

Immune response deciphering interactions on the biomaterial-body interface by the advanced immunoprofiling: impacts on implants and medical devices

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Abstract

The demand for biomaterials has increased rapidly due to societal ageing and accompanying surge in the demand of anti-ageing agents. However, introducing biomaterials to the body induces early immunogenic effects and further down chronic immune response due to the degradation products released by devices (tissue engineered scaffolds, orthopedic implants, biomedical devices) that combined determine the outcome of the integration and the biological performance of the implant. Currently, clinical uptake of biomaterials is poor.

In recent years, quantitative immunomics has developed rapidly, offering systems level immune response analysis and personalized medicine at high-throughput. Mimotope Variation Analysis (MVA) is a powerful tool to characterize the immune response profiles in a blood sample against millions of synthetic peptide antigens simultaneously. Here, this approach has been used to delineate immunoprofiles of biomaterials and to predict the response to biomaterial (BM) accommodation by the body.

Using MVA immunoprofiling technology, several specific amino acid patterns were predicted to be associated with certain antibody response profiles to BMs. The immune response to any foreign material was found to be highly individual. The individual epitopes displayed by different peptide sequences varied in abundance. These were quite frequently detected in some individuals while not detected at all in others. The observed high variance of specific epitope targeting patterns across studied cohort (one BM might elicit a very different response in one individual vs the other) and across BMs (for one person, a certain BM might be more compatible with the body than the other) highlighted the necessity for a multiplexed, robust and fast assay system to be used in the BM selection process for biomedical development and clinical care. In sum, MVA data allowed to define antibody response signatures, whose presence might be enhanced due to their pre-existing nature by implanted BM and thus misdirect immune responses against self, against microbiota or environmental derived antigens.

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Biography

Dr. Kaia Palm (Ph.D), CEO, (f): She graduated from the Faculty of Chemistry, University of Tartu, Estonia, defended her PhD in 1998 in Karolinska Institute, Sweden, with specialization on molecular neurobiology. During her post-doc studies, in years 1998-2001, Kaia participated in the original clinical trials of autologous stem cell-therapy for the treatment of the Parkinson's disease at Cedars-Sinai Medical Hospital, LA, USA. She has more than 15 years of experience in academia as associate professor at Tallinn University of Technology, Estonia, and more than 14 years of experience in the biotech business. Dr. Palm has published >30 peer-reviewed publications and is the co- inventor of 15 patents. Acting as the CEO of Protobios, she has led the MVA technology development activities. Under her chair, Protobios has become one of the most innovative biotech companies in the region and holds a globally competitive position in biomarker discovery and as service provider in the field of immunomics.

