Liposomal mucosal vaccine delivery system: Immunogenicity, inflammatory response and protection from group A Streptococcus challenge

Mehfuz Zaman, Victoria Ozberk, Jennifer Reiman, Emma L Langshaw, Manisha Pandey, Michael R Batzloff and Michael F Good
Griffith University, Australia

Group A Streptococcus (GAS) infections are extremely important clinical problems due to their global health burden. Rheumatic fever and rheumatic heart disease are responsible for the majority of morbidity and mortality (estimated at 12 million cases annually with 380,000 fatalities). Current leading GAS vaccine candidates are challenged by their limited efficacy against primary GAS infections of the upper respiratory tract (URT) due to lack of mucosal antibody responses. This is due in large part to the lack of human approved mucosal adjuvants. We describe an innovative vaccine strategy to induce mucosal and serum antibodies against GAS in animal models based on an important neutralizing antibody determinant from the cell surface GAS M protein. Incorporation of carrier protein and M protein-based B-cell epitopes onto liposomal vesicles induce potent serum and mucosal antibodies without the need for an additional adjuvant. Immunized mice were capable of preventing GAS infection post-challenge. The size of liposomes influenced the immune response and antigen-specific inflammatory response. Liposomes could be lyophilized to a powder form negating cold-chain storage and stability issues, highlighting the promise to translate from murine studies to application in humans as a vaccine candidate. The study provides important mechanistic insights into how liposomal particulate delivery systems can collectively induce the desired mucosal immune responses to combat GAS infection. The strategy reported here is relevant to the development of subunit mucosal vaccines against other pathogenic organisms.

Biography

Mehfuz Zaman is a NHMRC Early Career Fellow. He has completed his BSc and PhD from the University of Queensland in Medicinal Chemistry. His research interests are drug delivery, sub-unit vaccines, adjuvants, lipids and peptides. His research aims to rationally design and develop vaccines by understanding the mechanisms by which pathogens induce immune response and correlates of protective immunity.

m.zaman@griffith.edu.au