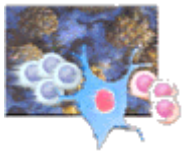
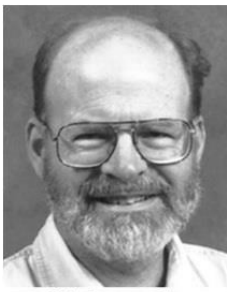
PATTERN RECOGNITION THEORY



C.A. Janeway, Jr. and his colleagues revised the working model of the immune system from the age of Burnet's clonal selection theory. It is now clear that



C.A. Janaway, Jr
(1943-2003)

antigen-presenting cells recognize conserved microbial components, Pathogen-Associated Molecular Patterns (PAMPs) such as bacterial lipopolysaccharides and peptidoglycans as well as viral ssRNA and dsRNA. These PAMPs serve as ligands for a broad array of protein families

Sir F.Macfarlane Burnet
(1899-1985)

referred to as Pattern Recognition Receptors (PRRs) such as Toll-Like Receptors (TLRs), C-type Lectin Receptors (CLRs), NOD-Like Receptors (NLRs), RIG-1-Like Receptors (RLRs), and AIM-2-Like Receptors (ALRs). When a PRR on an antigen-presenting cell binds to an appropriate PAMP, this cell begins to present antigen (signal 1), stimulate the expression of costimulatory molecules (signal 2), and secrete cytokines (signal 3), which is required for the course of an adaptive immune response to the causative pathogen. Thus, known PRRs are explicitly being triggered by adding or conjugating PAMPs to antigens of interest.

Since the germline-encoded PRRs are selected during evolution to detect microbial PAMPs, which are not produced by multicellular hosts, they can efficiently discriminate "self" from microbial "non-self." Their recognition by PRRs means the presence of microbial "non-self," commonly a pathogen, and triggers both the urgent innate immunity and the adaptive immune responses.

Nowadays, modern immunology is based on two major paradigms: clonal selection theory and pattern recognition theory. Both paradigms were developed initially on theoretical grounds and experimentally proven years later.