Abstract
The boy-to-girl ratio at birth (secondary sex ratio) is around 1.06 in most populations. The sex ratio may be influenced by many factors, such as stress and immunosuppression, age of parents, parity and sex of preceding siblings. The most common human protozoan parasite in developed countries, Toxoplasma gondii (prevalence 20% - 80%), is known to change the behaviour of its intermediate hosts, thereby increasing the probability of transmission to its definitive host (the cat) by predation. The results of our retrospective cohort study suggest that the presence of Toxoplasma gondii, can influence the secondary sex ratio in humans. Depending on the antibody concentration, the probability of the birth of a boy can increase up to a value of 0.72, which means that for every 260 boys born, 100 girls are born to women with the highest concentration of anti-Toxoplasma antibodies. In accordance with results on human subjects, laboratory mice with toxoplasmosis produced a higher sex ratio than controls, in the early phase of latent infection.
Our further results showed that mice in the early phase of latent infection exhibited temporarily increased production of interleukin (IL)-12 and decreased production of IL-10. The mice showed decreased production of IL-2 and nitric oxide and decreased proliferation reaction (synthesis of DNA) in the mixed lymphocyte culture in the early and also in the late phases of latent toxoplasmosis. The results for the infected mice are in accordance with the hypothesis that the increased probability of birth of male offspring in Toxoplasma-infected mice and humans might be just a nonadaptive side effect of Toxoplasma-induced immunosuppression. Similarly, the immunosuppression could also be responsible for the observed longer pregnancy of mothers with latent toxoplasmosis, either due to reduced implantation potential of the fertilized ovum in immunosuppressed females or due to higher probability of survival of fetuses with genetic or developmental defects. It can only be speculated whether the observed immunosuppression could be also responsible for the effect of latent toxoplasmosis on weight gain during pregnancy in Rh-negative women. Since about 30 % of the world population are latently infected by T. gondii, the toxoplasmosis-associated immunosuppression might have serious public health consequences.