



## A seroprevalance survey of *Toxoplasma gondii* amongst slaughter cattle in two high throughput abattoirs in the North West Province of South Africa

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### Abstract

Toxoplasmosis has been identified as one of the common opportunistic infection in HIV infected individuals, it can also cause abortion and congenital defects in humans. Since some of the infections are acquired from meat, it becomes essential that the epidemiology of the disease amongst meat producing animals be studied. The objective of the study was to determine the seroprevalence of *T. gondii* amongst slaughter cattle in the North West Province. Blood samples were randomly collected from 178 slaughter cattle in two high throughput abattoirs. The samples were tested for the presence of *T. gondii* antibodies using Enzyme Linked Immunosorbent Assay (ELISA). Seroprevalence ranged from 17.1 to 23.5% ( $\mu = 20.8\%$ ) It is recommended that more serological surveys be undertaken for proper policy formulation, and that awareness campaigns be prioritized.

**Key words:** Slaughter cattle, *Toxoplasma gondii*, abattoirs.

### Introduction

*Toxoplasma gondii* is a common protozoan parasite that infects both human beings and warm-blooded animals. It is prevalent world-wide with nearly one-third of humanity having been exposed<sup>4</sup>. *T. gondii* infection in humans cause abortions or congenital diseases, though most infections in humans are asymptomatic<sup>4</sup>. Humans become infected through eating tissue cysts in undercooked or raw meat or by ingesting water and food tainted with the oocysts from infected cat faeces. Persons with compromised immune systems (e.g. those living with the HIV virus or receiving immunosuppressive) are more vulnerable, experiencing severe symptoms which include confusion, headache, seizures, nausea, poor coordination and coma and those situations, the outcome may be fatal<sup>6</sup>. Human congenital infection occurs only when a woman becomes infected during pregnancy, with infections acquired during the first trimester being more severe than those acquired in the second or third trimesters<sup>17</sup>. Such infections may lead to spontaneous abortion, stillbirth and congenital toxoplasmosis (children born with abnormal head size) that lead to mental retardation<sup>8</sup>.

Unlike in small ruminants, infections in cattle are usually asymptomatic because of the high natural resistance to the parasite<sup>12</sup>. The epidemiology of *T. gondii* in cattle has been studied more extensively western countries, but in Sub-Saharan Africa, where the prevalence of the human immunodeficiency virus (HIV) is among the highest in the world, data are limited. The objectives of this study were therefore to study the seroprevalence of *T. gondii* amongst cattle in the North West Province and determine the possible risk of human infections.

### Materials and Methods

Samples were randomly collected from slaughter cattle in two high throughput abattoirs in Klerksdorp (S26 52.02281 E26) and Rustenburg (S25 39.57833 E27) which are in the Bojanaga and Dr Kenneth Kaunda Districts of the North West province of South Africa, respectively. Klerksdorp has a semi-arid climate, with warm to hot summers and cool, dry winters and an average annual rainfall of 482 mm. Rustenburg has a temperate humid subtropical climate, with very warm summers and mild winters, with an average annual rainfall of 513 mm.

High through put abattoirs are those that slaughters more that 20 cattle per day. Blood was collected into vacutainer tubes that were then transported to the North West University hematology laboratory and left at room temperature overnight to allow coagulation. Sera were collected after centrifugation at 2500 rpm for 10 min and stored at -20°C until analysis.

The ELISA method was used to determine the presence of antibodies against *T. gondii* using the checkit *T. gondii* Antibody test kit (lot number is 192-V391), obtained from IDEXX laboratories Switzerland AG.

### Results and Discussion

A total of 178 cattle of various breeds and ages above one year were sampled. Seroprevalence ranged from 17.1- 23.5% ( $\mu = 20.8$ ) (Table 1). To the best of our knowledge, this is the first study of the prevalence of *T. gondii* in cattle in the North West Province. There is scant and fragmented data on *T. gondii* in cattle in Africa and other parts of the world. Cattle contribute the highest dietary protein percentage in South Africa, making possibilities of cattle-human infections quite high. The seroprevalences revealed in this study are of enormous public health concerns considering

**Table 1.** Seroprevalence of *T. gondii* in slaughter cattle in the North West Province.

Abattoirs	No. of samples collected	No. seropositive	Percentage seropositive
Rustenburg	102	24	23.5
Klerksdorp	76	13	17.1
Total	178	37	20.8

the range of possible conditions in humans and the asymptomatic nature of the disease in cattle that makes possibilities of silent spread quite high<sup>6,8,12</sup>. Cattle have historically been considered as less significant as a source of human infection, but outbreaks linked to beef and high seroprevalences in some countries have caused the role of cattle in human infections to be reconsidered<sup>13</sup>. Many people consume beef which is under cooked (beef steaks, roast beef and steak tartar), which may lead to the spread of *T. gondii* infections<sup>19</sup>. The advent of HIV/AIDS, which is quite rampant in Sub-Saharan Africa<sup>7</sup>, also places special significance on the current results since infected individuals are more susceptible, which results in severe toxoplasmosis<sup>11</sup>.

The overall seroprevalence of 20.8% was higher than figures in other countries that include Ethiopia (6.6%), Mexico (11.9%), Tanzania (3.3%) and Iran (9- 20.2%)<sup>2,5,9,10,18</sup>, but are dwarfed by the 76.3% for Serbia<sup>13</sup>. In the United Kingdom, one out of four beef samples randomly chosen from the retail outlets was tested positive for *T. gondii* using the PCR method<sup>3</sup>. The differences in prevalence may be explained by variations in certain ecological factors and the breeding systems in each area<sup>15</sup>. Higher prevalences are associated with moist, humid, rainy areas than with dry, arid areas because oocysts survive longer in cool moist conditions. This could explain the higher prevalence in Rustenburg than in Klerksdorp.

Previous studies in South Africa have also revealed seroprevalences in sheep (4.3%) and goats (6.4%), with very low awareness levels of the disease among farmers and community members<sup>1,16</sup>. This largely increases the public health significance of the infection. Food safety awareness campaigns should therefore be undertaken to emphasize practices that mitigate against the spread of the infection. These include thorough cooking of meat, vigorous hand washing before meals or after doing outdoor activities such as gardening, having a healthy person dispose of cat litter boxes rather than pregnant women, the use of gloves in cat box disposal, and the pasteurization of milk before consumption by humans<sup>14</sup>. This will assist in the control of toxoplasmosis especially in Sub-Saharan Africa which remains the most affected region in the AIDS pandemic with more than two thirds (68%) of all people who are HIV-positive living in this region<sup>7</sup>. Serological evaluation of food animals therefore should be prioritized as tool in the control of the disease<sup>16</sup>.

### Conclusions

The investigation may serve to increase the data on prevalence of *T.gondii* infection amongst food animals in South Africa and in addition determine the risk factor for human infection as a result of consuming cattle products.

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