



# New, previously unreported correlations between latent *Toxoplasma gondii* infection and excessive ethanol consumption



Dorota Samojłowicz<sup>a,\*</sup>, Aleksandra Borowska-Solonyanko<sup>a</sup>, Marcin Kruczyk<sup>b</sup>

<sup>a</sup> Department of Forensic Medicine, Medical University of Warsaw, 02-007 Warsaw, 1 Oczyki St., Poland

<sup>b</sup> Independent researcher

## ARTICLE INFO

### Article history:

Received 7 September 2016

Received in revised form 1 August 2017

Accepted 7 September 2017

Available online 18 September 2017

### Keywords:

*Toxoplasma gondii*

Toxoplasmosis

Risk behaviors

Ethyl alcohol

Post-mortem serological testing

## ABSTRACT

A number of world literature reports indicate that a latent *Toxoplasma gondii* infection leads to development of central nervous system disorders, which in turn may lead to altered behavior in the affected individuals. *T. gondii* infection has been observed to play the greatest role in drivers, suicides, and psychiatric patients. Studies conducted for this manuscript involve a different, never before really reported correlation between latent *T. gondii* infection and ethanol abuse. A total of 538 decedents with a known cause of death were included in the study. These individuals were divided into three groups: the risky behavior group, inconclusively risky behavior group, and control group. The criterion for this division was the likely effect of the individual's behavior on the mechanism and cause of his/her death. The material used for analyses were blood samples collected during routine medico-legal examinations in these cases. The blood samples were used to measure anti-*T. gondii* IgG antibodies with an enzyme-linked immunosorbent assay (ELISA). Moreover, the following data were recorded for each decedent: sex, age, circumstances of death, cause of death, time from death to autopsy, and (if provided) substance abuse status (alcohol, illicit drugs). In those cases where blood alcohol level or toxicology tests were requested by the Prosecutor's Office, their results were also included in our analysis. Test results demonstrated a strong correlation between latent *T. gondii* infection and engaging in risky behaviors leading to death. Moreover, analyses demonstrated a positive correlation between the presence of anti-*T. gondii* IgG antibodies and psychoactive substance (especially ethanol) abuse, however, the causal relationship remains unclear. Due to the fact that alcohol abuse constitutes a significant social problem, searching for eliminable risk factors for addiction is extremely important. Our analyses provided new important information on the possible effects of latent *T. gondii* infection in humans.

© 2017 Elsevier B.V. All rights reserved.

## 1. Introduction

*Toxoplasma gondii* is a common parasite, found worldwide, capable of adapting perfectly to many species of intermediate hosts, and causing one of the most common anthrozooses – toxoplasmosis. The prevalence of *T. gondii* infection in the general human population varies widely depending on the climate zone, sanitary conditions, and even nutrition, and is estimated to range from approximately 3% in South Korea to approximately 76% in Costa Rica [1].

For many years, the latent phase of toxoplasmosis was believed to be completely asymptomatic in immunocompetent individuals, and the infection was even considered beneficial due to the acquired immunity protecting women against an acute infection

during pregnancy and the consequent infection of the fetus. However, many years of observational and independent experimental studies, initially in animals and later in people, persuaded researchers to revise their beliefs on the possible consequences of latent *T. gondii* infections in immunocompetent individuals.

Latent *T. gondii* infection in humans was found to trigger a number of abnormalities, possibly leading to a lack of concentration, poorer reflexes, and a reduced feeling of fear [2,3]. Moreover, the evaluated seropositive women demonstrated increased levels of aggression, and males – excessive impulsiveness [4]. These traits may predispose to behaviors that pose a health risk and are directly life-threatening.

The mechanisms of action of *T. gondii* on the body of an intermediate host have not been fully understood. The traits leading to potentially dangerous personality disorders are believed to be a likely result of cerebral changes in people infected with *T. gondii*. One of such changes is deregulation of cerebral

\* Corresponding author.

E-mail address: [samojlowiczd@gmail.com](mailto:samojlowiczd@gmail.com) (D. Samojłowicz).

neurotransmitter levels, especially deregulation of dopamine levels [5–7].

Dopamine is a catecholamine neurotransmitter. By activating specific receptors, it plays a role in regulating emotions, mood, anxiety levels, and coping with stress. Dopamine also takes part in regulating such processes as locomotion and maintaining body posture [8]. Normal dopamine levels determine mental and physical well-being. Abnormalities in dopamine production, secretion or activity within the central nervous system lead to a number of disorders, the most important of which include major depression, schizophrenia, Parkinson's disease, and all types of addictions, including alcohol and drug dependence [8,9].

There have been a number of reports on the effects of human *T. gondii* infection on risky behaviors [2–4,10,11]; with many authors focusing on the role of *T. gondii* infection in contributing to road traffic accidents and as the causative factor of suicidal behaviors [12–19].

The last two decades saw the emergence of studies closely evaluating the correlation between latent toxoplasmosis and severe psychiatric and neurological conditions. Among other findings, latent toxoplasmosis was demonstrated to most likely be one of the most important risk factors for schizophrenia [20–23]. Recent studies also suggest the existence of a relation between toxoplasmosis and suicides [24].

The Forensic Medicine Department at Medical University of Warsaw conducted extensive studies on the effect of *T. gondii* infection on behaviors leading to death. Some of the numerous analyses yielded a strong correlation between *T. gondii* infection and ethanol consumption. Since this correlation has not been explored in the available literature, the results of those analyses that pertain to a correlation between *T. gondii* infection and ethanol consumption have been presented in this manuscript.

The purpose of this study was to analyze the association between *T. gondii* infection and ethanol consumption.

## 2. Material and methods

### 2.1. Material

The study was conducted on samples collected during external forensic examinations and autopsies performed at the Forensic Medicine Department, Medical University of Warsaw, between the year 2010 and 2013. Decedents included in the study were only those whose circumstances of death were known already at the time of autopsy and from the information provided by the Prosecutor's Offices investigating the individual cases. Corpses showing late postmortem signs were excluded from the study.

Based on external forensic examination and autopsy reports as well as the records provided by the Prosecutor's Office, including – in the case of inpatients – medical records, we obtained the following data for each decedent: sex, age, circumstances of death, cause of death, period between death and autopsy, and (if provided) ethanol and/or illicit drug abuse status.

A total of 538 decedents (61 females and 477 males) were included in this study. The fact that males constituted a considerable majority of subjects in the study sample was consistent with the general proportion represented in all postmortem examinations conducted at the Forensic Medicine Department (in approximately 80% of all autopsies the decedent is male). The median age for the study group was 49 years (with the youngest decedent 18 and the oldest 89 years old). The period between death and autopsy ranged from 1 to 24 days (mean: 4.93 days). The graph illustrates the age histogram for the evaluated group with the superimposed normal curve (Fig. 1).

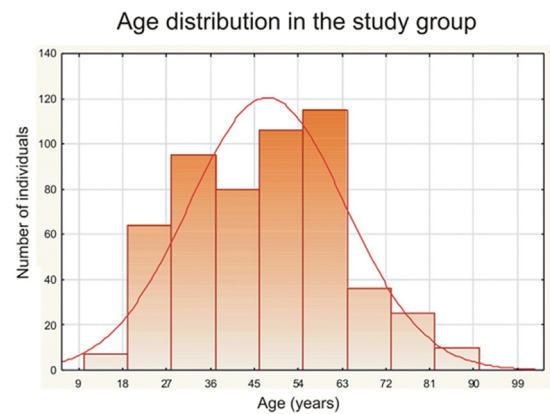


Fig. 1. Age histogram for the evaluated group with the superimposed normal curve.

After autopsy reports, including additional tests, had been evaluated and the circumstances of death reviewed, all evaluated decedents were divided into three groups: **risky behavior (RB)**, **inconclusively risky behavior (IRB)**, and **control (C) groups** (Table 1).

The **risky behavior (RB) group** constituted those cases where the available data indicated that the death was due to the so-called risky behaviors ( $n = 277$ ). The RB group included:

- drivers who, based on the available data, were classified as indisputable perpetrators of traffic accidents ( $n = 48$ )
- individuals who committed suicide ( $n = 126$ )
- individuals who died as a result of substance overdose ( $n = 83$ )
- other individuals ( $n = 20$ ) who died as a result of disregarding reasonable safety precautions, e.g. riding a two-wheeled vehicle without a helmet, swimming under the influence of alcohol, other risky behaviors under the influence of alcohol, or jaywalking.

The substance overdose subgroup included individuals who died as a result of ethanol intoxication ( $n = 45$ ), non-consumable alcohol intoxication ( $n = 7$ ), illicit drug overdose ( $n = 28$ ), or prescription drug overdose ( $n = 3$ ).

The **control (C) group** ( $n = 165$ ) consisted of individuals whose deaths were not associated with risky behaviors (mostly individuals who died as a result of disease).

Those decedents whose deaths could not be definitively attributed to risky behaviors (after reviewing all available information, including data provided by the Prosecutor's Office, autopsy findings, and additional assessments/tests) were included in the **inconclusively risky behavior (IRB) group** ( $n = 96$ ). The IRB group included:

- drivers who could not be unequivocally identified as the perpetrators of the traffic accident that caused their death ( $n = 30$ )

Table 1  
Evaluated groups of decedents stratified by sex.

Evaluated decedent groups	No. of cases	Sex	
		F	M
Risky behavior group	277	26	251
Control group	165	25	140
Inconclusively risky behavior group	96	10	86
Total	538	61	477

Download English Version:

<https://daneshyari.com/en/article/4760231>

Download Persian Version:

<https://daneshyari.com/article/4760231>

[Daneshyari.com](https://daneshyari.com)