reinfestation in screwworm-free areas.

Research has shown that a screwworm fly can migrate up to 180 miles during its lifetime. Of course, larvae may be inadvertently transported for thousands of miles through shipments of infested animals.

The Screwworm and Its Past

The screwworm fly is known scientifically by the name *Cochliomyia hominivorax* (Coquerel), but not until 1933 was any clear distinction made between this parasitic insect and the common blowfly species *Cochliomyia macellaria* (Fabricius), which had been known since the late 18th century. For over a hundred years, it had been assumed that maggot infestations in living animals were those of blowflies feeding on the decaying tissues around wounds and sores—just as blowflies feed on the carcasses of dead animals. These larvae, or maggots, were called screwworms because of the circular rows of spines around their bodies, which made them resemble the common wood screw.

Screwworm infestations in living animals were reported in the western States as early as 1825. Destruction caused by the pest increased over the years to the point where livestock production became unprofitable in some areas. Home remedies for treating infestations were ineffective, and by the turn of the century, ranchers were appealing to the Government for help.

The U.S. Department of Agriculture (USDA) started research on screwworms in 1913, but these early studies failed to show the distinction between parasitic and non-parasitic infestations. In 1929, the USDA's Bureau of Entomology and Plant Quarantine established a station for continued research at Menard. Tex. This station was subsequently moved to Kerrville, Tex., and expanded.

At the new research station, insect toxicologists and entomologists concentrated on measures to protect wounds against screwworms—an effort that advanced rapidly when the team developed a way to rear large numbers of screwworms artificially, thereby obtaining adequate numbers for tests. Among the various toxic chemicals tested, No. 62—diphenylamine—proved the most effective as a wound dressing. When dissolved in benzol and thickened with a turkey-red-oil wetting agent, this became an effective larvicide. The preparation was further stabilized with the addition of lampblack, and became the well-known "Smear 62". For years this was the only relief from screwworm infestations. Organophosphorus compounds have replaced Smear 62 in recent years.

Even with an effective wound dressing, screwworm infestations continued. Constant vigilance was needed to protect livestock. The trapping of immense numbers of blowflies over several years brought no appreciable reduction in the number of infestations. At this point, extensive research on the screwworm life cycle was undertaken, and in 1933, a clear distinction was finally made between the parasitic screwworm and the non-parasitic blowfly.

By the time screwworms were clearly identified, they had spread to Florida and other southeastern States, where they caused heavy losses among livestock, pets and wildlife. As in the Southwest even humans occasionally became infested.

Research on the effective method of screwworm control or eradication was suspended during World War II, but resumed immediately thereafter under a team including, among others: Dr. E. F. Knipling, Dr. R. C. Bushland, Dr. A. W. Linquist, A. H. Baumhover, A. J. Graham, D. E. Hopkins, Frank Dudley, and Weston New.

Because the female screwworm fly usually mates only once, it was proposed that if large numbers of male screwworm flies could be sexually sterilized and distributed throughout infested areas, natural reproduction would be stopped if eggs were not produced or if those produced were not fertile.

An intensive search was launched, therefore, to find an effective, economical means of sterilizing large numbers of male screwworm flies. It was found that screwworm pupae, just before emerging as flies, could be sterilized by exposure to X-rays. Further research, with assistance from the Atomic Energy Commission, showed that sterility could be produced through exposure to gamma rays, using a radioactive substance such as Cobalt-60.

The Southeast Eradication Program

To test the "sterile male technique" theory, USDA scientists sought out an infested area isolated by natural barriers from other infested areas to eliminate the problem of reinfestation by migrating flies. In 1954, the Dutch West Indies island of Curacao, 50 miles off the northeastern coast of South America, was selected for the screwworm eradication experiment. The test was successful. Screwworm egg masses, collected from wounded animals, showed a rising percentage of sterile masses compared to fertile masses. The number of infestations dropped steadily, and after 4 months, no more egg masses or infestations were reported. Curacao—the first screwworm eradication success—remained screwworm-free for more than 20 years but recently suffered a re-invasion of screwworms. USDA cooperated with the Government of Curacao and eradicated screwworms again during 1977.

The Curacao experiment captured the interest of southeastern livestock producers. If screwworms could be eliminated within a small, isolated area, could they not be eradicated over a larger isolated area—such as the southeastern United States? Until 1933, the southeastern States had been free of screwworms. The movement of infested cattle into southern Georgia enabled screwworms to spread into Florida, where they became established and survived year round. From then on, they were a major pest of the region, often ranging northward during the warm seasons into all the southeastern States as far north as the Carolinas.

In 1957, preliminary tests in Florida showed promising results. The Florida legislature shared the costs of the 2-year eradication program conducted in cooperation with the USDA. The effort was further supported by Georgia, South Carolina, Alabama, and Mississippi in a regionwide cooperative program authorized by Congress.

The eradication effort began in 1958 under joint direction of USDA's Agricultural Research Service and the Florida Livestock Board.

A vital ingredient in the southeastern program was producer cooperation. In order to be effective, a ratio of 10 sterile flies to each fertile fly was, and is, necessary. It was up to producers to help reduce the fertile fly population by inspecting their animals frequently for infested wounds and treating all infestations and wounds with an approved insecticide. They also helped by postponing surgical operations—such as castrating and dehorning—until cool weather helped reduce the fly population. Ranchers were urged to send in worm samples for identification to help pinpoint areas of screwworm infestation.

The flies needed in enormous numbers for the southeastern program were reared in Sebring, Fla., in an abandoned airplane hangar modified as a sterile fly production plant. For the first time, a parasitic insect was mass-reared and sterilized in an industrial type operation. Twenty aircraft dispersed the sterile flies in small cardboard boxes. Livestock inspection stations were established along the Mississippi River to prevent infested livestock from moving east and reinfesting the area.

By the end of 1959, the Southeast was free of screwworms. The 2-year campaign cost about $11 million—eliminating the annual $20 million losses caused by screwworms in the southeastern States previously.

The Southwest Eradication Program

Success of the screwworm eradication program in the Southeast led western ranchers to request similar efforts in their region. Elimination of this destructive pest would relieve the region of losses estimated in excess of $100 million annually.

But screwworm eradication in the Southwest was clouded by several problems not present in the isolated southeastern region: screwworm overwintering areas in the Southwest were larger, extending continuously southward into Mexico: screwworm migrations across the 2,000-mile U.S.-Mexico border presented a tremendous potential for reinfestation: climatic conditions and livestock populations were entirely different from the Southeast situation

Nevertheless, State and Federal officials decided to go ahead with the Southwest program—with authorization by Congress and substantial support from the livestock industry. In addition to State and Federal appropriations, southwestern livestock producers, represented by the Southwest Animal Health Research Foundation (SWAHRF), raised and donated $4.5 million to eradicate screwworms.

The southwestern eradication program, which began in February 1962, had two principal objectives: (1) eradicating the screwworm fly from overwintering areas in the Southwest; and (2) stopping northward migrations by establishing and maintaining a screwworm barrier zone along the Mexico-U.S. border.

Drawing heavily on experience gained in the southeastern eradication effort and using funds largely donated through SWAHRF, a sterile fly production plant was constructed by modifying a hangar at the former Moore Air Base at Mission, Tex. Federal expenditures were matched by those of the five States comprising the original eradication area—Texas, New Mexico, Arkansas, Louisiana and Oklahoma. The new plant was designed to rear more than 150 million sterile flies per week.

As in the southeastern eradication program, success depended on rancher cooperation. Livestock producers were asked to check their animals regularly, to treat every wound and infestation and to send worm samples to the Mission laboratory for identification.

The eradication program proved an outstanding success. By September 1963, screwworm infestations within the original five-State area had been reduced by 99 percent, and, with the cooperation of the Mexican Government, an artificial barrier zone had been established along the Rio Grande.

By 1964, overwintering screwworm populations had been eradicated from the original five-State eradication area, and by the end of 1966, the last self-sustaining screwworm population had been eliminated in Arizona and California. Also, 1975 saw the successful completion of a 4-year cooperative program with the U.S. Air Force to eradicate screwworms from Puerto Rico and the Virgin Islands.

The Barrier Zone

Screwworm eradication in the Southwest did not guarantee the region against annual reinfestations from Mexico, though. The screwworm barrier zone was established to prevent or minimize such reinfestations.

The necessity for such a zone was obvious, since a screwworm fly can migrate more than 180 miles in search of a suitable host animal. A single infestation can produce more than 300 flies within 21 days and any warm-blooded animal with an untreated wound—even as small as a tick bite—is a potential host.

The barrier zone operated on the strategy of (1) screwworm surveillance and prevention throughout the region: (2) case reporting through submission of worm samples and egg masses and: (3) aerial release of sterile flies over generally infested areas and individual sites of infestation.

Cooperation of ranchers, veterinarians, county agents, livestock inspectors and others was again an essential element in the successful barrier program. Treating wounds and submitting samples enabled program officials to utilize sterile flies most effectively.

The Screwworm Plant at Mission

The Southwest Screwworm Eradication Program and the expanded eradication activities in northern Mexico are directed from the sterile fly production plant at Mission, Tex. The mailing address is: Southwest Screwworm Eradication Program, APHIS, USDA, Box 969, Mission, Tex. 78572.

The artificial rearing and distribution of over 200 million sterile flies each week is a highly complex operation involving entomologists, engineers, pilots, veterinarians, administrators and plant personnel. Some 400 employees, working three shifts a day, 7 days a week, collect fertile screwworm eggs, raise the larvae, irradiate and store the pupae, package and then release the flies from the program's fleet of aircraft.

The plant, which has over 81.500 square feet of floor space, is sealed to prevent the escape of fertile flies or contaminated materials. All employees and visitors must observe biological security by changing into uniforms and passing through a security area in order to enter the plant and by showering with larvacidal soap before leaving. All materials must be incinerated or "sterilized" before leaving the plant, including heavy hardware which must pass through a special "hot room" before removal.

Plant operations at Mission are based on the techniques developed at Sebring, Fla. Fertile eggs are collected from the fertile fly colony. The tiny larvae hatched from the eggs feed in warm, shallow vats on a medium simulating the flesh of warmblooded animals. The larvae mature in 5 to 7 days and crawl off the vats, falling into channels of flowing water which carry them to a water-larvae separator. They are then placed in sawdust-filled boxes for pupation. The pupae are separated from the sawdust after 10 hours and held in a temperature- and moisture-controlled room. After about 6 days, the pupae are placed in metal canisters and exposed to approximately 7,000 roentgens of gamma radiation emitted from radioactive Cesium-137. Canisters of irradiated pupae are conveyed automatically to the packaging section where the pupae are measured into cardboard release boxes. When the flies emerge from their pupal cases, the boxes of flies are ejected from aircraft over infested areas.

Flies are released from the aircraft through specially constructed chutes that eject and open the boxes at predetermined rates. Normally, the planes fly on parallel routes approximately 2 to 5 miles apart. Other aircraft fly "hot-spot" and "strategic" sterile fly release missions. These operations are supported by livestock inspectors who visit ranches in the infested areas, mark the sites for aircraft where necessary, and encourage ranchers to inspect their livestock, spray their herds and submit larvae samples for identification.

Field Survey and Identification, Methods Development, Plant and Aircraft Maintenance and Administrative Section combine with the sterile fly rearing operations to make up the APHIS Mission facility. But the importance of owner cooperation and screwworm-preventing husbandry practices cannot be overemphasized. Sterile flies alone do not eradicate screwworms.

The Joint Mexico-U.S. Screwworm Eradication Program

The barrier zone alone could not prevent screwworms from causing damage to Southwest livestock. The disastrous 1972 season demonstrated clearly that a more effective barrier zone was needed. The United States and Mexico agreed jointly to eradicate screwworms from most of Mexico north and west of the narrow Isthmus of Tehuantepec in Southern Mexico. To that end, U.S. Secretary of Agriculture, Earl L. Butz and Mexican Secretary of Agriculture and Livestock, Manuel Aguirre, signed an international agreement on August 28, 1972, which authorized the joint Mexico-U.S. Commission on Screwworm Eradication. The Commission consists of the program director and co-director, representing Mexico and the United States respectively, and eight Commis-

sion members—four each from Mexico and the United States. The Mexico program—headquartered at Leibnitz No. 20-12/Apartado Postal M-2890/Mexico, D.F.—is funded from U.S. (80 percent) and Mexico (20 percent) sources.

In 1977, four distribution centers were opened in Mexico and the 300 million flies being raised in the new plant in Tuxtla Gutierrez, near the Isthmus of Tehuantepec, began to be distributed primarily in northern Mexico and along the eastern Mexico coast. In addition, program officials mounted an intensive campaign to eradicate screwworms in Baja California and, by 1978, cases were down to virtually zero. Plans in 1978 call for concentrating flies in western Mexico and establishing quarantine lines to help keep the northern third of Mexico screwworm-free.

The over 500 million sterile flies reared each week at the Mexico and Texas plants will be released throughout Mexico until screwworms have been eradicated. Eradication is estimated to take from 5 to 7 years. After eradication, a new barrier zone will be maintained across the Isthmus at approximately one-fourth the cost necessary to maintain the present zone along the U.S.-Mexico border.

The 1977-78 Push Toward Eradication

Man and nature combined to make 1977 *the* year to push screwworms out of Texas for good. Cold weather in the winter of 1976-77 destroyed most of the overwintering population and inhibited fly activity in southern Texas, thus greatly reducing the number of fertile flies in the spring.

A new fly strain was in production in the Mission plant. Called the "009" or "superfly" strain, it produced a bigger, more aggressive fly capable of competing successfully with the wild fly. This new strain helped overcome criticism that artificially reared screwworm flies were too "domesticated" to be effective in nature.

A third benefit to the 1977 program was the doubled fly production resulting from the opening of the Mexico sterile fly production plant. During 1977, over 400 million sterile flies were available each week for distribution. Many of these flies were concentrated in eastern Mexico to prevent migration into Texas.

Program officials decided to take advantage of these positive factors by adding a public information campaign designed to encourage renewed dedication on the part of anyone owning a warm-blooded animal. The resulting "Mission, '77—Stamp Out Screwworms" campaign was the name given the entire concentrated push toward eradication in 1977.

The end result was a reduction in screwworm cases in Texas from over 29,000 in 1976 to only 39 in 1977. Of interest was the fact that non-screwworm case reporting stayed approximately the same—around 2,000 cases each year. This could be interpreted to mean that the interest in looking for screwworms stayed high even though incentive (being eaten alive by the pest) was greatly reduced.

The "Mission '77" information part of the campaign included materials such as bumper stickers, buttons, window decals, posters, calling cards, existing and new publications, radio and TV spots, slide series and other "awareness" materials. Each item carried a distinctive logo and the slogan "Mission '77—Stamp Out Screwworms" to help keep the focus of the eradication effort constant. These materials reached the grass roots level through Texas A&M Extension Service, the Mission plant, livestock organizations, and re-activated county screwworm committees.

A similar campaign, using the same logo, but a new slogan—"Screwworm Watch"—will be conducted in Arizona, New Mexico, and California during 1978.

What the Public Can Do

Before screwworm eradication, ranchers were alert for screwworms. That principle should be just as valid until it has been proven that screwworms cannot re-invade the United States. Every infestation that is prevented or treated increases the potential effectiveness of the sterile screwworm flies. Every infestation that goes untreated provides an opportunity for screwworms to multiply to dangerous levels.

The following measures—recommended for the maximum effect in preventing or eliminating screwworms—should be continued until at least 2 years after the last screwworm case has been reported in the United States.

(1) Inspect animals at least twice a week. Screwworm larvae reach maturity in less than 7 days.

(2) Treat every wound with an approved preparation.

(3) Spray animals when screwworm danger is high, and after livestock surgery or shearing of sheep and goats.

(4) Collect larvae or egg masses that are found in or near wounds and send them in for identification. Free mailing kits are available from State and Federal livestock inspectors, veterinarians, county agents, and at locations such as livestock markets, feed stores and animal health offices.

(5) Avoid surgery during seasons of high screwworm activity. Branding, dehorning, castrating, docking and shearing should be completed before traditional screwworm buildups in the spring and fall.

(6) Manage animals so as to avoid unnecessary injuries. Avoid crowding: keep gates and corrals free of protruding nails and other sharp projections.

(7) Observe all regulations governing livestock movements from areas of seasonal screwworm infestations. Never move an infested animal.

Pet owners, veterinarians, market operators, hunters, zoo keepers, and medical doctors also can help by watching for and reporting screwworm infestations.

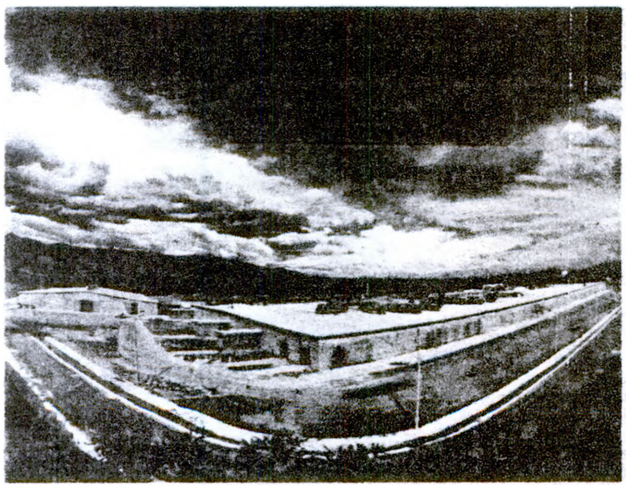
The Future

The success of the Mexico-U.S. Screwworm Eradication Program will depend on the support given the program by livestock producers, veterinarians, and all others involved in keeping or handling animals. Regardless of proximity to the barrier zone or an eradication area, these key people must remain alert to the possibility of screwworm infestation. Inspecting animals, treating wounds, and reporting cases are critical elements of eradication.

Because it is predominantly tropical, Mexico presents problems not encountered within the United States—such as high rainfall and temperatures favorable to year round screwworm survival. Experience in tropical screwworm eradication was gained, though, during the recent successful eradication effort in Puerto Rico and the Virgin Islands.

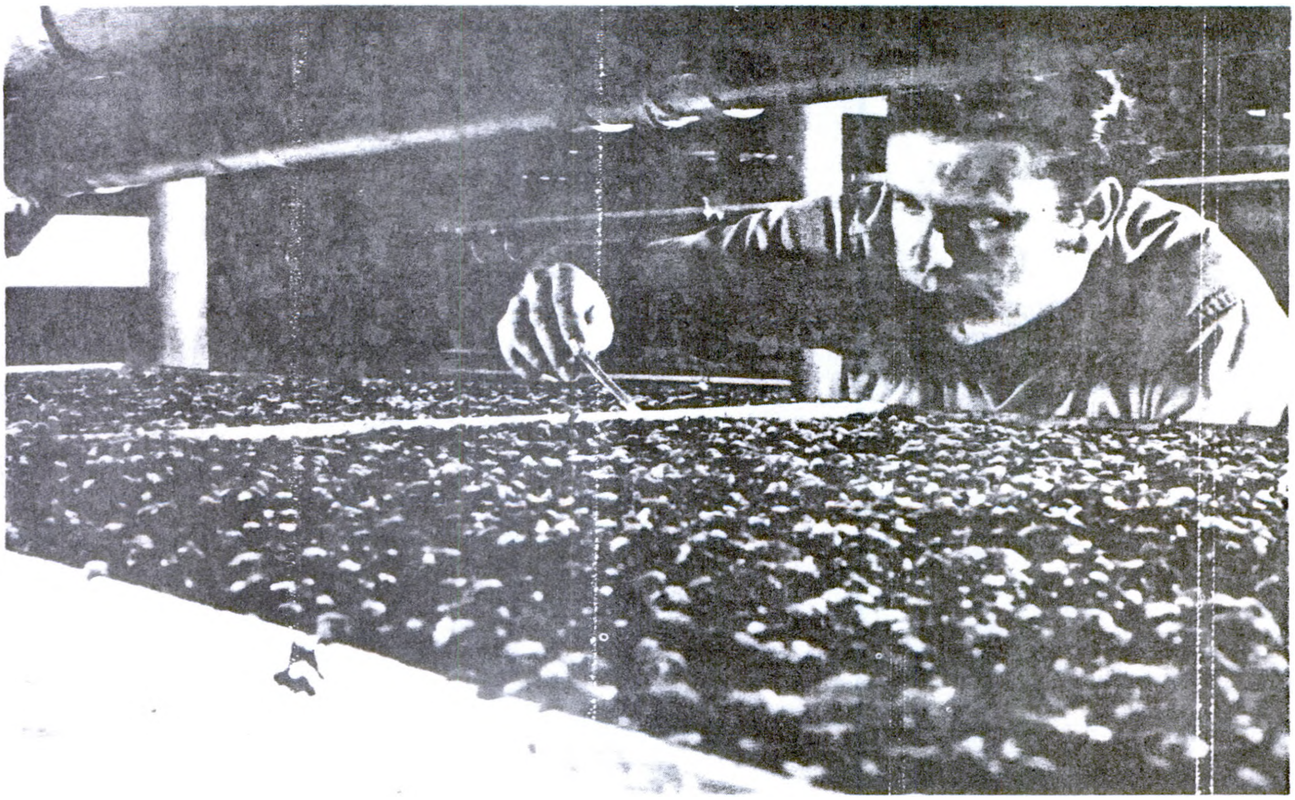
USDA's Agricultural Research Service continues to study eradication methods and techniques, screwworm fly attractants, new sterilizing techniques, and the behavior of various strains of screwworm flies. Epidemiological studies are being refined to identify environmental factors that affect the activity and distribution of screwworms.

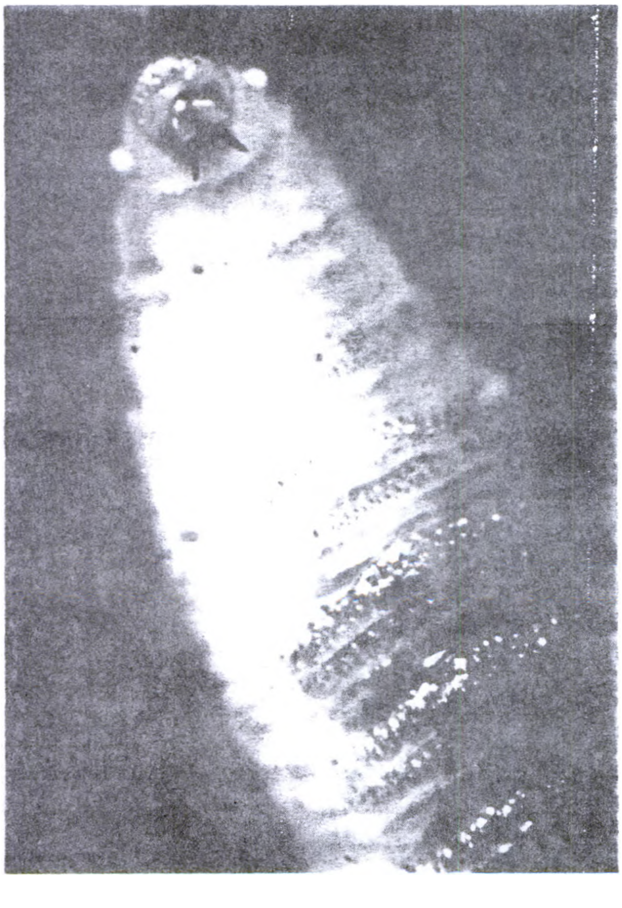
Ranchers and animal health officials on both sides of the border now have a great incentive to push toward the successful completion of the Mexico-U.S. Screwworm Eradication Program. It is now possible to rid the North American continent of screwworms and establish a secure and economical barrier against future invasions of this pest. Experience leaves no doubt that success will be well worth the effort.



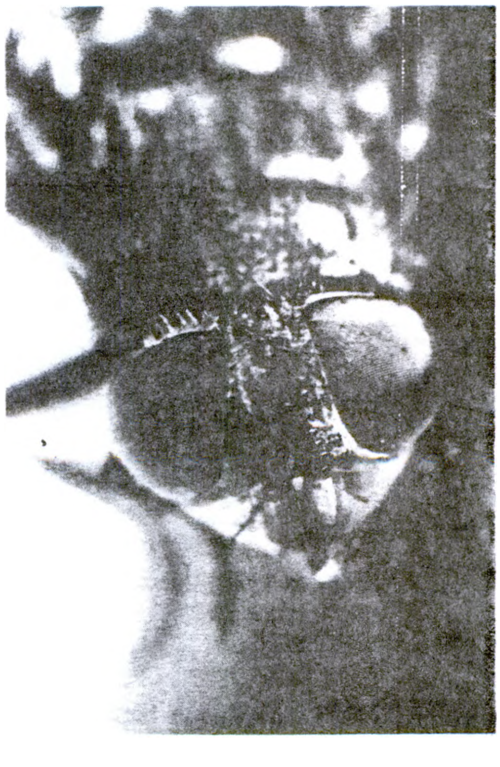
The 1972 initiation of the Joint Mexico-U.S. Screwworm Eradication Commission was a major step in the fight against screwworms. The Commission's new sterile fly production plant in Tuxtla Gutierrez, Mexico was dedicated in August 1976 by Secretary of Agriculture Earl L. Butz and President of Mexico Luis Echeverria.

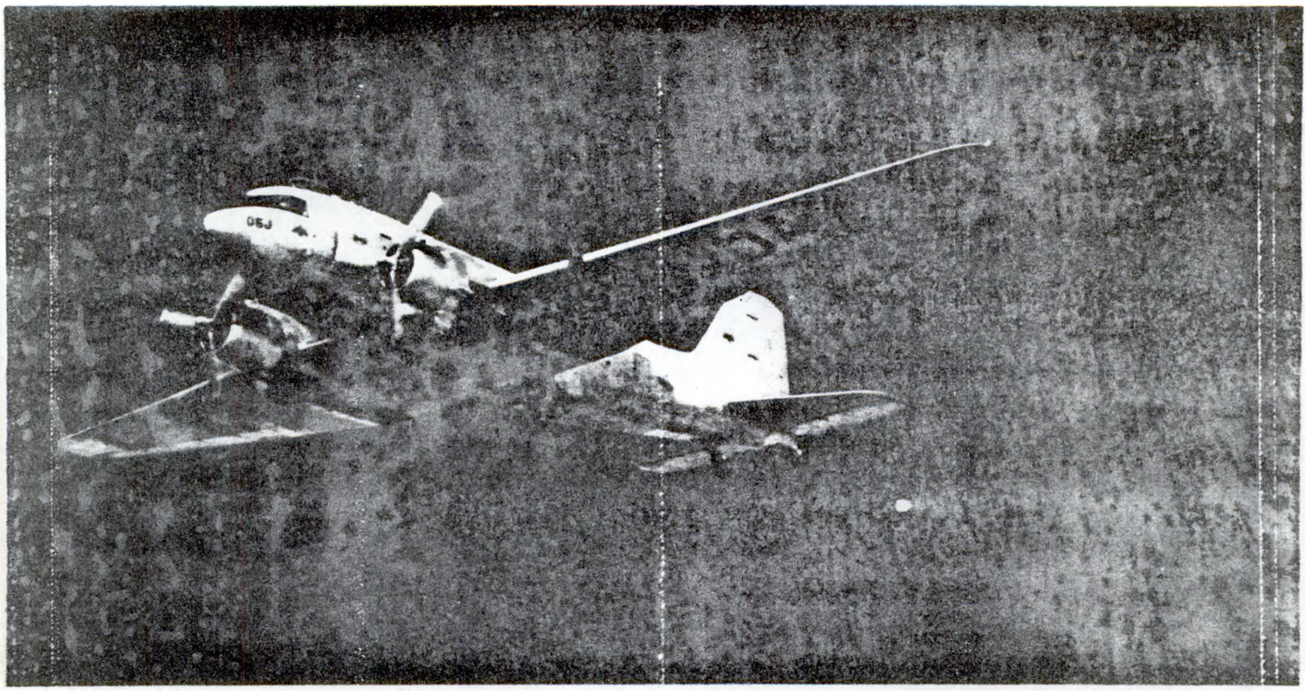
Rancher cooperation is crucial to the screw-worm eradication program. Ranchers participate by inspecting animals frequently for wounds, treating all wounds with approved insecticides and sending samples of worms for identification.





Each week millions of screwworms are reared artificially in production plants in the United States and Mexico. The flies are sexually sterilized. . .



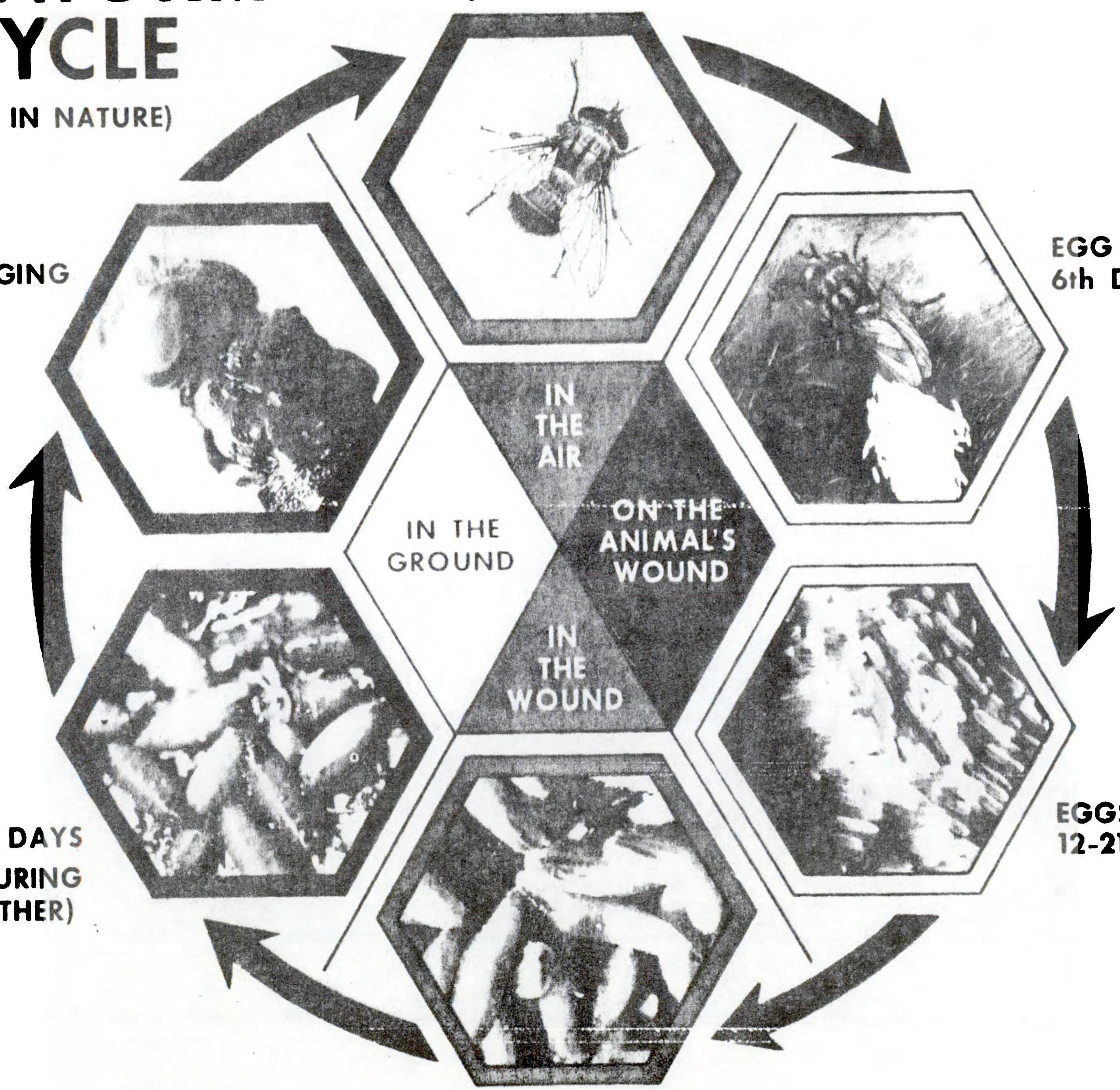


. . .and then released over infested farm and ranch land to mate with native fertile flies.

The accelerated 1977-78 drive to push screwworms south into Mexico began with a kickoff hosted by the Governor of Texas and attended by close to 2,000 livestockmen, county agents and press.

SCREWWORM LIFE-CYCLE

(AVERAGE TIMES IN NATURE)



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San Jose, Costa Rica, 8-12 September, 1980

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COMISION MEXICO-AMERICANA PARA LA ERRADICACION DEL GUSANO BARRENADOR DEL GANADO

JOINT MEXICAN-AMERICAN SCREWWORM ERADICATION COMMISSION

Dr. Nazario Pineda.

COMISION MEXICO-AMERICANA PARA LA ERRADICACION DEL GUSANO BARRENADOR DEL GANADO.

SEGUNDA REUNION DE DIRECTORES DE SALUD ANIMAL DEL HEMISFERIO

INSTITUTO INTERAMERICANO DE CIENCIAS AGRICOLAS.

I.- GUSANO BARRENADOR

El Gusano Barrenador del Ganado es la forma larvaria de la mosca Cochliomyia hominivorax (Coquerel), llamada comunmente mosca del Gusano Barrenador. Es un parásito de todos los animales de sangre caliente, incluyendo al hombre, en quien se evidenció primeramente.

El ciclo biológico dura aproximadamente 21 días en condiciones favorables, y empieza cuando la hembra fecundada oviposita en los bordes de la herida, siempre y cuando exista solución de continuidad. El peligro es grande porque el tamaño de la herida no importa a la mosca, ya que la hembra busca cualquier herida para ovipositar, pudiendo ser ésta tan pequeña como la simple herida que deja el piquete de garrapata. En pocas horas eclosionan y salen las larvas, que se alimentan de los exudados, y en una semana aproximadamente caen a la tierra, enterrándose para transformarse en pupas. Después de una semana rompe la corteza y emerge a la superficie como mosca para aparearse aproximadamente 5 días después y buscar una herida para iniciar nuevamente su ciclo.

Es en la etapa de larva o gusano donde parasita a los animales ocasionando importantes daños a la economía de los países en donde existe este parásito.

JOINT MEXICAN-AMERICAN SCREWWORM ERADICATION COMMISSION.

SECOND HEMISPHERIC MEETING OF DIRECTORS OF ANIMAL HEALTH

INTERAMERICAN INSTITUTE OF AGRICULTURAL SCIENCES.

I.- THE SCREWWORM

The screwworm -- larval form o the fly Cochliomyia hominivorax (Coquerel), commonly called the screwworm fly -- is a parasite of all warm-blooded animals, including humans.

The life cycle of the screwwor lasts approximately 21 days under favorable climatic conditions. Lif begins for the screwworm when the fertile female lays her eggs on the edges of a fresh wound. The screwworm is particularly dangerou because it is attracted by the sce of blood to any wound, even one as small as a tick bite. In a few hours, the eggs hatch and the tiny worms penetrate the wound to feed. After feeding for approximately one week, the worms drop out of the wound and burrow into the ground to pupate. In 7-10 days, depending on the climate, the adult fly emerges from the pupal casing and within a week is ready to mate.

It is in the worm stage that the screwworm causes damages to both the animal and the economy of the infested country.

II.- ANTECEDENTES

Las infestaciones por gusano barrenador en los animales de sangre caliente se conocen en México desde tiempos de la Colonia y en el Sudoeste de los Estados Unidos desde principios del siglo XIX.

Pero no fue sino hasta el año 1933 que se hizo la clasificación, diferenciándose la mosca del gusano barrenador del ganado de la mosca azul Cochliomyia Macelaria (Fabricius), la cual se conocía desde el siglo XVIII y se pensaba era la causante de las gusaneras en los animales vivos.

Después de la Segunda Guerra Mundial un grupo de científicos inició las investigaciones para determinar un método con el cual se controlara o erradicara este parásito. Debido a que la hembra se aparea una sola vez en la vida, determinaron que esterilizando sexualmente a las moscas machos sería posible romper su ciclo biológico.

Después de numerosos estudios determinaron que con la utilización de la energía atómica se podían esterilizar millones de moscas en forma rápida.

Entre 1954 y 1959 se hicieron las primeras pruebas en la Isla de Curacao, en el Caribe, y en el Sureste de los Estados Unidos, erradicando con este método al gusano barrenador de estas áreas.

En 1962 se inicia el Programa de Erradicación en el Suroeste de los Estados Unidos, y como parte de este programa el Gobierno mexicano autoriza al Gobierno de Estados Unidos la dispersión de moscas estériles en la frontera de los Estados de Tamaulipas Nuevo León y Coahuila.

II.- HISTORY

Screwworm infestations have been known in Mexico since Colonial times, and in the Southwestern United States since the beginning of the 19th Century.

But it wasn't until 1933 that researchers differentiated the parasitic screwworm fly Cochliomyia hominivorax (Coquerel) from the common blowfly species Cochliomyia macelaria (Fabricius), which had been known since the late 18th Century. It had been assumed for over one hundred years that maggot infestations in living animals were those of blowflies.

After World War II, a group of scientists began an intensive search for a method of controlling or eradicating this parasite. Since the female mates only once in her life, they determined that by sexually sterilizing the male flies it would be possible to break their life cycle.

After numerous studies they concluded that by using atomic energy millions of flies could be sterilized in a rapid manner.

Between 1954 and 1959 the first tests of the sterile male technique were made in the Island of Curacao in the Caribbean, and in the Southeastern United States. The technique was successful and screwworms were eradicated from these areas.

In 1962 an Eradication Program started in the Southwestern United States, and as part of this program, the Mexican Government authorized the United States to disperse sterile flies along the border of the states of Tamaulipas, Nuevo León and Coahuila.

Los resultados fueron satisfactorios, por lo que los ganaderos mexicanos a través de la Confederación Nacional Ganadera y los ganaderos del Sudoeste de los Estados Unidos (Southwest Animal Health Research Foundation) solicitaron a sus respectivos gobiernos la ampliación de las áreas de dispersión.

Por los éxitos obtenidos en los primeros años, los ganaderos de ambos países solicitaron en repetidas ocasiones la constitución de un organismo mancomunado que coordinara los esfuerzos para establecer un programa conjunto en la República Mexicana.

Como resultado de las gestiones y después de muchas reuniones, se creó el 28 de agosto de 1972 la Comisión México-Americana para la Erradicación del Gusano Barrenador del Ganado en México, con el fin de erradicar el parásito en la región norte y oeste del Istmo de Tehuantepec y a la vez formar una barrera biológica en esta zona para proteger a México y EE.UU. de reinfestaciones provenientes del Sur del Continente.

The results again were satisfactory, and Mexican and U.S. livestock producers, through the Confederación Nacional Ganadera and the Southwest Animal Health Research Foundation, requested from their respective governments that the are of dispersion be enlarged.

The expanded program continued successfully and the livestock producers of both countries requested that a Joint Program be established in Mexico to eradicate screwworms from that country.

As a result of negotiations which followed their request, an Agreement was signed between Mexico and the United States on August 28, 1972, establishing the Mexico-American Screwworm Eradication Commission. The Commission's goal is to eradicate screwworms in Mexic north and west of the Isthmus of Tehuantepec, and at the same time, form a biological barrier to protect Mexico and the U.S. from reinfestation from the south.

III.- ORGANIZACION

La Comisión quedó integrada por personal mexicano dependiente de la Secretaría de Agricultura y Recursos Hidráulicos y personal norteamericano dependiente del Departamento de Agricultura de los Estados Unidos y personal pagado con recursos del fondo común proveniente de ambos países.

La Autoridad Máxima está formada por cuatro Comisionados de cada país, los cuales tienen como órgano ejecutor un Director mexicano y un Co-Director norteamericano.

En línea directa los Directores cuentan con un Subdirector General mexicano y un norteamericano, que son el enlace entre la Dirección y las Subdirecciones de Area, que son:

III.- ORGANIZATION

The Commission is composed of Mexican Federal employees from the Secretaría de Agricultura y Recurso Hidráulicos, American Federal emplo ees from the U.S. Department of Agr culture and personnel paid with joint funds from both countries.

The policy-setting body of the Commission is made up of four Commissioners from each country. The executive body of the Commission is headed by a Mexican Director and a U.S. Co-Director.

Under the Directors are a Mexican General Sub-Director and a U.S. General Sub-Director who act as liaisons between the Directors and the following departments:

Subdirección Administrativa
Subdirección de Operaciones de Campo
Subdirección de Producción de Moscas Estériles

así como también las Jefaturas Regionales.

IV.- EJECUCION DEL PROGRAMA EN EL CAMPO

Al implantarse la campaña en un área determinada, se realizan las siguientes actividades:

<u>Fase de Promoción</u> - Se desarrolla una intensa campaña de divulgación del programa a través de todos los medios de comunicación y en forma personal en ranchos, ejidos, comunidades, asociaciones ganaderas locales, autoridades y toda la población en general, con el fin de sensibilizarla y para que nos ayuden en el combate del pará sito.

Simultáneamente, distribuye tubos para que los ganaderos recolecten muestras del gusano barrenador y las envíen a los laboratorios de las Jefaturas Regionales, para su identificación; distribuye insecticida y proporciona asistencia técnica a los ganaderos para el tratamiento de heridas; recopila información sobre la situación geográfica de la zona de trabajo, vías de comunicación, censo ganadero por especies, actividades económicas de la población, factores climáticos y su influencia estacional; rutas pecuarias; incidencia y distribución del gusano barrenador; así como otras informaciones que brinden un conocimiento claro y preciso de la problemática de la ganadería y los daños que causa el gusano barrenador en la producción pecuaria.

<u>Fase de Control</u> - En la segunda fase que es la de control, se realizan las actividades especiales de combate. Se establece el control de la movilización de animales, se recomienda el baño de ganado con un insecticida

Administrative Sub-Directorate
Field Operations Sub-Directora

Sterile Fly Production Sub-Directorate

and the Regional Directors.

IV.- PROGRAM IN THE FIELD

The screwworm eradication campaign in a determined area consists of the following activities:

<u>Promotion Phase</u> - An intensive publ information campaign is carried out using all communications media and implemented personally by Commissio personnel through contacts with ranchers, ejidos, communities, local livestock associations, authorities and the general public. The campai is designed to create awareness of the program and solicit help in the battle against this parasite.

Collection tubes are distribut simultaneously so that the livestoc producers can collect screwworm samples and send them to regional labs for identification. In addition, insecticide is given away without charge, and technical assistance in treating wounds is offered. Commission personnel also gather information on the geographical situation in the working area, communications livestock census (by specie), economical activities of the populatic climatic factors and their influenc cattle routes, incidence and distribution of screwworms as well as oth pertinent information that helps gi a clear and precise picture of the livestock population and the damage caused by the screwworm in livestoc production.

<u>Control Phase</u> - In this second, or control phase, eradication activities are started including controlli the transportation of animals, spraying cattle with an adequate insecticide, inspecting animals and

apropiado, se realiza la inspección, se recogen tubos colectores con muestras, se proporciona asistencia técnica en el tratamiento de heridas y se dispersan moscas estériles con la intensidad y periodicidad que requiere el grado de infestación para disminuir la población de mosca silvestre. Se apoyan estos trabajos con la dispersión de un nuevo producto llamado SWASS - Sistema de Supresión del Adulto del Gusano Barrenador del Ganado - que es un comprimido de aproximadamente 2-1/2 cms., con un atrayente específico y un insecticida.

<u>Fase de Erradicación</u>.- En la fase de erradicación, se intensifican estas actividades mediante dispersión de moscas estériles en parrillas especiales, apoyada con la dispersión de SWASS y baños de ganado donde persiste el parásito; se establece el control estricto sobre la movilización de ganado en las diferentes rutas pecuarias; se practican inspecciones periódicas en los predios para detectar si aún sigue existiendo el parásito.

<u>Fase libre</u>.- Antes de declarar libre una zona determinada, la Comisión realiza registros y estudios epizootiológicos para comprobar que se han cumplido las condiciones de erradicación del parásito durante los 6 meses anteriores.

Cuando una zona se declara oficialmente libre, se programan actividades de vigilancia e inspecciones periódicas, para detectar y controlar de inmediato cualquier reinfestación que pudiera aparecer.

V.- PLANTA PRODUCTORA DE MOSCAS ESTERILES.-

Para producir moscas estériles, se construyó en 1976 una Planta en Chiapa de Corzo, Chis., con la capacidad de producción de 500 millones de moscas estériles semanales.

collecting screwworm samples, assisting in the treatment of wounds and dispersing sufficient sterile screwworm flies to reduce the native fly population. These activities are reinforced with the dispersal of a new product called SWASS -- Screwworm Adult Suppression System -- a pellet approximately 2-1/2 cms. composed of a specific attractant and an insecticide.

<u>Eradication Phase</u>.-

In the eradication phase, the above activities are intensified by dispersing sterile flies in special swath widths, reinforced by strictly controlled transportation of animals in different livestock routes and intensive surveillance for screwworm cases.

<u>Free Phase</u>: Before declaring an area screwworm-free, the Commission conducts research and epizootiologic studies to prove that the eradication has, in fact, been accomplished and that the area has been truly screwworm-free for the preceeding six months.

When an area is declared officially free, surveillance and periodic inspections are carried out so as to detect and immediately control any reinfestation that might occur.

V.- THE STERILE FLY PRODUCTION PLA

In 1976, a sterile fly production plant was constructed in Chiapa de Corzo, Chiapas State, with a production capacity of 500 million sterile flies per week.

En el proceso de producción, se de-sarrollan todas las etapas del ciclo de vida del gusano barrenador imitando las condiciones naturales: huevecillo, larva, pupa y mosca.

La producción empieza con una colonia de moscas, de la que se recolectan masas de huevecillos que se incuban hasta obtener el estado de larva. Conforme va adquiriendo este estado, se le nutre en preparaciones especiales que simulan heridas de animales para proporcionarles un medio semejante al de la naturaleza. Después de adquirir el estado de pupa en charolas provistas de aserrín, y en el momento apropiado, se les esteriliza sexualmente, exponiéndolas a la acción de rayos gamma de Cessium 137. Esterilizadas, se empacan en grandes recipientes especiales y se transportan en trailers refrigerados de la planta a los centros de distribución, ubicados estratégicamente, para ser posteriormente dispersadas en las zonas de trabajo.

VI.- RESULTADOS OBTENIDOS DE 1977 A 1980.

La Comisión, en este período, mejoró su organización adecuándola a la extensa superficie que comprenden sus actividades, fijando objetivos generales y específicos en cada área. Se perfeccionaron las técnicas de trabajo, en el campo, en producción, distribución, dispersión y de control de calidad.

Se amplió el conocimiento de las rutas migratorias del gusano barrenador; se recolectaron 107 000 muestras de larvas para su estudio e identificación; se dispersaron aproximadamente 62 000 millones de moscas estériles que se produjeron en México y en Estados Unidos, en una superficie de 92 millones de hectáreas en los estados del norte de la República.

During production, each step of the life cycle of the screwworm eggs, larvae, pupae and flies - is accomplished by imitating natural conditions.

Production starts in the fly colony from which egg masses are collected and hatched into tiny larvae. The worms are fed with a special preparation which simulate an animal wound. After approximately one week, the mature larvae crawl off the feeding vats and are placed in trays of sawdust to pupate. At the proper moment, the developing flies are sexually sterilized in the pupal casings by exposing them to gamma rays from Cessium 137. After sterilization, the pupae are packed in special containers and transported in refrigerated trailers from the plant to strategically located distribution centers to be dispersed in areas in which the program is working.

VI.- PROGRESS FROM 1977 TO 1980.

During this period, the Commiss improved its organization, adaptin it to better serve the constantly growing area of work and setting general and specific goals in each area. As part of this reorganization, the work systems in the field were revised and production techniques, pupae transportation systems, fly dispersal systems and quality control were improved.

In addition, research was conducted to determine the migratory routes of the screwworm; 107 000 screwworm samples were collected for analysis and identification and approximately 62 000 million sterile flies, raised in Mexico and the United States, were dispersed over 92 million hectares in the northern states of the Republic.

Con la estrategia adoptada y la intensificación de los trabajos, se han obtenido resultados altamente satisfactorios, teniendo actualmente libres de parásito, los 2 Estados de Baja California; en etapa de erradicación, Sonora, Chihuahua, Nuevo León, Coahuila y Tamaulipas; y en etapa de control, Sinaloa, Durango, Zacatecas, San Luis Potosí, norte de Hidalgo y Veracruz.

Se produjeron en la planta de Chiapas 55 140 millones de moscas estériles. Se desarrollaron 3 estirpes de moscas más agresivas; la Aricruz, la D-E-9 y la Sinaloa.

Se mejoró la organización general de la Comisión, creándose las Jefaturas Regionales y Centros de Distribución Temporal, se desconcentraron facultades, funciones y actividades acordes con la Reforma Administrativa. Se elaboraron Manuales de Políticas y Procedimientos de las unidades del área administrativa, un Manual de Organización General de la Comisión y se mejoraron los sistemas de control de los recursos asignados a la misma.

Estos avances constituyen, un claro ejemplo de lo que han sido capaces los dos países, con apoyo de los ganaderos al unir sus recursos y esfuerzos para erradicar en sus respectivos territorios la plaga del gusano barrenador del ganado.

With the strategy adopted and the intensification of eradication efforts, the Program has freed the states of Baja California Norte and Baja California Sur from screwworms and is completing the eradication phase in Sonora, Chihuahua, Nuevo León, Coahuila and Tamaulipas. Sinaloa, Durango, Zacatecas, San Luis Potosí and the northern parts of Hidalgo and Veracruz are currently in the contro[l] phase.

Also during this period 55 140 million sterile flies were produce[d] in the plant in Chiapas and three new strains of more aggressive flies were developed -- Aricruz, D-E-9 and Sinaloa.

To improve the general organization of the Commission, three Regional Director positions were established and temporary Distribution Centers were created, decentralizing obligations, function[s] and activities in accordance with the Administrative Amendment. Policies and Procedure Manuals for the Administrative units and a General Organization Manual for the Commission were written. Control systems, especially in the budget area, were also improved.

These advances very clearly show what the two countries -- wit[h] the backing of their livestock industries -- have been able to accomplish by joining their resource[s] and efforts to eradicate screwworm[s] from their respective territories.

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

Agenda Item No. 3

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September 5, 1980
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THE TECHNICAL FEASIBILITY FOR ESTABLISHING A REGIONAL PROGRAM TO ERADICATE THE SCREWWORM FROM CENTRAL AMERICA AND PANAMA

IICA

THE TECHNICAL FEASIBILITY FOR ESTABLISHING A REGIONAL PROGRAM TO ERADICATE THE SCREWWORM FROM CENTRAL AMERICA AND PANAMA

A group of six people, most of them knowledgeable in eradication of screwworms, was recruited by Dr. Frank J. Mulhern, Director of Animal Health, IICA, in June and July 1980. The group was assigned the task of identifying any reasons from a technical viewpoint, that would prevent the eradication of screwworms from Panama and Central America with the present known technology (sterile make technique, SWASS, preventive practices by livestock owners, etc.)

Those comprising the group are as follows:

- Dr. Robert S. Sharman, Group Leader, Assistant Professor at School of Veterinary Medicine, Auburn University, Alabama, USA, and one of the USA Commissioners for the Mexico-USA Screwworm Eradication Program currently underway in Mexico.
- Dr. Abraham A. Arce, Animal Health Project Specialist PAF/LIVE, Inter-American Development Bank, Washington, D.C. 20577.
- Dr. James E. Novy, USDA, APHIS, VS, Screwworm Eradication Program, P. O. Box 969, Mission, Texas 78572.
- Dr. Donald L. Williams, Co-Director, C.O.P.F.A., Panama, R.P.
- Ing° Ag° Alfredo Alonso, IICA, San José, Costa Rica.

Five members of the group assembled in Panama on Sunday, July 27 and were later joined by Agronomist, Alfredo Alonso of IICA in Costa Rica. On

July 28 members met with the Director of Animal Health for Panama and several other staff members. We were unable to schedule a meeting with the Minister of Agriculture or Panamanian cattlemen since all were attending the annual cattlemen's association meeting in a city north of Panama City. Dr. Williams will hold a meeting with them on his return.

On July 29, a meeting was held with the Vice Minister of Agriculture in Costa Rica and later with the Director of Animal Health and his staff. On July 30 a meeting was held with Costa Rican cattlemen in their association office. The President of Costa Rica's Cattlemen Association is also the President of C.I.A.G.A.

On July 30 we met in the evening with the Director of Animal Health and his staff in Managua, Nicaragua.

On July 31 we met with cattlemen of Nicaragua and later that day with the Vice-Minister of Agriculture.

On August 1, we met with the Vice-Minister of Agriculture of Honduras, the Director of Animal Health, and staff members in Tegucigalpa.

On Saturday, August 2, we took a field trip to Comoyagua, Honduras to interview livestock owners in the vicinity. While in Tegucigalpa we tried through four different channels (some personal) to schedule meetings in El Salvador but in all instances were advised it would be impossible due to religious holidays there during the week of August 2-9. Dr. Donald Williams will return around August 12 to hold meetings there.

On August 4 we met with the Vice-Minister of Agriculture for Guatemala and later that day with the Director of Animal Health and his staff.

On August 5 we met with Guatemalan veterinarians who were holding their 3rd annual conference in Guatemala City. In the afternoon, the group made a field trip to interview cattlemen.

On August 6, the group was en route to Belize and devoted considerable time to discussions of its findings and preparing a rough draft of a report.

On August 7, a meeting was held with cattlemen from Belize and later with the Minister of Labor.

Hurricane Allen disrupted return schedules and it was necessary to enter the United States by the way of Miami on August 8.

During the trip to six political entities, thirteen meetings were held with about 120 agricultural officials and cattlemen attending. The screwworm movie, made in Mexico with Spanish sound track, was shown at the meetings, the purpose of the visit explained, and questions raised by those attending were answered. It was possible to get many opinions about losses, treatments, other diseases and parasites, etc.

The group id deeply grateful to numerous individuals and organizations who helped arrange meetings and provide transportation on a tightly scheduled trip. Since most flights taken left very early in the mornings the group found it possible to fully utilize working hours in most instances.

With few exceptions the scientists comprising the group had known one another for many years and had worked together on screwworm matters over that period. Except for a few phone calls there was little discussions of its charge before the group assembled in Panama.

In all candor, however, the subject was not a new one to the members. They agreed that they had given informal thought to the matter over a period of years because of their intimate relationship with ongoing screwworm eradi-cation efforts in the US Sothwest and Mexico, and because of their contacts and travels in Central America in the last two decades. It was agreed that, though they would rely on experience and knowledge previously acquired, preconceived notions and conclusions would be discarded in this approach because of the possible serious impact the group's conclusions might have on the future of screwworm eradication in the area under discussion.

The average age of the members of the group is over the half-century mark. They represent over 100 years continued experience in screwworm eradication. They have lived in Latin America for a total of over 100 years while conducting research or eradication and control efforts associated with agriculture in the area. All but one speak fluent Spanish, and the exception can converse quite well. Three members have been directors of interstate and/or international screwworm eradication program in the USA or Mexico. Three members have over thirty years experience at the policy level in Washington, D.C. Those who planned, put together and directed the programs in the US southwest, US southeast, and Mexico are represented within the group. One member is a native of Honduras, another of Uruguay and a third member is now stationed in Panama.

It is obvious from the average age that the conclusions reached were not based on youthful optimism. The fields of research, finance, economics and program planning and execution are well represented and the group will not protest its lack of experience in screwworm eradication in approaching the charge.

Since this is the first formal step taken by anyone to assess the potential for a possible screwworm eradication program in this region of the hemisphere certain data had to be assembled for a review by the group to enable it to make comparisons with patterns and circumstances resulting from previous screwworm eradication efforts in the Caribbean, USA, and Mexico. Some of the data considered are as follows:

(1) Size of area in kilometers and square miles* (see attachments)

(2) Population (people) by country

(3) Livestock census by country and species and regional total

(4) General geography (narrow and wide points in area, mountains, lakes, etc.)

(5) Climate

(6) Livestock practices

(7) Other diseases and parasites, including bats, ticks, and torsalo.

Comparisons

(1) Climate

(2) Size

(3) Geographical advantages and disadvantages

(4) The region is made up of seven distinctive political entities, one of which is not a member of IICA. Although the matter is not within the scope of this group to evaluate, it is obvious that considerable inter-institutional and administrative skills will be needed to co-ordinate the technical efforts of such a diverse number of countries in pursuing the goal of eradication.

Conclusions

With possibly some exceptions screwworms are found throughout Central America and Panama throughout the year. Most domestic livestock are observed and treated daily or almost dailiy. Bovines are sprayed or dipped for ticks frequently, and the usual time interval is given as 15 days, but few cattlemen claim to treat their animals this often. Of the animals we observed ticks were absent or estremely scarce. Most owners use coumaphos (Asuntos^R) as a tickicide.

Frequent observations of animals and the use of screwworm smear or home remedies and tick dippings or spraying probably serve well to keep screwworm populations at a level where few livestock death occur.

Those we interviewed cited creolin, tobacco, bovine feces, smear-62, EQ-335, Neguvon (R), Supona (R), and Coumaphos as treatment for infestations or wounds. Most of the smear-62 is made by Franklin Serum Co., and as far as we could ascertain no one manufactured smear-62 in the region in question. Treatment used seemed to depend on what an owner could afford to purchase.

There appeared to be some seasonal variations in screwworm population in all the countries visited - Panama, Costa Rica, Nicaragua, Honduras, Guatemala,

Belize (El Salvador will be visited at a later date) - the dry season with a lower population and the wet season having a higher incidence. The Pacific coast is generally drier than the Caribbean coast.

We were unable to elicit any firm information about screwworm in wildlife, but most agreed that it probably occurred.

Cattlemen, livestock foremen and cowboys discussed incidence and treatment of screwworm in much the same terms as those in Mexico and the United States. In fact, the responses were so similar that one could believe that they all had been programmed to respond identically. One may attribute this to years of personal hard work with their animals, observing them frequently and treating infestations - a tough and nasty chore by any measurement. They demonstrated little resentment over this state of affairs, seeming to accept the necessity for coping with screwworm as they would lightening, drought, and other phenomena over which they have little control. Their reaction to possible eradication through use of sterile flies and supportive measures was polite and restrained even though one could detect considerable interest among them. They were quick to bring up other disease and parasite problems with their animals such as <u>Dermatobia</u> <u>hominis</u> (torsalo), ticks, and bat rabies. Frequent questions about the torsalo were probably asked because livestock producers are well aware that it can only be controlled, not eradicated, using the insecticides now available to them.

The general reaction among agricultural officials and field veterinarians was less specific and to some extent more dubious in nature. Several times it

was suggested that a possible better plan would entail combining screwworm efforts with those against ticks and the torsalo. The group advanced several reasons why this had not appeared feasible in Mexico and the United States and did not appear to be so for Central America and Panama.

Other questions were raised about costs, sources of funds, the timetable, locations of production plants, where eradication might start, etc. The group explained that such basic information is not available and could not be obtained without field and laboratory studies in the countries involved.

Each country was favorable to the idea of training at least one veterinarian or entomologist for approximately one month at either Mission, Texas, USA, or Tuxtla Gutierrez, Chiapas, Mexico if it is decided that field and laboratory studies are to be undertaken in the near future, so that a knowledgeable counterpart would be available to work with any experienced screwworm scientist or technician assigned to work in the region.

Disqussions of the geography and other characterictics of the region leads the group to suggest that any eradication measures attempted should proceed from north to south, tying in with the nearest screwworm free zone in Mexico as a starting point. There appear to be cogent technical reasons for suggesting this at this time, even though we are not prepared to discuss, in the absence of hard field data, other matters such as the number of flies needed, program costs, and sources of sterile flies. The reasons are as follows:

(1) Once the Yucatan peninsula, Belize and Guatemala are free of screwworms the region is narrow enough to establish a barrier at almost any point,

at relatively low cost along the way, should a shortage of funds or some other calamity forestall forward progress. Such a barrier should protect the gains already made. A start in the southern extremity would leave a barrier exposed at both ends to screwworm infiltration. The same thing would take place if eradication were started in the center of the area. If eradication were begun over the entire region at the onset, such as took place in the south-eastern USA, the likehook of bogging down for some reason such as lack of funds would be mathematically more probable. Again, gains made by the program would be more easily lost. A "one-front" approach would enhance the chances for success from the technical point of view.

The group has carefully discussed and assessed the data accumulated during its trip through the Panama - Central America region. Subsequent studies of the epidemiology of the screwworm in the region, particularly detailed field and laboratory investigations, might uncover some anomaly not yet encountered in Mexico or the USA which would drastically and adversely affect a screwworm eradication program. Although the possibility exists, we do not believe conditions are so different (granted the presence of some cold and/or dry weather in northern Mexico and the United States) that the task is impossible. The many similarities between Mexico and the region under study lead us to believe that eradication of screwworms is feasible. Moreover, the geography of the isthmus is favorable to a program and it is probable that screwworm

populations do not fluctuate as drastically as they do in the northern regions. Consequently, it might be easier to eradicate the species from Central America than it has been in other regions.

Although there were field tests in Curazao and Florida before the south-eastern program, there were, even so, more unknowns at that time than now about eradication of screwworms over a large area.

We recommend:

1. That screwworm eradication in this region be considered technical feasibility.
2. That, if eradication is undertaken, the program move from North to South.
3. That, screwworm eradication in this region not be combined with any other arthropod or animal disease program.
4. That one man from each country be trained for at least one month in Mission, Texas or Tuxtla Gutiérrez, Chiapas.

P.S. In a letter dated August 18, 1980, Dr. Donald Williams reported on his visit to El Salvador, August 11-12. His meetings with agricultural officials and livestock owners (about 80) revealed that "screwworms are a serious problem to El Salvador and any efforts to eradicate them can count on the cooperation of both livestock producers and government veterinarians."

Attachment #1. Livestock Population in Central America and Panama

Panama

Bovine	1,358,360
Ovine	N/A
Caprine	N/A
Porcine	179,000
Equine	130,019

Costa Rica

Bovine	1,346,222
Ovine	N/A
Caprine	N/A
Porcine	246,802
Equine	106,576

Nicaragua

Bovine	2,864,198
Ovine	N/A
Caprine	N/A
Porcine	207,059
Equine	149,446

Honduras

Bovine	1,685,487
Ovine	2,863
Caprine	16,938
Porcine	511,124
Equine	264,753

Guatemala

Bovine	1,712,851
Ovine	667,766
Caprine	53,576
Porcine	659,031
Equine	165,174

El Salvador

Bovine	960,774
Ovine	112
Caprine	N/A
Porcine	11,160
Equine	104,674

Belise

Bovine	50,000
Ovine	2,000
Caprine	2,000
Porcine	15,000
Equine	7,000

Total

Bovine	9,977,892
Ovine	672,741
Caprine	72,514
Porcine	1,829,176
Equine	927,642

Attachment #2. Population of Central America and Panama (Almanaque Mundial, 1980)

Panama	1,798,000
Costa Rica	2,044,237
Nicaragua	2,346,000
Honduras	2,954,000
Guatemala	6,531,000
El Salvador	4,310,000
Belise	140,000
TOTAL	20,123,237

Land Area of Central America and Panama

Panama	77,000 Km^2
Costa Rica	50,900 Km^2
Guatemala	108,900 Km^2
Nicaragua	148,000 Km^2
Honduras	112,000 Km^2
El Salvador	21,000 Km^2
Belise	22,965 Km^2
TOTAL	540,765 Km^2

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LA FIEBRE PORCINA AFRICANA EN REPUBLICA DOMINICANA

Dr. Orlando A. Sánchez Díaz
Secretario Ejecutivo.
Comisión de Alto Nivel para la
Erradicación de la Peste Porcina
Africana.
Santo Domingo, Rep. Dominicana.

LA FIEBRE PORCINA AFRICANA

EN REPUBLICA DOMINICANA

por el

Dr. Orlando A. Sánchez Díaz

Secretario Ejecutivo, Comisión de Alto Nivel
para la Erradicación de la Peste Porcina Africana
Secretaría de Estado de Agricultura
Santo Domingo, República Dominicana

Agosto 1980

I N D I C E

1.- GENERALIDADES:

La República Dominicana, situada entre Cuba al Oeste y Puerto Rico al Este, ocupa las dos terceras partes oriental de la isla Hispaniola, con una extensión de 240 millas de Este a Oeste y 170 millas de norte a sur. Tiene una costa lineal de 979 millas y una frontera compartida con Haití de 193 millas.

Está dividida en 27 provincias, las que a su vez se dividen en municipios y estos en secciones.

Según censo 1971, la población porcina existente en el país fué de 787,052 cerdos prevaleciendo el cerdo criollo, aunque muchos han sido cruzados con Duroc, Yorkshire y Hampshire.

Durante los años 1973 - 1977, la producción de cerdos se estimó haber aumentado a una tasa anual de aproximadamente 3 %; en 1978 la cantidad de cerdos estimada existente era del orden de los 1.5 millones de cabezas.

Según análisis sectorial realizado en 1976 indicaba que el 84 % de los porcicultores tenían entre 1 - 10 cabezas; un 11 % entre 11 - 20 y un 5 % tenían explotaciones con 21 cabezas de cerdos y más.

Los sistemas de explotación porcina existentes en 1978 eran:

1.- Sistema de pastoreo extensivo:

El 20 % de todos los cerdos eran criados bajo este sistema. Los animales estaban sueltos en grandes extensiones de terreno, donde debían buscar sus alimentos: frutas de palmeras, hierba, tubérculos, etc.

2.- Sistema Casero:

Este sistema cubre cerca del 10 % de los cerdos producidos, donde una o dos hembras eran alimentadas con desperdicios de cocina, permitiéndosele merodear en la vecindad.

3.- Sistema Semi-extensivo:

Cerca de un 50 % de los cerdos se producían bajo este sistema, el cual consistía en dar pastoreo libre a los animales y proveer un techo y alimento para las hembras paridas durante los primeros meses después del parto.

4.- Sistema intensivo Moderno:

Este sistema se ha desarrollado rapidamente y cubre cerca del 20 % de los cerdos producidos. Se usan razas mejoradas y mejores niveles de alimentación y manejo.

II.- ANTECEDENTES Y DIAGNOSTICOS:

La Fiebre Porcina Africana fué diagnosticada por pruebas del laboratorio a través de muestras enviadas desde la provincia de San Juan de la Maguana al laboratorio de Plum Island, E. U. A. en Julio de 1978. Estudios realizados posteriormente hacen pensar que los primeros brotes de la enfermedad aparecieron en Febrero de 1978 en la localidad de Villa Mella, Distrito Nacional. (Mapa Nº 1)

III.- PROGRAMA DE ERRADICACION:

El Gobierno Dominicano tomó la decisión de erradicar la enfermedad mediante el exterminio de la especie porcina, para cuyos fines, las autoridades Dominicanas suscribieron un contrato de préstamo con la A. I. D. en Diciembre del mismo año.

La República está dividida con fines operacionales por la Secretaría de Estado de Agricultura, en ocho (8) Regionales Agropecuarias (Mapa Nº 1).

El programa de eliminación de los cerdos del país, fué formulado de manera geográfica y progresiva de Este - Oeste, comenzándose en la Regional Agropecuaria Este y la Península de Samaná de la Regional Agropecuaria Nordeste. (Mapa Nº 2)

El programa a ejecutarse en 27 meses, consta de tres fases:

1ra. Fase:

Despoblación / Descontaminación

En esta fase se eliminaron todos los cerdos de la región, procediéndose luego a la descontaminación de los lugares donde existían cerdos y de todo objeto que se encontrara en contacto con los mismos.

Esta fase comprende los siguientes componentes:

a) Detección: Que consiste en tomar muestras de sangre a todos los cerdos que se captan, con el fin de establecer los lugares donde existe el virus de la Fiebre Porcina Africana, lo cual sería utilizado como parámetro para la fase de centinelización. Las actividades desarrolladas en este componente aparecen descritas en el Cuadro Nº 1.

b) Despoblación: Eliminación de cerdos, los que serían destinados al consumo humano o enterrados, dependiendo de su condición sanitaria. Las actividades desarrolladas aparecen en el Cuadro Nº 2.

c) Tasación / Compensación: Consiste en valorar los animales captados en base al peso para fines de pago al productor. El valor del kilo en pié está siendo pagado a RD$1.00, y el monto desembolsado hasta Junio del presente año asciende a RD$8,417,221.75. (Ver Cuadro Nº 2).

d) Descontaminación: Desinfección de los lugares donde existían cerdos.

2da. Fase:

Vigilancia Epiziootiológica.-

Una vez terminado el proceso de eliminación de los cerdos y desinfección de los lugares donde existían estos, se procedía a dejar la zona libre de cerdos

por un período de tres meses, durante los cuales brigadas de técnicos recorrían la zona con la finalidad de evitar la introducción de cerdos y productos derivados del cerdo a las zonas despobladas, para lo cual se acordonaba militarmente la misma.

3ra. Fase:

Centinelización.-

La cual comenzaría finalizada la segunda fase, y consiste en colocar cerdos altamente susceptibles importados de Estados Unidos, en lugares escogidos por la división correspondiente de la Secretaría Ejecutiva.

Los lugares fueron seleccionados tomando en consideración la presencia de la Fiebre Porcina Africana diagnosticada por el Laboratorio, diagnosticada por necropsia y lugares donde hay historia de mortalidad en cerdos.

Esta fase tendría una duración de tres meses, durante los cuales brigadas de técnicos hacen un chequeo diario de los animales, detectando cualquier problema que se presente y se efectúa muestreo mensual para hacer diagnóstico de F. P. A.

Con la finalidad de dar apoyo al programa de erradicación, está en ejecución un programa de Educación y Divulgación a nivel nacional y se creó un laboratorio de diagnóstico de enfermedades del cerdo.

Investigaciones sobre vectores y cerdos salvajes (cimarrones), están en ejecución. Hasta la fecha, no se han registrado muestras positivas. Ver los Cuadros Nos. 3 y 4.

IV.- ESTRATEGIA ACTUAL.-

El Gobierno Dominicano, consciente de la importancia del renglón porcino en

.../

República Dominicana, decidió en el mes de Diciembre de 1979, agilizar los trabajos de erradicación de la Fiebre Porcina Africana poniendo como fecha límite el 31 de Agosto de 1980 para la eliminación de la especia porcina, y así poder comenzar cuanto antes con un programa de Repoblación y Recuperación de la especie.

Con tales fines el personal del programa fué incrementado, así como los recursos materiales, y fué diseñado un programa de actividades ajustado al nuevo límite y que aparece a continuación.

A los 7 1/2 meses de ejecución del nuevo calendario de actividades la República Dominicana se encuentra en la etapa final del programa de eliminación de los cerdos. (Ver Mapa Nº 3).

DE LA F.P.A. EN LA REP. DOM.-

A C T I V I D A D E S 1980.-

REGIONAL AGROPECUARIA	PRIMER TRIMESTRE	SEGUNDO TRIMESTRE	TERCER TRIMESTRE	CUARTO TRIMESTRE
ESTE	Serán terminados los trabajos de eliminación de la especie porcina en el primer mes.- Quedarán 10 brigadas para desinfectar los lugares donde existió cerdos y hacer vigilancia de la zona rechequeando la existencia o no de cerdos Quedarán establecidos dos cordones militares para garantizar que la región no sea nuevamente repoblada y evitar la entrada de productos que la Secretaría de Estado de Agricultura concidere contribuye a la permanencia del virus de la F.P.A. en la región.-	Las 10 brigadas continuarán su labor de vigilancia y desinfección en la región.- A inicio de este trimestre serán traidos 800 cerdos para hacer cuarentena y ser distribuidos a mediados del trimestre en todos aquellos lugares que hubo brote de F.P.A., labor que estará supervigilada por los encargados de la sección de centinelización y repoblación de esta Secretaría Ejecutiva. El período de centinelización tendrá una duración de tres mes en los cuales el laboratorio hará chequeos serológicos periódicos que determinarán la existencia o nó del virus de la F.P.A.	En el primer mes de este trimestre quedará concluido el trabajo de centinelización. Si las pruebas serológicas realizadas en los chequeos periódicos arrojan resultados negativos la región quedará lista para comenzar el programa de repoblación con las razas de cerdos que se estime adecuada, programa que está a nivel de factivilidad del proyecto.- Se proyecta que para fines de este trimestre comience la repoblación de esta región; lo que contemplará cursos a los agricultores sobre explotación porcina en forma intensiva.-	Se continuará con el programa de repoblación de la región.
CENTRAL	Se implementarán 10 brigadas que comenzaría la despoblación de esta región comenzando en su límite con la región Este desplazandose hacía el Oeste, acompañada de una amplia actividad divulgativa para hacer que los porcicultores comprendan el problema y comercialicen sus cerdos dentro del menor plazo posible. La Secretaría de Estado de Agricultura adoptará medidas enérgicas para lograr que los porcicultores se enrolen en el programa de erradicación de la especie porcina del país.	Para fines de este trimestre la población porcina de la región Central estará eliminada por completo para dar paso a la etapa de vigilancia y desinfección de todas las granjas porcinas despobladas.-	En este trimestre se hará la vigilancia y desinfección de la regióe, para dar paso en el siguiente trimestre a la centrinelización de la zona.-	Este trimestre se dedicará a la centinelización siguiendo el mismo patrón de la región Este. Los cerdos a utilizarse en esta labor serán procedentes del programa de repoblación de la región Este, al igual que los que se utilizarían en las demás regiones.-
NORDESTE	En el primer mes quedará despoblada la zona comprendida por los municipios de Nagua, Villa Riva, Arenoso y Provincia de Samaná. En el segundo mes el número de brigada será aumentado para completar 20, las cuales continuarán la labor de despoblación de la región con miras a terminar en un plazo no mayor de cinco meses. Las brigadas completarán la despoblación de la provincia María Trinidad Sánchez y una vez terminada se dirigirán en dirección Norte-Sur hasta completar la región completa.-	Serán terminados los trabajos de despoblación de la región, quedando lista para que se inicie la vigilancia y desinfección.	Este trimestre será dedicado a la vigilancia y desinfección para dar paso en el próximo trimestre a la labor de centinelización.-	En este trimestre se hará la centinelización de la región siguiendo el mismo patrón que en la región Este.- La repoblación quedaría enmarcada en los planes de la Secretaría de Estado de Agricultura para el proximo año 1981.
NORTE	En el segundo mes de esta trimestre se implementará un número de 30 brigadas las cuales terminaría la despoblación de la provincia de Puerto Plata y la costa Norte, para luego avanzar de Norte a Sur hasta completar la eliminación de los cerdos de esta Región en un período de cinco meses. En esta región se colocará un número mayor de brigada, ya que es en ella donde se encuentra la mayor concentración de cerdos.-	En este trimestre se terminaría los trabajos de despoblación de la región para dar paso a la siguiente etapa.-	Vigilancia y desinfección de la Región.	Centinelización, siguiendo el patrón ya establecido.-
SUR	En el primer mes se terminaría los trabajos de la depoblación de los quince Km. de la frontera con Haití hacia el Este y se continuará con la despoblación de la región con un número de cinco brigadas ya que la población porcina es pequeña.	Se continuará con la despoblación de la Región.	En el primer mes se terminará con la despoblación total de la región para pasar a la etapa siguiente de vigilancia y desinfección; la cualse terminará en el primer mes del trimestre siguiente.	Se terminará con la vigilancia y desinfección y se comenzará la etapa de centinelización.-
SUROESTE	Se concluye la despoblación de la provincia Elias Piña en el primer mes y se continuará con la despoblación de la región en dirección Oeste Este con un total de 6 brigadas; ya las condiciones son similares a la región Sur.-	Se continuará con la despoblación total de la Región.	Igual que en la Región Sur.-	Igual que en la Región Sur.-
NOROESTE	Se concluye con la despoblación de las provincias de Dajabón y Monte Cristy y se continuará en avanzada Oeste-Este hasta completar la despoblación total de la región con un total de cinco brigadas.-	Se continuará con la despoblación de la Región.-	Igual que en la Región Sur	Igual que en la Región Sur.-

NOTA:

1.- A medida que se van despoblando por áreas, en cada región, se van estableciendo puestos de control militares para evitar la repoblación de las áreas libres de cerdos.-

2.- En la forma que las regiones terminen la despoblación, el personal se irá trasladando hacia las regiones que por uno u otro motivo se hayen resagado en su labor de despoblación.-

3.- Las Regiones Fronterizas con Haití no serán repoblados hasta tanto no se tenga la seguridad de haberse eliminado la [illegible]

V.- PROBLEMAS EN EL DESARROLLO DEL PROGRAMA.-

1- Con los Porcicultores:

1.1.- Pequeños y medianos:

a) No creían en la existencia en el país de la Fiebre Porcina Africana, atribuyendo la muerte de sus cerdos al cólera porcino, conocido por ellos como "Dandí" y "KC2".

b) Se mostraban renuentes a entregar sus cerdos a las brigadas de despoblación.

c) Escondían los cerdos en lugares distantes de sus viviendas.

1.2.- Productores Organizados:

a) No estaban de acuerdo con el precio establecido por el Estado Dominicano para la indemnización de RD$ 1.00 el Kilo de animal en pie.

b) Querían que sus granjas fueran protegidas.

2- Plantas Procesadoras:

El programa contempla la no circulación de productos derivados del cerdo en las zonas de centinelizar, lo cual reduce las zonas de comercialización de dichas industrias.

3- Equipo:

Hubo casos en que equipos de campo necesarios para las brigadas de

.../

despoblación, no se encontraba en existencia en él mercado local, lo que hizo mermar la labor de despoblación.

4- Huracanes:

Al inicio del programa, la República Dominicana fué azotada por dos Huracanes, destruyendo gran parte de las vías de comunicación, lo cual limitaba el transporte de las brigadas de despoblación hacia las zonas de trabajo, mermando considerablemente el rendimiento de las mismas.

5- Presiones Políticas:

De personas interesadas en que el programa no fuera ejecutado.

CUADROS

Y

MAPAS

ESTUDIO SEROLOGICO
POR REGIONES
JULIO 79 - JULIO 80
CUADRO Nº 1

REGION	TOTAL MUESTRAS	MUESTRAS NEGATIVAS	MUESTRAS POSITIVAS	MUESTRAS NO APTAS	CANTIDAD POR TIPO MUESTRAS	CANTIDAD MUESTRAS POR PROCEDENCIA
Central	1,939	1,922	10	7	40 Tejidos 1,872 Sueros 27 Descon. ——— 1,939	182 Finca 640 Patio 672 Matadero 420 Invest. 25 Sin proced. ——— 1,939
Norte	1,526	1,509	14	3	22 Tejidos 1,504 Sueros ——— 1,526	183 Finca 532 Patio 734 Matadero 77 Sin proced. ——— 1,526
Norcentral	164	161	3		164 Sueros ——— 164	17 Finca 131 Patio 16 Matadero ——— 164
Nordeste	3,567	3,511	12	44	9 Tejidos 3,512 Sueros 46 Descon. ——— 3,567	1,858 Finca 1,344 Patio 142 Matadero 85 Invest. 138 Sin proced. ——— 3,567
Noroeste	1,655	1,651	4	-	5 Tejidos 1,650 Sueros ——— 1,655	704 Finca 853 Patio 98 Matadero ——— 1,655
Suroeste	540	538	2		540 Sueros ——— 540	46 Finca 423 Patio 71 Matadero ——— 540
Sur	152	150		2	6 Tejidos 146 Sueros ——— 152	5 Finca 89 Patio 26 Matadero 23 Patio 9 Invest. ——— 152
Este	1,371	1,350	20	1	46 Tejidos 1,302 Sueros 23 Descon. ——— 1,371	568 Finca 400 Patio 167 Matadero 66 Parque Nac. 6 Invest. 164 Sin proced. ——— 1,371
Totales	10,914	10,792	65	57	128 Tejidos 10,690 Sueros 96 Descon. ——— 10,914	3,563 Finca 4,412 Patio 1,926 Matadero 520 Ivest. 404 Sin proced. 66 Parque Nac. 23 Monte ——— 10,914

AVANCE ACUMULADO EN ACTIVIDADES
DE TASACION Y COMPENSACION
A JUNIO 1980
CUADRO Nº 2

REGIONES	PROPIETARIOS AFECTADOS	CERDOS TASADOS	VOLUMEN CARNE (KGS.)	VALOR COMPENSACION (RD$)
Central	1,381	50,457	4,110,484	$4,110,484
Norte	1,756	22,381	1,549,728.75	$1,549,728.75
Norcentral	45	131	10,107	10,107
Nordeste	1,436	8,084	322,158	$322,158
Noroeste	2,274	6,940	255,266	$255,266
Suroeste	3,922	9,509	258,307	$258,307
Sur	11,195	44,212	1,238,213	$1,238,213
Este	1,611	12,996	672,958	$672,958
TOTALES	23,625	154,710	8,417,221.75	$8,417,221.75

AVANCE INVESTIGACION DE VECTORES
POR REGIONES AGROPECUARIA
Y ACUMULADO A LA FECHA
CUADRO Nº 3

REGION	Nº FINCA MUESTREADA	RESULTADOS
Central	5	Neg.
Nordeste	2	Neg.
Noroeste	20	Neg.
Este	24	Neg.
Sur	10	Neg.
Totales	61	Neg.

AVANCE ALCANZADO
INVESTIGACION F.P.A. DE
CERDOS SALVAJES
ACUMULADO A LA FECHA
CUADRO Nº 4

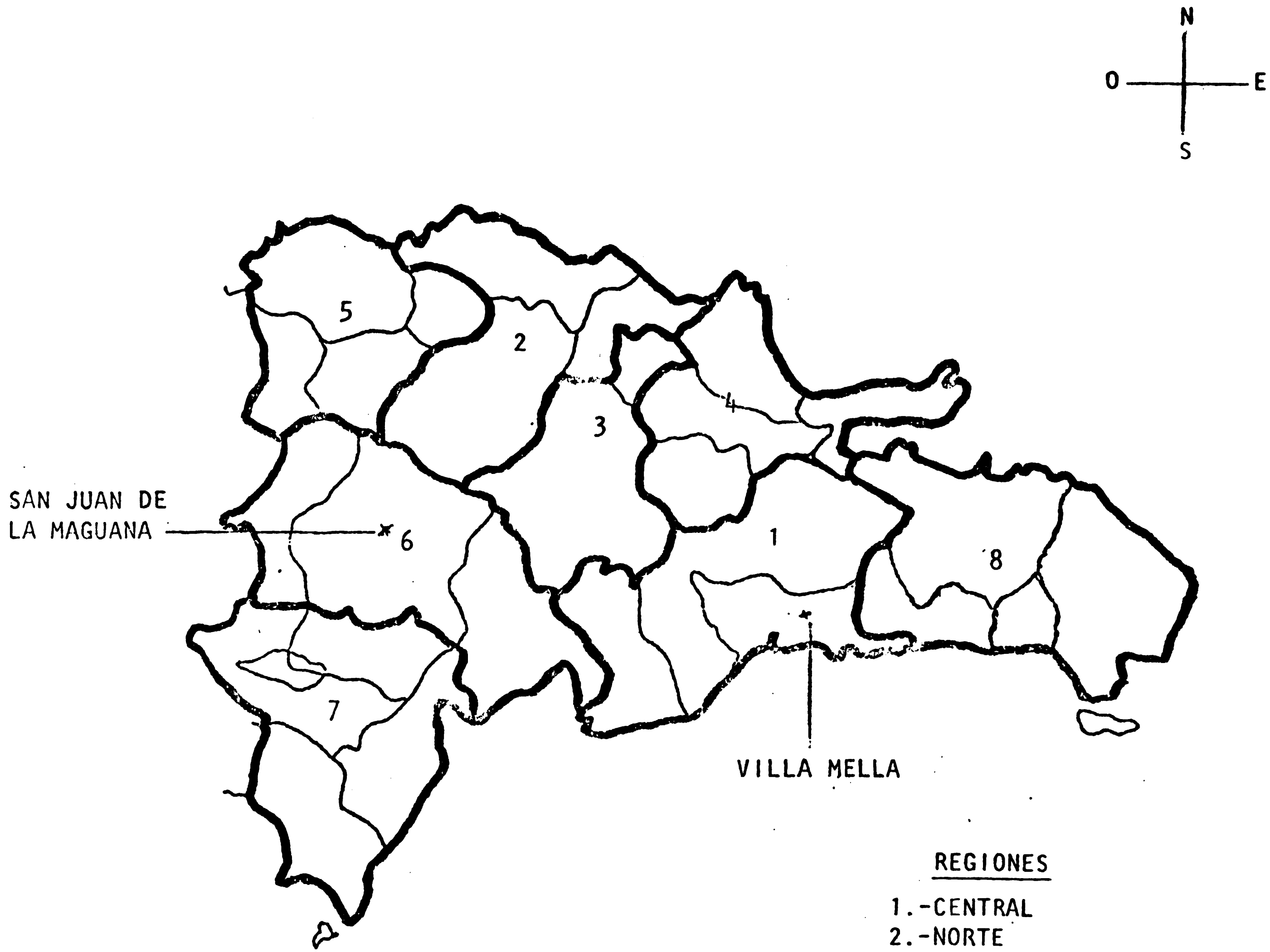
PERIODO	CERDOS CAPTURADOS				MUESTRAS ENVIADAS		RESULTADOS
	C	SC	A	TOTAL	TEJIDO	SUERO	
ACUMULADO A LA FECHA	49	2	6	57	80	52	Neg.

Lectura:

C: Cimarrones
SC: Semi-Cimarrones
A: Alzados

DIVISION POR REGIONES AGROPECUARIAS

MAPA Nº1

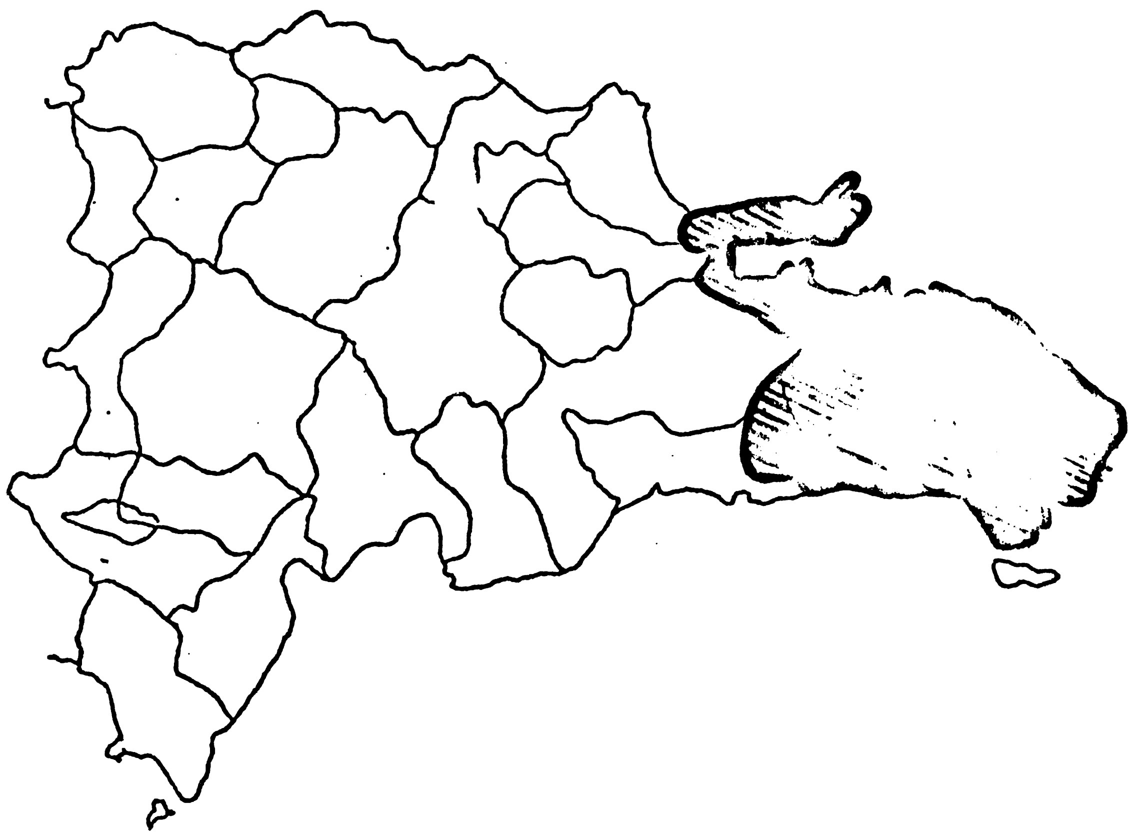


REGIONES

1.-CENTRAL
2.-NORTE
3.-NORCENTRAL
4.-NORDESTE
5.-NOROESTE
6.-SUROESTE
7.-SUR
8.-ESTE

ZONAS A INICIARSE EL PROGRAMA DE DESPOBLACION

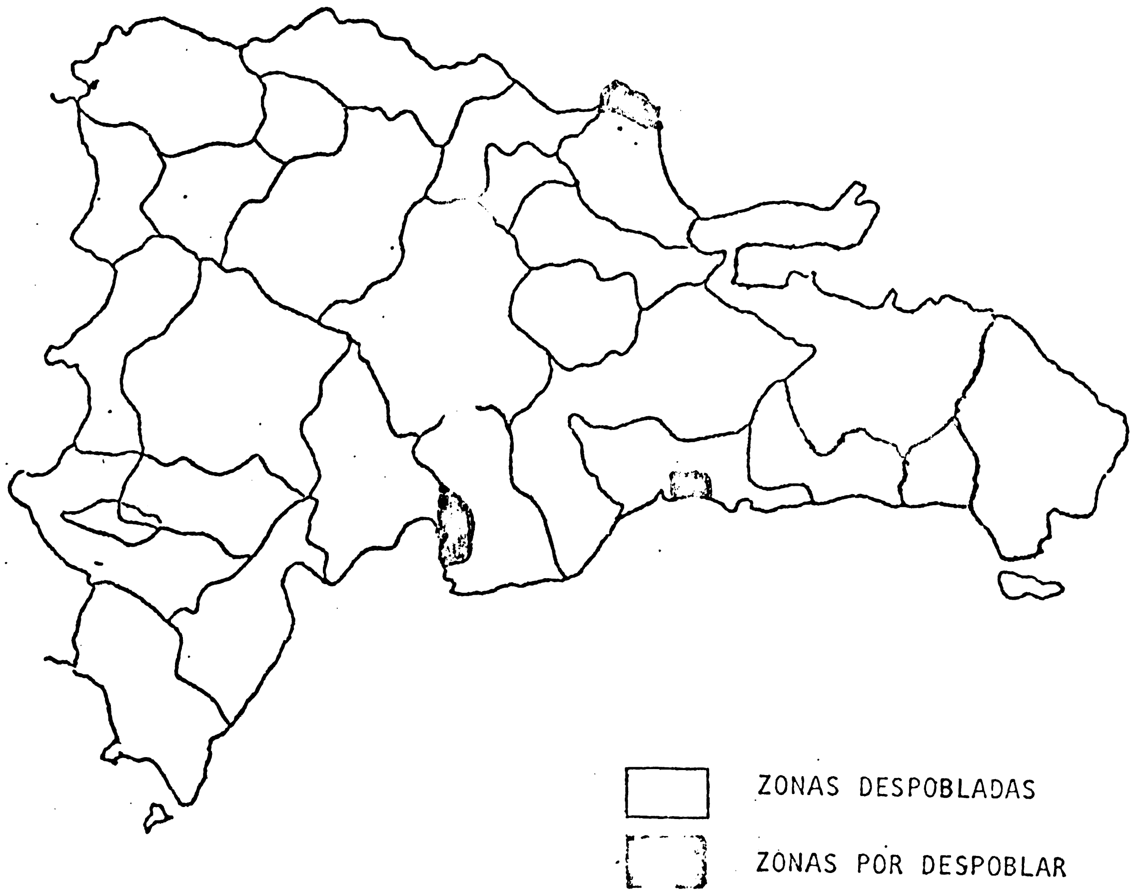
MAPA Nº2



RELACION ZONAS DESPOBLADAS

AGOSTO 1980

MAPA Nº3



INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

Agenda Item N°5

REDISA2/13 (Ingl.)
September 6, 1980
Original: Spanish.

PROGRAM FOR ERADICATING HOG CHOLERA IN CHILE

Dr. Jorge Benavides
Director Defensa Pecuaria
Servicio Agrícola Ganadero
Ministerio de Agricultura
Santiago, Chile.

HOG CHOLERA ERADICATION PROGRAM

REPUBLIC OF CHILE

In order to foster discussion among Animal Health Directors attending this meeting, I will present an outline of the Hog Cholera Eradication Program, which is under study in our country.

We have to previously consider the country's development. One of its fields is livestock production and for the balanced and productive growth of livestock, the control and prevention of diseases has to be considered.

Background information required to elaborate an Animal Health Program:

- Knowledge of the development policy of a country.
- Knowledge of the development strategy of that country.
- Knowledge of the sectorial policy (Agriculture).
- Existence of an Animal Health policy.

The first three points are a framework into which the Chilean Animal Health Director must fit, to plan and formulate a new Animal Health Project. He must be consistent with the above-mentioned and to be able to allow for the three following factors:

A. Technical feasibility
B. Operational feasibility
C. Economic feasibility (cost-benefit position)

A. TECHNICAL FEASIBILITY

A number of countries in the world have controlled and erradicated Hog Cholera. For example: United States of America in 1976.

Countries that have er adicated the disease, according to the Animal Health Yearbook FAO-OMS-OIE 1978.

Albania, 1953; Australia, 1962; Botswana, 1953; Canada, 1963; Cyprus, 1967; Denmark, 1933; United States of America, 1976; Finland, 1977; Hungary, 1972; Ireland, 1958; Iceland, 1953; Israel, 1959; Japan, 1975; Luxembourg, 1971; Norway, 1963, New Zealand, 1953; Romania, 1974; United Kingdom, 1953; Sweden, 1944; Tunisia, 1960.

B. OPERATIONAL FEASIBILITY

To evaluate the viability of a project, it is necessary to know the status of the disease . in a specific moment and the conditioning factors for its appearance.

This requires a DIAGNOSIS of the Agent, the Host and the Environment in which they function. It is necessary to know each one of the followings:

B.1. Agent.- Hog Cholera Virus

Morphology, Viability, Virulence, Pathogenicity, Contagiousness, Infestiousness,

B.2. Host.- Swine

Age, sex, breed, physiological condition, susceptibility, population, population density and geographic distribution.

B.3. Environment.-

Biological:	Plant and Animal Life
Physical :	Weather (temperature, moisture and rainfall) Hidrography and Orography
Socio-Economic :	Praedial (number of properties, number of owners, feed, genetic and health management) and extra-praedial (market places, slaughter-houses, smokehouses, garbage dumps, livestock shipping and marketing.

B.1. Agents:

B.1.1. Virus: The virus causing Hog Cholera has been classified in the Togavirus Group. Togaviridae Family.

B.1.2. Morphology: This virus has a ribonucleic acid core (R.N.A.) of icoschedrical symmetry and a lipoproteic envelope of variable shape, it is very similar to the bovine virus diarrhea (B.V.D.) with which it has some specific antigens in common. It only affects pigs and it has been adapted to rabbit with a considerable effort, producing strains adapted to rabbits thar are used in many countries as attenuated live vaccines.

B.1.3. Viability. It's a virus relatively resistant to ~~the~~ environmental conditions:

a) In laboratory conditions is stable between pH 5 and 10, and to destroy it, temperatures above 60° for 60' are required.

b) In polluted stock-yards, it survives between 2 and 4 weeks, depending in the cleanliness and disinfection conditions.

c) It quickly dies in buried carcasses.

d) It survives for a long period in meat meat products and in raw cured meat, especially if its considered the conditions of refrigeration and freezing help for its survival.

B.1.4. Variability: There is only one antigenic virus type having diferences as to pathogenicity and virulence between strains.

B.1.5. and B.1.6.

Virulence and Pathogenicity: most of the isolated strains are of a high pathogenicity, causing morbility over 90% and also causing high death rates. Nevertheless, reduced virulence strains has been detected, ~~which~~ produces light clinical signs and low or null death rates. Some of these strains show normal virulence once in experimental work.

B.1.7. Infectiouness: Hog Cholera virus is highly infectious; it spreads rapidily from pig to pig by means of excretions and secretions, in a herd or in accidental animal concentrations, in market places.

Even though it has been shown that the virus can be transmitted in different ways as in men, vehicles, birds, insects, etc., it is recognize that the most important dissemination means are infected pigs and pigs feeded with non-treated wastes that contains infected meat. Within infected pigs; vaccinated pigs and suckling pigs surviving a transplacental infection deserve a special reference as a contamination sources, since they might not present symptoms after an infection, but they can eliminate virus for a variable period of time.

B.2. **Host: Swine**

B.2.1.,B.2.2., B.2.3., B.2.4. and B.2.5.

Age, sex, breed, Physiological Condition and Susceptibility.

Only swine are susceptible to Hog Cholera Virus, and factors such as sex and breed do not affect susceptibility. In relation to age, young animals are considered to be more susceptible. Physiological conditions do not influence the appearance of the disease, except for the presence of stress factors that decrease natural resistance in a given moment.

It is important to emphasize transplacental infections, which produce miscarriages, fetal abnormalities and congenital infections of the survivors; this situation occurs even with attentuated strains.

B.2.6. **Population**

Census on 1965 : 1.021.594 hogs
Census on 1976 : 889.969 hogs, being inferior to the above-mentioned.

Ever since 1965 to 1979, there are been fluctuation in the swine population, caused by: a) economical causes, b) product supplies; c) sanitary (Foot and Mouth Disease, Hog Cholera); d) variations in the prices caused by the changes that the bovine meat trade has experienced.

B.2.7. Density: The 51.7% of the population are found in pig farms of a domestic type with 1 to 10 hogs. The population has been divided in 2 big stratums for the effects of the program according to the population's size, considering "family type" those ones with less than 40 pigs and "industrial type" those ones with a greater population. The industrial type has increased since 1976 through 1979 from 194.000 to 239.792 hogs, which means a 20% increase of population in 3 years.

The 9th Region posseses the highest hog's population of the country, and the 3rd. Region the lowest one.

When only the industrial type pig farms are considered, the Metropolitan Region registers the highest population;

The 3rd. Region stands as the one with less number of pigs, being then clearly stablish that the regions with the largest hog's population is due to the existence of pig farms of a family type.

B.2.8. Geographical distribution

1976 Census

SWINE POPULATION

NUMBER OF HOGS AND NUMBER OF OWNERS IN FAMILY AND INDUSTRIAL STRATUMS BY REGIONS CENSUS ON 1976

REGIONS	Family Type		Industrial type		Total Chile	
	Num.of Owners	Num.of pigs	Num.of Owners	Num.of pigs	Owners	Num. of pigs
TOTAL CHILE	164.331	695.577	1.118	194.392	165.449	889.969
I	629	3.307	12	946	641	4.253
II	363	2.289	35	2.449	398	4.738
III	768	2.732	14	946	782	3.678
IV	4.292	10.003	13	1.149	4.305	11.152
V	4.411	11.590	75	18.034	4.486	29.624
R.M.	6.369	22.929	183	55.517	6.552	78.446
VI	16.999	57.501	96	30.625	17.095	88.123
VII	22.487	79.793	114	26.724	22.601	106.517
VIII	36.926	153.377	180	20.636	37.106	174.013
IX	34.245	176.639	178	19.970	34.423	196.609
X	35.500	166.559	187	14.122	35.687	180.681
XI	1.003	6.493	10	552	1.013	7.045
XII	339	2.365	21	2.725	360	5.090

B.3. Environment

B.3.1. Biological : Flora and Animal Life
It doesn't have any influence

B.3.2. Physical : Weather (temperature, moisture, rainfall)

Hidrography and Orography

It doesn't have any influence

B.3.3. Social Economical

B.3.3.1. Praedial (farms)

B.3.3.1.1. Number of properties (farms)

Similar to number of owners

B.3.3.1.2. Number of owners

Census on 1976 165.449 owners for 889.969 hogs.

B.3.3.1.3. Nutrition

In industrial pig farms, nutritional systems are used in the following percentage: 34.8% of complete and/or concentrated food 25.4% of sub-products: 12% of pasture and 10.6% of wastes.

House hold, waste and agriculture waste are fed to family type farm.

B.3.3.1.4. Management

The use of technology increases according to the size of the pig farm, being null or limited in the familiar level.

There are 946 industrial pig farms in the country (INE Investigation on 1979) having 592.490 m^2 of constructed area. The 64% of them are in work and represents 493.153 m^2 of constructed surface for 616 pig farms.

The manual labor used is relatively low, registering a total of 1.812 workers. (Figure N°3) 2 to 3 workers are employed, in 5% of the farms.

75% of the pig farms performs breeding and finishing, a 16.5% just breeding, a 7% just finishing and a 2.8% have the complete breeding, finishing and reproduction cycle. (Figure N° 4)

Of the swine population in the industrial level, the 14.9% are breeders. the 1[illegible]% corresponds to females in the reproduction act. The remaining 85% corresponds to fedder hogs for the market (Figure N°5).

The weaning age is very variable, the most frequent occurs between 51 to 60 days (38.9%); between 41 to 50 days (29.9%); nevertheless these values alter in regions of greater devélopment, where early weaning is observe.

The weight at weaning shows that 62.2% of the stock-farms wean with weights between 10 and 15 kilograms, appearing to be this situation the most generalized.

68.9% of the farms of the industrial level receive technical assistance; 49.7% receives this assistance in a permanent way, and 28.2% in a sporadic way. (Figure N° 11). This assistance is handed over in a 83.5% by veterinarians and the permanent one in a 30.5% by the above-mentioned which corresponds to the pig farms of a bigger size.

B.3.3.1.5. Genetics

The most frequent breed is the Landrace, existing around 900 male breeders (36%), in the second place is Large White Race with 615 male breeders (26.7%), then are the half-breeded with 14.3% (Figure N°6)

B.3.3.1.6. Health

In relation to sanitary management, the information related to vaccine application, shows that Hog Cholera vaccine is the most frequently used.

INE investigation in industrial level registers diarrhea as the most frequent disease with a 2.5% and a death rate of 1.2%. Then, respiratory problems are placed with an incidence of 1.7% and a death rate of 0.6%. Hog Cholera appears with one of the smaller incidences of 0.05% and a death rate of 0.02%. Lethality reaches a 32.8%.

The information at slaughterhouses shows that parasitary diseases are the ones with bigger incidences with a presentation of 18.9% in slaughtered animals (1978).

Infections diseases in the same statistic appear with a 0.3%. Hog Cholera is detected at slaughter houses, where 37 and 92 cases were diagnosticated, in 1978 and 1979, respectively.

A high death rate (17.5%) is present in the period between birth and wean, due to management and inespecific sanitary problems. This figure lowers to 4.8% for the post-weaning period, in which other parasitary and infections diseases are present.

Extreme regions (I and XII) present a greater death rate for the pre and post weaning periods.

Vaccination: All of the Hog Cholera vaccine that is used, is produced in the country, Chinese Strain is utilized for vaccine production. The vaccination is voluntary.

PRODUCTION OF HOG CHOLERA VACCINE IN CHILE

YEAR	NUMBER OF DOSIS
1970	533.372
1971	494.334
1972	698.840
1973	363.800
1974	483.850
1975	254.110
1976	341.280
1977	380.705
1978	612.390
1979	402.640

In most of industrial type farms, vaccination is used in a systematic way. The 70% of pig farms having more than 60 hogs use vaccination in IV, V, VI, VII Regions, family type farms use the vaccine in a very low proportion.

SWINE POPULATION ACCORDING TO YEAR AND VACCINATION RATES

YEAR	POPULATION	VACCINATION RATE %
1970	1.025.279	52.02
1971	1.026.015	48.18
1972	1.026.752	68.06
1973	967.761	37.59
1974	886.148	55.80
1975	734.410	34.60
1976	889.969	38.34
1977	954.777	39.87
1978	1.024.303	59.78
1979	1.098.893	36.64

Vaccine controls performed by the Livestock and Agriculture Service of Chile.

Purity and Sterility Tests: To specify the absence of pathogenic and saprophyte microorganisms.

Safety and Security Tests: % determine that the vaccine doesn't produce damage or diseases in normal health hogs when inoculated according to the specifications of the producer.

Potency Test: To show that the vaccines, once inoculated in pigs as prescribed by the producer, are able to protect against a pathogenic virus discharge (challenge). For this test 10 hogs were used, 6 vaccinated and 4 controls, having to survive to the discharge at least the

80% of the vaccinated hogs without evident symptoms of disease, and at least 3 out of 4 controls must show typical symptoms and lesions of Hog Cholera.

XI and XII Regions have never had Hog Cholera diagnostic neither vaccine has been used; what would show that these regions are free of the disease.

To estimate Hog Cholera prevail in the rest of the country, necessary information for the diagnostic and evaluation of the program. The following information has been taken into account slaughterhouses and laboratories diagnosis. Information gathered by the INE's survey on 1979 and a prevalence study performed at slaughterhouses level on 1980.

Hog Cholera cases registered at slaughterhouse's level were 37 for 1978 and 92 for 1979 which gives a rate of 0.76/10.000 and 1.5/10.000 cases, respectively. It's very important to point out that the greater number of cases are respectivaly registered at the IX and Metropolitan Regions, being higher the presentation in winter months, fact that coincides with the greater slaughtering season.

At laboratory's level, there is information only from 1979, year in which it started to apply the Immunofluorescence technique in the diagnostic. This occurs simultaneously with an increase in the number of samples caused by the threaten of the African Swins Fever that on 1978 attacked South-America. The greater number of samples corresponds to the Metropolitan Region, the same as positive diagnostics on 1980, an outbreak was detected and at Metropolitan Region, damaging 11 industrial type pig farms.

Prevalence Study: Taking in consideration the distribution of the swine population in the country, the study was limited to the Regions included among the IV and X Regions, where the 90% of the population is concentrated.

The study was performed in hog's slaughterhouses. The number of samples was determined according to a 5% estimated prevail with a 1% error and a confidence of 95% in 1.900 samples. For the sample's choice it was used a stratified selection with a proportional affixal to slaughtering which determined the distribution of the samples by Regions.

The samples consistents in tonsils, spleen and limph nodes were submited in the laboratory to direct Immunofluorescence test, to specify the presence of Hog Cholera Virus.

The results of this study shows that at slaughterhouse's level the 9.7% - 1.31% of the hogs are carriers of the Hog Cholera Virus, in their tonsils. Due to slaughterhouse's slaughters hogs coming from several regions, the results do not represent the situation of the problem in each region. This percentage of positives would show a situation of the presence of Hog Cholera Virus in the studied regions, which would reveal a probable missinformation. On the other hand, it has been stablished that the 190 positive samples corresponds to 73 different origins, being very hard to stablish if each one of these origins corresponds to an outbreack. The 73.6% of the positive samples corresponds to slaughterhouses with average monthly slaughtering over 800 hogs, receiving pigs monthly from market places.

B.3.3.2. Extra Praedial

B.3.3.2.1. Pig market places

There is a total of 78 livestock market places in the country, distributed among the IV and X Regions. Pigs are settled in the 8% of them (68 pig market places).

The greater number of livestock market places are found in the VIII, IX and X Regions, with13,24 and 13 respectively. In the 92% of the livestock market places located along these regions, hogs are commercialized. There are 7 livestock market places in the Metropolitan Region and one of them is dedicated to pig's commercialization. The maps of is movement to pig market places shows a tendency of the displacement towards the Metropolitan Region.

An average of 300.000 hogs are annually sold in market places in the country. On 1979, 360.758 hogs were sold at pig market places, from which the 39.5% were settled at the Metropolitan Region, the 16,3% at the IX Region and the 15% at the VII Region.

All pig market places must have Veterinarian assistance.

B.3.3.2.2. Slaughterhouses

There are 235 slaughterhouses in the country. All must have Veterinarian assistance. Even though, the zone having the greater hog's population is comprenhended among the VII and X Regions, hog's displacement towards V and Metropolitan Region's slaughterhouses. The same its emphasized once analysing the slaughtering rates by Regions. (Metropolitan Region with a 3.09 and the V Region with a 1.29).

Slaughterhouses slaughtering pigs are not distributed in regions in the same way that the slaughtering does it, having straight relation with the pig's population what demonstrates the existance of a bigger number of small slaughterhouses with a minimum slaughtering (Figure N°   )

FIGURE N°

YEAR	SLAUGHTERED ANIMALS	%
1968	593.662	100
1969	661.762	155,5
1970	671.646	113,1
1971	700.950	118,1
1972	760.263	128,1
1973	762.594	128,5
1974	757.178	127,5
1975	462.681	77,9
1976	376.206	63,4
1977	415.695	70,0
1978	485.596	81,8
1979	623.920	105,1

The slaughtering rate is considered as the relationship between the number of slaughtered hogs and the swine population of the country, which has given a slaughtering rate of 56.8% in 1979 with 623.930 slaughtered pigs and with a population of 1.098.863 hogs. The extraction rate must surpass the slaughtering rate, since there are not data of slaughtering at family type farms.

Based in the number of slaughtered animals and assigning them an average weight of 100 kgs. with a yield of 75%, 46.974 Tons. of meat were offered in the market in 1979.

FIGURE N°

YEAR	HOG'S MEAT TON.	PRICE IN US DOLLARS/KG.	TOTAL PRICE IN US DOLLARS-SEPTEMBER 1979 WITHOUT TAX
1973	57.575	0.97	55.847.750
1974	56.788	0.88	49.973.330
1975	34.701	0.76	26.372.760
1976	28.215	1.11	31.318.650
1977	31.177	1.68	52.377.360
1978	36.420	1.54	56.086.800
1979	46.974	1.49	69.723.060

From the meat produced in 1979 (46.974 Tons.) 43% (20.121.42 Tons) was used as sausages or as elaborated products, representing in US dollars /September 1979/ without tax 29.980.915 dollars and 26.672.58 Tons.were consumed as meat, with a value of 39.742.144 US dollars.

FIGURE Nº

SLAUGHTERING BY REGIONS IN 1978

REGION	SLAUGHTERING	%	SLAUGHTERING RATE PER REGION
Country's total	485.116	100	0.54
I	3.783	0.8	0.89
II	1.790	0.4	0.38
III	839	0.2	0.23
IV	3.648	0.7	0.33
M.R.	38.185	7.9	1.29
V	242.938	50.1	3.09
VI	20.202	4.1	0.23
VII	36.830	7.6	0.34
VIII	62.728	12.9	0.36
IX	28.540	5.9	0.14
X	38.261	7.9	0.21
XI	940	0.2	0.13
XII	6.332	1.3	1.24

B.3.3.2.3. Sausage Plants

There are 380 sausage plants in the country, from which a 60.5% is considered to be industrial and the rest are small plants managed in a family way.

Distribution: Sausage plants are located in: very little in the extreme regions, and a higher concentration in the Center-South regions where the distribution is relatively uniform, emphasizing that the VIII Region presents the country's higher percentage (21.5%). Figure Nº 15.

B.3.3.2.3. Garbage Dumps

There is at least one garbage dump per county our country has 318 counties, corresponding to 50 provinces within the 13 regions. There is legislation about garbage dumps installations, that is observed in only 20%, corresponding to the big urban centers.

B.3.3.2.4. Swine movement

Pigs move from downsouth towards the center of the country, specially to Metropolitan Region. Of the hogs coming to the Metropolitan Region, the 23% coming from the VI Region, 37% from the VII Region and 27% from the VIII Region. The rest coming from the IX and X Regions.

Towards the V Region, there is also pig movement, coming from the south of the country, but in a lower amount than to Metropolitan Region.

Of the total number of pigs moving, the 20.5% goes to pig's market places, 51.3% goes directly to the slaughterhouses and 28.2% goes to another property.

B.3.3.2.5. Commercialization

In industrial type pig farms, the commercialization channels deserve the same comments as done in the general way, but the existing facts allow to estimate the relative importance of the different commercialization channels.

The higher number of hogs are sold to sausage plants, (29.4%) this value is over 50% in the IV, V, X and XII Regions. The second channel in importance are pig's market places where the 24.2% of the pigs arrives, being this the most important commercialization method in the IX Region (Figure N°16)

The channel that is less frequently used is direct sale to other pig farm, nevertheless, part of what is sold in pig market places also goes to pig farms.

In relation to sales by categories is possible to observe that the 92.2% of the hogs sold corresponds to finished pigs, sales for breeding, feeding and left over correspond to a very low percentage, being within these the feeders the higher. (Figure N°17)

The big urban centers located in Metropolitan and V Region have the higher demand for pig product so its production has to be suplemented with animals coming from other regions of the country.

Similar situation occurs in the extreme regions where the demand exceeds the regional production.

In the last 6 years the price of pig products have had a sustained increase, which has stimulated the production until reaching the current levels.

The comparison of the prices in wholesale of meats, shows that the prices of the hog's meat is only surpasses by the price of cattle in these last years.

FIGURE N°

PRICES OF DIFFERENT KINDS OF MEAT US DOLLARS/KG. ON SEPTEMBER 1979, WITHOUT TAX. SANTIAGO, CHILE AT WHOLESALE

YEAR	HOG	CATTLE	OVINE	BROILER
1973	0.97	1.10	1.04	1.37
1974	0.88	1.57	0.97	1.47
1975	0.76	0.9	0.57	1.20
1976	1.11	1.29	0.97	1.44
1977	1.68	1.70	1.34	1.52
1978	1.54	1.71	1.45	1.46
1979	1.49	1.83	1.62	1.51

The commercialization channels of hogs are of a greater efficiency than the ones of other meats, since commercialization margin is smaller, and therefore, pig meat has a better price for the consumer and then it can complete with broiler who has a better food conversion.

FIGURE N°

PRICE OF DIFFERENT MEATS IN MARKET PLACES AND SLAUGHTERHOUSES

YEAR	CATTLE			SHEEP			PIG		
	MRKT. PLACE	SLAUG. HOUSE	% DIFF.	MRKT. PLACE	SLAUG. HOUSE	% DIFF.	MRKT. PLACE	SLAUG. HOUSE	% DIFF.
1973	0.79	1.10	39.3	0.66	1.04	57.6	+	+	+
1974	1.19	1.57	32	0.70	0.97	38.6	+	+	+
1975	0.54	0.90	66.8	0.39	0.57	46.4	+	+	+
1976	0.79	1.29	63.4	0.65	0.97	19.3	1.11	1.11	-
1977	0.98	1.70	73.5	0.77	1.34	74.1	1.29	1.68	30.3
1978	1.06	1.71	61.4	0.83	1.45	74.7	1.25	1.54	23.2

+ No information registered

P R O G N O S I S

A.- Tendency of Swine Population

According to the historical figures and general tendencies of agriculture in our country, ODEPA estimates that swine population will increase in the next 3 years at a rate of 5%, to reduce afterwards to a growth's rate of 1.7%, what is slightly higher to the estimated growth for human population.

B.- Tendency of Hog Cholera

The control measures applied up to date, has been mainly concentrated in the vaccination and sending sick animals to slaughterhouses. These measures have allowed to decrease the diseases incidences in a considerable way, counting with a vaccine of proved efficency.

The diseases prevail has been estimated in 3.2%, nevertheless, the prevalence studies performed in 1980, showed the presence of Hog Cholera Virus in 9.7% of the pigs that arrive to the slaughterhouses (this percentage doesn't mean that all the pigs are sick). These figures would show the presence of virus in the environment (IV through X Regions) what would not show as clinical disease because of the high vaccination rates in the industrial type farm and because of a low notification in the family type farm.

If a program of erradication is not applied, this situation would tend to maintain.

P R O G R A M

P R O G R A M ' S   P U R P O S E

1.- Erradication of Hog Cholera will permit an increase of Swine production which will carry lower prices for pig's meat and its elaborated products to the consumer, and it will increase the possibilities of exportation.

2.- To establish a system of preventive vigilance, against the possible introduction of the African Swine Fever or other exotic diseases.

STRATEGY:

It has been divided in three stages:

I To increase the vigilance, to arrive to the exact knowledge of incidence and geographic distribution of the problem.

II To improve the structure and take measures that allows to cut the epidemiological chain of transmision.

III Erradication with suspension of the vaccination and control based on killing of the sick animals and the contacts.

A C T I O N   L I N E S

FIRST STAGE

1.- Identification and registration of pig owners (completed)

2.- Epidemiological surveillance

- systematic sampling slaughterhouse's level.

- Investigation of all positive diagnosis to determinate the source of infection.

3.- Sanitary control at slaughterhouses, pig market places, sausage plants and garbage dumps levels.

4.- Education at owners level, giving special emphasis to incentivate the notification of sick animals.

5.- Modification of the present sanitary regulations.

6.- Advance training for the staff.

7.- Laboratory's diagnostic

8.- Vaccine's control

SECOND STAGE

1.- The action lines of the first stage are still standing.

2.- All sick animals and contacts pigs are send to slaughterhouses, being their meat, products and sub-products destined for human consumition only after a treatment that guarantees the destruction of the virus.

3.- Control of the administration of cooked wastes to hogs.

THIRD STAGE

1.- The pertinent action lines of the First Stage are still standing.

2.- The production and use of vaccines against hog cholera will be prohibited.

3.- The slaughtering of infected and contact animals will be determinate.

4.- This stage will be applied in a gradual way, starting from the southern regions in which the problem is not presented at the moment. Because of this, XI and XII Regions of the country would begin the program in this stage (1981)

COST AND BENEFIT OF THE PROGRAM OF ERRADICATION OF HOG CHOLERA

A - IDENTIFICATION OF THE CASES DUE TO HOG CHOLERA

1.- A 2.4% of the pigs annually dies to Hog Cholera in the country, considering an average weight of 51 Kg. per dead pig, we have a loss of 1.300 Tons. of meat per year.

2.- It's estimated that a 0.8% of the swine population falls sick and survives, needing at least 580 Tons of feed more, to recover the lost of weight during the disease.

3.- The productive structure is used a 15% less annually per each hog that becomes ill and survive. Pigs that die, are replaced. giving another loss item by the greater price of the hog of replacement. This loss is bigger if it deals with breeders of a high genetic quality.

4.- Greater cost coming from management and sanitary products required to control the outbreack.

B - IDENTIFICATION OF PROFITS

1.- Quantifiables.

They correspond to the avoided losses by control and posterior erradication of the disease, which had been especified in the previous paragraph.

2.- Unquantifiables:

Improvement in foreign trade for national hog's products, whether meat or breeders.

It will improve the present system of control in order to avoid the introduction of African Swine Fever or another exotic swine diseases.

COSTS OF THE PROGRAM'S STRATEGY

a) State Costs

Survillance and Control:

- Transportation
- Extra labor hours and traveling expenses ($)
- Equipments for pathology of sampling and shipment of samples to the central laboratory.

Pig owner education program:

- Audiovisual equipments
- Publicity material
- Material for communication in group
- Programs of instruction in mass
- National and international training courses

Laboratory support:

- Amortization of structure of diagnosis
- Technical products
- Vaccine's control

Administration:

- Practically it doesn't have any costs, since it will be using the structure of Animal Health already existant. The only cost added will be due to epidemiological investigations.

b) Pig Owners Cost:

- Vaccination
- Veterinarian services
- Disinfectants
- Greater cost of structure amortization

c) Industry Cost:

- Improvement of pig market places and slaughterhouses structures.

TABLA Nº 2

NUMERO DE CRIADEROS EN EXPLOTACION POR SISTEMA DE ALIMENTACION UTILIZADO

Clasificación geográfica.	Total	NUMERO DE CRIADEROS EN EXPLOTACION — SISTEMA DE ALIMENTACION: Alimento completo y concentrado.		Pastoreo		Soiling		Ensilaje y Pasto seco		Subproductos		Desperdicios		Otros	
		N°	%	N°	%	N°	%	N°	%	N°	%	N°	%	N°	%
Total País	616	453	34,8	157	12,0	95	7,3	39	2,9	331	25,4	139	10,6	88	6,7
I Región	56	35	-	15	-	37	-	2	-	39	-	27	-	7	-
II Región	13	5	-	-	-	1	-	-	-	11	-	6	-	2	-
III Región	15	4	-	1	-	7	-	1	-	13	-	10	-	1	-
IV Región	13	10	-	1	-	5	-	3	-	9	-	4	-	-	-
V Región	71	65	-	9	-	7	-	13	-	52	-	17	-	-	-
VI Región	60	60	-	12	-	10	-	3	-	12	-	5	-	9	-
VII Región	60	52	-	18	-	11	-	8	-	47	-	9	-	4	-
VIII Región	62	55	-	29	-	5	-	4	-	50	-	17	-	5	-
IX Región	68	61	-	36	-	5	-	3	-	58	-	21	-	9	-
X Región	40	33	-	25	-	6	-	2	-	32	-	9	-	6	-
XI Region	7	1	-	6	-	-	-	-	-	2	-	3	-	4	-
XII Región	12	10	-	5	-	1	-	-	-	6	-	11	-	3	-
Reg. Metrop.	139	62	-	-	-	-	-	-	-	2	-	-	-	38	-

TABLA Nº 3

ENCUESTA NACIONAL DE PORCINOS

PRIMER SEMESTRE 1979

NUMERO DE CRIADEROS DE CERDOS POR CAPACIDAD INSTALADA TOTAL PAIS Y REGIONES

CLASIFICACION GEOGRAFICA	TOTAL DE CRIADEROS		CRIADEROS DE EXPLOTACION		CRIADEROS PARALIZADOS TEMPORALMENTE	
	NUMERO	SUPERFICIE M2 CONST.	NUMERO	SUPERFICIE M2 CONST.	NUMERO	SUPERFICIE M2 CONST.
TOTAL PAIS	948	592.490	616	493.153	332	99.337
I REGION	73	15.944	56	10.358	17	5.586
II REGION	33	9.980	13	5.280	20	4.700
III REGION	25	6.766	15	4.576	10	2.190
IV REGION	34	7.971	13	4.585	21	3.386
V REGION	94	66.717	71	56.885	23	9.832
VI REGION	83	84.546	60	68.414	23	16.132
VII REGION	102	70.830	60	62.426	42	8.404
VIII REGION	105	35.002	62	22.465	43	12.537
IX REGION	122	65.547	68	53.032	54	12.515
X REGION	61	18.125	40	15.427	21	2.698
XI REGION	8	891	7	873	1	18
XII REGION	22	12.118	12	11.033	10	1.085
R. METROPOL.	186	198.053	139	177.799	47	20.254

TABLA Nº 4

ENCUESTA NACIONAL DE PORCINOS PRIMER SEMESTRE 1979

MANO DE OBRA UTILIZADA EN LOS CRIADEROS DE CERDOS

TOTAL PAIS Y REGIONES

CLASIFICACION GEOGRAFICA	TOTAL		GRUPO DE TRABAJADORES PERMANENTES									
			1		2 y 3		4 y 5		6 a 8		9 y Más	
	Número Criaderos	Número Trabajadores	Número Criaderos	Número Trabajadores	Número Criaderos	Número Trabajadores	Número Criaderos	Número Trabajadores	Número Criaderos	Número Trabajadores	Número Criaderos	Número Trabajadores
Total País	616	1.812	145	145	363	818	50	221	27	184	31	444
I Región	56	88	28	28	27	56	1	4	-	-	-	-
II Región	13	30	3	3	9	20	-	-	1	7	-	-
III Región	15	50	1	1	13	28	-	-	-	-	1	21
IV Región	13	29	1	1	11	23	1	5	-	-	-	-
V Región	71	217	2	2	57	135	5	22	5	35	2	23
VI Región	60	231	8	8	33	71	9	41	3	21	7	90
VII Región	60	204	16	16	33	75	4	16	3	20	4	77
VIII Región	62	119	26	26	33	71	1	4	1	6	1	12
IX Región	68	156	39	39	20	46	6	27	-	-	3	44
X Región	40	96	7	7	29	64	1	5	3	20	-	-
XI Región	7	11	4	4	3	7	-	-	-	-	-	-
XII Región	12	32	2	2	8	18	-	-	2	12	-	-
Reg.Metrop.	139	549	8	8	87	204	22	97	9	63	13	177

TABLA nº 5

ENCUESTA NACIONAL DE PORCINOS - 1979

EXISTENCIA DE CERDOS EN LOS CRIADEROS AL 30 DE JUNIO

TOTAL PAIS Y REGIONES

CLASIFICACION GEOGRAFICA	NUMERO TOTAL CRIADEROS EN ACTIVIDAD	TOTAL CERDOS	NUMERO DE CERDOS																	
			REPRODUCTORES										CERDOS ENGORDA							
			Total Reproductores		Machos en Servicio		Machos en Crianza		Hembras en Reproducción		Hembras en Crianza		Total Cerdos Engorda		0 - 15 kg.		15 - 50 Kg.		50 y más kg.	
			Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%
Total País	615	239.792	35.901	14,9	1.497	0,6	802	0,3	25.376	10,6	8.226	3,4	203.891	85,0	64.655	26,9	71.193	29,7	68.043	28,4
I Reg.	56	3.667	831	22,6	49	1,3	34	0,9	501	13,6	247	6,7	2.836	77,3	1.217	33,1	1.594	43,4	25	0,6
II Reg.	13	1.475	379	25,6	22	1,5	6	0,4	308	20,9	43	2,9	1.097	74,3	641	43,4	455	30,8	-	-
III Reg.	15	989	234	28,6	18	1,8	11	1,1	97	9,8	108	10,9	755	76,3	344	34,8	210	21,2	201	20,3
IV Reg.	13	3.072	581	18,9	27	0,9	31	1,0	311	10,1	212	6,9	2.491	81,0	946	30,8	617	20,0	928	30,2
V Reg.	71	24.209	3.583	14,8	170	0,7	55	0,2	2.767	11,4	591	2,4	20.626	85,1	7.292	30,1	6.593	27,2	6.741	27,8
VI Reg.	60	42.884	6.198	14,4	210	0,5	65	0,1	4.682	10,9	1.241	2,9	36.685	85,5	12.688	29,6	10.315	24,0	13.683	31,9
VII Reg.	60	33.242	4.166	12,5	169	0,5	56	0,2	3.074	9,2	867	2,6	29.076	87,4	8.258	24,8	10.134	30,5	10.684	32,1
VIII Reg.	62	10.113	1.843	18,2	94	0,9	19	0,2	1.257	12,4	473	4,7	8.270	81,7	2.675	26,4	2.981	29,5	2.614	25,8
IX Reg.	68	18.896	2.719	14,3	106	0,5	126	0,7	1.595	8,4	892	4,7	16.177	85,6	3.853	20,4	5.444	28,8	6.880	36,4
X Reg.	40	6.298	965	15,3	75	1,2	51	0,8	565	8,9	274	4,3	5.333	84,6	1.481	23,5	1.870	29,7	1.982	31,5
XI Reg.	7	996	325	32,6	21	2,1	7	0,7	216	21,7	81	8,1	671	67,3	160	16,1	391	39,2	120	12,0
XII Reg.	12	4.734	853	18,0	54	1,1	21	0,4	629	13,3	149	3,1	3.881	81,9	2.078	43,9	1.115	23,6	688	14,5
Reg.Metrop.	138	89.217	13.224	14,8	482	0,5	320	0,4	9.374	10,5	3.048	3,4	75.983	85,1	23.027	25,8	29.494	33,0	23.497	26,3

tabla Nº 5 a)

ENCUESTA NACIONAL DE PORCINOS

PRIMER SEMESTRE 1979

Número de Criaderos de Cerdos por Actividad. Total País y Regiones

Clasificación Geográfica	Total	Paralizado		En Actividad		-Crianza		Engorda		Crianza y Engorda.		Crianza Engorda y Reproducción	
		N°	%	N°	%	N°	%	N°	%	N°	%	N°	%
Total País.	948	332	35	616	64,9	102	16,5	29	4,7	468	75,9	17	2,8
I Región	73	17	23,2	56	76,7	53	94,6	-	-	3	5,3	-	-
II Región	33	20	60,6	13	39,3	13	100	-	-	-	-	-	-
III Región	25	10	40	15	66	-	-	-	-	15	100	-	-
IV Región	34	21	61,7	13	38,2	1	7,6	-	-	12	92,3	-	-
V Región	94	23	24,4	71	75,5	5	7,0	1	1,4	64	90,1	1	1,4
VI Región	83	23	27,7	60	72,2	1	1,6	6	10	52	86,7	1	1,6
VII Región	102	42	41,1	60	58,8	2	3,3	3	5	53	88,3	2	3,3
VIII Región	105	43	40,9	62	59,0	5	8,0	1	1,6	56	90,3	-	-
IX Región	122	54	44,2	68	55,7	4	5,8	6	8,8	51	75	7	10,3
X Región	61	21	34,4	40	65,5	1	2,5	4	10	34	85	1	2,5
XI Región	8	1	2,5	7	87,5	3	42,8	-	-	4	57,1	-	-
XII Region	22	10	41,4	12	54,5	5	41,6	-	-	6	50	1	8,3
Reg. Metropol.	186	47	25,2	139	74,7	9	6,4	8	5,7	118	84,9	4	2,9

TABLA Nº 6

NUMERO DE CRIADEROS DE CERDOS EN EXPLOTACION POR PESO ESTIMADO AL DESTETE Y PERIODO EN QUE SE REALIZO

CLASIFICACION GEOGRAFICA	TOTAL	NUMERO DE CRIADEROS EN EXPLOTACION																			
		PESO ESTIMADO AL DESTETE (KILOS)										PERIODO EN QUE SE REALIZO EL DESTETE (DIAS)									
		Menos de 10		De 10 a 15		De 16 a 21		De 22 a 27		De 28 y Más		Menos de 30		De 30 a 40		De 41 a 50		De 51 a 60		De 61 y Más	
		Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%
Total País	535	100	18,7	333	62,2	78	14,6	18	3,4	5	0,9	6	1,1	87	16,2	160	29,9	208	38,8	75	14,0
I Región	48	5	10,4	42	87,5	1	2,0	-	-	-	-	-	-	1	2,0	3	6,2	26	54,1	18	37,5
II Región	13	6	46,1	5	38,4	1	7,6	1	7,6	-	-	-	-	-	-	1	7,6	5	38,4	7	53,8
III Región	15	1	6,6	13	86,6	1	6,6	-	-	-	-	-	-	3	2,0	3	20,0	4	26,6	5	33,3
IV Región	13	6	46,1	5	38,4	2	15,3	-	-	-	-	-	-	6	46,1	6	46,1	1	7,6	-	-
V Región	70	15	21,4	41	58,0	13	18,5	1	1,4	-	-	2	2,8	12	17,1	34	48,5	20	28,5	2	2,8
VI Región	54	10	18,5	34	62,9	10	18,5	-	-	-	-	1	1,8	14	25,9	14	25,9	19	35,1	6	11,1
VII Región	48	12	25,5	27	37,4	5	10,6	3	6,3	-	-	-	-	5	10,2	23	47,9	20	40,8	1	2,0
VIII Región	49	5	10,2	29	59,1	12	24,4	1	2,0	2	4,0	-	-	3	6,1	10	20,4	23	46,9	13	26,5
IX Región	53	5	9,4	32	60,3	12	22,6	2	3,7	2	3,7	-	-	11	20,7	13	24,5	21	39,6	8	15,0
X Región	34	4	11,7	21	61,7	5	14,7	4	11,7	-	-	-	-	8	23,5	3	8,8	18	52,9	5	14,7
XI Región	7	-	-	3	42,8	1	14,2	3	42,8	-	-	-	-	1	14,2	1	14,2	3	42,8	2	28,8
XII Región	8	2	25,0	4	50,0	1	12,5	1	12,5	-	-	-	-	1	12,5	1	12,5	4	50,0	2	25,0
Reg.Metropol.	123	29	23,5	77	62,6	14	11,0	2	1,6	1	0,8	3	2,4	22	17,8	48	39,0	44	35,7	6	4,9

TABLA Nº 7

ENCUESTA NACIONAL DE PORCINOS

PRIMER SEMESTRE 1979

NUMERO DE CRIADEROS DE CERDOS EN EXPLOTACION QUE RECIBIERON ASISTENCIA TECNICA

CLASIFICACION GEOGRAFICA	TOTAL NUMERO DE PLANTELES	NUMERO DE CRIADEROS EN EXPLOTACION RECIBIERON ASISTENCIA TECNICA: TOTAL QUE RECIBIERON ASISTENCIA TECNICA. N°	%	MEDICO VETERINARIO. PERMANENTE. N°	%	MEDICO VETERINARIO. ESPORADICA. N°	%	OTRO TECNICO AGRICOLA. PERMANENTE. N°	%	OTRO TECNICO AGRICOLA. ESPORADICA. N°	%
TOTAL PAIS	616	425	68,9	188	30,5	167	27,1	63	10,2	7	1,1
I REGION	56	31	55,3	12	21,4	18	32,1	1	1,8	-	-
II REGION	13	4	30,8	1	7,6	2	15,4	1	7,6	-	-
III REGION	15	11	73,3	6	40,0	4	26,6	1	6,6	-	-
IV REGION	13	7	53,8	1	7,6	5	38,5	1	7,6	-	-
V REGION	71	58	81,7	25	35,2	19	26,7	12	16,9	2	2,8
VI REGION	60	60	100,0	24	40,0	22	36,6	13	21,6	1	1,6
VII REGION	60	47	78,3	23	38,3	14	23,3	10	16,6	-	-
VIII REGION	62	36	58,1	9	14,5	16	25,8	9	14,5	2	3,2
IX REGION	68	34	50,0	8	11,7	17	25,0	7	10,3	2	2,9
X REGION	40	25	62,5	11	27,5	13	32,5	1	2,5	-	-
XI REGION	7	1	14,3	1	14,3	-	-	-	-	-	-
XII REGION	12	8	66,6	4	33,3	4	33,3	-	-	-	-
R. METROPOLITANA	139	103	74,1	63	45,0	33	23,7	7	5,0	-	-

TABLA Nº 8

ENCUESTA DE PORCINOS 1979

EXISTENCIA DE REPRODUCTORES (MACHOS
POR RAZAS TOTAL PAIS AL 30 DE JUNIO

RAZAS	NUMERO DE CERDOS	%
Total País	2.299	99,9
Landrace	829	36,0
Large White	615	26,7
Duroc Yersy	186	8,1
Angler Satelrschwein	101	4,4
Berkshire	6	0,3
Hampshire	6	0,3
Otras razas	10	0,4
Híbridos	216	9,4
Mestizos y Criollos	330	14,3

TABLA Nº 9

ENCUESTA NACIONAL DE

PORCINOS

PRIMER SEMESTRE 1979

NUMERO DE CRIADEROS DE CERDOS EN EXPLOTACION POR TIPO DE VACUNA APLICADA

CLASIFICACION GEOGRAFICA	TOTAL	PESTE PORCINA		ERISIPELA		NEUMONIA		LEPTOSPIROSIS.	
		N°	%	N°	%	N°	%	N°	%
TOTAL PAIS	616	489	79,4	321	52,1	32	5,2	62	10,0
I REGION	56	43	76,8	-	-	-	-	-	-
II REGION	13	2	15,4	1	7,7	-	-	-	-
III REGION	15	2	13,3	1	6,7	-	-	-	-
IV REGION	13	9	69,2	4	30,8	-	-	1	7,7
V REGION	71	65	91,5	51	71,8	-	-	12	16,9
VI REGION	60	54	90,0	42	70,0	3	5,0	15	25,0
VII REGION	60	58	96,7	52	86,7	4	6,7	15	25,0
VIII REGION	62	52	83,9	19	30,6	3	4,8	1	1,6
IX REGION	68	55	80,9	22	32,4	14	20,6	5	7,4
X REGION	40	17	42,5	4	10,0	4	10,0	2	5,0
XI REGION	7	-	-	-	-	-	-	-	-
XII REGION	12	-	-	2	16,7	-	-	-	-
R. METROPOL.	139	132	95,0	123	88,5	4	2,9	11	7,9

TABLA Nº 10

ENCUESTA DE PORCINOS 1979

Enfermedades mas frecuentes y tasas de mortalidad, letalidad e incidencia

ENFERMEDAD	CERDOS	CERDOS ENFERMOS	N°DE MUERTOS	MORTALIDAD	LETALIDAD	INCIDENCIA
Total	239.792	11.719	5.071	2,1	43,3	4,9
Erisipela	-	964	356	0,1	36,9	0,4
Enfermedad Respiratoria	-	4.096	1.465	0,6	35,8	1,7
Peste Porcina	-	116	38	0,02	32,8	0,05
Leptospirosis	-	65	22	0,009	33,8	0,03
Diarrea	-	5.943	2.788	1,2	46,9	2,5
Otros	-	535	402	0,2	71,1	0,2

TABLA Nº 11

NATALIDAD Y MORTALIDAD DE CERDOS

CLASIFICACION GEOGRAFICA	N°TOTAL HEMBRAS QUE PARIERON	N°TOTAL CERDOS NACIDOS VIVOS	PROMEDIO LECHONES NACIDOS VIVOS X HEMBRA	N°TOTAL HEMBRAS PARIDAS QUE DESTETARON	N°TOTAL CERDOS DESTETADOS	% MORTALIDAD HASTA DESTETE	NUMERO TOTAL DE CERDOS MUERTOS			
							Total	Antes del Destete	Después del Destete	% Mortalidad Estimada Post Destete
Total País	20.662	202.391	9,8	11.909	167.009	17,5	40.236	35.382	7.956	4,8
I Región	371	3.463	9,3	316	2.597	53,9	2.202	866	336	12,9
II Región	185	1.466	7,9	173	1.228	16,2	391	238	153	12,4
III Región	97	766	7,9	97	684	10,0	157	77	77	11,2
IV Región	285	3.406	12,0	280	2.556	24,9	919	850	69	2,7
V Región	2.540	25.601	10,1	2.210	19.637	23,3	6.633	5.964	669	3,4
VI Región	3.761	37.672	10,0	3.566	31.599	16,1	7.335	6.073	1.262	3,9
VII Región	2.627	26.181	10,0	2.375	21.378	18,3	5.357	4.803	554	2,6
VIII Región	793	7.037	8,9	718	5.844	16,9	1.513	2.193	320	5,5
IX Región	1.193	11.093	9,3	1.166	9.297	16,2	2.492	1.796	696	7,5
X Región	383	3.375	8,8	348	2.764	18,1	841	611	230	8,3
XI Región	185	1.152	6,2	142	734	36,3	568	418	150	20,4
XII Región	537	5.240	9,8	518	3.632	30,7	1.946	1.608	329	9,3
Reg.Metropol.	7.705	75.939	9,8	-	65.054	14,3	14.007	10.885	3.122	4,8

TABLA Nº 12

ENTRADA FERIA
PRIMER SEMESTRE 1979

DEST. / ORIG.	IV	V	R.M.	VI	VII	VIII	IX	X
I								
II								
III								
IV	14		170					
V		4.805	3.062					
R.M.			21.297			63		
VI			11.995					
VII			1.449		18.177	1.145		
IX			1.531				24.957	
X							228	10.589
XI								
XII								

TABLA Nº 13

SALIDA DE FERIA

PRIMER SEMESTRE 1979

DEST. / ORIG.	III	IV	V	R.M.	VI	VII	VIII	IX	X
I									
II									
III									
IV		14							
V			4.620	185					
R.M.		357	4.627	70.449	1.089				
VI									
VII		2.600		3.537		9.976			
VIII				1.690		608	21.505		
IX				10.746			16.184	22.033	
X				454					10.137
XI									
XII									

TABLA Nº 17

PROYECTO PESTE PORCINA CLASICA

INFORMACION BASICA

REGION	POBLACION	N°PLANTELES	BENEFICIOS	MATADEROS	FABRICA CECINAS			% VACUNACION		% Planteles que Usan Desperdicios
					T	I	C	% Cerd.	% Plant.	
Total	889.969	165.449	428.275	235	-	-	-	-	-	-
I	4.253	641	3.311	2	2	2	-	37.3	39.0	73.5
II	4.738	398	1.799	2	1	1	-	14.1	0.8	96.4
III	3.678	782	751	3	5	5	-	-	-	-
IV	11.152	4.305	2.662	10	25	15	10	51.4	6.1	68.9
V	29.624	4.486	42.132	19	24	14	10	76.5	22.4	59.3
R.M.	76.446	6.552	215.504	15	50	37	13	78.0	5.6	79.2
VI	88.123	17.095	17.649	18	-	-	-	-	-	-
VII	106.517	22.601	28.372	28	31	26	5	76.7	24.6	95.4
VIII	174.013	37.106	47.027	59	82	43	39	16.3	3.9	75.0
IX	196.609	34.423	26.080	45	44	30	14	29.5	3.9	87.7
X	180.681	35.637	36.211	27	46	42	4	3.9	1.2	78.7
XI	7.045	1.013	-	3	5	3	2	0.0	0.0	100.0
XII	5.090	360	6.777	4	4	3	1	0.0	0.0	100.0

TABLA Nº 18

NUMERO DE CERDOS VENDIDOS POR TIPO DE CANAL DE COMERCIALIZACION

CLASIFICACION GEOGRAFICA	TOTAL	NUMERO DE CERDOS VENDIDOS - CANALES DE COMERCIALIZACION															
		Correderos		Ferias		Mataderos		Comerciantes		Cooperativas		Fábricas de Cecinas		Otros Criaderos		Otros	
		Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%
Total País	150.575	21.808	14,5	36.424	24,2	16.039	10,6	4.243	2,8	10.954	7,3	44.209	29,4	4.909	3,2	11.989	7,9
I Región	1.781	-	-	-	-	73	4,1	989	55,5	-	-	35	1,9	91	5,1	593	33,2
II Región	767	-	-	-	-	166	21,6	303	39,5	-	-	191	24,9	-	-	107	13,9
III Región	402	-	-	-	-	-	-	206	51,2	-	-	97	24,1	-	-	99	24,6
IV Región	1,756	-	-	66	3,7	1	0,1	111	6,3	-	-	1.421	80,9	33	1,9	124	7,0
V Región	12.886	960	7,4	2.205	17,1	472	3,6	330	2,6	540	4,2	7.729	59,9	100	0,8	550	4,3
VI Región	22.124	2.650	11,9	7.578	34,3	2.921	13,2	221	0,9	1.433	6,5	5.894	26,6	1.364	6,2	63	0,8
VII Región	20,047	4.262	21,3	3,704	18,4	3.715	18,5	88	0,4	687	3,4	7.358	36,7	233	1,2	-	-
VIII Región	4,890	198	29,1	1.424	29,1	910	18,6	293	5,9	-	-	1.722	35,2	180	3,7	163	3,3
IX Región	16,128	40	0,2	8.168	50,6	52	0,3	68	0,4	30	0,1	6.689	41,7	825	5,1	256	1,5
X Región	3.726	33	0,9	228	6,1	41	1,1	351	9,4	-	-	2.886	77,4	13	0,3	174	4,7
XI Región	559	-	-	-	-	-	-	296	52,9	-	-	180	33,9	28	5,0	45	8,1
XII Región	2,808	-	-	-	-	-	-	-	-	-	-	2.421	86,2	129	4,6	258	9,1
Reg.Metrop.	62.701	13.665	21,8	13.051	20,8	7.688	12,2	987	1,6	8.264	13,2	7.586	12,1	1.913	3,0	9.597	15,2

TABLA Nº 21

CERDOS VACUNADOS POR ESTRATOS Y REGIONES
PRIMER SEMESTRE 1979

REGION	CASERO			INDUSTRIAL			TOTAL PAIS		
	N°Cerdos	N°Vacunados	% Vac.	N°Cerdos	N°Vacunados	% Vac.	N°Cerdos	N°Vacunados	% Vac.
TOTAL	331.999	32.444	9,8	271.598	232.189	85,5	613.597	264.631	43,1
I	1.946	937	48,2	2.956	896	30,5	4.902	1.833	37,3
II	1.921	0	0	1.178	438	37,1	3.099	438	14,1
III	x	x	x	x	x	x	x	x	x
IV	3.791	951	25,1	2.389	2.228	93,2	6.180	3.179	51,4
V	2.596	747	28,8	27.353	22.167	81,0	29.949	22.914	76,5
R.M.	14.529	1.354	9,3	79.634	72.138	90,5	94.163	73.492	78,0
VI	22.961	3.901	17,0	53.949	53.338	99,4	86.910	57.237	65,9
VII	15.331	5.406	35,3	38.741	36.106	93,1	54.072	41.512	76,7
VIII	120.694	6.002	5,0	22.257	17.395	78,1	142.951	23.397	16,3
IX	94.534	12.706	13,4	35.510	25.761	72,5	130.044	38.467	29,5
X	52.263	440	0,8	3.165	1.722	54,4	55.428	2.162	3,9
XI	686	0	0	210	0	0	896	0	0
XII	747	0	0	4.256	0	0	5.003	0	0

x No registra información.

TABLA Nº 22

VACUNACION PESTE PORCINA PLANTELES DE CERDOS ESTRATOS FAMILIAR E INDUSTRIAL - PRIMER SEMESTRE 1979.

REGION	ESTRATO FAMILIAR			ESTRATO INDUSTRIAL			T O T A L		
	N°Plantel	N°Vac.	%	N°Plantel	N°Vac.	%	N°Plantel	N°Vac.	%
TOTAL	59.949	2.697	4,5	582	397	68,2	60.531	3.094	5,1
I	65	23	35,4	22	11	50	87	34	39,1
II	228	-	-	13	2	15,4	241	2	1,0
III	#	#	#	#	#	#	#	#	#
IV	672	31	4,6	13	11	84,6	685	42	6,1
V	247	23	9,3	65	47	72,3	312	70	22,4
R.M.	2.459	66	2,7	122	81	66,4	2.581	147	5,7
VI	4.528	200	4,4	76	74	97,4	4.604	274	5,9
VII	4.755	1.118	23,5	86	76	88,4	4.841	1.194	24,7
VIII	25.288	954	3,8	80	46	57,5	25.368	1.000	3,9
IX	19.879	266	1,3	84	44	52,4	19.963	310	1,6
X	1.639	16	1,0	16	5	31,3	1.655	21	1,3
XI	112	0	0	2	0	0	114	0	0
XII	77	0	0	3	0	0	80	0	0

No registra información.

TABLA Nº 23

CERDOS VENDIDOS POR CATEGORIA

Cerdos Vendidos y Categoría	Número de Cerdos	%	Tasa de Extracción sobre población total
Total	150.575	100	$\frac{150.575}{239.792}$ = 62,8
Terminados	138.864	92,2	
Crianza	7.423	4,9	
Reproducción	546	0,3	
Desecho	2.620	2,4	

TABLA Nº 24

PRODUCCION, OFERTA Y CONSUMO DE CARNE DE CERDO CHILE 1965 - 1979.

AÑO	Población Porcina.	Beneficio	Tasa de Beneficio	Oferta de carne TON.	Importación KG.	Exportación KG.	Oferta para consumo TON	Población País	Consumo de carne de cerdo por hab. año.
65	1.021.594			39.765	-	-	39.765		4,5 Kg.
66				42.269	-	-	42.269		4,7
67				42.681	-	-	42.681		4,7
68		593.662		47.884	-	-	47.884		5,1
69		661.762		48.325	-	-	48.325		5,1
70	1.025.279	671.646	65,5	48.516	-	-	48.516	9.367.633	5,2
71	1.026.015	700.950	68,3	53.206	-	-	53.206	9.533.989	5,6
72	1.026.752	760.263	74,0	65.651	-	-	65.651	9.697.448	6,8
73	967.761	762.594	78,8	57.575	-	-	57.575	9.860.611	5,8
74	866.148	757.178	87,4	56.788	-	-	56.788	10.026.069	5,7
75	734.410	462.681	63,0	29.960	-	-	29.960	10.196.423	2,9
76	889.969	376.206	42,3	24.881	12.910		24.894	10.371.939	2,4
77	995.777	415.695	41,7	28.891	292.741	-	29.185	10.550.886	2,7
78	1.024.303	485.596	47,4	33.875	140.905	14.822	34.002	10.732.863	3,2
79	1.098.863	623.920	56,8	42.541	472.108	10.000	43.004	10.917.465	3,9

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS
II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

Agenda Item N°6

REDISA2/14 (Ingl.)
Septembre 6, 1980
Original: Spanish

COORDINATING VETERINARY INSTITUTES AND LABORATORIES FOR DIAGNOSIS AND RESEARCH

Dr. Carlos Arellano
Director
Instituto Investigaciones
Pecuarias, Palo Alto,
Mexico.

COORDINATING VETERINARY INSTITUTES AND LABORATORIES FOR DIAGNOSIS AND RESEARCH

Animal health problems have always restricted the development of livestock production on this continent. With the exception of Canada and the United States of America, which are highly advanced in matters of animal health, the countries of the Americas have not reached the desired status in this field, in spite of the major efforts and progress some of them have made.

Modern systems of communications can become the most effective means of transmitting animal diseases. This fact, combined with the economic importance of livestock production on the continent and what it represents for our countries' present and future development, makes it appropriate and absolutely necessary to establish solid, consistent foundations so that each and every one of the continent's countries can combine its efforts to achieve the timely application of the available technology to fight, control and prevent epizootiological problems, or to achieve the potential for developing new technologies (through research) when necessary.

In this area, the Animal Health Program of the Inter-American Institute of Agriculture Sciences is particulary valuable. Its objective is to co-operate and interact with the continent's countries in order to prevent the appearance of exotic diseases and to eradicate or control existing ones.

We would like to describe and to submit to your consideration, some functions that IICA Animal Health Program could develop in order to achieve the above objective:

1. EPIZOOTIOLOGICAL MONITORING.

To establish, through copartnership with the animal health organizations in the countries, a system of epizootiological monitoring and continuously up-dated statistics on the incidence, prevalence and distribution of diseases affecting livestock in the area. This system would

provide ready and timely evaluation elements for establishing national and regional programs to prevent, control and/or eradicate diseases, and at the same time, it would appraise the actions and effectivness of existing health campaigns.

2. DIAGNOSTIC SERVICES AND REFERENCE LABORATORIES.

To make use of the positive experiences of some countries, and acquire access reliable information on the incidence, prevalence and distribution of diseases, based on laboratory diagnosis; to provide technical support to countries requesting assistance, in order to establish regional and continental networks of strategically distributed diagnostic laboratories which would make reliable information available to be fed into the Continent's Epizootiological Monitoring System.

Once the laboratory network were established, it would be necessary to determine which laboratories are technically adequate, and give them scientific and financial support in order to establish strategically located "Reference Laboratories" whose function would be to standarize diagnostic techniques, produce the uniform reagents and/or biologics necessary for disease diagnosis and, upon country request, to train laboratory personnel in methods of diagnosis for the disease stipulated for each "Reference Laboratory".

3. TRAINING, UPDATING AND DATA PROCESSING SERVICES.

Human resources are the cornerstone and the most important factor of any activity; most of the continent's countries can be considered technically and scientifically young in the field of animal health; fortunately there is already a big supply of technological information on veterinary medicine as well as modern information and teaching systems that make it possible to train and update professionals or technicians in a relatively short time.

Courses in all disciplines needed for improving the technical and scientific level of animal health services in the countries of the region. Ongoing training could thus be established for program personnel.

As an indispensable complement to any training system, we must have available a scientific data processing system that will provide timely, ongoing access to new publications on the various disciplines of veterinary medicine so that we can ensure that the qualified personnel are up to date in their specialies.

In the area of training and updating, it is important to underscore the language problem. Unquestionably, human technological development is due mostly to the enormous influx of scientific information generated every day, all over the world; unfortunately, only a small amount of this information is published in Spanish or Portuguese, and this represents a serious problem to our countries, since only a small percentage of our professional and technical personnel master foreign languages and therefore enjoy timely access to new information. It is absolutely essential to establish a data processing service on veterinary medicine which would give the continent's veterinary community analytical, selective access to periodically updated bibliographical reviews of subjects of regional interest in Spanish and Portuguese. Only in this way will we be able to lessen the technological gap between our countries and the more developed ones.

4. QUALITY CONTROL OF VETERINARY BIOLOGICS.

Until now, experience has shown that the timely acquisition of sufficient amounts of good-quality biologics can be a limitation on planning and accomplishing health campaigns.

"Reference Laboratories" could back the official checking and quality control services done by the governments of the area's countries. This should be done strategically and regularly in order to guarantee the quality of the biologics used in the health campaigns and at the same time, to back quality control in the laboratories that produce them.

Through this systematic sampling of the quality of the biologics produced, it will be possible to choose laboratories that would provide for the health campaigns, selecting those whose product is of acceptable quality. The existence of this control system will generally contribute to raising the quality of the biologics produced in the area.

From the information obtained through the "epizootiological monitoring" system, it would be possible to establish a strategic reserve of biologics to carry out effective and timely vaccination campaigns.

As for biologic production, some countries have official production laboratories, and when necessary, these laboratories could receive technical and financial support to provide for the needs in the area.

5. HEALTH CAMPAIGNS.

Modern communications have eliminated many geographical barriers that once prevented the spread of animal diseases. In order to ensure the success of health campaigns, it is necessary that they be planned regionally, often involving more than one country; IICA Veterinary Medicine Division could be a major collaboration and coordination factor among the health units of the countries concerned with the campaign.

At regional and continental levels, some countries have had positive experiences which could and should be extended into regional health campaigns, and which have already attained effective technological elements for achieving control and/or eradication. Examples include the campaigns against foot and mouth disease, Venezuelan horse encephalitis, screwworm, Boophilus ticks, hog cholera, African swine fever, bovine brucelosis, etc.

6. RESEARCH.

It is important to find academically excellent research teams in Latin America in order to encourage and strengthen them both technically and financially and work with them to establish research projects on animal health problems found in the area. It is necessary to be aware that there are not many of these teams, so it is appropriate to coordinate their efforts, avoid duplication, and optimize their activity.

In Latin America has health problems that have already been overcome in the United States and in Canada, as well as others that are exclusively tropical problems. In the former case, it is necessary to review the technology applied in the continent's northern countries and to adapt it to the prevailing circumstances in Central and South America; it would be desirable

to have the experience of scientific and technical personnel that have successfully conducted the research and activities of the health campaign in order to reinforce the scientific and technical capabilities of the research and health personnel in the area where a health campaign is undertaken. In the latter case, the research institutions in the tropical areas would have conduct the research into these health problems in order to develop the necessary technology for solving them.

In conclusion, if the above tasks can be carried out, major progress in the area's animal health can be achieved, and healthy stock is the primary basis for successful livestock production.

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

AGENDA ITEM N°1

REDISA2/15 (Esp.)
August 21, 1980
Original: Spanish

RECOMMENDATIONS OF THE FIRST MEETING OF DIRECTORS OF ANIMAL HEALTH

(REDISA 1)

San José, Costa Rica - 22-25 August, 1979

GENERAL GUIDELINES FOR IICA ANIMAL HEALTH PROGRAM

RECOMMENDATIONS

The meeting of Animal Health Directors, held in San José, Costa Rica, on August 22 to 24, 1979, and declared the First Meeting of the Consultative Committee of IICA's Animal Program, recommends:

GENERAL RECOMMENDATIONS

1. That the head of the Animal Health Program occupy the level of Director within the structure of IICA, and be specially hired as an Expert in the field, and that the Program be given the hierarchical status and internal connections that correspond to its importance.

2. That regular meetings of Animal Health Directors and Specialists be given top priority as a forum for discussing fully the breadth and components of the Animal Health problem in this hemisphere.

3. That IICA's Animal Health Consultative Committee be constituted as the appropriate entity for this purpose, providing technical support for the decision-making and fun-granting efforts of Ministries of Agriculture, the Director of IICA itself, and other international organizations active in Animal Health.

4. That highly-qualified Veterinary Medical personnel, well versed in the facts of the health situation in this continent, be included in the high-level decision-making process at IICA.

5. That the countries in the Zones be consulted before National Health Specialists are designated to be responsible for zone activites, and that professionals who are native to the countries in the Zone be given preference in the employment process.

SPECIFIC RECOMMENDATIONS

1. Human Resources Development

IICA Should consider the possibility of using its resources and its background in education to reinforce and complement national efforts and contributions from other international organizations, always avoiding unnecessary duplication.

The primary specializations to be covered in educational programs are:

- Epidemiology;
- Animal Health Planning;
- Disseminating Information on Animal Health;
- Animal Quarantine;
- Diagnosis;
- Input Control in Health Campaigns;
- The Training of Field Personnel; and
- Health Statistics.

IICA will have a broad range of responsibilities procuring the resources and improving the practical mechanisms for the participation of national Animal Health specialists, and conducting research into refresher courses and technical activities to guarantee on-going training efforts.

IICA's Animal Health Program must give special priority to improving the public image of veterinarians by emphasizing their contributions to human health and the economic development of their countries. At the same time, certain essential elements must be obtained if necessary services are to be provided.

In the Antillean Zone, it is recommended that IICA outline the possibilities for training Veterinary Doctors for the Antilles, and provide access both to existing Veterinary Schools (Dominican Republic) and to those that are now being developed (Trinidad) for the training of Veterinary professionals.

The actual demand for this type of education in the Antillean countries must be clearly identified, as well as the institutions capable of financing veterinary training programs for both doctors and assistants.

It is also important to recognize and to begin meeting, the urgent need in the Antillean Zone for Animal Health consulting services.

In the particular case of Haiti, special assistance is needed urgently in identifying the needs for personnel and infrastructure for Animal Health and Production, and in recommending appropriate solutions.

2. Identifying the Problems of Individual Countries

The countries of the Americas have received technical assistance in controlling and eradicating the most economically damaging infectious diseases in the region, including Hoof and Mouth Disease, Brucellosis, Bovine Rabies, Tuberculosis, Horse Encephalitis, and African Swine Fever. However, the countries are being affected by a number of diseases whose economic effects are severe, and it is recommended that IICA begin taking the necessary action to establish regional programs for the necessary activities.

Animal Health services, aware of the importance of high quality inputs for the success of disease control and eradication compaigns, request the governments either to reinforce, or when necessary, create, quality control systems for animal drugs and feed. Specifically, the countries and international organizations are requested to identify their research into improved vaccinations against Hoof and Mouth.

The countries in the Southern Zone have selected the following diseases as high-priority areas of concern for immediate attention:

- hog cholera
- infectious horse anemia
- newcastle disease
- bovine leucosis
- blue tongue

The countries in the Antilles have expressed special interest in:

- infertility, calf affections, and bovine mastitis
- endoparasitosis
- ticks and the diseases they transmit
- poultry diseases
- health inspection for meat and poultry
- blackleg
- torsalo

Similarly, they emphasize the need for IICA to contribute to tasks which are currently covered by agreements between the governments of Brazil, Guyana, and Venezuela with support from

the Pan-American Health Organization and the International Epizootic Office, these projects involve intensive research into primary sources of reinfestation. The goal is to develop more effective control measures for hoof and mouth disease.

The countries of the Northern Zone are establishing in Panama a regional loboratory for vesicular diseases. Contributions have been received from Panama, OIRSA, and the United States Department of Agriculture. Construction and equipment have been approved, and work will soon begin. The sources of working funds for future operations has not yet been determined.

A regional reference laboratory on animal diseases en Central America has yet to be established, to deal with other than vesicular diseases.

In view of the accomplishments of, and outlook for the program of tick identification, classification, and control in Costa Rica, conducted in coordination with FAO and the Central American Economic Integration Bank (BCIE), it is felt in this region that the program should continue. IICA support could take the form of working with international organizations and countries interested in livestock development in the Americas to ask them for economic resources to equip the Tick Program laboratory in Costa Rica.

3. Acquisition of Financial Resources

It is recommended that IICA assist national and regional institutions in reviewing and evaluating projects to be submitted to financing organizations. Also, IICA should support efforts to encourage international and/or regional financial agencies to establish special lines of credit.

4. Information and Communication for Animal Health

In this area, international support and reinforcement are recommended, oriented fundamentally toward generating methods for keeping farmers aware of the true scope of Animal Health Programs.

Likewise, it should be noted that a proper understanding of the health problems in other countries and regions must be a fundamental part of the information system. In this way, it can guarantee the immediate implementation of measures needed to solve eventual problems.

5. Establishing rapid-response mechanisms for emergency situations

Delegates agreed on the need to establish mechanisms of this type; however, they recognized the complexity and practical difficulties of the problem. Therefore, it is recommended that

IICA's Animal Health Program study the various possibilities for alarm and immediate response systems. This could take various forms but must satisfy the need to provide immediate aid to national services in the case of disease outbreaks needing fast attention. In addition, IICA's Director General should be empower to disburse funds immediately and have access to technical advisory services enabling him to react appropriately to different situations, and alternatives.

6. Developing Quarantine Systems

In this specific subject area, it is recommended that IICA assist countries to develop projects for quarantine systems according to the particular characteristics of the regions. They should also remember the publicity and support structures of national organizations for implementing and standardizing inspection and health control systems for the transportation and selling of livestock and animal products and byproducts.

7. Legislation

Attention should be given to improving areas of health legislation to facilitate the exchange and sale of animals and livestock products and byproducts, averting any spread of disease. To this end, the following recommendations were made:

a. Developing a catalogue of health legislation on the continent.

b. Working to up-date existing laws and regulations.

c. Developing standard formats for international shipping certificates.

SPECIAL RECOMMENDATION

The Meeting of Animal Health Directors recommends the creation of a politically and technically high-level commission to present the status and needs of Animal Health to the Ministers of Agriculture in this Hemisphere. The goal would be to make optimun use of possibilities for improving the structure of various international programs in this area, complementing current efforts and, at the same time, to request economic support as needed from the member countries. This would make it possible to expand the project functions to include the international problems of Animal Health in the Americas as a whole

ADDITIONAL REMARKS OF THE PLENARY SESSION

After the recommendations had been read and approved, the Representative of the United States asked for the floor, he observed

that his government feels it is very important for IICA to do its utmost to acquire the highest quality technical and administrative personnel for the Program positions, and thus assuring its success.

CLOSING SESSION

The President then gave the floor to the Director General of IICA, who outlined the accomplishments of the Meeting and expresses his gratitude to the delegates for their attendance. He once again committed himself to provide cooperation with Animal Health activities through the Institute's program structure by carrying out the recommendations of the Consultative Committee.

Dr. Jorge R. Benavides Muñoz, Representative of Chile, spoke in the name of all the participants to highlight the achievements of the Meeting and the principles that stand behind the recommendations made to IICA for coupling its efforts with those of the countries themselves in the fight against animal diseases. Finally, he expressed his appreciation for IICA's interest in Animal Health and its importance in food production.

President Manuel Guardia Tinoco then spoke in the name of the Minister of Agriculture and Livestock of Costa Rica to express his pleasure with the choice of his country as a headquarters for the event. He bid the participants well and officially closed IICA' Meeting of Animal Health Directors.

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

REDISA2/16
3 setiembre 1980
Original: Esp.-Ingl.

LISTA PROVISIONAL DE PARTICIPANTES

PROVISIONAL LIST OF PARTICIPANTS

ARGENTINA

Dr. Carlos Hugo Caggiano
Director del Servicio de Luchas Sanitarias
Servicio Nacional de Salud Animal
Secretaría de Agricultura y Ganadería
Buenos Aires, Argentina.

BARBADOS

Dr. Trevor H. King
Senior Veterinary Officer
Veterinary Services
Ministry of Agriculture
Bridgetown

<u>BOLIVIA</u>

Dr. Fernando Ruiz García
Jefe, División de Sanidad Animal
Ministerio de Agricultura
La Paz

<u>BRASIL</u>

Dr. Norberto Dos Santos
Director de Sanidad Animal
Secretaría de Defensa Agropecuaria
Ministerio de Agricultura
Brasilia, Brasil.

CANADA

Dr. John McGowan
Under Secretary
Animal Health Services
Otawa, Canadá.

Dr. Tim Scott

COSTA RICA

Dr. Manuel Guardia Tinoco
Director de Sanidad Animal
Ministerio de Agricultura y Ganadería
San José, Costa Rica.

COLOMBIA

Dr. José Pérez
Jefe Sanidad Animal
Instituto Colombiano Agropecuario (ICA)
Bogotá, Colombia.

CHILE

Dr. Jorge R. Benavides M.
Director División Protección Pecuaria
Servicio Agrícola Ganadero
Ministerio de Agricultura.
Santiago, Chile.

ECUADOR

Dr. Pedro Díaz
Director de Sanidad Animal
Ministerio de Agricultura
Quito, Ecuador.

EL SALVADOR

Dr. Rolando Vargas
Jefe División de Sanidad Animal
Dirección General de Ganadería
Cantón El Matazano
Soyapango

ESTADOS UNIDOS

Dr. Pierre Chaloux
Deputy Assistant Administrator
APHIS - USDA
Washington, D.C., U.S.A.

GRENADA

Dr. K.S. Manyam
Chief Veterinary Officer
Ministry of Agriculture
Stt. George, Grenada.

GUATEMALA

Dr. Francisco Bobadilla
Director de Sanidad Animal
Dirección General de Servicios Pecuarios
Finca Nacional La Aurora
Zona 13, Guatemala.

GUYANA

Dr. Patrick McKenzie
Chief Veterinary Officer
Ministry of Agriculture
Georgetown, Guyana.

HAITI

Dr. Fred Calixte
Directeur Services Veterinaire
Minister de la Agriculture
Port-au-Prince, Haitî.

HONDURAS

JAMAICA

Dr. Clifford L. Grey
Chief Veterinary Officer
Ministry of Agriculture
Kingston, Jamaica.

MEXICO

Dr. Oscar Valdés Ornelas
Director General de Sanidad Animal
Secretaría de Agricultura y Recursos Hidraúlicos
Dr. Mora N°15
México D.F. ZP 1

NICARAGUA

Dr. Roberto Villavicencio
Dirección de Ganadería
Ministerio de Agricultura
Managua, Nicaragua.

PANAMA

Dr. Arcadio Carrizo
Sub-Director Producción Pecuaria
Ministerio de Desarrollo Agropecuario
Panamá.

PARAGUAY

Dr. Raúl Prieto Busto
Director de Salud Animal
Ministerio de Agricultura
Asunción, Paraguay.

PERU

Dr. José F. Castillo Pascual
Sub-Director de Sanidad Animal
Ministerio de Agricultura y Alimentación
Lima, Perú.

REPUBLICA DOMINICANA

Dr. Reynaldo Peña de la Cruz
Director Departamento Sanidad Animal
Dirección General de Ganadería
Secretaría de Estado de Agricultura
Santo Domingo

SURINAME

URUGUAY

Dr. Hugo Tortora
Jefe de Sanidad Animal
Ministerio de Agricultura
Montevideo, Uruguay.

VENEZUELA

Dr. Humberto Olmos
Director Sanidad Animal
Ministerio de Agricultura y Cría
Caracas, Venezuela.

ORGANISMOS INTERNACIONALES

AGENCIA INTERNACIONAL PARA EL DESARROLLO DEL GOBIERNO DE LOS ESTADOS UNIDOS DE NORTE AMERICA. AID.

Robert Mc Colaugh.

ORGANIZACION DE LAS NACIONES UNIDAS PARA LA ALIMENTACION Y LA AGRICULTURA. FAO.

Dr. F.J. Peritz
Asesor Regional
Oficina Regional para las Américas
Santiago, Chile.

OFICINA INTERNACIONAL DE EPIZOOTIAS. OIE

Dr. Louis Blajan
Director General
12 Rue de Prony
París. Francia.

ORGANISMO INTERNACIONAL REGIONAL SANIDAD AGROPECUARIA. OIRSA

Dr. José Ferrer
Director Salud Animal
OIRSA
San Salvador. El Salvador

BANCO INTERAMERICANO DE DESARROLLO. BID.

Dr. Danilo Poklepovic
Representante en Costa Rica
San José. Costa Rica.

ORGANIZACION PANAMERICANA DE LA SALUD. OPS

Dr. Emigdio Balbuena
Representante OPS/OMS
San José, Costa Rica.

INSTITUTO INTERAMERICANO DE CIENCIAS AGRICOLAS. IICA

Dr. José Emilio G. Araujo
Director General

Dr. Manuel Rodríguez
Sub-Director General

Dr. Francis J. Mulhern
Director Salud Animal

Dr. Rubén Lombardo
Asesor Veterinario Area Sur
Brasilia. Brasil

Dr. Thomas Murnane
Asesor Veterinario Area Norte
México D.F., México

Dr. Franz Alexander
Asesor Veterinario Area de las Antillas
Georgetown, Guyana

Dr. Germán Gomez
Asesor Veterinario Area Andina
Bogotá, Colombia

Dr. Pedro N. Acha
Asesor del Director General
Washington D.C.

OBSERVADOR INVITADO

Dr. Willen F.G.L. Droppers
Reino de los Países Bajos.

CONSULTORES IICA:

Dr. Miguel Osorno
Proyecto Investigación Babesiasis
Instituto de Investigaciones Pecuarias
Palo Alto, México

Dr. Nazario Pineda
Director Programa Erradicación Gusano Barrenador
Secretaría de Agricultura y Recursos Hidráulicos
México, D.F., México

Dr. Carlos Arellano
Director Instituto Investigaciones Pecuarias
Secretaría de Estado de Agricultura y Recursos Hidráulicos
Palo Alto, México

Dr. Kenneth Kuttler
Departamento de Agricultura de los Estados Unidos (USDA)
Beltsville, Maryland
U.S.A.

Dr. Ronald Smith
College of Veterinary Medicine
University of Illinois
Urbana, Illinois
U.S.A.

Dr. Andrew Carson
College of Veterinary Medicine
University of Missouri
U. S. A.

Dr. Orlando Sánchez
Jefe Programa Erradicación Peste Porcina Africana
Secretaría de Estado de Agricultura
Santo Domingo, República Dominicana

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

REDISA2/17
September 11, 1980
Original: Esp-Engl

RECOMMENDATIONS OF THE MEETINGS FOR PLANNING AND COORDINATION IN THE COUNTRIES

As established in Agenda Item 8, the meetings for programming and coordination of the countries were held on the days 10 and 11 September. Three regional groups were constituted, whose reports and recommendations are presented in this document.

NORTHERN AND CENTRAL AMERICAN REGION

This group, constituted by the following countries: Canada, Costa Rica, El Salvador, Guatemala, Mexico, Nicaragua, Panama and the United States of America, had two working sessions and concluded the following recommendations:

1. Cataloging Biological and Assistance Funds

Outbreaks of indigenous diseases occur in certain countries where biologicals or funds to purchase biologicals are not readily available. It is recommended that IICA maintain a catalog biologicals, their source and cost and that IICA examine the feasibility of establishing a fund that could be used by certain countries to purchase biologicals and in consultation with participating countries determine the criteria for use of the fund.

2. Tick Control and Eradication

In consideration of the great impact that tick infestations have on livestock development in the Central American countries and Panama, it is requested that IICA give its support to international organizations and the interested countries in carrying out a study of the feasibility of control and eradication of ticks in the countries of this area.

Furthermore, since the Tick Control Laboratory in Costa Rica is important to the execution of this feasibility study, it is requested that IICA encourage international organizations and the countries concerned with livestock development in this area to provide economic support to this laboratory to ensure its continued operation in fields of investigation and training of personnel.

IICA should collaborate with OIRSA in order that previous actions and the experience of this organization in relation to investigations of tick infestations be utilized in the study of the feasibility of tick control and eradication.

3. Leptospirosis

It is manifestly important that studies be conducted to determine the incidence of leptospirosis in Mexico, Central America and Panama. Policies for control of this disease in livestock as it is important not only to livestock economy and production, but also to public health.

It is recommended that IICA in coordinating a study of leptospirosis in Mexico, Central America and Panama solicit the participation of OPS since leptospirosis is a recognized zoonotic disease.

Progress on the study should be presented at the III Inter-American Meeting of Directors of Animal Health.

4. Animal Disease Reporting

It is recommended that at the III Inter-American Meeting of the Directors of Animal Health, each director present, in schematic form, information on infectious diseases diagnosed in the different animal species

in their respective countries and the estimated losses and associated campaigns for their control or eradication. The format of reporting these diseases would be prepared by IICA and distributed to the Directors of Animal Health of each country.

5. Training

Mexico, the countries of Central America and Panama have, or are in the process of initiating intensive programs for the control or eradication of livestock diseases. Most of these programs are financed by outside agencies and therefore, have specific objectives to meet within specified time frames. In executing these programs, these countries must have available trained personnel in the fields of programming, administration and epidemiology. The experience already acquired by some countries in this area may be utilized in assisting other countries.

Accordingly, it is recommended that IICA direct the organization of an intensive training program in the fields of programming, administration and epidemiology. The programs should preferably designed for the professionals who are participating in or directing these campaigns in Mexico, Central America and Panama. International institutions linked to these programs and national organizations experienced in these fields may provide faculty and other type resources. Consideration should also be given to the possibility of sending instructors to each country thus benefiting a greater number of professionals in each country in the shortest time possible.

6. Parasitic Infections

Internal parasites adversely affect growth and development of livestock and consequently, reduce the available quantity of food animal protein.

It is recommended that IICA coordinate a study for the control of internal parasites in Mexico, Central America and Panama, ascertain the capabilities within each country for diagnosing parasitic infections and provide the guidelines for programs to control internal parasites of livestock in each country of the area.

7. OIRSA/IICA

OIRSA has had considerable experience working in Mexico, Central America and Panama, and has accumulated information that would be of assistance to IICA in certain programs it may wish to establish.

Accordingly, it is recommended that close cooperation be established between these organizations thereby benefiting programs of mutual interest within the countries of this area.

JOINT MEETING OF THE DIRECTORS OF ANIMAL HEALTH FROM THE SOUTH AMERICAN REGION

Two meetings were held on the 10th and 11th September with the representatives of the following countries:

Southern Area:	Argentina
	Chile
	Paraguay
	Uruguay
Andean Area:	Bolivia
	Ecuador
	Venezuela

The group voted to have Dr. Carlos Hugo Caggiano (Argentina) as Chairman and Dr. Fernando Ruíz (Bolivia) as Rapporteur. Drs. Rubén Lombardo and German Gómez -Area Veterinarians - IICA - acted as Secretary ex-officio.

The group considered that the recommendations presented in the final report of REDISA I, held in 1979 had been fulfilled.

The meeting analyzed in detail the guidelines presented by Dr. Francis Mulhern The Director of Animal Health, IICA, and the Program of

activities proposed for 1981 as well as the suggestions for 1982. The following conclusions and recommendations were made:

1.- To acknowledge the efficiency demostrated in such a short time to complete with the general recommendations of REDISA I considering their importance and range.

2.- To obtain all possible assistance to develop effectively a Regional Center of Training in Animal Health in collaboration with the University of La Plata in Argentina. Further to consider as a first step the priority establishment of short and medium courses for field personnel in control programs.

3.- Equally to seak the necessary support to establish the project in the Southern Area concerning the Veterinary Investigation Laboratory at the National Institute of Livestock Technology (INTA) in CASTELAR, Province of Buenos Aires, Argentina to form part of the network of Veterinary laboratories in the country with possiblities to be afford as a Regional Center.

4.- With reference to proposals for Animal Health programme for 1981 (Dr. Mulhern's Address. P.5) to approve numbers one (1) to eleven (11) and also number 13.

5.- To include within the activities of the Animal Health Programme for IICA for the year 1981 and 1982, special emphasis to obtain all possible collaboration for the development of programmes to control

Classical Swine Fever (Hog Cholera).

6.- To recommend that IICA within its Animal Health Program, prepares and distributes collated information on Bovine Leucosis and Blue Tongue concerning the disease characteristics, geographic distribution methods for prevention and control.

7.- With reference to the proposal for the Animal Health Programme to include Production, the Group expressed the following view:

a) They wished to endorse the great importance and need of every country to undertake efficiency animal production programmes for the production of food of animal origen.

b) Equally to obtain more information on the scope and implementation proposed.

MEETING OF DIRECTORS OF ANIMAL HEALTH

FROM THE CARIBBEAN REGION

On the 10th and 11th September two meetings were held with representatives from the following countries of the Caribbean Region:

Barbados

Dominican Republic

Grenada

Guyana

Haiti

Jamaica

Dr. Clifford Grey (Jamaica) was elected Chairman and Dr. Patrick McKenzie (Guyana) as Rapporteur. Dr. Franz Alexander Area Veterinarian, IICA acted as Secretary ex-officio.

The following recommendations were presented to the plenary session:

AFRICAN SWINE FEVER:

Considering the importance placed on health measures in order to reduce substantially economic losses and social impact in all countries that are due to the illnesses that today affect on livestock, however

concerning the continuos risks to which some of our countries are exposed from the introduction of exotic diseases and in some cases exotic to the American Continent, we recommend:

That in the shortest possible time, a programme of eradication for African Swine Fever in Haiti be initiated based on recommendations that IICA, jointly with FAO and the Government of Haiti approve taking into consideration among other things the experiences and results of a technical nature which has been obtained in the Dominican Republic in their eradication programme for African Swine Fever.

Equally to recommend to the Governments of the Americas the need for full support with technical and material resources for the execution of the programme of African Swine Fever if requested by the Government of Haiti.

2.- EMERGENCY FUND:

CONSIDERING:

That certain diseases are known to ravage the livestock population of a country, constitute a pest and are known to have major economic and / or public health significance and

CONSIDERING:

That a country may not be in a position, because of lack of funds

to respond in order to combat these diseases, recommends

1.- That IICA be empowered to establish a fund to be known as an emergency animal disease reserve fund from sundry sources, including contributions from governments of the Hemisphere, from which countries may draw and enable them to respond to the ravages of such diseases, where it is determined that the disease has been recently introduced.

2.- That IICA be empowered to establish the criteria governing the disbursement of the emergency animal disease reserve fund.

3.- SCREWWORM ERADICATION:

Recognizing the existing technology for the control and eradication of screwworm in countries of Americas,

Considering the reported losses from the effects of screwworm infestation in some countries in the Caribbean Region and the need to reduce significantly such losses,

Recommend that on request IICA should provide the countries of the Antillean Area with assistance to identify the extend of the screwworm problem and establish pilot projects in programmes of control.

4.- PREVALENCE STUDIES OF ANAPLASMOSIS, BABESIOSIS AND OTHER DISEASES:

Recognizing the economic importance of tick and tick borne disease in livestock industries of the Hemisphere, and

Conscious of the fact that a single serum sample also provides the opportunity to screen for a variety of diseases, recommends

IICA provides the necessary technical assistance, which will enable the conduct of prevalence studies about Anaplasmosis, Babesiosis, IBR and Bovine Leucosis in the countries of the Caribbean Region which request this service.

5.- DATA BANK:

Whereas reliable data on animal health is lacking in the Hemisphere, and that such data is unvaluable in the planning and evaluation of animal health programmes, and considered vital that the disease situation in the region be generally known and kept current.

Group recommends that

IICA be empowered to initiate a data bank on Animal Health using its computer services, in concert with any information gathering institution which may be currently functioning in the Region.

6.- VETERINARY POSITION:

Considering:

The importance of data collection and the administration of emergency fund in the overall implementation of IICA's programme and the need for special liaison on projects supported by IICA, recognizing the significant administrative duties involved in the Animal Health Programme at IICA headquarters; recommends

That a veterinary position be established at IICA headquarters to administer the said emergency fund, establish and monitor the data bank, and to be a special liaison on projects supported by IICA.

7.- POST GRADUATE TRAINING:

Considering the proposed establishment of regional training in Animal Health at the post-graduate level at the University of La Plata in Argentina.

Recognizing the geographical and language differences affect the fully utilizing the training facilities at the University of La Plata by Veterinarian from Caribbean Region,

Considering that some countries of the Antillean Zone have been utilizing the Regional Education Programme for Animal Health Assistants Center (REPAHA) located in Guyana, for continuing education for the veterinarians.

Conscious that the University of Florida, U.S.A. is developing programmes in tropical animal health,

Recommends that IICA investigates with a view to continue post-graduate and continuing education training for veterinarians of the Antillean Zone at the University of Florida USA and REPAHA respectively.

8.- EXPERT COMMITTEES:

Considering that research is continually uncovering information which signify advance in the many fields of veterinary medicine and that it is not always possible for anyone to keep abreast of all these advances,

Resolves that IICA sets up appropriate expert committees which will gather such information and make it available to the Directors of Animal Health.

9.- BLUE TONGUE:

Aware of the fact that Blue Tongue is of common interest to the countries of the Caribbean Region,

Recognizing that in some of the countries serological evidence has established the presence of Blue Tongue Virus,

Acknowledging the work already performed by PAHO/WHO in this area, The Group recommends,

IICA assists in the conduction of Blue Tongue surveys in the areas of serological testing and identification of vector(s) and strain(s) of the virus present in each territory.

10.- LABORATORY:

Considering that the need for diagnostic facilities in the Hemisphere generally, lags far behind current and future needs, and that

The need for biologicals is so diverse, and conscious of the fact that it is necessary to ensure that biologicals meet international standards, and that

There are distinct economic advantages in establishing a comprehensive system of diagnostic facilities at various levels of output and operation, and biologicals production in order to avoid costly duplication.

Recommends that IICA establishes an expert committee that will

1) Assess the diagnostic capabilities and develop criteria and methods for rating animal health laboratories in the Hemisphere.

2) Be a source of information as to where particular diagnostic capability exists in the Hemisphere.

3) Advise on which laboratories could serve as reference laboratories

for certain diseases and give advice generally that will enable a country to provide for laboratory service adequate to its needs.

4) Establish criteria to ensure that biologicals produced a attain international standards of purity and efficacy.

5) Establish the basis to secure the agreement of Governments for the entry of diagnostic materials into countries offering certain diagnostic services, and for the rapid shipment and or trans-shipment of such material without delay.

6) Develope a system for costing the services of and/or provide financial support to reference laboratories.

7) Establish where training of laboratory personnel at various levels may best be done.

11.- EQUINE ENCEPHALITIS:

Considering that periodically the countries of the Antillean Area are affected by outbreaks of equine encephalitis, an illness that not only affects the horse population but presents a danger to humans as well.

Considering that even though there have been several outbreaks in countries of the area the epidemiological situation has not been well defined much to the distress of the health authorities.

We recommend

That IICA provides a technical consultant personnel training and the necessary antigens required by the countries of the Antillean Area in order to determine the true situation in respect of Equine Encephalitis and in each case to undertake appropriate health measures.

12.- LABORATORY MAINTENANCE:

1) There is a need to keep laboratory equipment working in the region but maintenance service is not available.

2) Laboratory workers are not trained in maintenance of expensive instruments.

3) Consequently vital equipment needed for laboratory diagnosis is not available to the lab technicians,

Therefore,

IICA should provide training so that laboratory workers are informed about proper use of equipment and how to repair them if they breakdown.

IICA should stress to the Governments the need to provide electronic specialists to keep the equipment in the laboratories operating with the minimum breakdown time. Such specialists could be used in the repairs of equipment in the different laboratories of the country so they would be

properly utilized throughout the year.

13. COMMENDATION TO THE DOMINICAN REPUBLIC AND CUBA:

Aware of the excellent work done by the Government of the Dominican Republic and Cuba in conjunction with specific international organizations in the control and eradication of African Swine Fever,

Recommends to congratulate the Governments of the Dominican Republic and Cuba for its fortitude and attending success in the control and eradication of African Swine Fever.

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS

II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

San Jose, Costa Rica, 8-12 September, 1980

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LISTA DE PARTICIPANTES

LIST OF PARTICIPANTS

ARGENTINA

Dr. Carlos Hugo Caggiano
Director del Servicio de Luchas Sanitarias
Servicio Nacional de Sanidad Animal
Secretaría de Agricultura y Ganadería
Avda. Pte. Julio A. Roca 751 - P. 10
Buenos Aires, Argentina.

BARBADOS

Dr. Trevor H. King
Senior Veterinary Officer
Veterinary Services
Ministry of Agriculture
The Pine - Barbados.

BOLIVIA

Dr. Fernando Ruiz García
Jefe Nacional de Sanidad Animal
Ministerio de Asuntos Campesinos y Agropecuarios
La Paz - Bolivia.

CANADA

Dr. John McGowan
Assistant Deputy Minister Agriculture Canadá
Dirección: Sir John Carling BLOG
Otawa, Ontario, Canadá

Dr. H. Timothy Scott
Associate Director of Regulatory Programs
Animal Health División Agriculture Canadá
Sir William Logan Blog
Otawa, Ontario, Canadá

COSTA RICA

Dr. Manuel Guardia Tinoco
Director de Sanidad Animal
Ministerio de Agricultura y Ganadería
San José, Costa Rica.

CHILE

Dr. Jorge R. Benavides M.
Director División Protección Pecuaria
Servicio Agrícola Ganadero
Ministerio de Agricultura
Avda. Bulnes N°140 - 7° piso
Santiago, Chile.

ECUADOR

Franklin Alarcón Elizalde
Epidemiólogo. Programa de Sanidad Animal
Ministerio de Agricultura y Ganadería
Colón N° 624 - Casilla 512
Guayaquil - Ecuador

EL SALVADOR

Dr. Rolando Vargas
Jefe División de Sanidad Animal
Dirección General de Ganadería
Cantón El Matazano
Soyapango. El Salvador

ESTADOS UNIDOS

Dr. Pierre A. Chaloux
U.S. Dept. of Agricultural
Deputy Administrator, Veterinary Services
(Chief Animal Health)
Room 320 E. APHIS, VS
U.S.D.A., Washington, D.C. 20250

GRENADA

Dr. K.S. Manyam
Chief Veterinary Officer
Ministry of Agriculture
St. Georges, Grenada (W.I.)

GUATEMALA

Dr. Francisco Bobadilla
Director General de Servicios Pecuarios
Ministerio de Agricultura
Finca Nacional La Aurora
Zona 13, Guatemala

GUYANA

Dr. Patrick L. McKenzie
Principal Agricultural Officer
(Veterinary and Livestock Science)
P.O.Box 1001
Ministry of Agricultural
Georgetown. Guyana

HAITI

Dr. Fred Calixte
Directeur du Service de la Production Animale
Departement de Agriculture, des Resources Naturells et du
Developpment Rural
Damián. Port-au-Prince
Haití.

JAMAICA

Dr. Clifford L Grey
ACTG. Director Veterinary Services
Veterinary División.
Ministry of Agriculture
P.O. Box 309
Kingston, Jamaica.

MEXICO

Dr. Oscar Valdés Ornelas
Director General de Sanidad Animal
Secretaría de Agricultura y Recursos
Hidraúlicos
Dr. Mora N° 15
México 1, D.F.

NICARAGUA

Dr. Roberto Villavicencio
Jefe División Pecuaria
Ministerio de Desarrollo Agropecuario (MIDA)
Managua. Nicaragua

PANAMA

Dr. Arcadio Carrizo
Director Sanidad Animal
Ministerio de Desarrollo Agropecuario
Mida - Santiago - Veraguas
Panamá.

PARAGUAY

Dr. Raúl Prieto Busto
Ministerio de Agricultura y Ganadería
Director de Normas y Control Agropecuario y Forestal
Auto Pista 1761
Asunción, Paraguay.

REPUBLICA DOMINICANA

Dr. Reynaldo Peña de la Cruz
Director Departamento de Sanidad Animal
Dirección General de Ganadería
Secretaría de Estado de Agricultura
Feria Ganadera Nacional
Santo Domingo. República Dominicana

URUGUAY

Dr. Hugo Tórtora
Director de Sanidad Animal
Ministerio de Agricultura y Pesca
Colonia 892. Montevideo. Uruguay

VENEZUELA

Dr. Humberto Olmos
Director Sanidad Animal
Ministerio de Agricultura y Cría
Torre Norte. Piso 12
Caracas. Venezuela.

ORGANISMOS INTERNACIONALES

ORGANIZACION DE LAS NACIONES UNIDAS PARA LA ALIMENTACION Y LA AGRICULTURA FAO.

Dr. Frank J. Peritz
Oficial Regional de Producción y
Sanidad Animal
Of. Regional de FAO para América Latina
Casilla 10095. Santiago. Chile

OFICINA INTERNACIONAL DE EPIZOOTIAS. OIE

Dr. Louis Blajan
Director General
12 Rue de Prony - 75017
París. Francia

ORGANISMO INTERNACIONAL REGIONAL SANIDAD AGROPECUARIA. OIRSA

Dr. José Ferrer
Jefe Sanidad Animal
OIRSA
San Salvador. El Salvador

BANCO INTERAMERICANO DE DESARROLLO . BID

Dr. Parisio Pineda Ayala
Especialista en Sanidad Animal
Calle 4ta. Av. 3 y 5. Edif. Alfa. 5° piso.
San José. Costa Rica.

ORGANIZACION PANAMERICANA DE LA SALUD. OPS

Dr. Edilberto Antezana
Epidemiólogo
Organización Panamericana de la Salud -
OPS - OMS - Ministerio de Salud
San José. Costa Rica.

INSTITUTO INTERAMERICANO DE CIENCIAS AGRICOLAS. IICA

Dr. José Emilio G. Araujo
Director General

Ing. Manuel Rodríguez
Sub-Director General

Dr. Francis J. Mulhern
Director Salud Animal

Dr. Rubén Lombardo
Asesor Veterinario Area Sur
Brasilia. Brasil

Dr. Thomas Murnane
Asesor Veterinario Area Norte
México D.F., México

Dr. Franz Alexander
Asesor Veterinario Area de las Antillas
Georgetown, Guyana.

Dr. Germán Gomez Gutierrez
Asesor Veterinario Area Andina
Bogotá. Colombia

Dr. Pedro N. Acha
Asesor del Director General
Washington D.C.

OBSERVADOR INVITADO

Dr. Willem F.G.L. Droppers
Embajada Real de los Países Bajos
Agregado Agrícola para Asuntos Veterinarios
Maipú - 66
1084 - Buenos Aires - Argentina.

CONSULTORES IICA

Dr. Miguel Osorno
Coordinador del Area de Medicina
Instituto Nacional de Investigaciones
Pecuarias.
Corr. Mex. - Toluca Km. 15 1/2
México.

Dr. Nazario Pineda Vargas
Director Comisión México Americana para la
Erradicación del Gusano Barrenador
Leibnitz 20 - 12 piso. Col. Anzures
México, 5, D.F.

Dr. Carlos Arellano-Sota
Director General Instituto Nacional de
Investigaciones Pecuarias
Km. 15 1/2. México - Toluca
México 10, D.F.

Dr. Kenneth Kuttler
Laboratory Chief - Hemoparasitic Diseases
USDA - SEA - AR - BARL
Animal Parasitoloty Institute
Beltsville, Ud. 20705. USA

Dr. Ronald Smith
Associate Professor Vet. Pathobiology
College of Veterinary Medicine
University of Illinois
Urbana, Illinois 61801
U.S.A.

Dr. C. Andrew Carson
Professor and Chairman
Dept. of Veterinary Microbiology
University of Missouri
Columbia. Missouri.

Dr. Orlando Sánchez
Jefe Programa Erradicación Peste Porcina Africana
Secretaría de Estado de Agricultura
Santo Domingo. República Dominicana.

CONSULTORES IICA.

Dr. Norvan L. Meyer
Assistant Deputy Administrator
International Programs
USDA - APHIS - VS
12th. & Independence, Washington D.C. 20520

OBSERVADORES:

1.- Boris Szyfres
Consultor Temporero
Programa Nacional de Salud Animal, MAG/BID
Ricardo Gutiérrez 926, 1636 Olivos
Pcia. Buenos Aires
Argentina

2.- Dr. José L. Solano
Director Salud Animal Programa Nacional
Ministerio de Agricultura y Ganadería
San José, Costa Rica

3.- Sergio Andrade Berné
Asesor Dirección Programa Nacional Salud Animal
MAG/BID. Costa Rica
Aptos, Katita No. 2, Moravia
Los Colegios, Costa Rica

4.- Freddy Ramírez Brenes
Médico Veterinario
Proyecto Control Garrapata
MAG
Dirección: 29-50-80. Sanidad Animal

5.- Marlene Quesada
Médico Veterinario
MAG
Programa Nacional Salud Animal

6.- Johnny González Coto, M.V.Z.
Jefe Depto. Prev. Enfs. Exóticas
Contraparte Convenio Anti-Aftosa Bilateral USDA/MAG
MAG. Dirección de Sanidad Animal
Antiguo Colegio La Salle, Sabana, S.O.

7.- Dr. José Joaquín Oreamuno T.
Funcionario del Proyecto Estudio de Factibilidad para el
Control Garrapata.
Ministerio de Agricultura y Ganadería
Dirección de Sanidad Animal
Lab. El Alto, Cartago, Costa Rica

8.- Alfredo Marín Rojas
Coordinador Red - Laboratorio.
Ministerio de Agricultura y Ganadería
PRONASA - MAG/BID. 232721

9.- Dr. Celio Humberto Barreto
Médico Veterinario Asesor Adscrito a Costa Rica
OIRSA
Aptdo. 3628, San José, Costa Rica

10.- Sidney Brenes Martínez
Instructor en Zootecnia
Instituto Nacional de Aprendizaje (Depto. Zootecnia)
Alajuela, Barrio El Carmen
Calle 8, Avenida 10.

11.- Dr. Max Solano Pereira
Médico Veterinario
Programa Control de la Garrapata. MAG
Laboratorio Investigaciones Médico Veterinario
El Alto. MAG.

12.- Fernando Carvajal Salas
Ministerio de Agricultura y Ganadería
Jefe Sección Salud Porcina
Sanidad Animal. M.A.G.

13. Dr. Oscar Johanning Mora
Médico Veterinario - CAB
Ministerio de Agricultura y Ganadería
Aptdo. 1330 San José - MAG - San José, Costa Rica

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES – OAS
II INTER-AMERICAN MEETING OF DIRECTORS OF ANIMAL HEALTH

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EL PAPEL DE LA O.I.E. EN EL DESARROLLO DE LOS SISTEMAS INFORMATIVOS EN SALUD ANIMAL

Dr. Luois Blajan
Director General de la O.I.E.

EL PAPEL DE LA O.I.E. EN EL DESARROLLO DE LOS SISTEMAS INFORMATIVOS SALUD ANIMAL

Dr. Louis Blajan
Director General de la OIE.

En primer lugar, quisiera expresar mi agradecimiento más sincero al Dr. José Emilio G. Araujo, Director General del I.I.C.A. por invitarme a que participara como observador, a la Segunda Reunión de los Directores de Sanidad Animal de este hemisferio, y darme la posibilidad de conocer las acciones realizadas por la joven Dirección del Programa de Salud Animal. Felicito sinceramente a los Dres. Mulhern y Acha por los resultados que obtuvieron en tan poco tiempo.

No vacilé en aceptar la invitación de los responsables del I.I.C.A., e incluso lo hice con entusiasmo pues me propicia la oportunidad de dialogar con el grupo de los Países Americanos con la esperanza de que un mayor número de ellos se hagan miembros de la O.I.E.. Luego volveremos sobre este tema.

Me alegra también conocer a Costa Rica que ha de ser el primer país que se una a la O.I.E. desde que he empezado mi mandato el 30 de mayo pasado.

Quisiera pues aprovechar esta oportunidad para presentarles rápidamente a la O.I.E. y los ámbitos en los cuales, a mi juicio, se debería desarrollar una colaboración fructífera entre la O.I.E., los Directores de

Sanidad Animal y las otras organizaciones internacionales regionales, o subregionales que trabajan en el campo de la salud animal.

Acaso muchos de ustedes conozcan ya suficientemente a la O.I.E., con lo cual no evocaré sus antecedentes. Sólo recordaré que se trata de una organización ya venerable pues se creó en 1924 por un Convenio Internacional que firmaron en París unos 28 países, entre los cuales 5 países de América (Argentina, Brasil, Guatemala, México, Perú).

En su Artículo 4, los Estatutos Orgánicos anexos al Convenio Internacional de 1924, y que no han experimentado ninguna modificación hasta la actualidad, le confieren como metas básicas -hoy se diría: funciones de la O.I.E. de:

a) provocar y coordinar cuantas investigaciones o experiencias conciernan a la patología o la profilaxis de las enfermedades infecciosas del ganado, por las cuales cabe recurrir a la colaboración internacional;

b) recoger y dar a conocer a los gobiernos y sus servicios sanitarios los hechos y documentos de interés general relativos a la evolución de las enfermedades epizoóticas y a los medios utilizados para combatirlas.

c) estudiar los proyectos de acuerdos internacionales relativos a la policía sanitaria de los animales así como poner a la disposición de los gobiernos firmantes de los mismos los medios de controlar su ejecución.

Cabe reconocer que los autores del citado Convenio así habían expuesto con suma clarividencia los principios fundamentales de la estrategia

de la cooperación internacional en lo que a la lucha contra las enfermedades de los animales respecta.

No cabe duda de que, en 1980, tendríamos que redactar distintamente este texto para adecuarlo a las realidades de las administraciones veterinarias que, hace 50 años, no habían pasado de la fase embrionaria.

Pero la información en el párrafo antèrior de funciones, que acabo de leerles en relación con informática, es muy patente que nuestros predecesores se proponían, en forma muy concreta, subrayar que es la información, la que debe regir las actuaciones de la Oficina Internacional de Epizootias.

Y es indiscutible que el desarrollo de los intercambios informativos zoosanitarios ha sido siempre la meta prioritaria de la O.I.E.

Dichas informaciones proceden esencialmente del dispositivo de notificaciones e informaciones epizootiológicas correspondiente a lo dispuesto en el título 1.2 del Código Zoosanitario Internacional de la O.I.E.; estas notificaciones abarcan unas treinta enfermedades clasificadas en varias listas en función de su contagiosidad y de su importancia en relación con la economía y la sanidad humana.

Asimismo, las Ponencias sometidas todos los años en la Sesión General Ordinaria y en las Conferencias Regionales de la O.I.E. por los Delegados Miembros constituyen un complemento informativo valorable.

Aunque existen los elementos y las bases para un sistema más completo, el dispositivo actual está fundamentalmente concebido para dar la voz de alerta y de emergencia en cuanto a las enfermedades que tienen un gran poder de difusión y una suma gravedad económica.

Ha llegado el momento de elaborar un auténtico sistema informativo, capaz de prestar a los Directores de los Organismos de Salud Animal de todos los países, los servicios que ellos precisan, aunque todos no pudieran aún utilizar al máximo este esfuerzo que está programando la O.I.E.

Pero, antes de proseguir, creo que es conveniente expresar brevemente lo que es el concepto moderno de un Sistema Informativo en Salud Animal, y ante todo, recordar lo que se entiende por sistema.

El caso es que este vocablo de "sistema" conlleva dos nociones complementarias:

- una noción de relaciones entabladas claramente entre una serie de elementos,
- una noción de finalidad, en función de la cual se efectúa la combinación de esta serie de elementos.

El Sistema Informativo en Salud Animal -digamos, para conformarnos con la moda de las siglas, el S.I.S.A.- consta pues de un conjunto coordinado de operaciones cuya función está adecuada a la planificación, ejecución y evaluación de los programas de Salud Animal.

Dicho sistema tiene por objeto proporcionar la información conveniente y procedente con vistas a la toma de dicisiones que se imponen en el momento de la elaboración y de la aplicación de los programas de Salud Animal.

Aunque parezcan a primera vista divergentes, las estadísticas, la documentación técnica y el conocimiento de las opiniones y tendencias de los ganaderos, así como del público de modo general, llegan a formar conjuntamente el S.I.S.A., porque todos estos distintos elementos informativos concurren a la toma de dicisiones.

Cabe decir que la noción de S.I.S.A. es una noción relativamente reciente. Vienen sustituyendo poco a poco la del "buen sentido común", en el cual se fundamentan todavía muchos directores de servicios veterinarios.

El gran filósofo francés, Descartes, dijo que: "El buen sentido es lo que mejor repartido está por el mundo". Pero cabe admitir que, o bien haya cambiado el significado del "buen sentido" desde el Siglo XVII, o bien sean distintos nuestros contemporáneos del Siglo XX a los de Descartes.

De todos modos, es cierto que quienes toman las decisiones hoy en día, ya no se conforman con apreciaciones de buen sentido. Se precisan hechos y cifras para convencerlos.

La crisis económica que viene afectando a todos los países de la que todos tenemos conciencia, hace todavía más apremiante la necesidad de la planificación, si es que, por otra parte, la dificulta también.

Por vía de consecuencia, se hace cada vez mayor la necesidad de información, y aquellos que no tienen información se ven condenados, si no a desaparecer, por lo menos a "ir tirando", quizás si esta palabra "información" no constituye la separación entre el desarrollo y el sub-desarrollo.

Por lo tanto, mi convencimiento es que hay que hacer hincapié en que los servicios de salud animal deben tender con prioridad al desarrollo, formando el S.I.S.A. como parte integrante y básica de sus programas.

El objetivo es evidente para los servicios veterinarios nacionales; también lo es para la O.I.E. y con eso, volvemos a lo de la cooperación internacional que es la meta esencial de la O.I.E., como del I.I.C.A.

La cooperación internacional es, en su esencia, el medio que permite beneficiarse de la experiencia y de los conocimientos de unos países a otros.

Tal vez sea más fácil iniciar acciones a nivel regional y, a este respecto, lo que viene realizándose en las Américas en cuanto a Salud Animal constituye un modelo.

Pero cada región es solidaria de las demás partes del mundo y puede sacar beneficios de su experiencia como puede, a su vez, comunicarles el fruto de sus conocimientos.

En eso, le corresponde a la O.I.E. desempeñar, en nuestro ámbito, un papel más importante de lo que solía desempeñar hasta la actualidad. La O.I.E. debe establecer a nivel mundial un sistema moderno de información sobre la Salud Animal que permita a los países:

- preparar la metodología y documentación imprescindible para el desarrollo y el mantenimiento de un S.I.S.A. adaptado a las necesidades de cada nación;

- desarrollar un S.N.I.S.A. (Servicio Nacional) en los Países-Miembros que lo deseen y promover su utilización como instrumento con vistas a la planificación, la ejecución y la evaluación de los programas de Salud Animal,

- utilizar los elementos de apoyo técnico y otros, disponibles en algunos países a nivel internacional.

Pero, podrá lograr este fin en forma más rápida la O.I.E. si un mayor número de países no se incorpora al Organismo y le aporta su dinamismo específico?

Les decía al principio que el Convenio Internacional de 1924 había sido firmado por 5 países de América de los 28 firmantes.

Actualmente, de unos cien países miembros de la O.I.E., 15 son de las Américas. Para que siguieran iguales los porcentajes de 1924, deberíamos tener 18. Espero que alcancemos muy rápidamente esta cifra e incluso que la superemos, incorporando los 32 países de este hemisferio.

Es otro deseo de la O.I.E. reforzar los lazos de colaboración con las Organizaciones Regionales tales como el I.I.C.A., cuyo programa de Salud Animal incluye una parte importante dedicada al desarrollo de un Servicio de Información en Salud Animal.

Las buenas relaciones que ya existen entre nuestras Organizaciones respectivas nos permitirán, de ello estoy seguro, evitar la trampa de las duplicaciones y alcanzar la máxima eficacia, tomando en cuenta la complementaridad existente entre el I.I.C.A. y la O.I.E.

Siempre al finalizar una exposición de esta naturaleza se precisa una conclusión. Acaso piensen algunos de ustedes al oirme, que la O.I.E. tiene poco que ofrecer en el campo de información.

Les responderé que la O.I.E. no sólo está dispuesta a ofrecer información, sino que también será capaz de dar su colaboración a los países y demás Organizaciones Internacionales, especialmente en lo que se refiere a la coordinación y la ejecución de los programas en el campo de la Salud Animal.

Sin embargo, fue intencional de mi parte el limitar esta presentación al tema de información, pues es una actividad que me parece prioritaria y fundamental; y uno de los primeros dichos que yo aprendí en clase de español fue: "Quien mucho abarca, poco aprieta".

INSTITUTO INTERAMERICANO DE CIENCIAS AGRICOLAS – OEA

II REUNION INTERAMERICANA DE DIRECTORES DE SALUD ANIMAL

San José, Costa Rica, 8-12 Setiembre, 1980

REDISA2/20 (Ingl)
September 11, 1980
Original: English

FINAL REPORT

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The Second Inter-American Meeting of Directors of Animal Health (REDISA II) was held at the Inter-American Institute for Agricultural Sciences (IICA), in San José, Costa Rica on the 8th to 12th of September 1980, according to the declaration made by the Director General of the Inter-American Institute for Agricultural Sciences, following the Resolution IICA/RAJD/Res. 94, approved by the Board of Directors in their XVIII Meeting.

ELECTION OF OFFICERS

On 8th of September the Chief of Delegations of the participating countries met at a preliminary Session to elect the officers for the meeting. The following were proposed and unanimously elected.

President - Dr. Oscar Valdés Ornelas
Director General of Animal Health
Secretaría de Agricultura y
Recursos Hidráulicos of
México.

Vice President - Dr. Humberto Olmos
Director Animal Health
Ministry of Agriculture of
Venezuela

Rapporteur - Dr. Patrick McKenzie
Principal Agricultural Officer
(Veterinary Livestock Science)
Ministry of Agriculture
Georgetown, Guyana.

Dres. Francis Mulhern and Pedro N. Acha acted as Secretary ex-officio.

PARTICIPANTS

The following Governments were represented at the meeting: Argentina, Barbados, Bolivia, Canada, Costa Rica, Chile, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Jamaica, Mexico, Nicaragua, Panama, Paraguay, United States of America, Uruguay and Venezuela.

The following International Organizations were also represented: Agency for International Development of the United States (AID/ROCAP), Pan American Health Organization (PAHO), Food and Agricultural Organization (FAO), Inter-American Development Bank (IDB), International Office for Epizootics (OIE), International Régional Organization for Animal and Plant Health (OIRSA) and observer of the Netherlands was also present.

The complete list of participants is provided as document REDISA 2/18.

PLENARY SESSIONS:

The inaugural session took place on 8th September and following his introduction, Dr. José Emilio G. Araujo, Director General of IICA extended a welcome to all the participants at the Second Meeting.

Dr. Araujo expressed his pleasure at the effective development of the Animal Health Programme for IICA in fulfilment of the recommendations of the respective Member Governments of the Inter-American Institute of Agricultural Sciences.

Based on the recommendations of the First Meeting of the Directors of Animal Health, IICA had put into place the minimum structure required for the program. He told the meeting that during the last few weeks, the staffing of professional Veterinarians considered in the budget for the year 1980 had been completed.

The Animal Health Program of IICA has been incorporated as an integral part of the priority line of the Institute of production and productivity. We consider, he said, animal health as an essential component of animal production.

Dr. Araujo emphasized that the total regular budget increase for the year 1981 for IICA, had been placed in support of the Animal Health

Program which would therefore become in the future one of their major activities.

He expressed his commitment to give every possible support to the new program. There were tremendous tasks to be accomplished and so little time for them. He reiterated the need for a more active coordination among International Organizations to increase the support for Animal Health Programs in the Americas.

The representantive of the Minister of Agriculture and Livestock of Costa Rica Enge. Oscar Echandi Murillo, on behalf of his Government extended a warm welcome to the meeting. He expressed his hope for an effective success to the conclusions from the deliberations of this very important meeting. He gave full support to the concept of animal health and production, considering the great importance health had to production. He requested the meeting to consider programs to increase fertility of livestock by controlling disease, in order to provide a most efficient stimulus to the Animal Industry and to the production of food.

At the commencement of the working sessions the participants were requested to ratify the proposed Agenda as outlined. There were no dissensions.

Dr. Francis Mulhern, Director of Animal Health IICA, reported on the development of the Program according to the recommendations from the first meeting. Already he had visited several countries where he had

been encouraged by the full support he had received. Several projects would be developed in various countries especially in Tick Control, screw-worm, Hog Cholera and African Swine Fever. Projects were also being prepared for development of diagnostic laboratories and even at this present time in IICA, assistance was being provided to initiate a data bank on Animal Health utilizing computer services. He made special mention of the need to establish an Animal Disease and pest emergency fund. He outlined the principal aspects of the activities of the program for 1981, 1982 depending on the approval of the participants of the meeting.

Dr. Pedro N. Acha, Advisor to the Director General of IICA gave a report on the evaluation following the recommendations based on the First meeting (REDISA 1). This evaluation showed that much had taken place in a very short time with very few resources. One of the projects that had been recommended was in the field of human resources. He announced the promotion in Argentina of the Post Graduate School for Animal Health at the University level where philosophy as well as veterinary medicine and technology would be emphasized.

Both presentations received the acclaim and support of the meeting. OIRSA offered full collaboration of their data bank and similarly other international organizations and countries offered their help to IICA in support of the new program. Equally certain countries requested help from IICA to solve certain problems in Animal Health.

The representative from Argentina was afforded the opportunity to read a letter from the Director General of Animal Health expressing best wishes for the success of the meeting and offering his country on behalf of the Minister of Agriculture as the site for the 3rd REDISA Meeting.

At the Second Plenary Session Agenda Item 2, the Panel Discussion on Babesiosis and Anaplasmosis of Cattle was held. Presentations were given on Epidemiology by Dr. Ronald Smith; Progress in Immunization by Dr. Kenneth Kuttler; Immune Responses to Babesia Bovis by Dr. Miguel Osorno this was followed by outlook and future needs for research by Dr. Andrew Carson; and Epidemiological and Feasibility Studies in Costa Rica by Dr. Manuel Guardia.

The Panel presentations were followed by an active discussion and interventions by several participants.

The Third Plenary Session took place on the morning of September 9; Agenda Item 3, was presented by Dr. Norvan Meyer, who introduced the subject of "Programs for Screwworm Eradication", describing the experiences of the succesful program in the United States of America.

The experiences of the equally successful program in Mexico was presented by Dr. Nazario Pineda. Following these presentations, Dr. Francis Mulhern made a brief summary of the REDISA 2/11 Document "The Feasibility of Eradicating Screwworm from Central America and Panama", that had been prepared by a group of Consultants hired by IICA for this purpose. The

subject of screwworm eradication provoked a very active discussion on the part of the Representantives and observers. The speakers were requested to enlarge their presentations with more detailed information concerning eradication procedures, equipment, pesticides and administrative problems.

At the forth plenary session Dr. Orlando Sânchez presented "The Program for Eradicating African Swine Fever (ASF) from the Dominican Republic", he described in detail the methodology and procedures utilized in the eradication process, indicating that the swine depopulation will be completed in a few weeks. Following this presentation Dr. Francis Mulhern, described the plans that are being prepared jointly by the Government of Haiti and IICA for the eradication of African Swine Fever in that country. Both presentations raised questions and comments from the participants. Special recognition was extended to the animal health authorities of Dominican Republic for their excellent performance in the eradication of this disease. The FAO Representantive, at the request of the plenary made a report of the information that has been made available to his Organization regarding the present situation of ASF in the countries of the Americas. This information will appear in the ASF News Letter that is being published by FAO.

Also, a document entitled "FAO's Programme of Technical Collaboration to Prevent the Spread and Introduction of African Swine Fever (ASF) in Latin America". LARC/80/INF/5, July 1, 1980, was distributed. The session continued with the presentation of Dr. Jorge Benavides of "The Program for Eradicating Hog Cholera from Chile". The speaker described an

indepth planning process that has been utilized for the implementation of this program in 1981.

The Representative of Paraguay indicated that his country is giving high priority to the control of Hog Cholera and that a proposal for technical cooperation of IICA, in this respect, has been submitted to the Director General.

The fifth plenary session took place Wednesday 10 in the morning under the chairmanship of Dr. Humberto Olmos. The Agenda Item 6, "The Need and Potential for Coordinating Veterinary Institutes and Laboratories for Diagnosis and Research in the Hemisphere", was presented by Dr. Carlos Arellano who described the needs for diagnostic capacity in the programs of animal health in the Region and the importance to establish reference laboratories using the excellent facilities that existed in some countries of the Americas. A status report on laboratories was introduced by Dr. Pedro N. Acha in which the distribution of trained human resources was outlined as well as available laboratory facilities. The observer from OIRSA reported that a feasibility study for the creation of a Regional Laboratory in Guatemala had been conducted. A suggestion was made for IICA to promote the establishment of such a laboratory as well, as to improve existing national laboratories.

The problems associated with laboratory facilities were discussed by several Representatives. Emphasis was placed on the need for support by the livestock industry, continued research and struggle for resourses. The

Representative of the United States of America called for the establishment of an expert commission to study the problems, needs, and capabilities of the veterinary laboratories in the Americas and report back to the meeting at REDISA 3. The observers from IDB noted that with the financial assistance of the Bank several countries of the Region have increased their number of animal health laboratories in the last 10 years. He emphasized the need for technical expertise in support as well as projects to utilize these laboratories.

The session continued with a special presentation of Dr. Louis Blajan, Director General of OIE, who reviewed the history and strategy of the development of the International Office of Epizootics. He promoted the new strategy of the Office to improve the information services of the Animal Health Programs in the world and requested the support of the American Region.

A special session requested by the Director General of OIE took place at 12:30 p.m. on Wednesday September 10, under the chairmanship of Dr. Pierre Chaloux and with the participation of the Representatives of the member Governments of OIE and other Representatives attending REDISA 2.

The group reviewed the preparations for the meeting of the American Commission of the OIE that will be held next year at Canada around the same dates of the RIMSA meeting in Washington D.C. Dr. Blajan made a plea to those countries of the Region that have not yet joined OIE to do so in the near future and recommended the maximum attendance at the meeting in Canada.

The meetings for Planning and Coordination in these countries were held in the afternoon of Wednesday September 10, 1980. Those groups were constituted:

- Northern and Central American Region, composed of: Canada, Costa Rica, El Salvador, Guatemala, Mexico, Nicaragua, Panama, and United States of America.

- Caribbean Region, composed of: Barbados, Dominican Republic, Grenada, Guyana, Haiti, Jamaica.

- South American Region, composed of: Argentina, Bolivia, Chile, Ecuador, Paraguay, Uruguay and Venezuela.

The sixth plenary session commenced with Dr. Pedro N. Acha discussing "Animal Health Training Program". He noted that in the short time IICA had conducted an in-country Seminar in Guyana for the Veterinarians in the Caribbean and that a project was being designed for animal health training at the University of La Plata, Argentina.

He emphasized IICA's high priority on training for the successful implementation and completion of Animal Health Programs of the Americas.

He made special reference to the need for the training of laboratory personnel.

Delegates and observers pointed to the need for training to be up-graded in quarantine and epidemiology. It was also noted that emphasis should be placed on trained persons being placed in the areas in which they were trained.

The observer of IDB stressed that the bank was willing to increase its contributions to adequately documented and justifiable requests for training.

The delegates then assembled according to regions to continue the meetings for planning and coordination in the countries.

There was a concensus of the delegates that Directors of Animal Health should plan for the training and development of their human resources and particularly as they relate to the programmes and projects in Animal Health and that further they should ensure the cooperation of their respective governments and funding agencies.

The seventh plenary session met Thursday 11, after the deliberations and discussions of Item 8 of the Agenda "Meetings for Planning and Coordination in the Countries". The following groups presented their comments and recommendations: 1) Northern and Central American Region; 2) South American Region; and 3) Caribbean Region. Each region, reported its recommendations to the plenary. These were discussed and are included as Document REDISA2/17.

The chairman open the discussion of Agenda Item 10, the offering of the Ministry of Agriculture of Argentina to host the 3rd. Inter-American Meeting

of Directors of Animal Health, was unanimously approved by the plenary who recommended to the Director General of IICA to organize REDISA 3 in Buenos Aires, Argentina around September of 1981.

The Representative of Ecuador presented to the chairman an official letter of his government offering the city of Quito, Ecuador as the place for the meeting of the Subregional Animal Health Committee Meeting of the Andean region.

The 8th Plenary Session took place on September 12, in order to continue the discussion of Agenda Item 10. The Representatives suggested different subjects for the program of REDISA 3. Document REDISA2/17 "Recommendations of the Meetings for Planning and Coordination in the Countries" was distributed.

The closing session was held immediately with the following program: reading and approval of the final report; message from the IICA Representative; message of the chairman of REDISA 2, Dr. Oscar Valdés Ornelas.

COMMENTS AND RECOMMENDATIONS

SCREWWORM ERADICATION

The successful progress of the programs to eradicate screwworm (*Cochliomya hominivorax*) in the United States of America and in Mexico has given rise to the potential of successfully eradicating screwworm from all of the countries of Central America, Panama and some Caribbean countries such as Jamaica, where the infection has become established.

An expert group of consultants united by IICA, knowledgeable in the eradication of screwworm, carefully reviewed the situation in each of the Central American countries and Panama as to the technical feasibility of eradicating screwworm from this area employing techniques and methods which have been so successful in progressively eradicating the disease in the United States of America and Mexico. It is concensus of the expert group that screwworm eradication is technically feasible in the region. Although the group did not specifically review the situation in the Caribbean, there is reason to believe that comparable techniques and methods could be successfully applied to the infected islands of the Caribbean, as was done in Curaçao, Puerto Rico and the Virgin Islands.

With the successful progress of screwworm eradication in Mexico, officials estimate that the goal of the joint Mexico-American Screwworm Eradication Commission to eradicate screwworm in Mexico north and west of the Isthmus of Tehuantepec will be achieved by 1982.

Given this estimate for the successful completion of the joint program in Mexico, the countries of Central America and Panama should begin now

to plan and prepare for the extension of the screwworm eradication program into their countries. To this end it is recommended that:

1. At least one veterinarian and entomologist from each country of Central America and Panama and interested countries in the Caribbean receive comprehensive training at the screwworm laboratories in Mexico or the United States of America to assist in future field and laboratory studies to be conducted in collaboration with experienced screwworm officials, scientists and technicians assigned to work in the region.

2. An Inter-American Commission for eradication of screwworm, comprised of representatives from Panama, the Central American nations, Mexico and the United States of America be established to coordinate the interests and future efforts of this multinational region in their common pursuit of eradication of screwworm.

The positive attitude of each of the countries contacted by the expert group was reinforced by supportive commitments from the representatives of Guatemala, Panama and the Minister of Agriculture of Costa Rica, whose message to the Inter-American Meeting of Directors of Animal Health reiterated that nation's endorsement of an extension of the screwworm eradication program into Central America and Panama.

The progress and success realized in the screwworm programs in the United States of America and Mexico, clearly demonstrate that countries

acting in close collaboration and with the support of their livestock industries can accomplish animal disease eradication.

ANAPLASMOSIS AND BABESIOSIS

There is a critical need for the implementation of safe effective immunizing agents and control systems for the prevention of livestock losses due to anaplasmosis and babesiosis.

Presentations and discussions centered on vaccination concepts, procedures for production of vaccines and associated tests for efficacy and safety. Research has provided the basic information and techniques, which when properly utilized can reduce and in some instances eliminate losses due to these diseases. Even so, there are not yet available perfect immuzing agents or control procedures which will work under all circunstances. The need for comprehensive, reliable epizootiologic data was emphasized.

Whole blood vaccines are good in theory but should be employed with great caution. Though live immunogens are present giving protection for years the biological material may not have been produced in the same area and there are risks of introducing other diseases. The attenuated _A. marginale_, _A. centrale_ or dilute stabilates should safely fill the need for premunizing agents when properly used. Improved adjuvants and better antigens should lead to more effective non-viable _A. marginale_ vaccines. The techniques to attenuate the babesias are well known and these

agents can be used where premunition is indicated. Evidence is rapidly accumulating to suggest that non-viable adjuvant vaccines against B. bovis and B. bigemina are possible. Some therapeutic agents (Imiducarb) have been found to have a sterilizing effect and prophylactic activity for extended periods of time.

As future field studies confirm the present favorable evidence of efficacy and safety, vaccines will become more readily available to prevent livestock losses due to Anaplasma and Babesia.

Prior to the initiation of an anaplasmosis or babesiosis control program, it is recommended that:

1.- Government authorities obtain the technical assistance for the establishment or development of laboratory competence to conduct epizootiologic studies of anaplasmosis and babesiosis. These studies should determine the incidence and regional prevalence of these diseases and, as well, the socio-economic impact of these conditions on national and livestock interests.

2.- Based on the need and country competence technical assistance should be employed for the development of safe and effective control programs for tick and tick-borne diseases utilizing apropiate vaccines, chemotherapeutic agents and tick control techniques.

3.- The disease control program must be based on a comprehensive plan

incorporating the epizootiologic and economic data. Measures for prevention, control and treatment based on current safe and effective scientific experience and recommendations, should be clearly defined. Legislation, as necessary, to enforce the application of control measures should be enacted. Adequate funding to fully sustain the projected program must be secured.

Recognizing that present techniques available for the control of these diseases have yet some deficiencies futher investigations and research should be encouraged for the development of more effective methods for prevention and control of these diseases.

AFRICAN SWINE FEVER

A lengthy comprehensive discussion took place regarding the problem of African Swine Fever in the Dominican Republic and Haiti. The delegates unanimously expressed a decision to commend the Dominican Republic and Cuba for the positive action taken by them to eradicate the disease and thereby protect all the other countries.

A unanimous conclusion reached was that their success was due to the unqualified support by the President and all branches of their Government to accomplish the objective.

At the same time great concern was expressed about the existance of the disease in Haiti and its threat to the other nations, especially

the Dominican Republic. The disease could spread to and from Haiti and negate the effective action that has been taken by them to date.

IICA discussed a proposed plan for eradication of African Swine Fever in Haiti. The delegates expressed their support for a program provided it has the approval of Haiti as being feasible to reach the ultimate objective of eradication.

Indemnization to the owners of the swine in Haiti who voluntarily sacrified their hogs in the border are near the Dominican Republic frontier was considered essential before any national eradication program could be supported by any other country. The delegates felt that Haiti should proposed an evaluation program and identify their level of support before they would commit their resources to such a program.

IICA and FAO agreed to work with the Haitian Government to develop a program that would have the best chance for success. Delegate urged that such a program be initiated as soon as possible in order to eradicate the disease in Haiti and thus eliminate the threat of the disease spreading to other countries.

Despite the initial hardships that would be encountered by the swine owners in Haití the Government should recognize the opportunity of improving the genetic and health status of the national swine herd. The experience to date in the Dominican Republic has shown that the swine imported for testing premises have acclimated very well. Therefore, through

the process of eliminating the disease they feel that have made a substantial step forward in developing a more reliable swine industry that will provide not only pork for their people but one of much higher quality.

Representatives of IICA and FAO agreed to meet with the Government officials in early October to determine what type of a program would be proposed by them and the degree of participation that could be expected. Following such a meeting and provided there is an agreement on the program, contacts would be made with donor countries and organizations to seek their support by IICA and FAO.

It is hoped that such a program would begin no later than January 1, 1981.

HOG CHOLERA

Because of the improved vaccines for hog cholera prevention and the possibility that the disease could mask the introduction of a disease like African Swine Fever and the animal losses caused by hog cholera, several countries expressed interest in an eradication program. Canada and the United States are free of the disease and Mexico has an active program under way.

Chile presented a comprehensive report indicating the need to acquire extensive data in order to develope a project that will be acceptable to donor organizations. Since it appears that Chile has

eradicated foot-and-mouth disease they are confident that they will accomplish the same result with hog cholera.

The disease was eradicated from the United States in 1978 though it had been in that country since the 1830's and was considered the most serious disease of swine in that country before it was eliminated. Before the program began, all types of potential reservoirs that would prevent eradication was cited. However, none of them had any major adverse effect in the eradicating the disease in those countries that have eliminated the disease.

At this time when more consideration is being given to the needs of the small farmer, swine are recognized as one of his major possessions providing money in time of need or animal protein. Losses to him from hog cholera can often be a tragedy. Larger owner tend to vaccinate their hogs against the disease but often the smaller farmer does not have the funds to do it or recognize the need.

Therefore eradication of the disease would be of great importance to the small farmer as well as the substantial economic benefits to the large producer. Based on the comments of the delegates, several countries will undoubtedly submit requests for assistance to control and eradicate the disease within their nations.

TRAINING IN ANIMAL HEALTH

Training was a topic of major importance to the delegates. It was established that this is a major deficiency in animal health programs of many countries.

The representative of IDB stressed the importance of overall training of veterinarians with special emphasis on epidemiology. It was suggested that this training be expanded to also include program administration and management.

The IICA Veterinary representatives within each zone will contact each director of animal health in their countries assigned, in an effort to develop overall training needs.

Epidemiological training should vary in length depending on the countries needs and the individuals involved. It was urged that IICA develops a proposed plan for training for veterinarians engaged in Animal health programs.

The planning for the training and development of human resources through the cooperative of the respective Governments and funding agencies was stressed.

DIAGNOSTIC LABORATORIES

It was recommended that IICA select a Commission of diagnostic laboratory experts, the terms of reference of which will include, an evaluation of the competency of all the laboratories of the Hemisphere. In doing so, it should identify the laboratories that can and will serve as reference laboratories to other countries.

This Commission should present its report and recommendations at IICA's next annual meeting of the Directors of Animal Health of the Hemisphere on 1981.

EXPERT COMMITTEES

It was recommended that IICA establish committees made up of experts on certain diseases of major importance to all of the countries. This would provide directors of animal health with an opportunity to hear evaluation by the experts as to the latest most important information available in relation to these diseases at the time of each annual meeting.

GENERAL RECOMMENDATIONS

To thank the Government of Argentina for the generous offer to host the Third Inter-American Meeting of Directors of Animal Health, and to recommend to the Director General of IICA to organize REDISA 3 in Buenos Aires, Argentina in 1981.

To express appreciation to the speakers for the excellent papers presented that have gave great scientific relevance to REDISA 2.

To express appreciation to the Government of Costa Rica for its cooperation in the organization of REDISA 2.

To express recognition to the Director General of IICA and his staff for their cooperation and collaboration in the organization and conduction of REDISA 2.