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Photodynamically inactivated Leishmania as a potential novel carrier for vaccine delivery against infectious and non-infectious diseases

Kwang Poo Chang, Sujoy Dutta and Bala K. Kolli
Chicago Medical School/RFUMS, USA

Leishmania are parasitic protozoa, including those, which cause self-limiting and self-healing simple cutaneous leishmaniasis. These parasites can be photodynamically rendered nonviable, but infection-competent for exploitation as an universal vaccine carrier because they are innately endowed with the following exceptionally favorable attributes: [1] Vaccine adjuvanticity, as indicated by the lasting cell-mediated immunity observed after spontaneous cure in human cutaneous leishmaniasis; [2] Large capacity to express multiple vaccines with posttranslational modifications by well-established simple transgenic approaches; [3] Tight protection of the vaccine loads due to their naturally acquired resistance to humoral lytic factors in the mammalian hosts; [4] Homing specificity to the desirable site in the very cells for vaccine processing and presentation, i. e. the phagolysosome of the antigen-presenting cells (macrophages and dendritic cells). This combination of advantages compares Leishmania favorably against viral, bacterial and particulate constructs to serve as a vaccine carrier. Our research objective is to safely harness the above-mentioned attributes of Leishmaina for homing vaccines to antigen-presenting cells, thereby enhancing their immune efficacy. Leishmania are genetically and chemically modified to facilitate their endogenous induction and exogenous loading with photosensitizers, i. e. porphyrins and novel phthalocyanines, thereby rendering them photosensitive to produce ROS for cytolysis to release vaccines in the ROS-resistant phagolysosomes of antigen-presenting cells. Our current efforts are focused on safety/efficacy evaluation of the available constructs and their optimization in vitro and in vivo by using ovalbumin as a surrogate vaccine. We plan to optimize the Leishmania carrier for photodynamic immuno-therapy and -prophylaxis against infectious and non-infectious diseases.

Biography

Kwang Poo Chang has completed his PhD in his twentieth from a Canadian University and postdoctoral studies from the Rockefeller University. He rose to the position of Associate Professor at Rockefeller University and has been a Professor of Microbiology/Immunology, Chicago Medical School since 1983. He has engaged in basic and translational laboratory research of Leishmania and leishmaniasis for >35 years through the support by >20 grant awards from NIH, NSF, WHO, AHA, private Foundations and other sources. He has published >120 papers in reputed journals, served as an editorial board member in 9 different journals and edited/co-edited 4 books/symposium volumes.

kwangpoo.chang@rosalindfranklin.edu