

Vaxinano: A vaccine against toxoplasmosis for Saimiris monkeys

Saimiris, also known as squirrel monkeys, are small South American primates particularly susceptible to toxoplasmosis, a parasitic infection caused by the protozoan *Toxoplasma gondii*. A vaccination campaign for squirrel monkeys started in September 2017 in 5 French zoos. The vaccine was developed by **Vaxinano** in collaboration with the BioMédicaments Anti Parasitaires (BioMAP) team of the Infectiology and Public Health Joint Research Unit (UMR ISP, Inra-University of Tours).



Toxoplasmosis is an infectious disease due to the protozoan *Toxoplasma gondii*, currently infecting over 2 billion people worldwide. Generally asymptomatic, toxoplasmosis is a major issue in pregnant women and immuno-compromised people, being also a relevant cause of abortions in small ruminants.

In the recent decades, there have been numerous cases of toxoplasmosis epidemics in captive Bolivian Saimiris (*Saimiri boliviensis*) around the world. These small monkeys live in the tree canopy of the tropical forests of South and Central America and they had not the opportunity to co-evolve with *T. gondii*: their first contact with the parasite is often fatal. In fact, squirrel monkeys die within a few days of acute toxoplasmosis without clinical signs in half of the cases.

An innovative and effective vaccine

Vaxinano in collaboration with the the BioMédicaments Anti Parasitaires (BioMAP) team of Pr Isabelle Dimier-Poisson, from the UMR ISP (Inra-University of Tours), has developed vaccine against *T. gondii* composed by all the antigens of the inactivated microorganism coupled with nanoparticles made up of starch and lipids. This innovative vaccine is adjuvant-free, safe, biodegradable, biocompatible, and produced according to the principles of green chemistry, respecting the environment.

The effectiveness of the vaccine had been demonstrated in experimental models, with both mice and sheep protected from acute/chronic infection and latent/vertical toxoplasmosis, respectively. After being administered by nasal route, the vaccine induced a strong protection associated with a cellular immune response and mediated by IFN- γ , IL-1 β and IL-17 production

Vaccination campaigns

During the summer of 2017, the vaccine was proposed as the only effective therapeutic solution against toxoplasmosis in squirrel monkeys. A pilot vaccination campaign was performed in collaboration with Dr Florence Ollivet-Courtois, the reference veterinarian for France's zoological parks. This trial involved 5 French pilot zoos (Doué-La-Fontaine, Amnéville, Mulhouse, Besançon and Calviac-en-Périgord) and more than 40 squirrel monkeys. After vaccination, these animals developed a specific immune response against the parasite.

To date, almost 3 years after the introduction of the vaccination, no mortality has been reported since the vaccination protocol was introduced, whereas mortality episodes were recorded every year in those zoos.

Based on these exceptional results, a second vaccination campaign involving additional zoos, namely Beauval Zoo Park, Flèche Zoo and Tourauparc, was launched at the end of 2019 - early 2020, involving around forty squirrel monkeys. In the perspective of protecting the endangered fauna, other extremely sensitive species (i.e., wallabies, Pallas cats, and 4 species of lemurs) were enrolled in this study. Accordingly, additional information on the effectiveness of the vaccine in other susceptible species are now available.

This research will contribute to the future distribution of a vaccine for veterinary and human use.

For further information

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