Kwang Poo Chang et al., J Vaccines & Vaccin 2015, 6:6
http://dx.doi.org/10.4172/2157-7560.C1.036

OMICS International
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9th Global Summit and Expo on
Vaccines & Vaccination
November 30-December 02, 2015 San Francisco, USA

Novel strategy for safe and effective vaccine delivery to elicit cell-mediated immunity against infectious and malignant diseases

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Cure of infectious disease does not usually produce life-long immunity to re-infection by the causative pathogen. One exception is the skin disease (cutaneous leishmaniasis) caused by a protozoan parasite. For millennia, the medical practitioners in the Middle East/Central Asia have inoculated children with live parasites. The immunity developed after self-healing of the lesion prevents subsequent infection with the potential to cause facial scars. The issue of importance is how this parasite differs from other pathogens to accomplish this feat. The parasite may contain vaccine molecules of superior quality to elicit protective immunity. The unique parasite surface polysaccharide/protein molecules protect these natural vaccines inside (and also add-on vaccines) and are responsible for their specific targeting to the phagolysosome of dendritic cells and macrophages - the desirable destination of vaccines. Thus, this is a highly deployable universal carrier for vaccine candidates of other diseases. Recently, a new way of parasite inactivation was devised to preserve its vaccine-delivery attributes for safe application. That is to chemically and/or genetically modify the parasite for loading with photosensitizers, making it light-activatable to produce singlet oxygen ($^1O_2$). This is a highly reactive ROS, which inactivates vital cytosolic enzymes, but too short-lived (2-3 micro-seconds) to cross the plasma membrane to inactivate surface molecules. The efficacy and safety of this vaccine delivery system has been under study. The parasite can be completely photo-inactivated after double-photosensitization for effective delivery of OVA. Photodynamic vaccination of hamster elicited cell-transferable immunity against visceral leishmaniasis. Immunotherapy of canine leishmaniasis alleviates clinical symptoms and parasite loads. Cancer vaccine candidates have been expressed in photo-inactivatable carrier ready for safety and efficacy evaluation.

Biography

Kwang Poo Chang received his PhD in 1972 from University in Canada and studied as a Post-doctoral fellow at Rockefeller University where he remained as an Associate Professor till 1983. He has since been Professor of Microbiology/Immunology in Chicago Medical School/RFUMS. He has published ~140 peer-reviewed papers and review articles in reputed journals. He has been serving as grant/journal reviewer, book/journal editor, and editorial board member of repute.He has engaged in international research collaboration and is an inventor of patents.

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