

**Raúl Alfredo López**

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# **CYSTIC EQUINOCOCCOSIS / HYDATIDOSIS PARASITOSIS MILENARIA**

**AND ITS IMPACT ON THE PROVINCE OF  
CATAMARCA, REPÚBLICA ARGENTINA**



***CYSTIC  
EQUINOCOCCOSIS/  
HIDATIDOSIS  
Parasitosis Milenaria***

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**And its impact on the Province of  
Catamarca, Argentina**

By the Veterinary Physician

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Teacher at the  
National University of Catamarca  
Catamarca Province  
Argentina

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wish to highlight that the English version of this book was possible thanks to the Dean of the Faculty of Agrarian Sciences of the National University of Catamarca, Agricultural engineer Oscar Arellano, who asked Professor Lidia Aguirre, English translator, and language specialist, to make the translation, which she worked for several months of the year 2021 until concluding.

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*I dedicate this book to my grandchildren,  
Matthias, and Santiago, who represent all children who get  
infected and suffer from Hydatidosis.*



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*Many of the writings in this book are his and show that we shared ideas and hopes.*

*With a lot of affection*

## **Prologue**

I have the honor bestowed by the author of the book “Hydatidosis, Millennial Parasitosis”, to write these words of joy to refer to a new book on a rural pathology that affects all areas with subsistence economy in the Argentine Republic.

The value of this book lies in the clear and simple language, available to all those interested in knowing and spreading knowledge about the disease, with clear and precise examples illustrating in amazement, in some cases, the variants of the location of the cysts and the symptomatology of each of them and especially the control measures for the definitive guests. There is a section dedicated to the procedures of the preparation of Arecoline Bromide, sample collection, the dark background reading, and observation and counting of adult parasites. These pages also refer to intermediate guests and the observation of cysts in the slaughtered animal.

Nothing is superior to a book that is written with the experience of years of work and with the wisdom gained by actions in the field. There, every day usually brings a new experience, and every year ends up with people who are unpaired in knowledge. They turn to be experts who will guide the work of those who are about to begin the path of control.



I thank Dr. Raúl López and his collaborator, Alberto Parra, with my heart for the effort put into writing this book, for not wasting the years coined on the path of hydatid control, and for the decision to make this book to be published.

Thank you for all this and much more.

A handwritten signature in black ink, consisting of a large, stylized 'E' followed by 'A', 'F', and 'G' in a cursive script. A horizontal line is drawn across the middle of the signature.

*Eduardo Alfredo Guarnera*  
President of the Argentine Association of Zoonosis

## I Preface

This work intends to be a useful contribution to society and it deals with a parasitosis recorded for thousands of years. It is totally controllable when correct prevention measures are carried out, depending, to a large extent, on how people cope with it.

The author's motivation to carry out this work is to make known an aspect of zoonosis that sometimes becomes unnoticed by the general population and only attended by specialists and by those who suffer this peculiar disease which may endanger their life.

Hydatidosis is undoubtedly a disease which is not easily detected at the beginning but only when it is very advanced. It is known as **cystic Echinococcosis**, or as **cystic hydatidosis**, due to the formation of cysts, true closed membranes which host thousands and up to millions of parasites. It develops mostly in organs vital to humans, such as the liver or the lungs, and in others to a lesser extent.

Both socially and economically, the problem is serious, mainly affecting the social strata with fewer resources.

The book then addresses the control of this endemic

disease. The control, although simple, is useless without continuity and political support which will take it as a priority, that is, as a state policy.

The consequences that those affected must suffer are highly detrimental to their health, their daily life, their own future, and their family's, influencing not only economically since it invalidates the worker, but also causing the death of the affected person.

Among the measures that should primarily be taken is a demanding educational work because, if people become aware of the problem, they will be able to solve it.

The most important thing in terms of population health is to keep it healthy, that is, the egg of the parasite should not reach anyone's mouth.

Diagnosis of certainty can currently be made in both the final host (dog), the intermediate host (goat, sheep, cow, pig etc.) and the accidental host (the human being). This is a tool, which well used, allows to make very efficient treatments.

The world situation is also analyzed, then the national situation and finally the situation in our province, showing and demonstrating that the disease is present and affects a significant number of people, causing a major public health problem.

The anecdote section shows some real cases that occurred and that allowed to see critical situations caused by the disease. Cases in children are mentioned, which allow us to know that the cycle is present and will continue to happen to the extent that no safety measures are taken.

This work was done in the hope that it will help keep people healthy and that significant economic expenditures can be avoided, both for the sick and for the state.

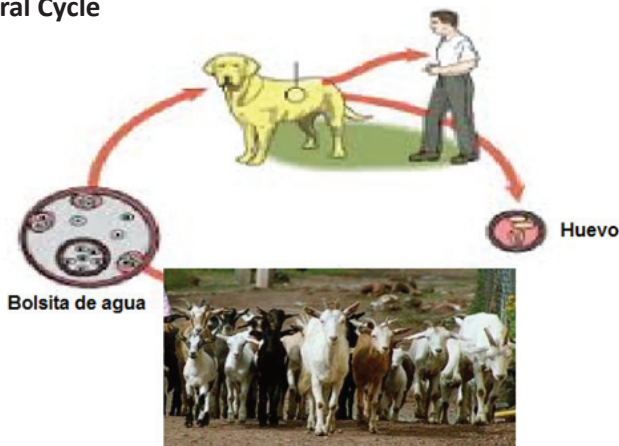
From an epidemiological point of view, this disease represents a global public health problem, due to the ease of reproduction of the parasite, especially in rural environments with low-income economies, that is, in areas where there are almost no resources allocated to combat this zoonosis.

The epidemiological problem arises as the parasite is temporarily hosted in the intestines of animals that shelter it and which the parasite hardly affects. That is the case of sheep, goats, cattle, etc. With their raw entrails, dogs are fed. Being great companions of man, they then infect people.

The current problem is serious and difficult to fight against; even though techniques to prevent the spread of evil are simple, easily implemented and relatively inexpensive, there is a cultural component, which needs to be overcome.

Awareness-raising is not easy to achieve both in the man in the street and in public health specialists, who do not give enough dimension to the situation as to take actions to eradicate this disease which is sometimes a silent scourge that some affected people, without a voice, suffer.

### Natural Cycle





## II General characteristics

Living beings maintain different types of relationships with each other to actively correspond and persist in ecosystems. Each species seeks to obtain nutrients, an appropriate habitat and ensure reproduction, thus guaranteeing its perpetuation. Human activities are increasingly involved as factors of alteration of those relationships, specifically through the transformation of the environment, where living things coexist.

Over millions of years, the original interrelationships underwent evolutionary modifications because of limitations that created risks to the survival of some species. Thus, parasitism, i.e., the relationship between two individuals where one is the parasite which feeds and achieves shelter at the expense of another who is the host, made its appearance.

It is established that existing parasites were once free-living organisms, until they managed to join another to ensure their livelihood and perpetuation.

Within parasitosis there are zoonoses or diseases transmitted from animals to man, with or without a vector intervention, which happens because the parasite finds in both hosts essential resources for life. In this sense, in many cases

there is a specificity of the parasite with respect to the host, which may be because it greatly depends on certain anatomical or physiological conditions.

Parasite zoonoses began to affect man due to his contact with wild animals and with their environment, a phenomenon incorporated into the domestic field after the implementation of livestock and pets' domestication.

It should be noted that all Tapeworms have a cycle where there is always a definitive host where the adult parasite develops, and an intermediate host where the parasite must complete the cycle.

One of these diseases, closely linked to the human habitat and the animals which coexist in it, is **Hydatidosis**, a pathology of a cosmopolitan nature that, due to the organic damage it produces in man and its ability to settle in communities (especially rural ones) is one of the most important zoonoses in the world.

**Hydatidosis**, also known as **cystic Echinococcosis** or water disease, is a parasitic pathology produced by the larval form of **Echinococcus granulosus**, a small **Cestode** whose definitive host is the dog or other canids. This organism belongs to the *Phylum Platyhelminthes*, *Cestoda Class*, *Eucestoda Subclass*, *Cyclophyllidea Order* and *Taeniidae Family*. In this genus, four species are recognized: **Echinococcus granulosus**, **Echinococcus multilocularis**, **Echinococcus oligarthrus**, **Echinococcus vogeli**, but only the first one has epidemiological significance in Argentina.

From its location in the intestine of these animals, it produces eggs that pollute the environment and when they enter man's body and domestic breeding ungulates (sheep, goats, cattle, pigs) they generate cysts of predominantly

visceral location. When these animals are slaughtered in the farm, which is common in rural areas, dogs are usually fed raw viscera. In this way, the parasite present in cysts infects the dog, lodging in its intestine where it grows to the adult stage, restarting the life cycle.

**Hydatidosis** has been known since ancient times and this is demonstrated by its description in very ancient texts. At first, thousands of years ago, the parasite had a wild cycle, with wolves and other wild canids as definitive hosts, and some herbivores (deer, antelopes, buffaloes, etc.) as intermediary hosts. Later, about six thousand years ago, the dog was incorporated into the domestic environment, while livestock started to grow in farms, thus getting involved as a circumstantial host.

From the time of Hippocrates (460-370 a.C.) **Hydatidosis** was known in man. In one of his Aphorisms, he says: *“All those whose liver, after filling up with water, bursts and goes to the epiplon, and the belly is filled with water, then those die.”*

There are other antique medical texts that show that in those days, **hydatid cysts** were known, recognized as bladders with water, although people were unaware of their parasitic origin.

Over several centuries, there are references to this condition and its expansion to different territories and continents. Iceland was recognized for the high incidence of the disease. In the mid-19th century, a third of the dogs were carriers of **Echinococcus granulosus**, and in 1869 the first campaigns to control the disease began.

The parasitic cycle was known since 1853, and in 1864 health education and slaughtering control campaigns began. In 1890, canine cure treatment with a tenifugus (Arecoline) was



initiated, and in 1975 the use of a tenicide (Praziquantel) was incorporated on a preventive basis.

In recent decades, there has been a change in the global distribution map of many diseases because of climate change and man's invasion of natural ecosystems. In the case of **Hydatidosis**, the phenomenon is not very evident due to the significant adaptation of the parasite to the most varied geographical conditions. Instead, other factors influence its distribution such as the growth of deprived populations with a severe neglect of their basic needs.

**Hydatidosis** is a major economic and public health problem in regions of the world where resources are mainly based on livestock exploitation.

There are countries in the Mediterranean region and others such as Australia and New Zealand where control programmes were highly effective, but it persists in large territories in Latin America and regions of Asia and Africa, such as Tunisia, Morocco, Libya, Iran, and Kenya. Some areas of the African continent, such as Turkana and Masai, are considered the most at risk and the frequency of the disease reaches high levels. In this part of the world, the control of **Echinococcosis** is far from effective, influenced by the fact that it is not a priority problem as some other even more pressing diseases such as HIV, hepatitis, tuberculosis, and other contagious pathologies.

In Asia, the problem is relevant in China and its control is hampered by the size of the territory and the extent of endemic focuses.

### III Epidemiology

**Hydatidosis** is a parasitic *cyclozoonosis*, i.e., it is a zoonosis where the agent passes through more than one species of vertebrate host without the intervention of an invertebrate host.

The adult state of ***Echinococcus granulosus***, which reproduces sexually, is in the small intestine of the definitive carnivore host that is usually a dog, even though a wolf, jackal, coyote, fox, and dingo can also act as such, being important for their intervention in the wild cycle.

This small cestode is about 3 mm long, usually has one year life span, and is a large egg producer, hatching between one thousand and three thousand eggs per month.

This parasitosis is NOT transmitted from one dog to another dog.





*Examples of Echinococcus granulosus*

*The parasite, in the fecal matter of the dog, is yellowish white.*

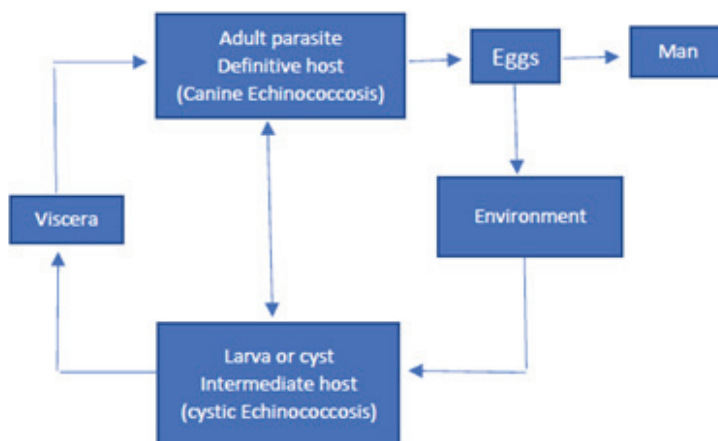
The parasite lives as a larva in the intermediate host, in which the asexuated reproduction takes place. ***Echinococcus granulosus*** has as an intermediary host: sheep, goats, cattle, pigs, horses, and camelids, in whose organs the parasite generates hydatid or *metacestode* shape, also called Hydatid Cyst or water sac depending on which host is in the environment.

Transmission to an intermediate host occurs through the eggs of ***Echinococcus granulosus*** eliminated in the fecal matter of the dog (for example: the goat consumes the grass that infested the fecal matter of a dog, and it lodges in its intestine). As a result, the dog is parasitized by ingesting cysts present in the raw viscera of an intermediary host (that is, when sacrificing the goat, the dog feeds on its raw viscera and contracts the parasite).

Man, by ingesting eggs of ***Echinococcus granulosus***, which are found in the dog's hair, in contaminated water, in vegetables etc. develops the larval form in different organs, preferably liver and lung.

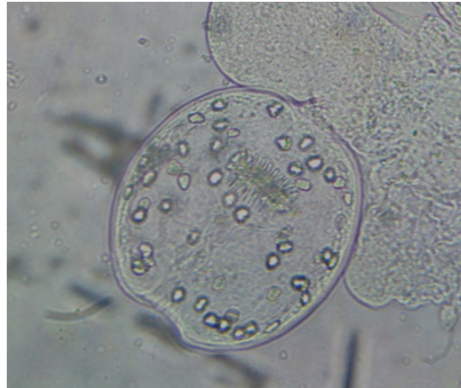
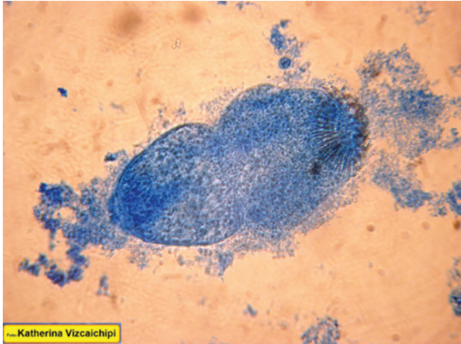
Eggs have high resistance in the outer environment and

in some cases can remain infective after three years in places with low temperature and significant aridity.



The evolutionary cycle of *Echinococcus granulosus continues* with the ingestion of the egg by an intermediate host, in whose digestive tract, by enzymatic action, the release of the inner embryo occurs. This embryo penetrates the intestinal wall and reaches a blood or lymph vessel so that it can locate in the liver, lung and less frequently in another organ.

In the course of time, the parasite will become a cyst, *metacestode*, or *larva* of varying dimensions, typically *unilocular* and *subspherical*, inside which the production of *protoscolysis* takes place. This will be the future heads of the adult form in the definitive host.



### *Protoscolysis of Echinococcus granulosus*

At this stage, *protoscolysis* has a double potential. If its destiny is the digestive system of a canid, it will develop the adult form of the parasite, which will produce eggs in a sexed way because it is a *hermaphrodite organism*. In contrast, by breaking a cyst, protoscolysis can generate other *metacestodes* in neighboring tissues, a process known as *hydatid planting*.

The cycle of ***Echinococcus granulosus*** continues when dogs feed on viscera of animals containing hydatid cysts. The

parasite is not transmitted from one intermediate host to another, even with the intake of cyst-containing viscera, i.e., it is not transmitted from one goat to another, or from one sheep to another.

The radial spread of infective eggs in the environment is a resource to ensure their arrival at the intermediate host, over which *Echinococcus granulosus* has no strict selectivity.

Eggs fly with the wind and spread in pastures and water, then they are ingested by any host, goat, sheep, or man.

Protoscolysis is formed inside the larva by an asexuated mechanism and manages to produce multiple elements, i.e., a multiplier effect occurs from a single embryo derived from an egg from the adult parasite. Undoubtedly, the purpose is to ensure its survival, the goal of every species.

*The Echinococcus granulosus* is an organism with great power of adaptation to extreme environmental conditions and is therefore present in all areas where man has established his livestock activity, a very extensive world territory.



#### IV

### Situation in America and in Argentina

In America, the most affected areas are those where livestock activity is practiced under conditions that favor the transmission and perpetuity of the parasitic cycle. The areas of greatest epidemiological relevance are the Central Sierra of Peru, the south of Chile, the State of Rio Grande del Sur in Brazil and much of the rural area of Uruguay and Argentina. In Bolivia, there is no reliable information to show its distribution, although it is supposed to be a major health problem. It is believed that the population had contact with the parasite with the arrival of sick dogs since the fifteenth or sixteenth century.

In the Argentine Republic, *Hydatidosis* is present throughout the national territory and is associated with livestock activity, particularly sheep and goat production. The most significant spotlights correspond to the Patagonian area (including Tierra del Fuego) and the humid pampa zone. There are other regions where the problem reaches smaller areas, but with a delicate epidemiological situation, such as high mountain and northwest valleys, mountainous areas of Córdoba, south of Mendoza, west of San Juan, Santiago del Estero, and part of Mesopotamia.



**Hydatidosis** is the zoonotic pathology that produces the greatest number of deaths in Argentina. At the meeting of Argentine experts in **Hydatidosis** in 2004, 177 people were warned about the problem in a document that states:

In Argentina, between 1995 and 2001 177 people died from the disease. Several studies conducted by public health services in affected provinces, national universities, and the National Institute of Infectious Diseases (INEI), ANLIS “Dr. Carlos G. Malbrán”, show that between 2% and 5% of children attending schools in endemic areas suffer from hepatic or pulmonary **hydatidosis**.

Between 10% and 40% of dogs in endemic areas are carriers of **Echinococcus granulosus**, which causes the disease in man. Nearly 25,000 tons of sheep, cattle, goats, and pigs infected with Hydatidosis are lost by confiscation every year in the country.

The social, economic, and educational deterioration to which the population has been subjected has favored the emergence, among other things, of diseases related to the excessive increase in uncontrolled canine populations. These diseases called zoonoses cause large economic losses and affect the health of the population, especially marginal people, and the state has systematically evaded its responsibility. (Gorodner J. O.1991)

In the Argentine Republic, over the years, control programmes in the provinces had dissimilar results and in many of them there is not even a diagnosis of situation.

The northwest of the country has very variable geographical characteristics that include areas with high-altitude deserts, jungles, forests, and salt flats, which give a special trait to each province or region, accompanied by large climatic variations and a very particular topographical polymorphism. The population has a typical ethnic origin in each territory, even more evident in rural sectors.

Throughout the region, there are native people's communities scattered, or in settlements with less than five thousand inhabitants.

In these provinces, man activities are closely related to the topographical and climate conditions. In general, plain areas have a subtropical climate where agricultural practices predominate; while in mountain regions, agricultural and livestock production for family provision prevail, mainly consisting of sheep and goats rearing.

During the 2005-2010 period, according to the National Health Surveillance System (SNVS), 2,291 cases of *Hydatidosis* were reported in the country, with an average of 458 cases per year. In the same period, in the northwestern provinces (Tucumán, Salta, Jujuy, Catamarca and Santiago del Estero) there were 494 cases, representing an average of 98 episodes per year.

The endemic areas of *Echinococcosis* in northwestern Argentina, correspond to small-scale areas of livestock production, with families possessing herds of sheep, goats and in some cases some camelids, such as llamas and alpacas. This activity is basically developed for family subsistence and is part of a regional tradition, as well as the practice of animal home slaughtering and close coexistence with dogs in the domestic area (Remis J. 2009).

In these communities, it is common for the viscera to be used as the only resource for feeding dogs, which facilitates the transmission of the parasite from one host to another, as they are eaten raw. Another detected feature is the high canine population in areas where *Echinococcus* is a serious public health problem.

In some sectors of northwestern Argentina, sociocultural conditions are observed that contribute to *endemicity*, particularly regarding population dispersion with geographical isolation, small-scale livestock production for family subsistence, structural deficiencies in basic services, little chance of economic progress, and limited accessibility to educational and health services.

In the detection studies of parasitic antigens in canine fecal matter from livestock establishments in Patagonia Argentina, prevalence rates were found between 0.6% (La Pampa) and 3.1% (Tierra del Fuego) (Cavagión L. 2005); while in different locations in the mountainous areas of the northwestern area of the country, this prevalence oscillated between 2.0% and 66.7% (Lopez & col., 2011; Parra & col., 2017).

Historically, northern Argentina was one of the most critical regions in health indicators, with records showing the presence of diseases linked to economic and social needs and deficit in health resources. In this regard, the 2012 World Health Organization's Scientific and Technical Report called for correcting the obvious inequity observed in these socially and economically postponed sectors.

From the 2000s onwards, because of the recorded cases in the provinces, the northwestern Argentine region was included in the national epidemiological context (Ministry

of Health. Argentina, 2008). Recorded data showed that the status of the disease in some localities was comparable to those of Patagonia in the 1960s.



## V

### Situation in the Province of Catamarca

We will mention here some geographical, socioeconomic, productive, and cultural characteristics which contribute to the presence of **Hydatidosis** in many communities in Catamarca.

The province of Catamarca is in the northwestern area of the Argentine Republic, along with others such as Jujuy, Salta, Tucumán, and Santiago del Estero.

The term 'Catamarca' comes from the Quichua language, a language imposed during the Inca Empire, and it means 'Hillside castle or fortress'. Mountains occupy 70% of its surface, and three geologically differentiated areas stand out: the puna, with heights of more than three thousand meters, with large salt flats, and imposing volcanoes; the central mountain range, located in the south-western part of the province, with summits more than 6500 meters high, and the rest of the territory is occupied by the Pampean mountains.

According to the last national census in 2010, the Argentine population was of 41,117,096 inhabitants and an average density of 14.4 inhabitants/km<sup>2</sup>, while in Catamarca there were 367,820 people. It is among the five most

underpopulated provinces in the country, its population density reaches only 3.5 inhabitants/km<sup>2</sup>. In addition, it has the peculiarity that 61.94% of the population is concentrated in localities of more than 2,000 inhabitants and 41.7% do so in the capital.

### Northwestern region in Argentina



It has a varied climate depending on the regions, it has desert areas and others with rainfall records exceeding 1,000 mm per year.

As for livestock production, it currently has about 250,000 goats, some 100,000 sheep, 240,000 cattle, and 40,000 camelids: llamas and wild camelids, mainly vicuñas, and also a small population of guanacos.



Panorama of a region of Catamarca province

In the province, there are approximately 120,000 dogs, according to calculations carried out in the massive anti-rabies campaigns, where almost one dog was found for every 3 people.

***Cystic Echinococcosis*** in Catamarca is a serious public health problem, particularly as it affects communities with



little chance of getting adequate human and technological health care.

In Argentina, *Echinococcosis* is a mandatory reporting disease as established by National Law No. 15,456, and the processing of information is defined by the National Epidemiological Surveillance System. The notification is individual and periodical, on a weekly basis for cases detected in consultations, and fortnightly for laboratory data.

Official records quality allows to determine the impact of the pathology on the population, and it influences any decision-making for its control. Correct case studies information is an invaluable tool in epidemiological surveillance and operational strategy. Errors and omissions in notifications lead to an incorrect situation diagnosis, a distorted interpretation of the situation in the regional context and affect the effective action for control (Parra A. 2010).

From an epidemiological point of view, the number of *Echinococcosis* cases reported annually is not a faithful reflection of the impact of the disease because this indicator is influenced by the active search for asymptomatic cases. As it is a chronic disease, finding the disease does not mean a recent condition. That is why the most important epidemiological parameter is the prevalence of parasitic dogs, which is a reference of the risk to get sick.

Since 1998, dogs carrying *Echinococcus granulosus* were reported, being detected by different diagnostic methods. In studies in more than 800 dogs in different administrative departments in the province, a prevalence between 6% and 23% of canine *Echinococcosis* is reported in different locations. In a study on contamination with parasitic elements in the houses and surrounding areas in the Aconquija department,

it was observed that more than 50% of the homes visited had eggs of the parasite (López R. 2011).

As in almost the entire national territory, the province does not have records of the disease in intermediary hosts since, in endemic areas, animal slaughtering takes place exclusively in the homes.

The *Echinococcus granulosus* biological cycle flourishes in the space next to the houses, or the pasture areas of animals that are intermediate hosts, where the agent's eggs gain access with some ease. The other environment involved is the home sector itself, where man performs practices such as the slaughtering of breeding animals, particularly ungulates for family consumption. He lives closely together with parasitized dogs, and has poor sanitary conditions, such as problems in the disposal of waste in general, lack of water network, of electricity, and of roads that facilitate accessibility to housing and the provision of necessities. In this area, there are still deficiencies in education and health benefits. These are communities with limited material and economic resources, with no technology available for sustained progress (Remis J. 2009).

In endemic territories, in addition to the presence of *Echinococcus granulosus* and the hosts necessary for the fulfillment of the biological cycle, the participation of the man who, when feeding dogs with raw viscera infects the definitive host where the adult form develops, is required.

In rural dwellings there is the possibility of contact between people and infective eggs. Thus, there is often dog excrement in the vicinity of the houses, or in the dirt courtyards where children have direct contact with dogs and contaminated surfaces. Permanent access of these canids to rooms and the contamination of orchards and water supplies

with canine feces is also common (Parra y col., 2017).

In the next page picture, you can see house slaughtering in a rural area- Photo taken in February 2020.



The rural sector is inhabited by mestizos identified with the Diaguita Calchaquí culture, groups that practice raising sheep and goats as a means of subsistence, since the areas are unfit for crops because of climate harshness and lack of knowledge in agricultural practices. There are no urban clusters and even some communities have seasonal migrations to other localities in the province. In general, this sector shows significant geographical isolation which undermines regional progress, and the availability of formal work, and hinders accessibility to education and health benefits. In these places,

the population is distributed in isolated places or villages, with a large dispersion of homes in the territory.



*A place in San Antonio del Cajon. Catamarca Province*

From a social and health point of view, 90% of families in the endemic region of ***cystic Echinococcosis*** have three or more critical factors, i.e., they are families at risk. Factors considered for evaluation include the availability of drinking water, illiteracy, the existence of bath or latrine in the dwelling, presence of three or more children under the age of 5, malnutrition in the family group, people with chronic or social diseases, minors in charge of minors, mothers under the age of 17, father or mother alone (Parra y col., 2009a). In these communities, you can see a high canine population, close coexistence with dogs, presence of hydatid cysts in slaughtered animals, and the habit of feeding dogs with raw viscera.



*Man with his goat herd.*

People also contribute to the spread of the disease by moving to other locations, especially for food supply and other necessities. This mobilization is carried out accompanied by their dogs, who can house parasites whose eggs thus spread in other areas or localities. This results in the onset of the disease in urban or peri urban areas far from the site of the parasite's domestic cycle (Remis y col., 2009).

Another form of dissemination of ***cystic Echinococcosis*** is by *transhumance*, or seasonal migration of families and animals, which usually occurs in winter season seeking better pastures for livestock. This migration contributes to the spread of infected hosts in other rural locations, where the parasitic cycle can be stabilized (Chazal y col., 2003).

In the province of Catamarca, reports from the Zoonosis Department of the Ministry of Health reported 158 patients between 2005 and 2016, with an average of 13.2

cases per year.

**Catamarca Province, Argentina**  
**Distribution of *hydatids* cases**  
(Source: Zoonosis Department, Catamarca)  
**Period 2005 – 2016 (n. 158 cases)**

<b>Year</b>	<b>Cases</b>	<b>Males</b>	<b>Females</b>
2005	12	3	9
2006	13	5	8
2007	12	6	6
2008	22	12	10
2009	16	4	12
2010	10	4	6
2011	13	6	7
2012	16	5	11
2013	8	3	5
2014	13	5	8
2015	13	7	6
2016	10	3	7
<b>Total</b>	<b>158</b>	<b>63</b>	<b>95</b>

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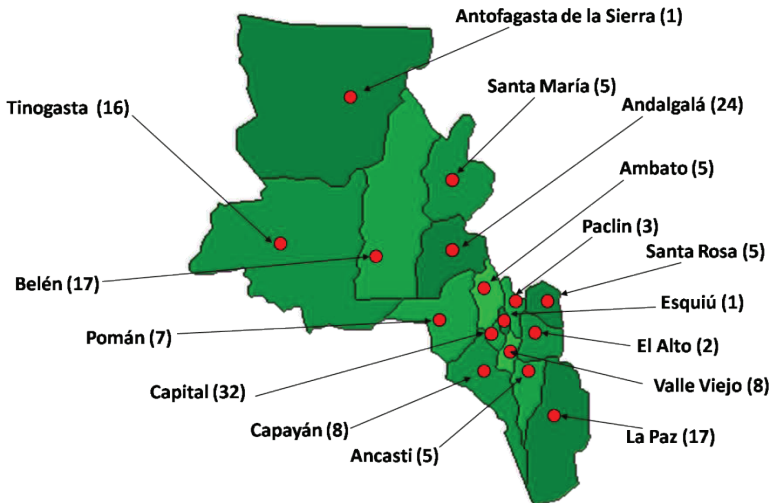
Annual average (158/12): 13.2

The registers show a clear predominance of females, accounting for 60% (95/158) of cases. This does not mean that women have greater contact with or increased sensitivity to the parasite, but the cause can be due to the fact that more women turn out to consulting rooms and diagnostic practices.

The ages recorded were from 4 to 89 years and two patients came from neighboring provinces.

As for the distribution of cases, the disease is observed throughout the province, although with greater prevalence in some departments.

**Catamarca Province**  
**Distribution by department of hydatid cases**  
**Period 2005 - 2016 (n= 156 cases)**



*Source: Zoonosis Department, Catamarca*

According to the address declared by the patients, there were 32 cases in the Capital department, which does not mean that they became ill in that geographical sector as they came from peripheral areas where there are precarious settlements with migrant families from interior villages. This could lead to a bias in terms of real distribution in the Province.

The most relevant data are observed in the departments Andalgalá, La Paz, Pomán, Belen, Tinogasta and Capayán. In the provincial territory in general, the annual prevalence observed during the period under study was 3.58 cases per year per 100,000 inhabitants.

The main affected departments were:

**Catamarca Province, Argentina**  
**Departments with higher prevalence of Hydatidosis**  
**Period 2005 – 2016 (n. 99 cases)**

Department	Cases	%	Cases/year	Population	Prevalence (*)
Andalgalá	24	15.2	2,00	18.147	11.02
Belen	17	10.7	1.42	27.829	5.10
Capayán	8	5.1	0.67	16.079	4.17
La Paz	17	10.7	1.42	22.128	6.42
Pomán	7	4.4	0.58	10.744	5.32
Santa María	5	3.2	0.42	21.905	1.92
Santa Rosa	5	3.2	0.42	12.087	1.92
Tinogasta	16	10.1	1.00	22.278	4.49
Valle Viejo	8	5.1	0.67	28.291	2.37

*(\*) Annual prevalence per 100,000 inhabitants.*



According to the population distribution, 40% of people live in localities with less than 2000 inhabitants. Considering this, the prevalence for this sector, over 147,128 people, would be 8.84 cases per 100,000 inhabitants if all sick persons are considered to belong to the rural area. In this calculation, only the natives of the province are included.

In recent decades, the presence *of cystic Echinococcosis* in people with urban or peri-urban domicile makes it possible to think that *Hydatidosis* has ceased to be a strictly rural disease, which is due to the habits and traditions moved by migrations from the countryside to the periphery of urban conglomerates. The same rural practices that allow parasitic transmission and an uncontrolled canine population in an area of high concentration of people appear in these places. Transmission is likely to be sporadic at these sites, but it still poses a risk to the health of the inhabitants.

In the province of Catamarca, the disease has been recorded since 1940. According to Dr. Juan Gustavo Andrada's account (1927-2017), surgeon at the San Juan Bautista Hospital, his father, Juan Benjamín Andrada (1891-1950) also a surgeon at the same hospital, saw a man with a marked exophthalmia while watching the pilgrims pass by in the 1940 procession of the Virgin of the Valley. He asked the man to go to the hospital for a checkup. The diagnosis was a retro-ocular hydatid cyst.

For illustrative purposes, we added this photograph, where the magnitude of the problem in an organ can be seen.



This is a caseous hydatid cyst or Garbi IV, removed from the liver to a patient by Dr Juan Augusto Andrada in 2010. This patient had been operated on by another liver hydatid cyst some 20 years earlier by Dr Juan Gustavo Andrada, Juan Augusto's father.

Alejandro Posadas had already filmed at the José de San Martín Clinical Hospital the first surgery in the world in the late 1800s, corresponding to the removal of a *pulmonary hydatid* cyst. As stated by Dr. Andrada (h), he operated on about one hundred people with Hydatidosis who came from different parts of the province. His son, also a surgeon, records interventions for the same pathology, thus completing three generations of doctors practicing the surgical treatment of ***cystic Echinococcosis***.

In May 1983, work began on the Antirabic Institute, where Dr. Gustavo Navarro and Dr. Brizuela had worked, with tasks aimed at diagnosing and controlling ***Hydatidosis***. These

pioneers used the arc 5 double diffusion technique to perform serological recordings and kept track of cases in humans.

At that time, formalities were initiated to acquire *Arecolina Bromide* and thus work began on the ground diagnosis in the final host. The first town studied was Entre Ríos, Andalgalá department, where parasitized dogs and several people with a history of the disease were found.

## VI Control

There is a current national program for disease control, but planned activities are limited in the absence of resources allocated by each province for its implementation. While there is an adequate distribution of antiparasitic, serious human and economic resource constraints remain.

None of the northern provinces has significant anti-parasitic treatment against definitive hosts in endemic areas. There is no continuity in the parasite's removal, and a lack of previous and periodic evaluations on parasites in dogs. The dissemination of preventive measures is absent, and in the meantime, each year there is an increasing number of people being treated by *cystic Echinococcosis* in public hospitals, a demand that represents the failure of prevention.



*Childcare in rural schools*

Depending on the characteristics of the disease and the patient's origin, the treatment involves a high social and economic cost, both for the families and for the state (Guarnera, 2009). The presence of large cystic masses in adults requires bloody interventions supplemented by a prolonged stage of pharmacological administration (Parra y col., 2017), to which periodic controls that force the transfer of patients from remote locations to care centers in the capital should be added.

Patients requiring surgical treatment demand admission in hospitals of some complexity, and in most cases the availability of intensive care services. This situation results in a high social impact and the distraction of state resources for preventable pathology.

The control of ***Hydatidosis*** involves continuous work with a team dedicated exclusively to the task, and that basically

develops primary and secondary prevention activities.

Primary prevention includes measures such as Health Education and the control of definitive hosts and intermediaries.

Secondary prevention, applied in humans, is developed through early diagnosis and appropriate treatment.

Primary prevention is intended to avoid the disease with measures that stop the agent from accessing receptive organisms.

In ***cystic Echinococcosis***, the basis of primary prevention is health education and veterinary control of definitive hosts and intermediaries participating in the ***Echinococcus granulosus*** biological cycle.

The objective of health education is to give the population, by different means, a greater knowledge about the pathology and its transmission, to achieve changes in health habits and behaviors and allow eradication. An efficient strategy involving basic information on the customs, beliefs, skills, and attitudes of the community should be adopted for its implementation, thus contributing to prevent the transmission and maintenance of the pathology.

Educational activities should place special emphasis on avoiding the feeding of dogs with raw viscera obtained from livestock work, warning about the risk of close coexistence with dogs in the domestic field and in highlighting the relevance of periodic canine's parasite removal.

It is essential to teach personal hygiene measures such as hand washing before meals, especially when living with dogs; avoid contact of children with these animals; and wash the vegetables, since the orchards can be contaminated with faecal matter of parasitized dogs.



*Observing viscera at the owner's farm*

It is important to convey that viscera, when possible, should be burned, buried out of reach of dogs, boiled, or discarded in the latrine.

As the feeding of dogs is onerous for a family of scarce resources, it is not a minor subject within the habits of the population. So, a safe alternative is to cook the viscera either boiled or roasted because it is an important source of dog food.

Health education should have a priority scope in populations most exposed to disease because it has significant prevalence rates in men and animals. In turn, a multiplier effect should be sought through educators, community leaders, health workers, civil associations, municipal and communal agencies, etc., i.e., sectors that can facilitate health promotion and expand the number of recipients.

Veterinary control, together with education, is the most important action from a preventive point of view. It basically

consists of establishing an initial situation diagnosis in each locality, referring to the number of dogs carrying *Echinococcus granulosus* or the proportion of homes contaminated with feces of parasitized dogs. From this evaluation, a scheduled and continuous canine parasite removal should be initiated, with similar annual controls, to assess the effectiveness of antiparasitic dosages.

The alternatives available, for initial diagnosis and post-parasite removal, are the Arecoline test and/or the identification of *Echinococcus granulosus* antigens in canine feces collected near homes.

Arecoline bromide is a potent parasympathomimetic that is administered orally at the dose of 4 mg/kg body weight, diluted to 1.5%. Approximately half an hour after dosing with this taeniafuge, dogs remove all or some of the adult tapeworms of *Echinococcus granulosus* or its proglottids (parts of the worm) in their feces.



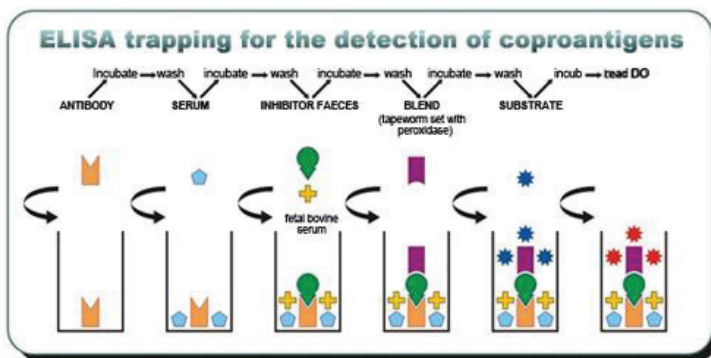
*Arecolina test image (year 2017)*



The evaluation technique with Arecolina has fallen into disuse due to several factors: it is a modality applied to individualized dogs implying environmental contamination by the remains of canine faecal matter; the drug has no pesticide or ovicide action; there are problems to obtain the product, and with transport of equipment and personnel; in addition, its effectiveness depends on the neighbors' concurrence to the call; the method has a low sensitivity, and it is also the cause of an important distress in animals.

The other methodology, that is the detection of coproantigens which allow to know whether the parasite exists or not, is to carry out a home survey collecting a sample of canine fecal matter per house, no matter how many dogs live in it. The samples are conditioned and then processed in the laboratory to identify the presence of *Echinococcus granulosus* antigens. The study can also be done in soil samples or pastures, or by swabbing the fur of dogs, among other ways.

The study of *coproantigens* is carried out using an ELISA capture technique, which is used as Screening and with Western blot as a confirmatory method.



ELISA technique for the detection of coproantigen in dogs

Praziquantel is used for the treatment of dogs at a 5 mg/kg oral dose and should be administered every 30 days by the dog owner.

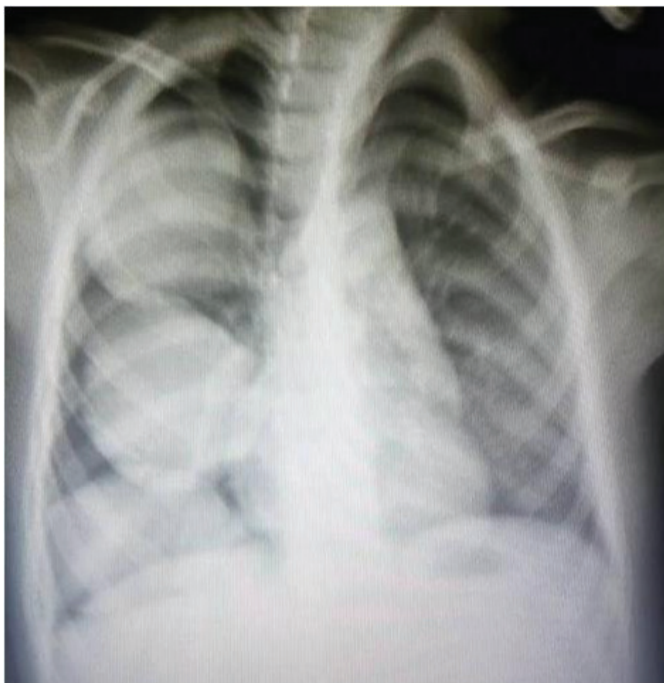
The Praziquantel is a non-ovicide taenicide, which means that after parasite removal, the dog can continue eliminating eggs for one or two days after dosing. So, during those days, the canine fecal matter found in the nearby areas should be buried.

The goal of parasite removal is to reduce the canine population with ***Echinococcus granulosus***, leading to a decrease in infecting biomass in the environment, which in turn results in fewer intermediate hosts with cysts and the consequent weakening of the parasitic cycle. They also decrease the risks of humans contracting the disease at home by coexistence with dogs.

Secondary prevention is intended to reduce the damage caused by the disease and facilitate the rehabilitation of people. In ***Hydatidosis***, the basis for primary prevention is early diagnosis and appropriate treatment.

Diagnosis of ***cystic Echinococcosis*** is based on clinical signs, but especially imaging and laboratory methods.

The following image is from *chest Rx in pediatric patient with pulmonary ***Echinococcosis****.



Field studies for diagnostic surveys in at-risk populations are conducted through raids or scheduled visits to detect active cases, especially in schoolchildren and asymptomatic people.

Finding children with ***cystic Echinococcosis*** is a sign of recent infection, which determines that the parasitic cycle is likely to be current in the locality.



*Ultrasound at an endemic school*

The therapeutic behavior of **cystic Echinococcosis** depends on several factors related to pathology and the patient.

It is necessary to have the required medication and to keep it available for the patient. Generally, people come from very remote and inaccessible areas, so effective care should be guaranteed in high-complexity hospitals.

Early diagnosis of the disease and its proper treatment requires multidisciplinary and interinstitutional work, the result of which is a great benefit for patients, and, in turn, causes a great reduction in the social and economic costs arising from this pathology.

The number of cases diagnosed annually is influenced by the development of early diagnosis activities (ecologies, serology), which is part of secondary prevention, and it aims to reduce harm in people suffering from the disease. Even with the finding of small cysts, surgery may be dispensed with as the

only therapeutic alternative.

Early diagnosis of ***cystic Echinococcosis*** through ultrasound and serologies in risky communities, and an appropriate treatment of patients results in a significant decrease in the average number of days of hospital stays, and of complications and costs (Parra and 2017).



*Scars in patients with ***cystic Echinococcosis****

## VII

### Operational aspects and discussion

The activities for the control of Hydatidosis in Catamarca began in 1998, with the development of a program to be applied according to the geographical, social, cultural and health conditions of the province, and with the general objective of reducing the morbidity caused by the pathology.

However, the activities did not have the continuity expected due to the lack of equipment, and material, economic and human resources. The large extent of the territory and the lack of staff for the many tasks to be performed also contributed to the program failure.

The health system did not raise the concerns required to combine efforts and resources with the different operational areas for the articulation of actions. Over time, work was on primary prevention, with canine parasite removal, health education, and early detection and treatment of patients, although they were not applied with the necessary intensity and persistence.

In *Hydatidosis*, the health system still maintains a significant debt to the community, which can be paid off with adequate resources and strategies to meet the objectives of

the program.

Despite the serious problem of *cystic Echinococcosis* and other zoonoses in the province, the department responsible for disease control continues to have a low level in the staff position and is relegated in the management of resources. After nearly twenty years of work, some strengths are perceived, but many weaknesses persist that are contingent on political decisions.

The capacity and commitment of a small working group, the insufficient equipment and drugs received from the National Administration, the planning of general labor guidelines, and the contribution of other provinces and institutions were not sufficient to develop a consolidated project. The pathology is distributed throughout the provincial territory; it is imperative, therefore, to achieve an articulation with all health regions, working regularly with them regarding parasite removal and health education.

Achieving the staff field training and work in the different operational areas could enable the Zoonosis Department to coordinate and supervise an important training activity.

*Cystic Echinococcosis* causes a significant economic and social cost which is not perceived by officials and far outweighs the investments required for its control. The prolonged stay of patients in high-complexity hospitals involves high state expenses, particularly when considering the stay of a few days in an intensive care unit, at least in cases of lung and abdominal surgeries with complications arising from the pathology.

Visiting these patients allows to detect a deep personal and family uprooting, and the anxiety about the return to their homes where their few belongings were left under the custody of minors and in some cases neighbors.

As regards the prospects and in consideration of the facts, it is to be assumed that fifty years from now, hospitals will continue to operate or treat hydatid patients.

***Hydatidosis*** is a millennial disease caused by a parasite that, in its evolutionary process, assimilated the way to be perpetuated, resulting from its ability to reproduce in two distinct areas, the intestine and the tissue. In the first, it does so in a sexual way; and in the second, in an asexual way, what gives it an incredible possibility of persistence. To this, the high resistance of the eggs in the environment is added.

Currently, the main control tool is parasite removal, which in the future will be complemented by the application of the EG95 vaccine in intermediary hosts, for which a particularly important organization and coordination is required to achieve acceptable immunization coverage. This observation arises from experience indicating a limited joint intervention by state departments. There is a great difficulty in teamwork between multidisciplinary sectors and even more so between different institutions.

There are still many pitfalls to overcome, including in the economic, social, and cultural aspects. People living in isolation, and with a culture established by their ancestors, will not change their behaviors. Therefore, the presence of the parasite will persist in the areas where it is installed. That is, changes will only be achieved when roads, schools, and health care facilities are built, and the state decides to provide the means to guarantee the rights of rural families.





## VIII

### Summary of Diagnosis Control and Prevention Measures

This chapter is intended to be concrete in diagnostic measures, both in the final host, in the intermediary and in the human carrier (accidental host).

- **Diagnosis in the ultimate host**

Although all canids can be hydatid definitive guests, in our country it has only been diagnosed in the domestic dog (*canis lupus familiaris*).

A diagnosis of etiological certainty is the coprological study, consisting of the analysis of fecal matter with a salt called Arecoline Bromide. The latter is a vermifuge, which stimulates intestinal peristalsis and eliminates intestinal parasites.

- **Preparation of the antiparasitic:**

Dissolve the salt in one liter of distilled water, in proportion to 1.5% by weight, then add 150 grams of sugar. This solution is administered by mouth, at a rate of 5 cm<sup>3</sup> per dose. It is expected to have an effect within the next 20 to 40 minutes in 80% of the animals. If fecal matter is not evacuated,

an additional 3 cm<sup>3</sup> can be administered, and wait for 40 minutes more.

It is quite common to find other tapeworms in the evacuation (*Tenia hydatigena*, *Dipylidium caninum*, etc.) or nematodes such as *Toxocara canis*, also zoonotic and important for public health.

The diagnosis of *Echinococcus granulose* with this methodology is made on a black tray where the fecal matter is placed. There, the parasite presenting its head and 3 proglottids, about 3 to 5 mm long and 0.5 to 2 millimeters thick is observed.

Parasitized dogs have no pathognomonic symptoms, i.e., no symptoms to suggest that the animal is parasitized.

The alternative to testing with Arecoline is the detection of fecal antigen by enzyme immune assay (ELISA). Currently, these indirect techniques allow to identify infestation from dog fecal matter, and can subsequently be confirmed by copro PCR, an alternative, although of higher cost.

CoproElisa classifies each livestock establishment or rural domicile, with a diagnosis of present or absent transmission. This classification is done in the laboratory after identification, even if it is a single positive sample. (Guide to the Prevention and Control of Hydatidosis at the local level: South American initiative for the control and monitoring of cystic echinococcosis/ Hydatidosis- <https://iris.paho.org/handle/10665.2/34173>).

### **Diagnosis in the intermediary guest**

The intermediate guests are always mammals, and particularly ruminants, both large (bovines, buffaloes, etc.)

and small (sheep, pigs, and goats). During necropsy of positive animals, cysts (single or multiple) are observed mainly in the liver and secondary in the lungs, with dimensions ranging from a few millimeters to several centimeters long, from 2 or 3 to 20, or longer. In volume, they would be like a small sphere of a few millimeters to the size of a watermelon or melon.

Cysts have thin, aqueous balloon-like membranes, so they are known as water sagging; there are little heads of *E. granulosus* (EQ) all over the surface of its walls. It is the product of asexual reproduction from a single egg.

Although necropsy is the preferred test, available serological techniques (Elisa), with acceptable sensitivity and specificity, can also be used. They are especially useful in newly infected animals (detected in lambs after 10 days of infestation).

## **In Humans**

Diagnosis of E.Q. in general is based on three pillars:

- 1- Physical examination and epidemiological background analysis
- 2- Imaging diagnostics, which allows to establish the location, stage, number of cysts, as well as their possible complications. X-rays, CAT (computerized axial tomography) or Magnetic Resonance, the parts where cysts may occur throughout the body are diagnosed: muscles, bones, internal organs (heart, kidneys, spleen, pancreas, intestine, etc.), there are even references to retro ocular location. At an exceptionally low percentage in the CNS (Central Nervous System), either brain or spinal cord.

3- Serological tests: ELISA, Western Blot (WB), Indirect Immunofluorescence (IFI) and Indirect Hemagglutination (HAI). Elisa and WB techniques are considered as first choice, the latter is used for confirmation after a positive Elisa. Serological techniques allow for a specific diagnosis. These require the antigen/antibody reaction, which demands the immune response capacity of the host and the contact of this immune system with the antigens (crack or breakage of the germinative layer). A negative serology does not rule out positive diagnosis because serological techniques can have false negative results. Approximately 10 to 20% of patients with liver cysts and 40% of lung cases do not produce detectable serum antibodies, the same goes for calcified or localized cysts in areas of low blood flow.

These tests should be considered with epidemiological data, clinical manifestations, and imaging.

### **Prevention**

Prevention of this and other zoonoses should be done or worked in a comprehensive and multisectoral way, with the approaches of UNA SALUD.

- **On the final guest:**

1º- Do not feed dogs raw viscera unless cooked, boiled, or roasted.

2º- Field dogs should have parasites removed at least 3 times per year with Praziquantel.

- **On the Intermediary Guest:**

1º- Majadas should be handled with dogs that have not been infected with parasitosis.

2º- The EG 95 vaccine, which has produced data indicating

it is very efficient to prevent the disease development in sheep and goats, is currently being produced and tested.

- **On the accidental guest:**

1º- In the case of man, teach about the cycle and ways to avoid infection increasing hygiene measures, especially hand washing (when dogs are touched, they may have parasite eggs in their fur).

2º- Recommend consumption of raw vegetables after a water immersion wash with vinegar for at least 15 minutes (animal faeces may have infected the vegetables)

3º- Consume safe water to prevent infected elements which may be dragged in it.

- **Education:**

This issue is decidedly the most important for all people at risk. They could be prevented by knowing the cycle, risks, and measures to take care of themselves.

I understand that the treatment of this topic should be included in all rural schools. From the initial cycle, students must be taught how to take care of themselves.

I will share a personal experience: in 1998, a case of pulmonary hydatidosis was presented in a 15-year-old boy from El Peñón, a town in Antofagasta de la Sierra Department, in this Province of Catamarca. He was hospitalized and operated on in a sanatorium in the capital city. I asked the patient's parents and surgeons for permission to film the surgery, so I did it with a cassette camera from the Health Ministry.

We then organized a trip to El Peñón to go to the school where the patient attended and gave a class about the evolutionary cycle of the parasite, made a diagnosis of Arecolina in a terrace, and showed the filming of the surgery, with the presence of the patient, since it had been more than

6 months since the operation. We achieved excellent results because not only the students and the educational community learned about the disease, but we also learned from this experience.

### **Treatment in People**

The treatment of this parasitosis has evolved over the years. In the beginning, from the late nineteenth to the end of the twentieth century, the treatment was surgical. Currently, the treatments are basically surgical with drug accompaniment, or sometimes only medicine is used depending on the characteristics of the cyst and the doctor's criterion.

Albendazole is the general purpose antiparasitic, being the dose used of 10 mg/ kg once a day for 3 months.

*Footnote: This book is not dedicated to treatment in people, so the reference in this regard is minimal.*

## **IX Conclusions**

Given the socio-economic and cultural characteristics of endemic regions of *Hydatidosis*, coupled with education and communication problems, it can be inferred that the solution of the hydatids-Echinococcosis problem is complex in the short term.

The following can be concluded from the above:

- 1) The actual prevalence levels of parasitosis are unknown, both in definitive hosts and intermediaries.
- (2) Sociocultural conditions in endemic areas promote the perpetuation of the cycle.
- (3) The control program presents serious political and economic livelihood problems.
- 4) The population's lack of awareness about the disease contributes to its permanence and dissemination.





## **X**

### **Anecdote**

By way of illustration, the Veterinary Physician Raúl Alfredo López describes some cases that occurred in Catamarca which he participated in, revealing in some way what happens “in situ” and taking corrective and preventive actions.

- **The following is his account.**

The Zoonosis area of the Provincial Health Ministry was mainly responsible for canine and feline vaccination since its creation in 1977. I started service in this area in 1983, when the antirabic treatment was its main activity.

At that time, Dr. Gustavo Navarro, who had a farm in the town of Aconquija, was working on the site. He had dedicated himself to the search and control of *hydatidosis*, as many cases of the disease were recorded at that time and continue being so.

Since 1983 till 1992, the activity related to the pathology of this work consisted only of recording hospital cases. We also carried out a search for the parasite in the town of Entre Ríos, Andalgalá Dpt.

From 1992 to 1997, I was not part of the Zoonosis

working group mentioned above. Then, when I returned to the working group, we continued with the activities.

In November 1997, we moved to the Rural Zoonosis Division of the City of Azul, in the province of Buenos Aires, to carry out a training course in *hydatidosis*.

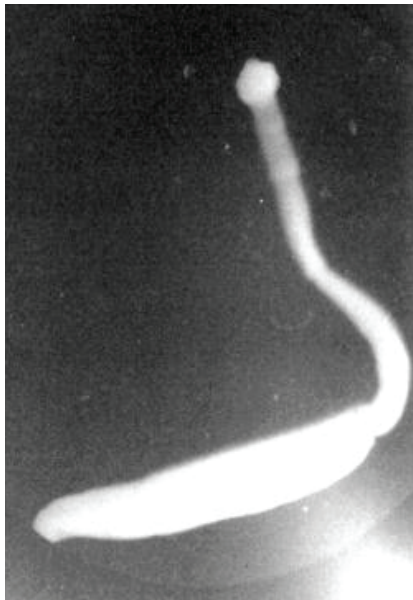
In the theoretical-practical course we got to know about the technique of “*Arecolina diagnosis*”. Arecolina is a vermifuge and parasympathetic drug which increases intestinal peristalsis. In addition, it gets the tapeworms to release their suction cups and/ or hooks from their head and so they leave the body of the animal. On that occasion, I had the opportunity to be the only participant who found an *Echinococcus granulosus* tapeworm in a dog from the farm where the practical activity took place.

Back in the city of Catamarca, we began to organize trips to look for the parasite. First, we went to Belen Dpt. as it was the area where more cases were reported.

After visiting the place twice without getting results, we found a dog in La Puntilla, a town in Tinogasta Dept, on the third trip. This animal eliminated many parasites in the fecal matter. They were genetically studied by Dr. Mara Rosenzvit, who found they belonged to the cow strain **G5**, first identified in the country. This happened in the first months of 1998.

At that time, I designed an action program for the control of *hydatidosis*. A key part in it was education, because I thought that filming surgeries and showing them at the patient’s place of origin will make visible and demonstrate the importance of the disease.

I also had the opportunity to take photographs of the *Echinococcus granulosus*, obtaining the following images



Next, we will show some cases.

- **Case 1**

A 15-year-old teenager, from the Puna town of El Peñón, Antofagasta de la Sierra Dept., had a cyst in a lung and was

hospitalized in the capital city. With the permission of the intervening surgeons, I filmed the surgery performed on the teenager, using a cassettes camera.

During this surgery, when attempting to split the cyst, the size of a duck egg, it broke and a crystalline liquid like water leaked out. The patient was given Albendazole, to prevent hydatid spreading.

The event of the breakage of the cyst reminded me of the story mentioned in the Bible, telling that Jesus on the cross was stabbed in his chest with a spear, and a crystalline liquid like water leaked out of the wound. We should remember that Hippocrates has mentioned something referring to people who died from bags of water that broke inside him, already 400 years BC, which makes us suspect about the possibility that Christ had a hydatid cyst which caused the water coming out of his body as mentioned in the Bible.

After a few months, I was able to travel to El Peñón and there I made an “Arecolina diagnosis”, with the collaboration of one of the teachers at the local school. Then, I gave a talk where we projected the video of the operation.

As on all diagnosis practices, dogs eliminated **hydatid genic tapeworms** and given their length, people got impressed and requested Praziquantel tablets to remove them.

The **hydatid genic tapeworms** confirm that dogs eat raw viscera of minor ruminants, since the intermediate stage of this **tapeworm** develops in the intestines of these animals (goats or sheep), so the cycle of **Echinococcus granulosus** can be fully fulfilled.

I could meet this patient ten years after the operation, and he was perfectly fine.

- **Case 2**

2008 was a year in which more cases came out, with

a total of 22. We will describe the case of the only patient registered with a brain cyst, 3 to 4 cm in diameter. In the images, the characteristic double membrane could be seen, one corresponding to the cyst itself and the other manufactured by the human organism to isolate itself from the foreign body.

Although the patient had been living in the Capital City for a few years, he was originally from the town of Esquiú, in La Paz Department, in the eastern region of Catamarca. a young doctor at the San Juan Bautista Hospital in the Capital City had been taking care of this patient, and he had been administering albendazole daily, at a rate of 10mg/kg bodyweight for a year, making the symptoms of hemiparesis at the beginning of the procedure disappear. The recovery was complete, to the point of avoiding brain surgery. It has really been a success.



We will only mention that within 9 months of starting the treatment, the germinative membrane of the cyst had

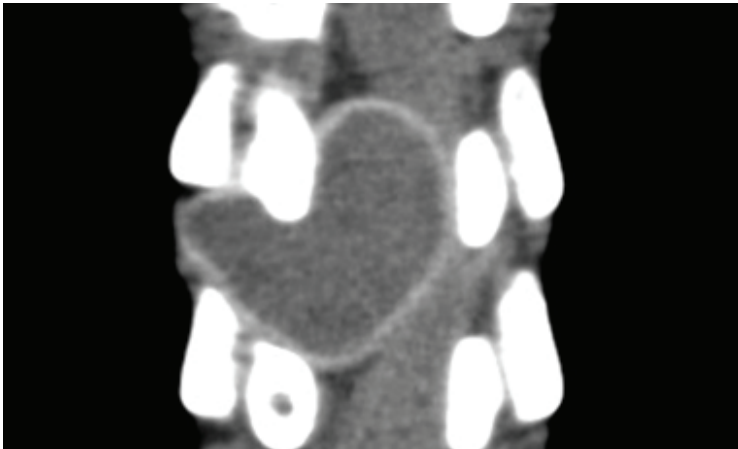
already retracted taking the form of a star, and after about 6 years there was only one scar left at the site of the cyst. (The images above show this situation)

- **Case 3**

This was the case of a 23-year-old patient from the town of San Antonio de la Paz, La Paz Dept., in the eastern region of Catamarca. He arrived at the San Juan Bautista Hospital in the Capital City without having been able to walk for 6 months.

Among the studies carried out, a Computed Axial Tomography (CAT) was carried out, and a cyst compatible with hydatidosis located in the medullary cavity was found between the fifth and sixth vertebrae.

The following image illustrates this case.



The patient began with the conventional drug procedure, daily Albendazole at the rate of 10 mg/kg weight. After a month, the patient began to move her legs; and after two months of admission and treatment, she could walk about with a medical walker, and could even bathe alone.

This patient remained alone for days because her partner was caring for their children. They had an unconventional relationship, because the man lived in polygamy with the patient's sister, with whom he also had children.

A very particular cultural socio-aspect is shown here as part of our customs. It also shows how certain health-related aspects are dealt with.

Seeing she had no support for days, I bought her mineral water, also a notepad and color-pencils so she could entertain herself while she was at rest. I also bought her underwear and pajamas because she did not have clothes to get changed. But this led the patient to tell me that her partner did not want me to go visit her anymore.

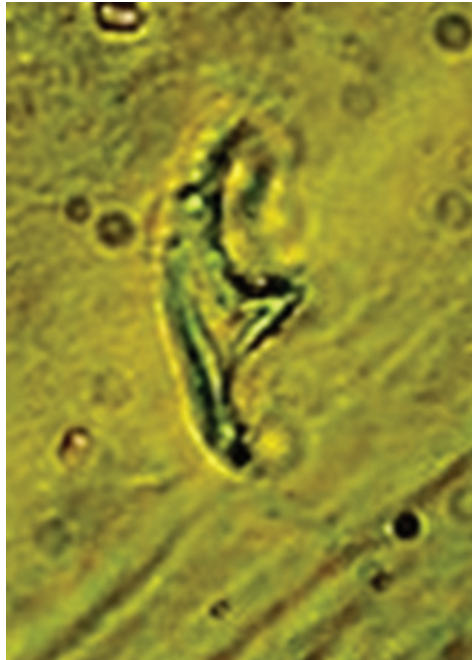
During the surgery, I had the opportunity to take pictures and film. On that occasion, when the bone arch was removed from the medullary cavity, the cyst broke, so I could have some of the content for later research.

In this liquid, I could observe under a microscope of the laboratory of the Children's Hospital, the typical hooks of the parasite proglottid, confirming the pathology.



*Typical Echinococcus granulosus Protoscolices hooks from the patient described.*





*Typical Echinococcus granulosus Protoscolices hooks from the patient described.*

Serological studies had been done with negative results. Evidently, the parasite had not had contact with the patient's immune system.

This patient never returned to the hospital, although doctors told her that she should be operated on again to fix part of her spine. The person was not sought to track her evolution.

• **Case 4**

The patient was a lady, about 50 years old, with a liver cyst. She lived in Palo Blanco, a town of Tinogasta Dpt. I used to visit her and many other patients and I told them what the

cycle of the disease was like, and how contagious it was.

This lady gave me an especially important and cute gift. After I spoke for a while and explained everything related to her situation, she told me that she already knew about it; so, I asked her how she has got to know about this disease. She mentioned that the boys at school had told her what it was like. I remember that the previous year I had visited that educational unit to give them a class on the disease. It was a beautiful gift to know that those students had listened carefully and could have also told others what they had learned.

This case allowed me to appreciate the value of teaching, which must be permanent. Education improves people's lives.

These are some of the many patients we saw and who were provided with the antiparasitic.

#### **. Special case**

This was a field experience which illustrates and makes us think about the general purpose of this book.

On the many diagnosis practices of Arecolina that we made in our Province and in others, we always collected teachings.

On the arecoline diagnosis, the presence of different parasites is quite common: round parasites such as *Toxocara canis* and flat parasites, or tapeworms such as the *hydatigena* tapeworm and *Dipilidium caninum* (parasite with characteristic segments or proglotides in the form of melon seeds), and other tapeworms of which we did not make diagnoses with certainty.

In the case of *Dipilidium caninum*, its intermediate host is the flea, in whose body a metamorphosis or evolution occurs necessary for this parasite cycle, which happens when dogs consume fleas which in turn ingested *Dipilidium caninum* eggs.

It called our attention that, when we made the arecoline diagnosis in the areas of Puna, or in El Peñon, Antofagasta

de la Sierra Dpt., the presence of *Dipilidium caninum* was not detected in the defecations, which led us to seek for the reason why this had happened. We concluded that fleas do not withstand extremely low temperatures, as their egg posture is in the soil. Winters are very cold in these geographical areas, with temperatures reaching more than 20 degrees Celsius below zero.

For this reason, if the intermediate host does not exist, there is no possibility that the cycle will be performed or closed.

**Efforts should therefore be multiplied to prevent and avoid situations like those described above and many more; they are all painful and not always with a happy ending.**

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***CYSTIC EQUINOCOCCOSIS/HIDATIDOSIS***  
***Parasitosis Milenaria***

**And its impact on the Province of  
Catamarca, Argentina**

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This work is intended to be a useful contribution to society, and it deals with a parasitosis recorded thousand of years ago, which is totally manageable if the correct prevention measures are taken. These measures depend mainly on the way most of the population behave.

The author's motivation to write this work is to make one aspect of zoonosis known because it is unnoticed by most people, and only specialists in the subject and the persons who suffer the disease pay attention to it.

Hydatidosis is, undoubtedly, a disease contracted without being conscious of it, and it is detected when it is at an advanced stage of development.

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