Effective Nanoscale Targeted Anti-leishmania Drug and **Technological Platform for Nano-medicine**

The Problem

Leishmaniasis is a vector-borne tropical disease that affects 88 countries worldwide. The causal agent is a parasitic protozoon, Leishmania ssp. Cutaneous leishmaniasis (CL), caused by L. major, L. mexicana, and visceral leishmaniasis caused by L. donovani, is one of the most important neglected tropical diseases. Available treatments are highly toxic, and the serious side effects require close monitoring of the patients. Additional limiting factor to use current drugs effectively is a fast parasite-developed resistance to these drugs has been reported. Moreover, iv administration reduces opportunity to be used in developed countries in routine without hospitalization. Therefore, there is a need for additional therapies for treating Leishmaniasis.

The Solution

Our cutting-edge, i.e., a nanoparticulate drug-like nanomaterial, Nano Lesh IL NPs, efficiently kill parasites within a few minutes of exposure locally. The NPs mechanism of action (MoA) was studied in vitro, ex vivo on parasitic cultures and in mice model. The novel MoA interferes with an essential parasite cell biology for host-parasite survival and results in lysosomal targeted damage. The LEISH IL NPS eliminate the visceral infection in mice after 2-3 injections of the drug. Topical formulation is in progress and preclinical test and clinical trials for cutaneous leishmaniasis will start soon.

The Commercial Benefit

Our Nano Lesh IL NPs:

- Topical delivery route should ease compliancy in the field use for army activities and local population without need in hospitalization.
- No resistance anticipated.
- Local route of administration offers low risk of side effects and low toxicity.

Market Potential

CL collectively affects up to 1-2 million people. It is also an emerging disease in Israel and for the troops of the NATO and a growing health risk to the U.S. Army, due to frequent infection of troops deployed to endemic countries in the Middle East.

Target Markets/Industries

- FDA-approved special fast regulatory path to treat Neglected tropical diseases, including CL.
- NanoMedicine for Cancer Therapeutics and Parasitic Infections. Our unique NPs are applicable as an enabling nano-medicine platform to other therapeutic applications, e.g. targeted lysosome-mediated anti-cancer treatment

Intellectual Property

Patent pending

Team: Primary Inventor

- **Prof. Jean-Paul (Moshe) Lellouche** is the Head of the Department of Chemistry and also registered in the Nano Materials Center at the Institute of Nanotechnology and Advanced Materials (BINA). • J.-P. Lellouche has authored 149 peer-reviewed papers, 15 patents and 3 book chapters while attracting more than US$ 6,581,000 in external grant funding.
Prof. Shulamit Michaeli
- **Prof. Shulamit Michaeli** is the Vice President for Research of Bar-Ilan University. She Investigates trypanosomatids, parasites that infect millions worldwide, causing African Sleeping sickness, South American Chagas disease, and leishmaniasis; as well as sand-fly fever, which affects a band of countries from Portugal through India, including Israel. Prof. S. Michaeli acted as the Dean of the Mina and Everard Goodman Faculty of Life Sciences. She was the Founding Director of the Nano-Medicine Center at the Bar-Ilan Institute for Nanotechnology and Advanced Materials (BINA). Prof. S. Shulamit Michaeli published over a hundred articles in professional journals and books. Prof. S. Michaeli patented several prominent technologies and won numerous prestigious awards, including the Israeli Society of Microbiology Award and the Andrew Lewoff award from the French Academy of Sciences.

Future Research

We plan to further develop these functional Nano-Lesh IL NPs for treatment of cutaneous leishmaniasis by incorporating these functional NPs into any appropriate ointment for both preclinical and clinical translational medicine paths.

The Opportunity

We can offer licensing of our patent
Collaborative and Sponsored research to qualified companies
Adoptation of NPs for drug delivery applications with other molecules and therapeutic targets
The drug couldbe generic for all the kinetoplastid parasites including Trypnosoma brucei (African sleeping sickness) and American trypanosomiasis causing Chagas' disease

Keywords

- Anti-parasitic
- Anti-leishmania
- Anti-donovani
- Functional nanoparticles (drug delivery systems)
- Anti-leishmania pentamidine drug delivery nanoscale system