

Design, synthesis and Biological evaluation of New, glycolipid-based Toll-Like Receptor 4 (TLR4) Modulators

Alessio Romerio¹, Andrea Luraghi¹, Ana R. Franco¹, Mohammed M. Shaik¹, Nicolé Gotri¹, Valentina Artusa¹, Simona D'amato¹, Francesco Peri¹

E-mail: a.romerio1@campus.unimib.it

¹ Università di Milano-Bicocca, Department of Biotechnology and Biosciences, Milano

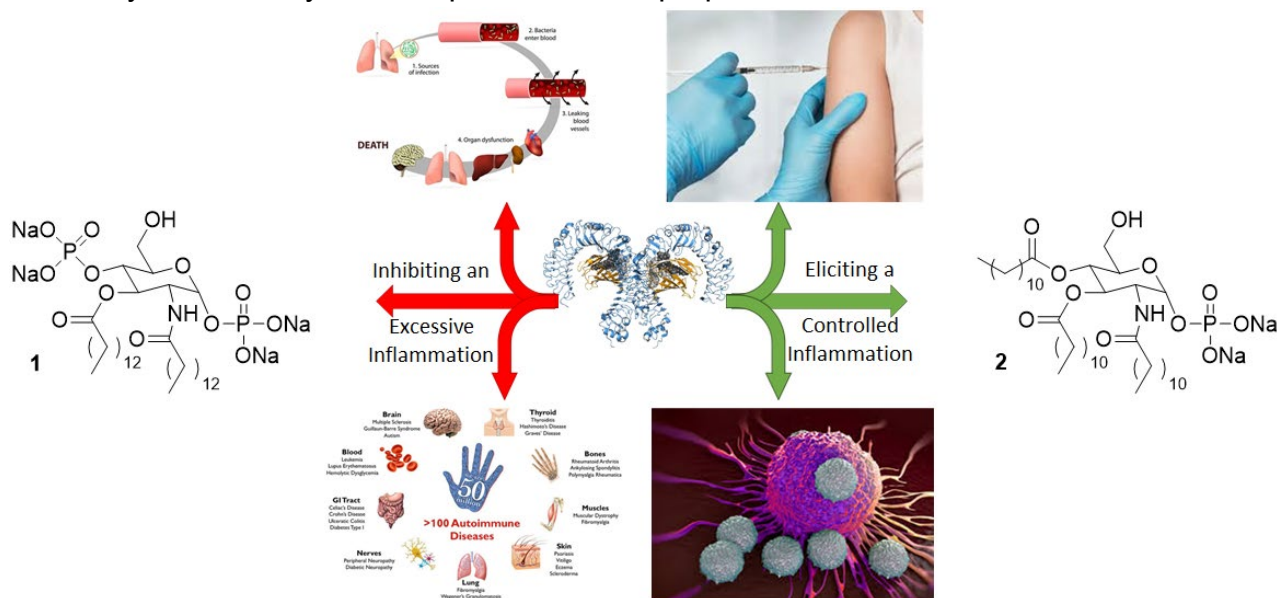
Keywords: TLR4, Innate immunity, Inflammation, Medicinal Chemistry, Organic Chemistry

Abstract:

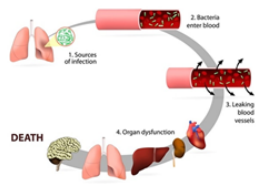
Innate Immunity is the first defense line in multicellular organisms against internal or external threats. It acts through inflammation, triggered by the recognition of specific Pathogen or Damage Associated Molecular Patterns (PAMPs or DAMPs) by specific pattern-recognition receptors (PRRs). Toll-Like Receptor 4 (TLR4) is one of the most important PRRs, and it responds to gram-negative bacteria lipopolysaccharide (LPS).

TLR4 modulation is emerging as an important therapeutic approach in several clinical settings: TLR4 inhibition has a potent anti-inflammatory effect; on the other hand, TLR4 mild activation can be used to stimulate immunity in vaccine adjuvants or to develop cancer immunotherapeutic drugs.

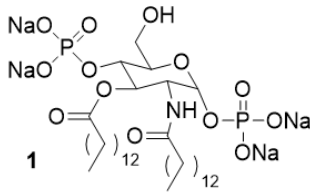
We present here rationally designed lipid A analogues based on a monosaccharide structure that are active in binding MD-2/TLR4, thus activating or inhibiting LPS/TLR4 or DAMP/TLR4 signalling. We also present synthesis optimization of TLR4 modulators, with the aim of producing versatile synthetic intermediates and reducing the number of synthetic steps to efficiently scale the synthesis up for industrial purposes.



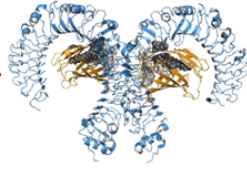
Sepsis Drug



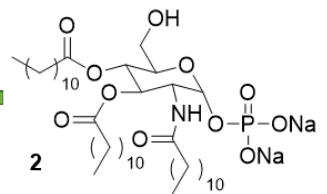
Vaccine Adjuvants



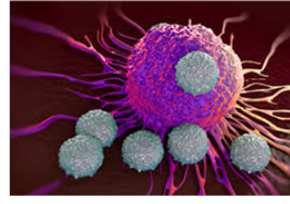
Inhibiting an
Excessive
Inflammation



Eliciting a
Controlled
Inflammation



Autoimmune Disease Drug



Cancer Immunotherapy