

Development of Aptamers into Cell-specific Ligands for Imaging and Therapy

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DNA and RNA aptamers interact with their target proteins with high selectivity, specificity and affinity. The SELEX method consists of iterative cycles of *in vitro* screening of a combinatorial oligonucleotide library containing to 10^{16} different molecules and possible secondary and tertiary structures for target binding followed by PCR amplification of selected sequences. Aptamer ligands can be developed against almost any target protein. Due to the wide spectrum of applications, these novel molecules are used in numerous pharmacological, clinical and industrial processes. In the beginning, RNA and DNA aptamers were identified which bind to proteins that naturally interact with nucleic acids or small molecules such as ATP. In the following years, the use of the SELEX technique was extended in order to isolate oligonucleotide ligands for a wide range of proteins of importance for therapy and diagnostics, such as growth factors, cell surface antigens, entire cells and even whole organisms. Recently, the use of *in vitro* selection methods have been extended to living organisms such as bacteria, trypanosomes and *Plasmodium falciparum*-infected erythrocytes. Moreover, since it became apparent that aptamers are capable to distinguish between little differences in cell surface-marker-proteins expressed by i.e. cancer cells, parasite-infected cells or stem cells in comparison to normal somatic cell, they have been developed into promising agents for diagnostic and therapeutic applications. In this talk, I will focus on new accomplishments of the aptamer technology, and demonstrate some examples from my own research in developing aptamers against stem and tumor cells and parasite antigens.

Curriculum Vitae

Prof. Henning Ulrich studied Biology at the Universities of Hamburg and Kiel (Germany) and performed his master thesis in Biochemical Parasitology, followed by a PhD. in Biochemistry and Neuroscience at the University of Hamburg, Germany. He completed his training by postdoctoral research at the Center of Molecular Neurobiology at the University of Hamburg and Cornell University, NY, the latter one financed by a fellowship of the American Heart Association. He came to the Institute of Chemistry at the Sao Paulo University as a visiting scientist, where he was then appointed as faculty member. Here he habilitated in Biochemistry, is currently Associate Professor and head of the laboratory of neuroscience, working on stem cells and mechanisms of neurogenic differentiation.

Another principle line of the laboratory is development of combinatorial library approaches for obtaining bioactive ligands and inhibitors, denominated aptamers, of disease-relevant proteins. We use the SELEX (Systematic Evolution of Ligands by Exponential Enrichment) technology for targeting proteases, signal transduction and cell surface epitopes of stem and cancer cell and parasites. Dr. Ulrich has published more than 100 papers in peer-reviewed journals (H-factor of 23, ca. 1500 citations), 3 books and 14 book chapters and participated in three patents. Two patent applications focus on the diagnostic and therapeutic use of aptamers. 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