



## ***BOVINE CYSTICERCOSIS***

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**elika**

Fundación Vasca para la  
Seguridad Agroalimentaria

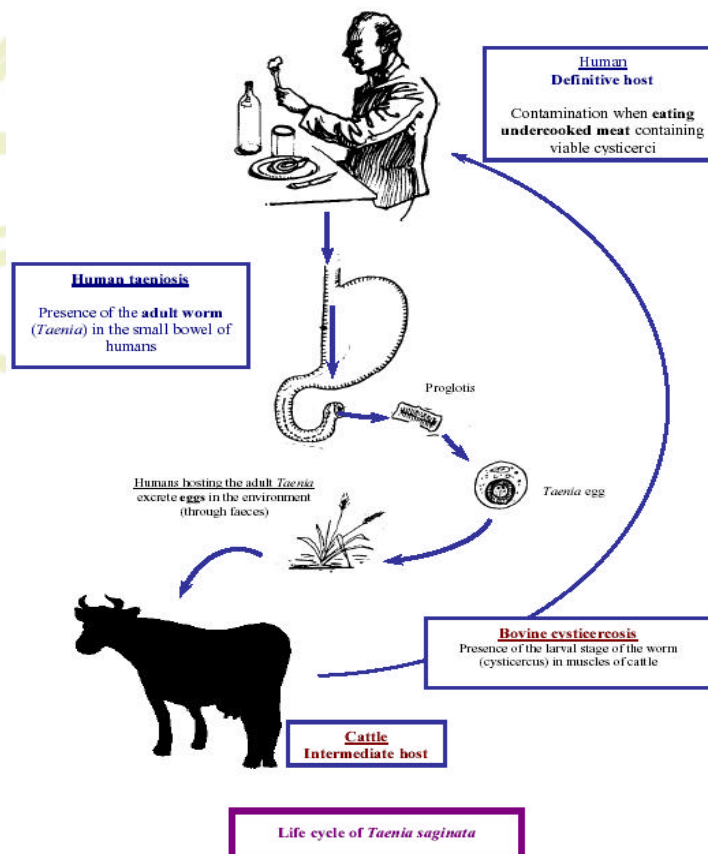
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# 1.- COMMISSION

The Scientific Committee of Erika has been requested to evaluate the risk of the presence of *Cisticercus bovis* in foods and to assess its magnitude in the Basque Autonomous Community. Likewise, the Committee has been asked to give its opinion about the need to carry out some kind of measure in order to prevent, reduce or minimise the risk and/or, if appropriate, to carry out some kind of additional research into this subject.

# 2.- BACKGROUND

Tapeworms are intestinal parasites found all over the world, which have infected human beings for thousands of years. There are two kinds of taeniasis, one caused by *Taenia saginata* and the other by *Taenia solium*. Both infestations are indirect, as human beings acquire them by ingesting beef or pork infected with with parasites. Human beings are the definitive host and the cows and pigs are intermediate hosts.



Bovine cysticercus is caused by *Cysticercus bovis*, which is the cystic larval form of the human tapeworm *Taenia saginata*

*T. saginata* is a cestode, segmented, hermaphrodite, from 4 to 12 m in length, whose definitive hosts are human beings. It consists of a head or scolex, with four suckers, followed

by a short unsegmented section, called the neck or germinative area, and the rest of the body or strobile made up of proglottids.

The *T. saginata* begins its infectious cycle (figure 1) when its eggs are released into the environment with human faeces, contaminating the pastureland. The eggs can live for long periods of time, depending on temperature and humidity. Under favourable conditions they can survive up to six months in pastureland, two and a half months in manure and one month in river water.

The eggs can be disinfected by radiation, drying, heat and also by using copper carbonate.

On being ingested by cattle, the intestinal medium of the animal causes the casing of the eggs to dissolve, releasing the embryo. By using its hooks the embryo crosses the intestine, enters the lymphatic circulation and bloodstream and reaches the muscular tissue of the cow, establishing itself and developing into a cyst. Finally it turns into a larva (bovine cysticercus). The preferred areas are the masseter muscles, tongue, heart and diaphragm. Cysticerci are visible 10-14 days after infection and are infectious after 10-12 weeks. Cysticerci can become viable (infectious) for up to 2 years. Later they degenerate and become calcified.

A single viable cysticercus can be enough to infect one person, although this will also depend on other factors, such as the immunity of the host. When a person eats beef containing a viable cysticercus (undercooked), due to the action of his gastric juices, the cysticercus sheds its cystic casing and secures itself to the small intestine with its suckers, and develops into an adult parasite. The last parts of the body, mature proglottids filled with eggs, become detached and are expelled with the faeces, contaminating the pastures, thus completing the cycle. From 2 to 3 months elapse from the moment of infection until the expulsion of the mature eggs.

An adult tapeworm can have up to 2000 proglottids and can expel from 6 to 9 proglottids per day. One proglottid contains approximately 80,000 eggs, which means 500,000 per day.

Some people have a high tolerance of parasitosis, with slight or negligible disorders. A number of symptoms may appear, such as abdominal pain and nausea. The obstruction of the lumen of the appendix sometimes causes acute appendicitis. Allergy symptoms can also appear, such as urticaria and cutaneous pruritus. The general symptoms are changes in character and disturbed sleep patterns, cephalgia and lack of appetite.

On the other hand, bovines do not show any kind of symptomatology although in massive infestations, symptoms may include salivation, anorexia, fever, serious heart disease due to the degeneration of the myocardium, and sudden death due to cardiac collapse.

The infectiousness of cysts in beef is affected by temperature and other kinds of treatments. The cyst dies at the following temperatures:

- Frozen meat: 15 days at -5°C  
9 days at -10°C  
6 days at -15°C
- Cooked meat: 50-60°C

- Radiation: 100 K rad

The disease is controlled with the implementation of adequate hygienic measures and with meat inspections.

Bovine cysticercosis is controlled in EU member countries through the performance of veterinary inspections in slaughterhouses.

Royal Decree 147/1993, establishes the conditions for producing and marketing fresh meats. In veterinary inspections, the following procedure is established for bovines of more than six weeks old. The external masseter muscles are examined. It is advisable to make two incisions parallel to the mandibula, as well as the internal masseter muscles (internal pterigoid muscles), in which an incision is made. The tongue is examined visually and felt. The visual examination is also made of the pericardium and the heart, the latter by means of a longitudinal incision, opening ventricles and crossing the intraventricular wall. Visual examination of the diaphragm.

The official vet declares carcasses with generalised muscular cysticercosis as not fit for consumption.

On the other hand, fresh meat that shows an infestation of non-generalised *Cysticercus bovis* must be subjected to a cold treatment: -7°C for at least 21 days or at -10°C for at least 14 days.

One study (1990) carried out on cattle slaughtered in Belgium, indicates that the number of cows infected with cysticercosis has fallen from 0.3 to 0.03% over the last 20 years, according to official data. A more exhaustive examination of slaughtered cows pointed out that 9.5% of these animals were infected with cysticercosis. According to this study, the discrepancy between these pieces of data was due to inappropriate detection techniques used in slaughterhouses. On the other hand, and based on information on sales of antiparasites used to combat cestodes as of 1980, the incidence of *T. Saginata* is estimated at 0.4%.

Prevalence of Bovine Cysticercosis and the incidence of human Teniosis in several European countries.

Country	Prevalence* Cysticercosis (%)	Incidence** Teniosis (%)	Reference***
Denmark	0.1-0.7	0.02	Ilsoe <i>et al.</i> , 1990
Germany:			
East	4.5-6.8	0.33-0.62	Mobius, 1993
West	0.4-0.8	0.09	Zimmerman, 1985
Holland	1.8-2.2	0.14	Van Krapen & Buys, 1985
Belgium	0.03-0.2	0.26-0.46	Geerts <i>et al.</i> , 1992
Spain	0.007-0.1	---	Garate, 1999
Poland	0.24	1.64	Pawlowski, 1999
Italy	0.02-2.4	0.02-0.04	Batteli, 1999

\*According to slaughterhouse data

\*\*Based on the sale of specific anti parasites

\*\*\*Surveys carried out in different periods of time and with different designs

In another study carried out between November 1997 and in June 1988 with the aim of determining the serum-epidemiological prevalence of *T. Saginata* cysticercosis in cattle slaughtered in 20 slaughterhouses in Belgium, 1164 samples of serum were collected. Veterinary inspections in slaughterhouses were carried out a regular basis. Samples of serum were analysed in search of parasitic antigens by using the ELISA method. Thirty-six samples (3.09%) were positive compared to 3 carcasses (0.26%) detected by routine inspection methods. The serum-prevalence detected in this study is 10 times greater than the annual prevalence of cysticercosis detected by inspection services in slaughterhouses.

There are no detailed studies of the prevalence of cysticercosis or of the factors that cause this on livestock farms. A study carried out in Denmark on the factors that cause bovine cysticercosis indicated that the most important form of infection was access of cattle to streams contaminated with sewage. Moreover, most sewage treatment plants are not designed to eliminate *T. Saginata* eggs.

With regard to the incidence of *T. saginata* in human beings, there is not very much information available, although it is estimated that levels are low in Europe. Estimated data is obtained from sales of specific anti-parasites (niclosamide, praziquantel).

For laboratory diagnosis, the WHO mentions a number of different methods for the detection of *Taenia spp* eggs: direct fecal frotis, concentration methods, perianal frotis, antigens in faeces, etc.

For the case of bovine cysticercosis, there are a large number of surveys on the different methods of immunological diagnosis, although none of them at attain 100% sensibility.

With regard to the risk factors for bovine cysticercosis, the following can be mentioned:

- Presence of *T. saginata* hosts on livestock farms.
- Poor hygienic practices on livestock farms.
- Defecation by human beings on pastureland.
- Contamination of pastures, streams and watering holes by sewage.

The most important factor in the infection of human beings is the consumption of undercooked meat.

In its decision issued on September 27-28 by the Scientific Committee of the European Commission, with regard to the control of teniasis/cysticercosis, the following recommendations were adopted:

- Creation of an awareness of teniasis/cysticercosis among doctors, vets, producers of meat products and consumers through adequate training and information.
- Epidemiological study on the incidence of *T. saginata* in human beings.
- Improve analytical tests for detecting cysticercosis in slaughterhouses, such as antigen detection tests.
- Notification of cases of *T. saginata* in a standardised manner within the EU.
- Within the concept "from the farm to the table", review the systems used in the production of animals in order to produce animals free of cysticercosis in Controlled Production Systems.

On the other hand, Royal Decree 2459/1996 establishes the list of animal diseases that must be declared compulsorily and the regulations concerning their notification. Bovine

cysticercosis is found in section C of Annex I. This disease must be notified in an annual report, and for information purposes, by the Autonomous Communities. This information will be transmitted later to the World Organisation for Animal Health (OIE).

Bovine cysticercosis is found in list B of the OIE of transmissible diseases which are considered to be important from the socio-economic and/or health viewpoint at a national level, whose repercussions in the international trade in animals and products of animal origin are considerable.

These illnesses are, in general, the subject of an annual report, although some cases, in accordance with the provisions set out in Articles 1.1.3.2. And 1.1.3.3. of the *International Zoosanitary Code*, these may be the subject of more frequent reports.

The data recorded by the Microbiological Information System (between 1999-2002) with regard to cases of *T. saginata* and *Taenia* spp, is shown in the following table.

Year	1999	2000	2001	2002	2003*
<i>T. saginata</i>	19	19	29	39	24
<i>Taenia</i> spp	47	29	39	37	10

\*Data committed up to week 21

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