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Comparative Study of Adult and Infant Immune Responses to new Vaccine Formulations Using Advanced Human In Vitro Models

Referenti: Prof.ssa Cristina Ulivieri cristina.ulivieri@unisi.it

Immune responses in young infants and older adults exhibit distinct characteristics, reflecting age-related differences in immune system function. Compared to adults, young infants exhibit reduced monocyte chemotaxis and phagocytic activity and lower levels of memory-effector T and B cells. Hence, the immune responses elicited by vaccines can differ markedly between adults and children in terms of efficacy and/or reactogenicity. This project aims to examine the differences in immune responses to vaccines between adults and infants using human in vitro immune models to significantly enhance our understanding of the molecular mechanisms that drive the efficacy and reactogenicity of new vaccine formulations. The student will develop human in vitro model using peripheral blood mononuclear cells (PBMCs) form healthy adults and cord blood-derived mononuclear cells (CBMCs) as surrogate for the immune responses in adults and infants respectively. She/He will employ multidisciplinary approach and high-content technologies such as immune profiling techniques (flow cytometry and multiplex cytokine detection) and RNA seq assay to uncover the underlying molecular mechanisms driving these age-related immune differences, potentially leading to more effective and tailored vaccination strategies for different age groups. in vitro blocking system utilizing monoclonal antibodies (mAbs), RNA interference, and/or CRISPR/Cas9 technologies will be also carried out.