Ovine Toxoplasmosis in Suriname and its Possible Impact on Human Infection

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Summary

This paper reports on the results of a serological survey on toxoplasmosis of sheep in the district of Commewijne, Suriname. A modified agglutination test showed the presence of specific IgG antibodies to Toxoplasma gondii *in 67% of the 106 samples examined. The seroprevalence was not affected by the origin of the samples, the sex and the breed of the sheep and neither by the presence or absence of cats on the premises. It appears from earlier work that an important proportion of the human population in Suriname is seronegative and thus susceptible to this disease. The results of this survey on sheep are discussed with regard to the zoonotic properties of the disease.*

Résumé

Dans cet article les résultats d'une enquête sérologique de la toxoplasmose ovine dans le district de Commewijne, au Suriname, sont décrits. A l'aide d'un test d'agglutination modifié, la présence d'anticorps spécifiques IgG, dirigés contre Toxoplasma gondii *a été démontré dans 67% des 106 échantillons utilisés. La séroprévalence n'était pas influencée par l'origine des échanntillons, le sexe ou la race des moutons, et la présence ou l'absence des chats dans les élevages. Il a été montré dans des études antérieures qu'une proportion importante de la population humaine au Suriname est séronégative et donc susceptible à cette infection. Les résultats de cette enquête sont mis en rapport avec le caractère zoonotique de cette maladie.*

Introduction

Toxoplasma gondii (Nicolle and Manceaux, 1908) is a protozoan parasite of the family of the *Sarcocystidae* which occurs world-wide amongst mammals and birds. The definitive hosts are the cat (*Felis catus*) and other felidae, while due to little host specificity nearly all mammals (including man) and birds can be infected as intermediate hosts (10). The importance of toxoplasmosis lies above all in it's zoonotic properties. Infection of pregnant women can cause severe congenital damage of the foetus, infection in adults can cause fever and lymphadenitis (4), while in immunodeficient patients reactivation of chronic infections can cause generalised and life-threatening infections (7). Toxoplasmosis in small ruminants is one of the predominant causes of infective abortion (4). The aim of this trial was to investigate the extent of ovine toxoplasmosis in the district of Commewijne, Suriname and to analyse the results with regard to the zoonotic potential, using the available information regarding the seroprevalence of toxoplasmosis in humans in Suriname.

Material and methods

The survey was carried out between February and September 1994 in the district of Commewijne, a rural area, east of the capital Paramaribo. In this district sheep are reared in small herds, on a non-economical basis, without (improved) pastures, supplemental feeding, regular worm-drenching or other management measures. Therefore, technical results are bad, production output being low, disease and mortality high. According to a recent survey-report on small ruminants in Suriname (3), 262 sheep are being reared in Commewijne, which represents 3% of the national herd, estimated at 8425 sheep.

Blood samples of 106 sheep of both sexes of the local Creole-sheep and the regional Barbados Black Belly breed were taken by jugular punction. Eighty-seven jugular blood samples were taken on 12 different sheep farms is the district, while the remaining 19 samples were collected at the Paramaribo abattoir. Only animals over 6 months old were sampled, as passively acquired antibodies may persist until the lambs are 5 months old (5). The blood was collected in silicone-coated tubes and cooled to 8°C as soon as possible. After coagulation and clot-retraction, the serum was transferred to cryopreservation tubes, whereafter these samples were frozen at -20°C. Each farmer was asked whether he/she owned a cat or several cats and/or whether (stray) cats would roam on the premises.

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Table 1
Seroprevalence of toxoplasmosis in sheep in the Commewijne district in Suriname

Sheep		N tested	N positive at ≥ 1:40	%
Origin	Alkmaar	9	2	22%
	Jagtlust	18	13	72%
	Marienburg	30	23	77%
	Meerzorg	30	22	73%
	Paramaribo Abattoir	19	11	58%
Sex	Ram	15	7	47%
	Ewe	86	60	70%
Breed[1]	Criollo	71	52	73%
	BBB	35	19	54%
Cat(s) on premises	Yes	43	27	63%
	No	44	33	75%
Total		106	71	67%

[1]Criollo: local breed of the Guyana's and Venezuela
BBB: Barbados Black Belly (imported)

Antibodies against *T. gondii* were determined using the commercially available Toxo-Screen™ DA-test (Toxo-Screen DA, Bio-Mérieux, Marcy l'Etoile, France), a direct agglutination test for the detection of IgG antibodies against *T. gondii*. Each sample was tested at a 1/40, 1/400 and 1/4000 dilution. A sample was considered negative if no agglutination occurred in any of the dilutions tested.

The effects on seroprevalence of sex and breed of sheep, the origin of the samples, and the presence of cats on the premises, were analysed using Chi-square tests.

Results

The results, summarised in Table 1, indicate that 71 out of 106 samples (67%) contained IgG antibodies against *Toxoplasma*. Twenty-four samples gave positive results at 1:40, 12 were positive at 1:400 and 35 were positive at 1:4000.
Seropositive animals were found in all 12 sampled flocks.
None of the observed differences between the parameters involved (origin of the samples, sex, breed or the presence/absence of a cat or cats on the farm), were significant at $P \leq 0,05$.

Discussion

The results of the serological screening show that a large percentage of adult sheep are infected with *T. gondii* (67%). The modified agglutination test used in this study is known to be one of the most sensitive and specific tests for *Toxoplasma*, comparable with the dye test (6). Modified agglutination titres are generally even higher than those of the dye test but as high titres may persist for more than a year post-infection they are not always indicative of recent infection (6). These results indicate that a considerable percentage of marketed mutton contains tissue-cysts and that the handling and especially the consumption of raw or scarcely cooked sheep meat represents a danger for susceptible humans such as pregnant women and immunocompromised patients.
Data on the prevalence of toxoplasmosis in man in Suriname are scarce. Bendter-Leysner (1) reviewed several occasional demographic screenings and routine hospital screenings for the period 1967-1981. An overview of these results is given in Table 2. These data reveal a relatively low seroprevalence of toxoplasmosis, especially in the endangered group of young women between 20 and 39 years of age. An overview of this group is given in Table 3. In Western Europe seroprevalence before pregnancy varies from 75% (France), 53% (Belgium) to 25% (Scotland, UK) (4).
It is surprising that even in townships with bad hygienic infrastructure (sewers, roads, drinking water facilities) and high population density as the Combé-township prevalence would remain at a level of merely 14% seropositives. Several factors may explain this apparent limited risk of transmission and infection. Firstly, cats are not as abundant in Suriname as they are in other parts of the world. Due to religion and/or superstition, lots of people consider cats to be animals of evil and darkness, thus unwanted on their premises. Wherever domesticated cats are kept, the contacts between owner and cat are scarce. Cats always roam (and sleep) outdoors and there is certainly no use of indoor cat-litters, which would appear to limit the contact with cat-excreta. Secondly, nor Javanese, nor Creole, nor Chinese, nor (Amer-) Indian cooking-habits include the consumption of uncooked or scarcely cooked meat.

Table 2
Overview of toxoplasmosis seroprevalence in women at risk in Suriname (1967-1981)

Screening	Year	Area	Test-group	Samples (N)	Test	Treshold titer	% positives
Malaria-campaign	1976	Billiton Mine	20-39 yrs	14	IFAT	1:64	42%
		Ma Retraite	20-39 yrs	22	IFAT	1:64	50%
		Alalaparoe	20-39 yrs	28	IFAT	1:64	67%
		Kambalowa	20-39 yrs	14	IFAT	1:64	7%
		Coronie-district	20-39 yrs	6	IFAT	1:64	50%
		Nickerie-district	20-39 yrs	30	IFAT	1:64	93%
M.W.I.	1979-1982	Maternity	Women (age?)	1998	IFAT	1:100	22%
Total Weighed average				2112			24%

Source: J.M. Bendter-Leysner (1985) (1)
IFAT = Immunofluorescent antibody test
M.W.I. = Medisch Wetenschappelijk Instituut

Table 3
Overview of the surveys on the seroprevalence of toxoplasmosis in man in Suriname (1967-1981)

Screening	Year	Area	Test-group	Samples (N)	Test	Treshold titer	% positives
De Roever-Bennett	1967	?	?	800	?	?	21%
M.W.I.	1975-1976	?	?	100	IFAT	1:64	37%
				?	SFDT	1:64	33%
Malaria-campaign	1976	Billiton Mine	Random	37	IFAT	1:64	40%
		Ma Retraite	Random	59	IFAT	1:64	42%
		Saramacca-district	Schoolchildren 5-10 yrs	100	IFAT	1:64	31%
		Alalaparoe	Trio-Indians	100	IFAT	1:64	36%
		Kambalowa	Negroïds	82	IFAT	1:64	25%
		Coronie-district	Random	123	IFAT	1:64	46%
		Nickerie-district	Random	57	IFAT	1:64	87%
M.W.I.	1979-1982	Maternity	Women	1998	IFAT	1:100	22%
Filaria-campaign	1979-1981	Combé and Tourtonnelaan	Random	623	IFAT	1:100	14%
		Zorg & Hoop and Abrabroki	Random	89	IFAT	1:100	10%

Source: J.M. Bendter-Leysner (1985) (1) M.W.I. = Medisch Wetenschappelijk Instituut
IFAT = Immunofluorescent antibody test SFDT = Sabin Feldman dye test

Meat is always thoroughly cooked, baked or roasted which destroys tissue cysts of *T. gondii* (4). Moreover, mutton in Suriname can be considered an exceptionally expensive meat (2) and is therefore in no way a classic ingredient of Surinamese dishes.
Although the risk of infection by *T. gondii* might not appear to be very elevated, the fact remains that a large percentage of the susceptible population (young women) are at risk and that standard serological screening of pregnant women and monitoring of seronegative pregnant mothers is failing. Moreover one should not underestimate the importance of toxoplasmosis with regard to AIDS. In several African countries, cerebral toxoplasmosis has become a major manifestation of AIDS in adults. In France, toxoplasmic encephalitis (TE) occurs in 30-40% of all AIDS patients (7). In a situation of social and economic distortions to which Suriname is subject, one can not exclude that (illegal) slaughtering and consumption of sheep and goat might drastically increase as meat prices of beef and poultry become increasingly expensive.
As a (first) precautionary measure, one should encourage consumers to clear all meat (goat or sheep) of cysts before consumption. This can be done by heating (15 to 20 minutes at 60°C or 5 minutes at 160 to 170°C) or freezing (at least 3 days at -15 to -20°C) (8). The handling of raw meat, as well as the consumption of raw goat milk (9) and agricultural work or gardening should be prohibited for any pregnant woman (4). Although direct contact with cats is not the most common mode of infection, handling of cats (and certainly cat litter) should be avoided at all times.

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