Preventing and Curing Infectious Diseases: Carbohydrate Vaccines and Continuous Flow Synthesis

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Infectious diseases kill many millions of people each year, not just in developing countries nut increasingly in industrialized nations as well. We are in danger of entering a "post-antibiotic" era as the drugs against many infectious diseases are becoming inactive due to the emergence of resistance. Most pathogens including bacteria, fungi, viruses and protozoa carry unique glycans on their surface. Currently, several glycan-based vaccines against bacteria are marketed very successfully. Since many pathogens cannot be cultured and the isolation of pure oligosaccharides is extremely difficult, synthetic oligosaccharide antigens provide a viable alternative. Based on the automated synthesis platform,[1] that has been generalized [2-4] and commercialized[5] we have created a series of vaccine candidates that are nearing clinical trials. In addition, synthetic oligosaccharides serve as tools to create monoclonal antibodies[6] and to establish glycan microarrays to map vaccine epitopes.[7] Diagnostic and preventive approaches against a host of bacteria and parasites will be discussed.

A fundamental shift in the production of active pharmaceutical ingredients holds immense opportunity to lower the cost for much needed drugs: Continuous flow chemistry systems are efficient, flexible and relatively inexpensive. I will discuss the use of continuous flow systems to produce drug substances and other chemicals via multi step reactions including continuous purification.[8] The anti-malaria drug artemisinin[9] and its derivatives[10] as well as other drugs will be used as case studies.

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