**Flow cytometry applications in medical and biological sciences**

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The flow cytometry method is a reliable and increasingly manageable tool for the quantitative analysis of cells or particles. Modern flow cytometers are able to analyze many thousand particles per second, and, if configured as cell sorters, can actively separate and isolate particles with specified optical properties. Increasing number of lasers and detectors in the cytometers allows for multiple antibody labeling, and more precise identification of target population by their phenotypic markers. Thus, it allows the measurement of many different parameters including expression of surface or intracellular antigens, apoptosis, DNA damage, or cell cycle. In view of the above this technology can be applied in a number of fields, including molecular biology, pathology, immunology, virology or plant biology. It is broadly applied in medicine especially in transplantation, hematology or tumor immunology.

Flow cytometry also is feasible for difficult tissues such as tumors. In our research we use the multicolor flow cytometry for detailed quantitative analysis of tumor microenvironment heterogeneity. The aim of our research is to determine the changes ongoing in TME after application of dendritic cell-based therapy supported by immunomodulating factors like inhibitors of immunosuppressive TGF-β1 or IL-10. Advanced multicolor cytometry gives us the possibility for simultaneous analysis of a number as well as functional and phenotypical changes of immune cells infiltrating tumors. Based on our recent investigation, the role of flow cytometry in tumor diagnosis and prevention as well as the advantages and limitations of the technique will be discussed.