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OUTLOOK FOR THE ELIMINATION OF HYDATIDOSIS IN THE SOUTHERN CONE

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1. Introduction

Hydatidosis is one of the eradicable zoonoses. It has been eradicated in island nations and territories, such as Iceland, New Zealand, and Tasmania. Its incidence has been reduced in Uruguay and Spain, both of which are continental countries, and in the province of Tierra del Fuego, in Argentina.

Control programs are underway in China, in the Río Negro and Chubut Provinces in Argentina, and in Regions XI and XII in Chile.

Echinococcosis (hydatidosis) has been the cause of considerable economic loss and damage to basic human health. It can be said with certainty that a control program in which pertinent agencies, such as health, agriculture, and education, participate directly by providing appropriate administrative, legal, technical, and economic support, will surely be a successful program.

The transmission of this disease is greatly influenced by how livestock and pets are managed. The custom, basically in rural areas, of slaughtering livestock in the facility in which they are raised and then feeding dogs contaminated viscera, a harmful practice, greatly facilitates infestation of the animals and the fields.

Hydatidosis was widespread throughout Uruguay, not only in the countryside, but in urban and periurban areas as well, a consequence of rural migration, the clandestine slaughtering of livestock, and the large number of dogs. This situation was aggravated by the fact that Uruguay is a continental country with all the accompanying geographical, demographic, and agricultural characteristics that maintain the latency of the disease.

In 1965 an organization that was to be responsible for controlling hydatidosis was created under the Ministry of Public Health. After years of changes, including political changes, and the development of local or departmental programs, the effort to control the disease was considered unsuccessful.

This led to the creation by law in 1990 of the Honorary National Commission for the Campaign against Hydatidosis, an organization that would be responsible for the sanitary program. The law creating this commission endowed it with a high degree of technical, economic, financial, and administrative autonomy and the possibility of creating its own budgets.

Basically, the Commission is comprised of the Ministry of Public Health, which presides over it, the Ministry of Livestock, Agriculture, and Fisheries, the Ministry of Education and Culture, the Ministry of the Interior, representatives of the private livestock sector, the Congress of Mayors, and the Schools of Medicine and Veterinary Medicine.

The goal of the National Commission is to reduce the risk of hydatidosis in the human population, and as a primary objective, to control the endemicity of the disease in Uruguay.

In that same year, the National Commission presented its Program of Activities, to be carried out in five phases over a 15-year period, continuing with indefinite epidemiological surveillance, given the geopolitical characteristics of the country. This program is unique in the world, since it has been created at the national level and has become effective at the rural, urban, and periurban levels, while in other countries with this problem, programs have only been proposed and carried out at the regional, provincial, zonal, rural, or urban and periurban levels.

The five phases of the Program of Activities	Year
1. Preparation and organization	1990
2. Diagnosis	1991
3. Attack	1992 to 1996
4. Consolidation	1997 to 2004
5. Epidemiological surveillance	2004 to ...

2. Preparation and Planning (1990)

The country was divided into five regions—specifically, three to the south of Río Negro and two to the north, each with three or four departments. This division was based on geoproductive characteristics and channels of communication (Annex, Map 1).

In this phase, the available resources to begin the work were ascertained, along with the minimum needed for carrying out a program at the national level.

3. Situation Analysis (1991)

In this phase the entire canine population in 2,615 rural facilities, which form a representative statistical sample, was tested, or 6,474 dogs in all. These tests were conducted in the 18 departments in the interior of the country, as well as in all the police precincts in each.

These studies showed that nationally, 10.7% of rural dogs were parasitized by *Echinococcus granulosus*, indicating that the system used to date—that is, distributing the parasiticide praziquantel to dog owners using a horizontal approach, had not been effective. In addition to this 10.7% prevalence of parasitized dogs, in previous inspection visits conducted in the country it had been found that the administrative offices of livestock facilities, there was a huge number of praziquantel tables. Thus, the dog owners complied with the requirement of purchasing the praziquantel in the commissaries, but they did not administer it. This led to implementation of what was called supervised canine dosage.

4. Attack (1992–1996)

Supervised canine dosage was carried out by program personnel (dose administrators) who disparasitized the dogs by administering praziquantel directly to the animals, covering the whole the country, facility by facility, and door-to-door every 30 days. This schedule ensured that the canine population in question received the proper dosage at the proper time.

This system of supervised canine dosage began to function and, thanks to the departmental data obtained, an "epidemiological map" of the country was drawn. It indicated the guidelines to be followed, the most basic of which was first of all, to begin treating dogs in the most contaminated areas of each and every department and then to extend the program to other areas.

To date, 260 population centers and five departmental capitals with a population of approximately 22,700 dogs have been covered, as have 39,500 rural facilities with a canine population of 90,783. This makes a total of 113,483 dogs treated with this dosage regimen, representing more than 90% coverage of the canine population involved (Annex, Map 2).

Work in this phase includes increasing registration of the dog population, which has led to the stabilization of the number of registered dogs, now approximately 315,000 at the national level.

Since the beginning of this phase, there has been control of home slaughter, now effective in almost all rural facilities in the country. The principal activity is the control of slaughter sites and disposal of offal. The use of pigs, kept in adequate pens that keep dogs out, as biological digesters is advocated. The other option is a septic tank, constructed for the deposit of viscera or offal, whose dimensions are adequate for the amount of slaughtering done at the facilities involved.

The implementation of this system is slow, since the veterinarian in charge, along with the future dose administrator, must prepare and organize routing slips, which will be the next dosage lines. To this end they must go from facility to facility, checking the installations required by the program and filling out cards for all the dogs listed on them, recording the basic data, including weight and identification.

These dosage lines are evaluated by diagnostic statistical monitoring of the dogs in the areas under dosage using the arecoline method and coverage analysis to determine whether that dosage line is functioning properly or not.

We have verified that more than 80% of the above-mentioned statistical monitoring shows no canine parasitic disease, with the deficiencies always linked to human performance. These results demonstrate the success of this change in the canine dosage regimen.

The activities are carried out at three levels: rural, urban, and periurban:

1. Human epidemiological situation at the national level:

   - Registry of surgical cases at the national level
   - Diagnostic study of the prevalence of hydatid cyst in preschool and school children

2. Registration of existing dogs to keep them under the program

3. Adjustment of the number of dogs

4. Prevalence studies in definitive and intermediate hosts

5. Promotion of education in curricular and extracurricular activities at all levels

6. Operation of centers for research on echinococcosis

7. Operation of a parasitological reference center

8. Operations of a mobile diagnostic team

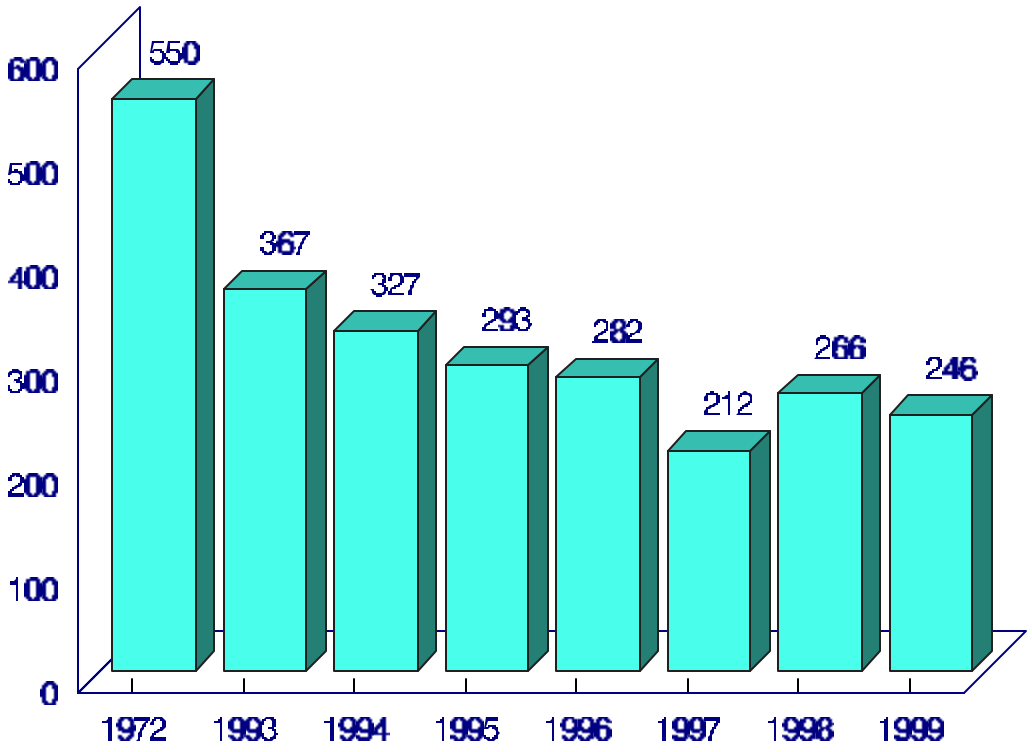
4.1 *Human Epidemiological Situation at the National Level*

Registration of surgical cases at the country level

The National Commission conducted a retrospective descriptive study to determine the surgical cases of hydatidosis that occurred in 1993. Since that year, its personnel have been compiling registries of surgical interventions in humans, year by year, in all the surgical centers of the country, either private or state.

The available historical data indicated that 550 persons were operated on per year. It was determined that in 1993, 367 people had surgery; the number of such cases has declined every year, reaching 246 in 1999.

Figure 1: Hydatidosis in Humans. Reduction in Surgical Cases, 1972–1999



Diagnostic study of the prevalence of hydatid cyst in preschool and school children (ELISA Project)

This is a serological diagnostic project to determine whether the tested individual suffers from hydatid cyst. It is conducted on the entire population of preschool and school-age children in rural centers with fewer than 1,000 inhabitants. The study tests blood utilizing the ELISA method , and the results are confirmed in serum using DD5. The children that test positive in the second instance are referred to treatment centers and then receive post-operative immunological monitoring.

This will permit:

- Early diagnosis of the disease
- Epidemiological analysis
- Detection of high-risk areas
- Future epidemiological monitoring

To date, 22,354 children have been studied in 447 populated centers, corresponding to 17 departments; 15 cases of hydatid cyst were confirmed.

In 2000 the epidemiological study was completed in order to prepare a national map. To this end, the commission set up a diagnostic serology laboratory. Along with the study of the children, a parasitological diagnostic analysis of the dogs owned by these children was performed. In a statistical sample of 2,095 dogs 0.17% were found to be parasitized by *Echinococcus granulosus*.

4.2 *Dog Registration*

This was carried out on four fronts:

(a) *Advertising*

Advertising is very important prior to, during, and after the registration of dogs, basically in order to convey dates, places, schedules, costs, the purpose of the data collected, and the rights and obligations of dog owners.

(b) *Timing*

Registration is conducted in July and August, coinciding with the activities of livestock producers, which require them to go to the departmental capital.

The following are distributed free of charge:

- Tag or label to be placed on the collar of the animal identifying it as registered during the school year.
- Dosage packet, containing one dose. The owner is responsible for administering one dose to his dogs every six months, except in rural areas where the dose must be administered every 30 days. For dogs that are in areas under supervised dosage, either urban or rural, the dose will be administered directly by the dosage administrator.
- Dosage card noting the dosage dates, one of which is stamped, indicating that that animal has received it.
- Instructional material, containing everything the program considers that a dog owner should know to keep from contracting the disease.

(c) *Control*

This is carried out door-to-door. Homes in urban and periurban centers are visited and inspected to determine whether all dogs are registered and licensed, whether for a fee or gratis.

In rural areas the inspection is carried out by the dosage administrators themselves or by the diagnostic evaluation team.

(d) *Legal backing*

Possession of adequate, up-to-date legal backing is a basic requirement for implementing the above. On 24 January 1990 the new law, No. 16,106, appeared. Promulgated on 24 March 1991, this legislation makes it possible to implement all the guidelines of the campaign against hydatidosis.

4.3 Adjustment of the Number of Dogs

In general, when a sanitary program related to any animal species is launched, the number of animals that are going to be involved ought to be known, in this case the number of dogs in the country. Only then will it be possible to know the number of animals to be dealt with from a health and program operations standpoint.

To this end, the first step to take is the registration of dogs by their owners through the procurement of an annual dog license. It follows then that adjustment of the number of dogs is effected through:

(a) *Capture of stray dogs*

Since 1992 the Stray Dog Control Service, under the program of the National Commission, has been functioning in most of the departments in the interior of the country. This Service generally acts at the request of departmental authorities or for epidemiological or technical reasons.

Currently in departments in which the number of dogs is controlled, that is, the dog/inhabitant ratio is adequate and remains stable with responsible ownership, "rational capture" is being practiced. This involves trying to locate the owner of the dog that is found running loose in public before taking it to the temporary shelter.

At the national level there is no capture team for each department, but there are three capture teams that visit the populated centers and urban capitals of each department on a rotating basis, according to the needs that are detected.

A temporary shelter should be available in each departmental capital and population center for animals that are found on the streets in violation of both national and municipal ordinances.

(b) *Animal castration*

This is a back-up measure taken once the adjusted number of dogs is determined:

- By agreement with the animal protection societies, which receive the necessary materials for the castration of dogs whose owners have low incomes.

- By agreement with the School of Veterinary Medicine.

- By similar agreements with departmental veterinary centers.

4.4 *Prevalence Study in Definitive and Intermediate Hosts*

Its purposes are:

(a) Determination of the prevalence of parasitic disease in dogs, the definitive hosts, and keeping that information up to date.

(b) Determination of the prevalence of hydatidosis in sheep and cattle, which are intermediate hosts, of different ages.

Determining the prevalence of the parasitic disease in dogs is very important in evaluating program operations and in ascertaining whether the action taken has resulted in disparasitization. Reducing the prevalence of parasitic disease in the canine population directly reduces contamination of the environment, which in turn leads indirectly to a reduction in the infestation of the human, bovine, and ovine populations.

The situation analysis carried out at the country level in 1991 yielded the following information:

Facility data

Percentage with dogs parasitized with *Echinococcus granulosus*	13.2%
Percentage with dogs parasitized with *Taenia hydatigena*	12.9%
Overall percentage with parasitic disease	20.9%

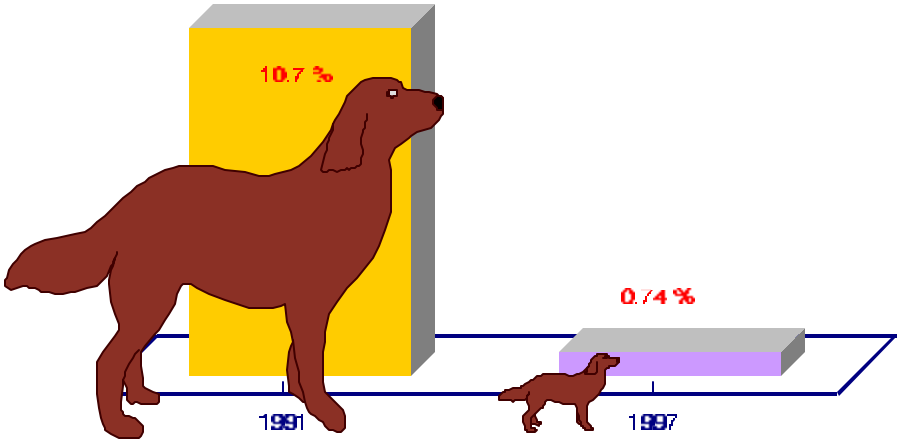
Dog data

Percentage parasitized with *Echinococcus granulosus*	10.7%
Percentage parasitized with *Taenia hydatigena*	11.3%
Overall percentage with parasitic disease	17.9%

These data were obtained by inspecting 2,615 livestock facilities and performing diagnostic testing on 6,474 dogs.

In 1997 the second situation diagnosis was carried out. It showed that parasitism in dogs from *Echinococcus granulosus* declined from 10.7% in 1991 to 0.74% (Figure 2). Similar changes occurred with cattle and sheep.

Figure 2. Uruguay - Decline of percentage of dogs parasitized with *E. granulosus*



4.5 *Promotion of Education in Curricular and Extracurricular Activities*

In this activity the Program works with curricular and extracurricular activities and the general public.

Within the curricular activities emphasis should be placed on the following:

- Agreements with the Primary and Secondary Schools Boards so that the subject of hydatidosis is explored in program curriculums.
- Agreements in higher education, specifically with the Parasitology Chair at the School of Veterinary Medicine, to teach graduate courses that involve hands-on learning.

The following curricular activities are carried out:

- Annual events in all teacher-training institutes in the country for students in their last year, who will be entering the rural, urban, and periurban labor markets as teachers the following year and will thus be effective multipliers for the dissemination of this subject matter.

- Preparation and printing of material for educators, students, and the general public.
- Preparation and printing of material for preschool education.
- Courses to bring teachers up to the same level.

The extracurricular activities system include:

- Through departmental health educators, reaching the people that have been treated for hydatid cyst and their families. Preparation and printing of material specific to this problem.
- Through the mass media, dissemination of information on the premises, needs, and progress of the program.

For technical personnel, field aides, dosage administrators, and administrative staff, events and courses for training and updating are organized in each of the branches. There have been a total of 51 regional symposiums, 11 national courses, 8 international courses, and 2 graduate courses in research methodology and parasitic disease in carnivores. This ongoing training makes it possible to carry out standardized activities at different levels throughout the country, which favors rapid implementation of the actions planned at central level. In addition, everything linked to the information system and the general operation of the Commission has been optimized, and the technical, administrative, and accounting levels have been automated.

The Commission also has a fellowship exchange program with programs in Río Negro and Chubut in Argentina; in Regions XI and XII of Chile; in Madrid, La Rioja, and Aragón in Spain; and in Brazil. To date there have been 20 visits by Uruguayan technical personnel to the aforementioned programs and 22 foreign technical personnel have been received.

4.6 *Operation of Centers for Research on Echinococcosis (hydatidosis)*

The research in these centers is exclusively applied research—that is, it pertains only to the lines of action of the national program or stems from them. Pure research is never conducted.

(a) Duplication of analysis of the fecal samples collected using arecoline at the field level to directly monitor the performance of program technical staff, to evaluate that performance, and to enable staff to evaluate their own performance and give them the opportunity to make the necessary corrections.

(b) Research on echinococcosis in unclaimed captured dogs, to determine the prevalence in population centers.

(c) Diagnosis using arecoline, on demand.

(d) Diagnosis using arecoline, in different neighborhoods in periurban areas.

4.7 *Operation of a Parasitological Reference Center*

Canine fecal samples collected using arecoline are sent to the parasitological reference center; they are obtained:

- During epidemiological monitoring of lines of supervised canine dosage, which makes it possible to visualize proper implementation and performance.

- From rural population centers, from dogs owned by children tested using ELISA.

4.8 *Operations of a Mobile Diagnostic Team in Urban and Periurban Slaughterhouses*

The team is made up of a professional (a veterinarian) and two appropriate aides. The migration from the countryside to periurban areas brought with it the custom of the household slaughter of livestock and this, aggravated by a socioeconomic problem that promotes clandestine slaughter, is what leads to the improper handling of offal and its feeding to dogs. For these reasons it is essential to have a diagnostic team working in these areas.

All the dogs tested in the two areas are returned to their owners after the administration of praziquantel. Those that are positive for *Echinococcus granulosus* or are fed viscera are also washed with pressurized soapy water to eliminate possible contamination of their fur with eggs and then kept for 72 hours as a precaution.

For the owners of dogs that test positive and for persons that live with their animals, appropriate measures are indicated to rule out the possibility of their suffering from hydatid cyst.

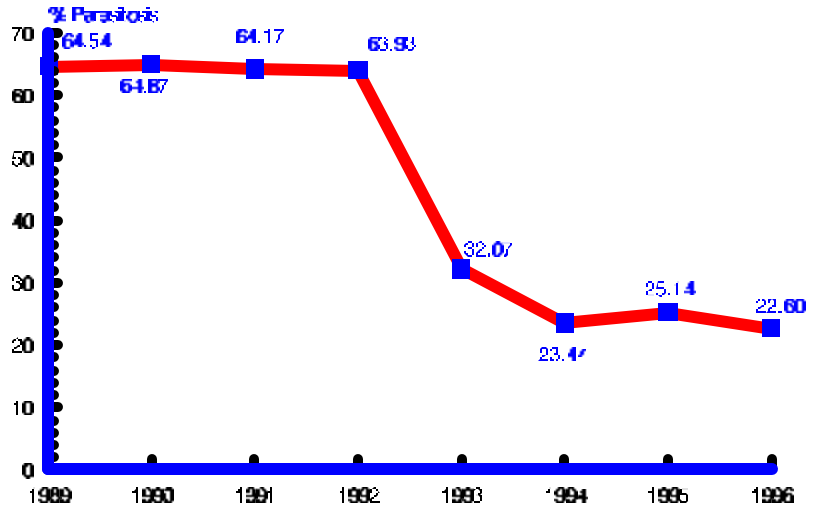
5. Consolidation Phase (1997 to 2004)

Having achieved indexes of supervised canine dosage coverage that are higher than 80% for the population of 120,000 dogs involved, a second situation analysis is under way. It is being conducted on a sample of 1,372 rural facilities, with a population of 2,956 dogs.

The data obtained indicate that the percentage of dogs parasitized with *Echinococcus granulosus* has declined from 10.7% to 0.74% and the percentage of facilities with parasitized dogs, from 13.2% to 1.51%.

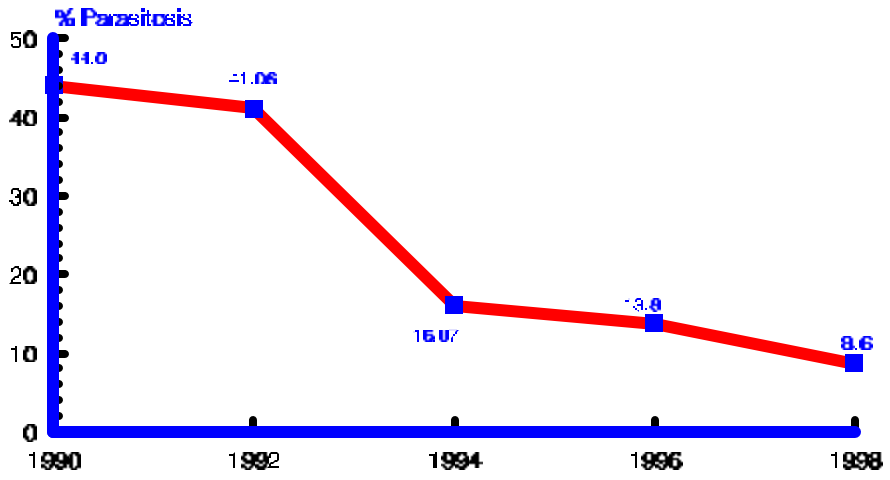
The percentages of slaughtered cattle and sheep in all categories of parasitization also declined significantly. In cattle it went from 64% in 1990 to 22.6% in 1996, and in sheep, from 44% in 1990 to 8.6% in 1998 (Figures 3 and 4).

Figure 3. Uruguay - Decline in bovine parasitosis, 1989-1996



Source: Area Estadística Sanitaria, M.G.A.P.

Figure 4. Uruguay - Decline in parasitization in slaughtered sheep, 1990–1998



Source: Comisión de Hidatidosis

It should be emphasized that the data from bovine slaughter are contributed by the health statistics unit of the Ministry of Livestock and Fisheries and those for sheep are from the operational statistics unit of the National Commission on hydatidosis.

Given the increase in the percentage of coverage of supervised canine dosage and in the reduction in the prevalence of this parasitic disease, it can be said that the attack phase is evolving into the consolidation phase, which means that the strategies implemented to date will be continued.

With reference to the economic losses that hydatidosis causes in the country annually, the only estimates available are those for the lost commercial value of parasitized viscera (liver): US$ 4,800,000 in 1991 and $ 1,650,000 in 1997, which represents a reduction in losses of approximately $ 3,200,000, or 66.7%.

Unfortunately, with respect to international trade losses related to other products (meat, milk, wool), there are no comparable studies that can be extrapolated. This is due to the high cost and long duration of adequate research on this point.

Another parameter in the program is the one linked to MERCOSUR. Uruguay, as a continental country, cannot work in isolation from its neighbors. Because of this, two important meetings have been held with Brazilian health authorities, at which declarations of intent were signed and a start was made on the development of plans—for example, the training of Brazilian professionals in courses offered by the Program in Uruguay, and the implementation of projects in Brazilian territory with the direct collaboration of Uruguay.

Similarly, in August 1994 a declaration of intent was signed with Argentina, Bolivia, Chile, and Paraguay in Punta del Este, Uruguay.

We are convinced that we should work jointly with the rest of the countries of the Americas, primarily with those on our borders, Brazil and Argentina. With the former we have already signed several letters of intent, including one considered basic by the highest authorities of both countries, dealing with epidemiological surveillance of echinococcosis (hydatidosis) at the border.

Several TCC projects have also been carried out with the support of PAHO-Brazil and Uruguay. Meanwhile, we continue to work with local authorities, basically on canine control.

6. Epidemiological Surveillance (from 2004 onward)

With the knowledge that we are developing a sanitary program to control a parasitic zoonosis in a continental country with more than 600 kms of open border with Brazil and just as many along the Uruguay River, whose bridges and dams link us more and more with Argentina, we are convinced that this phase should continue. That way, we will be able to detect the possible introduction of the disease from the rest of the continent.

7. Conclusions

We should point out that in Uruguay, a continental country in which this disease is endemic, we cannot think about a control program with a single line of work. Therefore, for all the reasons stated above and because of our experience, from the very beginning we had to continue the necessary steps in this program on a permanent basis.

In summary and, of course, with epidemiological priorities, we continue to carry out the following field activities:

- Administration of praziquantel by program personnel, that is, supervised canine dosage.
- Education in curricular and extracurricular areas. Training technical, paratechnical, field, and administrative personnel, each in his own field.
- Control of slaughter in households and commercial facilities under an agreement with the Ministry of Livestock, which will make it possible for us to change the strategy, controlling rural facilities with livestock that test positive for hydatid larvae.
- Diagnosis of the disease in humans, basically the young, giving them priority in treatment. This has not been implemented because the purpose of our program is control and prophylaxis. The health care phase we leave for the corresponding organizations, which continue with the treatment, with personnel from the laboratory of the hydatidosis commission continually monitoring the patient.
- Monitoring of new surgical cases.
- Control of stray dogs by increasing public awareness and removing the animals from the environment. Also, providing services at home or at the shelter to owners who want them.
- Epidemiological surveillance. Here we must consider different indicators, but fundamentally and mainly the definitive host, without ignoring the evolution of prevalence in the intermediate hosts: man, cattle, and sheep. From the start of the program this was one of our principal activities; it allowed us not only to compare results, but to evolve during the different phases of the program.

The certainty that a national program is under way that can be successfully applied in other countries or regions is demonstrated by the data that point to a decreasing number of cases in all the species involved. In addition, we have the opinion of international experts, such as Dr. Sheelagh Lloyd (U.K.), Dr. Peter Schantz (U.S.A.), Dr. Emilio Coltorti (Argentina), and Dr. Primo Arámbulo III (PAHO Washington), who in the official report of their last visit to our program attest to its good operation and the excellent results that are being obtained in Uruguay.

All these activities, along with a possible change in human behavior and a generational change, will take us along a single path in a coordinated tripartite operational strategy involving government, private, and academic entities in the country, into the 21st century, at the dawn of the control of the disease in Uruguay.

References

1. Cabrera, P.A. et all. Transmission Dynamics of E.granulosus, Taenia Hydatigena and Taenia ovis in sheep in Uruguay. International Journal of Parasitology. Vol.25 Nº 7 pag. 07-815. 1995.

2. Cabrera, P.A. et all. Rates of reinfection with E.granulosus, Taenia ovis and other cestodes in a rural dog population. International Journal for Parasitology. Vol.26 Nº 1 pag. 79-83. 1996.

3. Gemmell, M.A. Progreso en el control de E.granulosus. Memorias de la Reunión del Grupo Científico sobre avances en la prevención, control y tratamiento de la Hidatidosis. O.P.S. Octubre 1994. Montevideo-Uruguay.

4. Irabedra, P.. Características demográficas y ecológicas del Canis Familiaris. Tesis de Maestría. Facultad de Medicina. 1995. Montevideo-Uruguay.

5. Larrieu, E.; Orlando, D.; Thakur, A., Experience on the progress and failure of hidatid disease control programs: A global review. XVII Congreso Internacional de Hidatidología. Noviembre, 1995. Chipre.

6. Orlando, D.. Programa de Control de Echinococcosis en el Uruguay. Comisión Nacional Honoraria de Lucha Contra la Hidatidosis. 1992.

7. Orlando, D.. Capacitación Técnica para el control de la Hidatidosis. Proyecto TCP/URU/2251 - Coordinación Nacional. FAO-Comisión Hidatidosis 1992. Uruguay.

8. Orlando, D.; Ugarte, R.. Activities of the programme for the control of hydatidosis in Uruguay urban, suburban and rural areas. XVI Congreso Internacional de Hidatidología. Octubre 1993. China.

9. Orlando, D.; Murillo, N. y otros. Situación de la Hidatidosis en el Uruguay. Memorias de la Reunión del Grupo Científico sobre avances en la prevención, control y tratamiento de la Hidatidosis. O.P.S. Octubre de 1994. Montevideo - Uruguay.

10. Orlando, D.; Cabrera, P.A.; Irabedra, P.; Trindade, J.. Controled dosification plan at a national level nacional programe against hydatidosis. Noviembre, 1995. XVII Congreso Internacional de Hidatidología. Chipre.

11. Orlando, D.; Cardozo, M.; Elola, S. et all. Prevalence of Hydatidosis in Captured dogs in Montevideo (Parasitic Necropsy). Noviembre, 1995. XVII Congreso Internacional de Hidatidología. Chipre.

12. Orlando, D.; Cardozo, M.; Silveira, C. et all. Porcentage of E.g. and T.h. in urban and suburban dogs in Melo (Parasitic Necropsy). Noviembre, 1995. XVII Congreso Internacional de Hidatidología. Chipre.

13. Orlando, D.; Cardozo, M.; Viñals, G. et all. Echinococcosis in dogs in the Municipality of Montevideo 18th. Police Region-rural area. Noviembre, 1995. XVII Congreso Internacional de Hidatidología. Chipre.

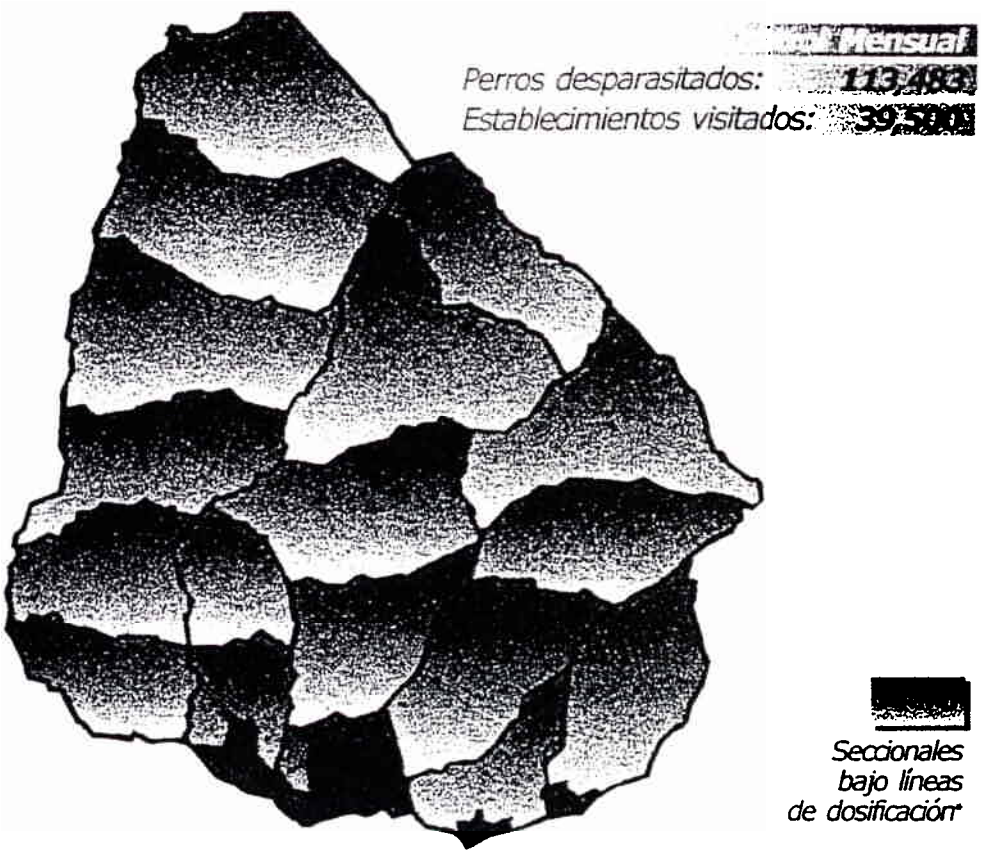
14. Schantz, P.. Características epidemiológicas de la Echinicoccosis quística. Distribución y modalidades de transmisión en el mundo. Memorias de la reunión del Grupo científico sobre avances en prevención, control y tratamiento de la hidatidosis. O.P.S. Octubre, 1994. Montevideo, Uruguay.

15. Las condiciones de salud en las Américas. O.P.S. ed. 1990.

16. Evaluación del Programa Nacional de Control de Hidatidosis de la República Oriental del Uruguay por expertos internacionales. O.P.S./O.M.S.- URU/1179/98. Uruguay, 1998.

MAP 1: REGIONALIZATION OF THE COUNTRY

MAP 2: GUIDED CANINE DISPARASITIZATION



El Programa Nacional de Lucha contra la Hidatidosis dosifica, cada treinta días, a los perros de los establecimientos agropecuarios y centros urbanos. Se asegura así la desparasitación y mantenimiento sanitario de 113.483 perros.