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The use of new adjuvants and VLPs for the development of vaccines for emerging and infectious diseases

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The increased burden of neglected and emerging infectious disease (EID) has caused a serious global public health threat. According to World Health Organization (WHO), infections such as dengue fever, *Zika virus* (ZIKV) and malaria are associated with billions of deaths worldwide. For disease prevention and control, vaccination remains the most effective tool. The use of adjuvants in vaccine development is a well-established concept and practice. Adjuvants improve and modulate immune responses to the desired antigen. They increase the half-life of vaccine antigens and improve antigen uptake, processing and presentation by APCs (antigen-presenting cells). Micro-crystalline tyrosine (MCT) is a depot adjuvant formulated in licensed vaccines for use in humans with an excellent safety profile. Virus-like particles (VLPs) have a high capacity to induce strong humoral and cellular immune responses and may have the potential to increase vaccine efficacy against malaria and ZIKV, in particular if combined with MCT. We investigated the impact of MCT and/or VLP presented vaccine antigens and compared to protein antigens formulated with alum. We have demonstrated that MCT is able to produce high and sustained IgG responses that are specific and protective against the sporozoite of *P. vivax.* Our results showed that malaria antigens conjugated to VLPs and formulated in MCT induced higher antibody and T-cell responses and protected against *Plasmodium bergei/vivax.* Hence, combining MCT with VLP-conjugate vaccines defines a promising strategy for the development of protective malaria vaccines. We are also investigating the use of VLPs for ZIKV vaccine development. We have induced high antibody titres using domain III (DIII) of the envelope (E) protein of ZIKV. This protein is strictly associated with specific virus neutralization, therefore this vaccination strategy should avoid eliciting cross-reactive antibodies against other Flavivirus, which have been shown previously to have a detrimental effect upon infection with other *Flavivirus e.g. Dengue.*

Biography

Gustavo Cabral de Miranda is a Post-doctoral Research Scientist in Vaccinology at Jenner Institute, University of Oxford, UK. He has a Degree in Biological Science at Bahia State University; MSc in Immunology at Federal University of Bahia and; PhD in Immunology at University of São Paulo, Brazil. He is currently pursuing his research which focuses on The use of new adjuvants, especially microcrystalline tyrosine (MCT) and phosphatidylserine (PS) derivatives, and virus like particles (VLPs) for the development of vaccines against malaria and *Flavivirus, especially Zika virus* (ZIKV) and *Dengue virus.*

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