Killed But Metabolically Active Vaccine against Parasitic Infections

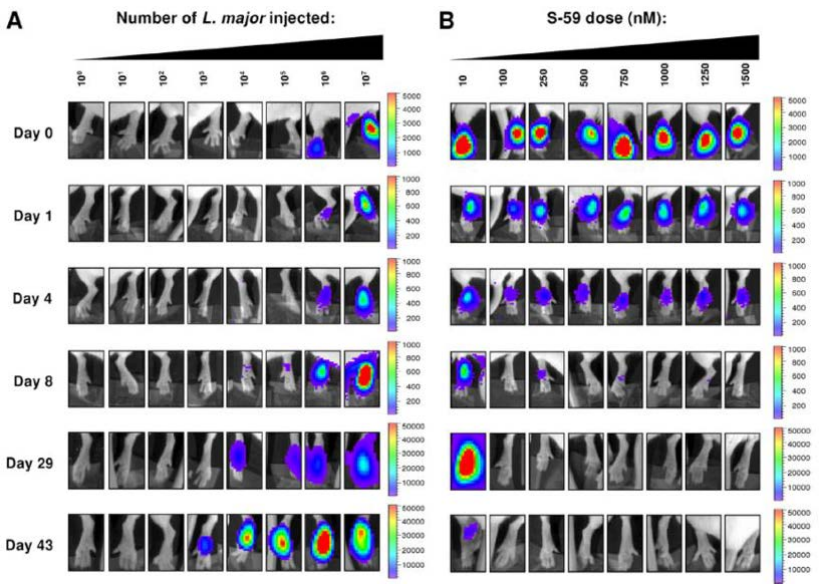
[LAB0044]

Background

- Leishmaniasis is caused by a protozoa parasite and is transmitted to humans via the bite of phlebotomine sandflies.
- These sandflies are typically found in parts of the tropics, subtropics, and southern Europe.
- There are several clinical forms of Leishmaniasis that range from disfiguring skin ulcers to an overwhelming visceral infection that leads to death.
- The World Health Organization estimated that there are 700,000 to 1 million new cases and 20,000 to 30,000 deaths annually.
- Designing effective and safe anti-protozoal vaccines has been challenging and, to date, there are no safe and effective vaccines to prevent any of these deadly infections in humans, dogs, or other mammals.

Innovation

- Dr. Craft developed a novel vaccination against protozoan parasites using Killed But Metabolically Active *Leishmania* organisms.
- These Killed But Metabolically Active (KBMA) parasites complete their normal infectious life cycle in a host but cannot replicate.
- When administered to a host, the KBMA parasites induce an immune response.
- An adjuvant may be added to the vaccine such as TLR-7 and/or TLR-8 to offer further protection against infection and/or pathogenicity of *Leishmania*.
- Previous practices for treating *Leishmania* infections include inoculating live parasites, which was abandoned due to the induction of infection and serious pathologies.
- Previous research has focused on heat-killed strategies but no effective vaccine has resulted from these inquiries.
- *In vitro* and *in vivo* studies show that the KBMA parasite completes its life cycle and activates macrophages to produce microbicidal nitric oxide.



Vaccination of mice with *Leishmania major* promastigotes prevents the progression of a subsequent footpad infection by live parasites (right panel, B) compared to no vaccination (left panel, A).

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Advantages

- The KBMA method is an effective way to render pathogenic protozoa safe for use as vaccines.
- The dangers of virulent infection can be reduced to nearly zero by using the KBMA technology.
- KBMA technology can be combined with TLR agonist adjuvants to increase the immune response.

Applications

- Killed but metabolically active protozoans are useful as a vaccination against *Leishmania*, *Trypanosome* and malaria causative *Plasmodium* species.

Lead Inventor: Noah Craft, MD, PhD

IP Status

- U.S. Patent No. 8,709,445 entitled "Vaccination with Killed But Metabolically Active (KBMA) Protozoans with Toll-Like Receptor Agonists," issued on April 29, 2014.

Related Publications

- Bruhn KW, Birnbaum R, Haskell J, et al. Killed but metabolically active Leishmania infantum as a novel whole-cell vaccine for visceral leishmaniasis. Clin Vaccine Immunol. 2012;19(4):490-8.

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