PATHOLOGY OF NEONATAL INFECTION OF CALVES WITH CYSTICERCUS BOVIS

K. BLAŽEK, J. SCHRAMLOVÁ and J. KURSA*

Institute of Parasitology, Czechoslovak Academy of Sciences, Prague, and *Agriculture University, Osaké Budějovice

Dedicated to Prof. V. Dyk D.Sc. on the occasion of his 70th birthday.

Abstract. It was demonstrated that the tissue reaction around the developing C. bovis in neonatally infected calves (4 days after birth) differs quantitatively and partly also qualitatively from the reaction in calves infected at the age of several months. In neonatal infection, the foet caused by cysticerci were 3-4 times smaller on day 14 p.i., and after 34 days, the cysts were quite transparent and similar to those occurring in older calves not before 42-50 days p.i. The tissue eosinophilia was lacking and the activation of fibroblasts and collagen formation was markedly weak. There was a surprisingly low number of cells of lymphoid type. The growth of the cysticercus and its morphological differentiation was only insignificantly more rapid. The serological tests (IFA, MFA, IFR) repeated four times (10-34 days p.i.) were negative in one calf, whereas in the other one, slaughtered on day 14 p.i., positive results were obtained only in IFR (1 : 10).

The cysticercosis has not been reported very often in calves in Europe, but it is not exceptional, as it follows from some literary data (Ziegler 1929) and information of workers of the veterinary service. It occurs more frequently in Africa, where some authors recorded cysticerci even in 3% of slaughtered calves (Canham 1946 ex McManus 1990, Ginzburg 1960, McManus 1990).

In some cases, remarkably large cysts or cysticerci at a late stage of differentiation were observed even in newborn or very young calves. This led the authors to the idea about a possible intrauterine infection (Heue and Buchwald 1978, Mango and Mango 1972, McManus 1960, Stais and Mann 1975). A direct evidence of prenatal infection, however, was obtained only by McManus (1960) who found cysticerci in 3 of 549 examined foetuses from cows suffering from cysticercosis.

The cysticercosis in calves exhibits both morphological and physiological peculiarities. The resistance to later reinfection does not develop in infected newborn (up to I week old) calves, whereas the calves first infected at the age of 4-6 months are resistant to reinfection (Soulsby 1962, Sewell and Gallie 1974). In neonatally infected calves, the humoral antibodies appear later and in lower titres than in calves infected at the age of 3 months (Sewell and Gallie 1974). It was therefore interesting to ascertain what is the organ reaction to the infection in newborn calves, in which the immunological response is deficient, and what is the course of cysticercus development. These questions have not yet been reported in the literature.

MATERIAL AND METHODS

Two newborn calves of dapple-red breed were used in the orientation experiments. At the age of 4 days, they were infected perorally with 25 000 eggs of Taenia saginata by means of a stomach tube. Both calves came from a farm, where no cysticercosis occurred. Immediately after birth they
were separated from their mothers and fed with milk. One calf was slaughtered on day 14, the other on day 34 after infection. At autopsy, the skeletal muscles and heart were cut in about 0.5 cm thick sections and samples for histological and electron-microscopic examinations were immersed in 10% neutral formal and glutaraldehyde. Paraffin sections stained with haemalum-eosin, Van Gieson’s method, Weigert’s method for elastic elements, toluidine blue, Sudan black and Rósa’s method were used for histological examinations. Some blocks were serially cut. The samples for the electron microscopy were fixed in 3% glutaraldehyde in 0.1 M cacodylate buffer and postfixed in 2% OsO4 in 0.1 M cacodylate buffer. The material was dehydrated through graded alcohol series and embedded in Epon 812. Ultrathin sections were contrasted with uranylacetate and Reynolds’s solution.

The findings were compared with those from several-month-old calves infected for 14 and 28 days (Blaszk et al. 1981).

RESULTS

Findings in calf slaughtered on day 14 p.i.

On clinical examination, bad nutritional condition, cough and edema in submandibular region were found. The serological examinations (IFA, MPA, IFR) were negative at the beginning of the experiment. At the end of the experiment, i.e., on day 14 p.i., IFR was positive (1:40), whereas both IFA and MPA were negative. Laminar deposits of fibrin were observed on the serosa of abomasum and on the mesentery. The mesenterial vessels were about 5 mm thick, stiff and of grey-white colour. The heart was characterized by fibrous flat adhesions of pericardium and epicardium, particularly in the region of vestibules, and rough surface of almost whole epicardium with grey, not sharply demarcated and slightly protruding flat foci. A cystercercus appearing like a white focus measuring about 1.5 mm in diameter and surrounded by a transparent field of 2 x 4 mm was found on the anterior wall of left ventricle. In skeletal muscles, the cystercerci were found mostly in neck and diaphragm, but they were lacking in muscles and oesophagus. The lesions were inoperculous grey focus mostly not more than 1 mm in diameter, exceptionally measuring 1 x 2 mm. They were solid, sometimes slightly opalescent. Lungs, liver and kidneys were without pathological findings.

Histological examinations revealed a circular zone of leucocytes around the larvae which was separated by collagen fibres from the peripheral zone of vascularized granulation tissue with remnants of atrophic muscle fibres. Sometimes the cystercercus was surrounded by cells with a foamy plasma and by leucocytes. This zone was surrounded by a zone of granulation tissue without any distinct demarcation. The granulation tissue consisted of macrophages and activated endothelia, contained numerous plasmaocytes and occasional lymphoid cells. A conspicuous inflammatory activity was observed in the granulation tissue. The formation of collagen was minimal and was represented only by fine fibres. A dilatation of capillaries occurred in the vicinity of the described foci. Sometimes the course of the vein could be followed to a great distance, where the structure of vessel wall was distinct, whereas in the region lying closer to the focus with cystercercus, its wall was only shadowy and eosinophilic. The vessel lumen contained leucocytes and cellular debris. The reaction in heart muscle was somewhat more pronounced and a crescent-shaped necrosis of tissue occurred around a pole of the cystercercus.

The larva was mostly bladder-shaped, elongated, with fine cells sparsely distributed at the periphery of section and clustered in a cone on one pole. The tegument was covered with microvilli and contained numerous spherical and rod-shaped osmiophilic bodies.

Observations in the electron microscope revealed macrophages with numerous large multivesicular bodies (phagosomes), lipid droplets and large number of ribosomes.
in polysomal configuration (Plate I, Fig. 1). The lymphocytes and lymphoid cells possessed a voluminous plasma and numerous mitochondria. The mitochondria were often swollen, with sparse cristae, or the cristae disappeared (Plate II, Figs. 1—3). The fibroblasts had no morphological characters of a pronounced activity. The granular endoplasmic reticulum of plasmacytes formed cisterns which were not yet arranged in the manner typical of mature plasma cells (Plate I, Fig. 1). The plasma of few granulocytes contained osmiophilic granules, lipid droplets and vesicular structures.

If these changes were compared with those occurring in a six-month-old bull at the same time after infection, there was a marked difference in the appearance and microscopical composition of changes; in the bull infected at the age of 6 months, the lesions were conspicuous, measuring about 4 mm in diameter, the foci were of grey-yellow colour with a slight green tinge. In their centre was a red or green pasty-like matter. Histological studies revealed a wide necrotic zone around the larva with remnants of necrotic and sometimes calcified muscle tissue. A wide rim of eosinophils was at the periphery of the zone. They infiltrated even a widened perimysium internum in the vicinity. This zone was surrounded by a region of granular tissue with activated fibroblasts and numerous lymphoid cells. The lymphocytes occurred even in a wide vicinity of the lesion. There was a marked formation of collagen.

The foci in neonatal infection were up to 4 times smaller and inconspicuous. The zone of necrosis around the larva was small (if it occurred at all) and the cellulization in the vicinity was not wide (Fig. 4). There occurred conspicuous macrophages and large histiocytes with a light plasma, occasionally also an activated reticular cell. The eosinophils were almost absent, the activation of fibroblasts was weak and fibroplasia minimal.

Findings in calf slaughtered on day 34 p.i.

No deviations were observed on clinical examination. The calf only used to lie and did not like to get up. Serological examinations (IHA, MPA, IFR) were quite negative both at the beginning of the experiment and in its course (14, 26 and 34 days p.i.). At autopsy, severe cisticercosis was found in almost all skeletal muscles, with the exception of masseters, in which the cysticerci occurred only occasionally (5). The muscles of mesos muscles contained 10 cysticerci. They were not very numerous even in the diaphragm. Although the cysticerci occurred very sparsely in the tongue, they were numerous in the muscles under the tongue. The cysts were mostly thin-walled, transparent (measuring 2 × 3—3.5 × 5 mm), with a disc-shaped thickening of grey-white colour at one pole. The scolex was clearly visible through their wall. The cysticerci could be easily removed from the cysts. There occurred very frequently elongated cysts with a red cup-shaped structure at one pole. The structure bleeded when it was cut. Large transparent cysts with large cysticerci possessing a conspicuous scolex were situated subperiosteally on the heart. However, there were also yellow cysts and small elongated foci of grey-white colour. The cysts reached the size of 5 × 5 to 7 × 5 mm. The largest cysticerci removed from the cyst measured 6 × 4 mm. The lungs contained 25 cysts situated subpleurally in the interstitium, sometimes even in the depth of lung parenchyma. The knots were tough, grey-white and some of them possessed a transparent wall. They measured 2.5 × 3 mm. Rather numerous grey-white foci measuring about 2 mm in diameter were observed in liver both on the surface and in the parenchyma. There occurred also transparent cysts without a reaction around them (3 × 4 mm), from which a surprisingly large cisticercus (even 5 × 4 mm) could be easily recovered. The digestive tract was without any pathological change. A spherical yellow body measuring 3 mm in diameter was found on the surface of one kidney.

Histologically, the transparent cysts were lined with endothelium and had a fine wall. The weak cell infiltration of the wall was lymphocytic. There were erythrocytes and a small number of eosinophils between the cyst wall and cisticercus. In the vicinity it was a marked dilatation of blood vessels, sometimes with thrombus, and a dilatation of lymphatic capillaries filled with lymphocytes. In some areas the cyst wall was thickened by an accumulation of epithelial macrophages. In serial sections through the cysts with "bloody" cap on one pole it was found that a widened blood capillary filled with numerous erythrocytes was involved (Figs. 1—3). Sometimes we could demonstrate a direct relation of the lumen of such a cyst with a dilated vessel in its proximity, which was surrounded by an inflammatory infiltration. The cysticerci in the latter 10 cysts was surrounded by erythrocytes, or the erythrocytes, or the cells with foamy plasma and lymphocytes were accumulated in one part of the cyst lumen, whereas in the opposite one, they occurred only in a small number between the bladder wall and cyst wall. At the sites near the opening of the spiral canal, large cells with a light foamy plasma formed a wedge-like structure embedded in the interstitium. There were numerous plasmocytes, groups of eosinophils and lymphocytes, which were mostly accumulated at the periphery of the lesion. Foamy macrophages near the cysticercus had a markedly vacuolated plasma and a horse-shoe-shaped nucleus and they were not close bound as at the periphery of the described wedge-like structure, where a slit-like lumen was sometimes visible among them. A layer of light, somewhat flattened cells was also found at the periphery of the cyst beneath the endothelium. The plasma of these cells, which got into the cyst cavity, contained erythrocytes and hemosiderin. In the vicinity of the part of the cyst which was filled with the erythrocytes was a hemorrhage and abundant deposition of hemosiderin. Hemosiderin was demonstrated in the cells with foamy plasma around the cyst periphery and in basophilic parts of the thickened basal membrane. The dystrophic calcification was only slight and limited to parts of dystrophic collagenic fibres. The cysticercus had a developed scolex with wide spiral canal and...
relatively well differentiated, but still rather cellular suckers. Its tegument was covered with microtriches and was filled with numerous vesicles. The osmiophile bodies occurred only occasionally.

Some cysts from the heart were of a similar structure as those from the skeletal muscles, they usually possessed only a narrow rim of lymphocytes and enormously dilated vessels with thrombs were encountered in their proximity. Around them were large, light cells, plasmocytes and a small number of lymphoid cells. The covering cells of epicardium were cubiform. The liver contained strongly dilated veins at the periphery of lobules, without reaction or with marked inflammatory changes in the wall. Sometimes there were clusters of large cells with foamy plasma or occlusion with organized and partly calcified thrombus. The solid nodule found suberosely on one kidney was a granuloma from epitheloid cells bordered by lymphocytes. The wider vicinity was infiltrated with lymphocytes and plasmocytes. The histological examination of cysts from lungs did not supply any surprising results. Their wall was only slightly infiltrated with lymphocytes, inside them were eosinophilic or again light cells with foamy plasma. The lumen of subepithelial lymphatics contained macrophages.

As it was said above, the cellular reaction was weak. The electron microscopic examination showed that the plasma of macrophages contained numerous ribosomes, but only few and small multivesicular bodies and remnants of membranous structures (Plate III, Fig. 1). Some macrophages contained vesicles or some parts of plasma were thin. The lymphocytes were of a typical structure. No increase and swelling of mitochondria, which occurred 14 days after infection, was observed in this case. The fibroblasts had signs of moderate activity and relatively few bundles of collagen fibres were situated in their proximity in a typical manner (Plate IV, Fig. 4), though there occurred also not fully mature forms. The cyst lumen was covered with a continuous layer of endothelial cells, beneath them were fibrocytes and histiocytes. Elastic fibres were demonstrated between the endothelium and other cellular components of the cyst wall in some cases (Plate IV, Fig. 1).

In comparison with the findings on day 28 and 42 p.i. in animals infected at the age of 4 months, the changes in the neonatally infected calf observed on day 34 p.i. were quite different. In neonatally infected calf, the cellular reaction was minimal, the cysts were already completely transparent and the formation of collagen was rudimentary. Not even calcification of the intercellular substance was found.

In the calves infected at the age of 4 months, the foci with cysticerccus are of a nodular character on day 28 p.i. The node around the larva consists of a granulation tissue with numerous lymphocytes and plasmocytes. There is a striking amount of collagenous connective tissue of hyaline appearance in some places and sometimes calcified. On day 42 p.i., the focus has already the character of a cyst, but its wall is still rather cellular and only half-transparent. The cellular reaction at this stage is sometimes very marked even in a wider vicinity of the cyst.

![Figure 3](image)

**Fig. 3.** Detail of inner surface of cyst — blood vessel with cysticerccus. Endothelium (arrows), erythrocytes (Er), sparse lympho-plasmacellular infiltration (In). (x 260).

(Plate IV, Fig. 3). The endoplasmic reticulum in plasmocytes was arranged in a typical manner (Plate IV, Fig. 4), though there occurred also not fully mature forms. The cyst lumen was covered with a continuous layer of endothelial cells, beneath them were fibrocytes and histiocytes. Elastic fibres were demonstrated between the endothelium and other cellular components of the cyst wall in some cases (Plate IV, Fig. 1).

In comparison with the findings on day 28 and 42 p.i. in animals infected at the age of 4 months, the changes in the neonatally infected calf observed on day 34 p.i. were quite different. In neonatally infected calf, the cellular reaction was minimal, the cysts were already completely transparent and the formation of collagen was rudimentary. Not even calcification of the intercellular substance was found.

In the calves infected at the age of 4 months, the foci with cysticerccus are of a nodular character on day 28 p.i. The node around the larva consists of a granulation tissue with numerous lymphocytes and plasmocytes. There is a striking amount of collagenous connective tissue of hyaline appearance in some places and sometimes calcified. On day 42 p.i., the focus has already the character of a cyst, but its wall is still rather cellular and only half-transparent. The cellular reaction at this stage is sometimes very marked even in a wider vicinity of the cyst.

![Figure 4](image)

**Fig. 4.** Comparison of the size of cysticerccus and extent of tissue reaction in neonatal and adolescent animals two weeks after infection. (x 37).

**DISCUSSION**

In neonatally infected calves, the tissue reaction to the presence of larva at the site of its definitive localization is much weaker than in older calves. It is apparent already on macroscopical observation both on days 14 and 34 after infection. Of practical importance is the fact that in the period of 30—34 days, in case of neonatal infection, the cysts on macroscopical examination are quite transparent and relatively large, whereas in calves infected at the age of several months, similar cysts occur usually as late as 42 or, more frequently, 50 days after infection (Blaszk et al. 1981). Consequently, the neonatal infection could be sometimes mistaken for an older infection than it is in fact.

The cellulation at the site of developing larva differs both quantitatively and qualitatively in the neonatal infection compared to infection of older calves. In both cases, the mixture of cells contains macrophages, but in neonatal infection, there is also a striking number of large, light cells with foamy plasma. Their provenance is unclear. They may originate from activated endothelia or from cells of perivascular mesenchyme.
The placemontes and their precursors were detected already on day 14 after infection, i.e., at the age of 18 days. On day 34 p.i., they particularly accumulated near the opening of the spiral canal on the surface of larva bladder. The eosinophiles are lacking in the tissue reaction on day 14 p.i. and they are few on day 34 p.i. in the larva bladder. But as we supposed (Blak et al. 1963), this is not usual, and another character of the neonatal infection is a weak activation of fibroblasts and a poor production of collagen. In older calves, the collagen production is very abundant and it is a conspicuous phenomenon in the early stage of infection. Also the cells of lymphoid type at both time intervals (14 and 34 days) are surprisingly few in number in neonatal infection.

We shall try to evaluate the significance of these findings and to explain the fact, as observed by other authors, that neonatally infected calves can be reinfected, whereas those infected at the age of 3 months (Goult 1962, Sewell and Gallie 1967). The role of macrophages in the specific immune response is known to be important, as they change the accepted antigens and transmit the information to the immuneocompetent cells, lymphocytes (Stirhemb and Fulginiti 1973). Thus the macrophages transmit to the lymphocytes an effective antigenic stimulus (Wilson and Billingham 1967). The lymphocytes sensitized by the antigen produce soluble factors supporting some properties of the macrophages (Stirhemb and Fulginiti 1973).

The role of eosinophiles in the inflammatory infiltrate has been only partly elucidated. It is generally recognized that they occur in exudates in allergic reactions, that they are attracted by specific antigen-antibody complexes, and that they also phagocyte and degrade these complexes (Stirhemb and Fulginiti 1973). They protect the host tissue not only by the phagocytosis and degradation of cytotoxic complexes, but also by suppression of the effect of inflammatory response mediators. Necrobiotic phenomena of inflammation in newborn children revealed a decreased migration of leukocytes and monocytes and deficiency of phagocytic activity in comparison with older children and adults. It is demonstrated that the phagocytic activity of the phagocytes in the cellular and humoral factors, as the phagocytic activity of neonatal leukocytes is normal in the presence of adult serum (Glink and Silverman 1957). It is generally known that a newborn mammal is incapable of producing antibodies to any antigen except to a few common infections. The antibody response appears simultaneously with the ability to produce plasma cells. The immunological deficiency of the newborn mammal lasts several days after birth and the ability of immune response slowly develops later. The level of this ability corresponding to that in adult specimen is reached only during some postnatal weeks (Gooit and Pappermaster 1964). This is supported also by the fact that the development of lymph follicles and formation of peripheral lymphoid tissue, characteristic morphological response to an antigenic stimulation, is a process of lymphoblastic transformation. However, it is not possible for a morphologist to decide whether the development of immunological potency of peripheral lymphoid cells in an early postnatal period is a primary effect of increased cellularity of lymphoid tissue or functional maturing of individual cells (Gooit and Pappermaster 1964).

In our case, there was a striking absence of eosinophiles in the neonatal infection, though the larval antigens were present. Apparently, the antigen-antibody complexes are not produced or they do not occur or it is very limited (34 days after infection). This is probably due to the fact that in the neonatal period, there is a smaller number of some cells, particularly lymphoid cells, which, moreover, are not fully developed. Probably a permissive functional and phagocytic proper is lacking. At the same time, the interaction between lymphocytes and macrophages and cells of other inflammatory stages in immune response is highly improbable. This is shown by Stadler and Mann (1970) in experiment with the scolicid and macrophages in immunized lymph nodes. They are considered to be an organus of lymphocytes specialized for attaching to other cells and for the transport of subcellular material. Wilson and Billingham (1963) in day 34 p.i. is for the transport of subcellular material, and they do not form clumps of memory cells. In our opinion, the sensitivity of lymphocytes during the reinfection is important for the destruction of onco-

spheres which get into the organism during the reinfection. An immunological reaction in neonatal infection with C. botris demonstrated that the cysticerci develops (at least in some cases) in the blood vessel—i.e., in vasculatary. It is indicated not only by the presence of blood in the cysts, demonstration of some typical structures in their wall and observation of the transition of the cyst into the vein during 34 days after infection, but also by the configuration of some lesions 14 days after infection. This localization could be demonstrated in the neonatal infection due to the weak tissue reaction and to the presence of eosinophiles which are very strong in calves infected by T. spiralis during 14 months. The oncochome, which is introduced into the muscle through a hemogenous way, may sometimes damage the blood capillary (mechanically or by its secretion) and later get into the lymphatic capillary, as we supposed (Blak et al. 1963). Another character of the neonatal infection is a weak activation of fibroblasts and a poor production of collagen. In older calves, the collagen production is very abundant and it is a conspicuous phenomenon in the early stage of infection. Also the cells of lymphoid type at both time intervals (14 and 34 days) are surprisingly few in number in neonatal infection.

Of practical importance is the answer on the question whether the cysticerci develops more rapidly in neonatal infection than in calves infected later. This would elucidate whether the large cysticerci found sometimes in very young calves could originate from an endogenous infection, though the advanced stage of morphological differentiation suggests that the infection occurred already during the intrauterine life. Our results summarized in Fig. 4 show that the cysticercal bladder can achieve larger size in neonatal infection than in older calves within the same time period of infection. The rapid growth of the bladder and the transparency of cysts are a usual, soon disease of occurrence and to prediction localizations of cysts are to a weak, soon development.

We have therefore compared the cysticerci from neonatally infected calves also with the cysticerci from older calves after 20 and 42 days of experimental parasitemia. From the data obtained in this experiment, we can conclude that the cysticerci from neonatally infected calves are significantly larger than those from older calves, even though in some cases the typical cysticerci were not observed. This is in accordance with the results of other authors (Ziegler 1929) who have shown that the cysticerci grow at an accelerated rate during the first weeks of infection. The results of our experiments agree with the interesting statement of Ziegler (1929) that the oncochomes get through the blood system into the muscle where they are localized in the capillaries and that quite intact ehrinocytes are often found in cysticercal nodules in suckling calves.

Of practical importance is the answer on the question whether the cysticercus develops more rapidly in neonatal infection than in calves infected later. This would elucidate whether the large cysticerci found sometimes in very young calves could originate from an endogenous infection, though the advanced stage of morphological differentiation suggests that the infection occurred already during the intrauterine life. Our results summarized in Fig. 4 show that the cysticercal bladder can achieve larger size in neonatal infection than in older calves within the same time period of infection. The rapid growth of the bladder and the transparency of cysts are a usual, soon disease of occurrence and to prediction localizations of cysts are to a weak, soon development.

We have therefore compared the cysticerci from neonatally infected calves also with the cysticerci from older calves after 20 and 42 days of experimental parasitemia. From the data obtained in this experiment, we can conclude that the cysticerci from neonatally infected calves are significantly larger than those from older calves, even though in some cases the typical cysticerci were not observed. This is in accordance with the results of other authors (Ziegler 1929) who have shown that the cysticerci grow at an accelerated rate during the first weeks of infection. The results of our experiments agree with the interesting statement of Ziegler (1929) that the oncochomes get through the blood system into the muscle where they are localized in the capillaries and that quite intact ehrinocytes are often found in cysticercal nodules in suckling calves.
ПАТОЛОГИЯ У ЗАРАЖЕННЫХ ЛИЧИНИКОЙ CYSTICERCUS BOVIS НОВОРОЖДЕННЫХ ТЕЛЬЯТ

К. Ближек, Я. Шрамлова и Я. Курса

Резюме. Было показано, что реакция тканей вокруг развивающейся личинки C. bovis у теленка, зараженного в возрасте 4-4 дня после рождения, отличается качественно и количественно от реакции, возникающей у теленка, зараженного в возрасте нескольких месяцев. У теленка, которое заражалось раньше, на 14-й день после заражения пришеецовые очаги были в 3-4 раза меньше, а через 34 дня после заражения шистозомы были совершенно прозрачны и подвижны на языке, встречаемые у старших теленок только через 42-50 дней после заражения. Зооморфная ткань отсутствовала и активация фагобластов и образование коллагена были необъяснимы слабо. Уязвимо было также малое количество клеток лимфоидного типа. Рост шистозом и его морфологическая дифференциация протекали только немного быстрее, чем при серологическом исследовании (коловая реакция гемаглютинации, реакция микропринципиалы в газовом геле и косвенная реакция иммунофлюоресценции) у одного теленка всех реакций, повторные четыре раза, были отрицательными (из 10-34-й дни после заражения), у другого положительные результаты получены только при косвенной реакции иммунофлюоресценции (1: 40) на 14-й день после заражения.

REFERENCES


K. B., Parasitologicky ústav ČSAV, Flemingovo n. 2, 166 32 Praha 6, ČSSR

Received 4 August 1981.
Neonatal infection on day 14 p.i. Fig. 1. Macrophage from the vicinity of cysticercus. Lysosomes (L) and lipid droplets (Li). (×10 000). Fig. 2. Immature plasma cell (×10 000).

Neonatal Infection on day 14 p.i. Fig. 1. Lymphocyte of typical structure (×9 800). Fig. 2. Cell of lymphoid row with increased and swollen mitochondria (Mi). (×23 800). Fig. 3. Lymphoid cell. Glands decreasing in number and disappearing swollen mitochondria (Mi). (×9 800).
Neonatal infection on day 34 p.i. Fig. 1. Contact zone between cysticercus (C) and host tissue (HT). Macrophage (MP) with lysosomes (L) and single vesicular bodies (V). Electron-dense substance (arrows) among microtubules and on the surface of host cells. (x 13200).

Neonatal infection on day 34 p.i. Fig. 1. Part of cyst wall. Endothelial cell (EN), fibrocyte process (FC), lymphocyte (LY), elastic fibres (arrows), and cysticercus (C). (x 7600). Fig. 2. Detail of a part of cyst wall. Microtubules of cysticercus tegument (MT), endothelial cell (EN) and transverse section, through elastic fibres (EL). (x 10000). Fig. 3. Fibroblast (FB), collagen fibres (CO). (x 9400). Fig. 4. Mature plasma cell. (x 7700).