Gene name: **C5AR1** **Previous HGNC Symbols for C5AR1 Gene:** C5R1

NCBI Gene Summary: Enables G protein-coupled receptor activity and complement component C5a receptor activity. Involved in several processes, including complement component C5a signaling pathway; mRNA transcription by RNA polymerase II; and positive regulation of ERK1 and ERK2 cascade. Located in the apical part of the cell and basolateral plasma membrane. Biomarker of Alzheimer's disease; asthma; chronic obstructive pulmonary disease; rhinitis; and severe acute respiratory syndrome.

GeneCards Summary: C5AR1 (Complement C5a Receptor 1) is a Protein Coding gene. Diseases associated with C5AR1 include Atypical Hemolytic-Uremic Syndrome and Hypersensitivity Reaction Type Iii Disease. Among its related pathways are Class A/1 (Rhodopsin-like receptors) and Complement cascade. Gene Ontology (GO) annotations related to this gene include *G protein-coupled receptor activity* and *complement component C5a binding*. An important paralog of this gene is C5AR2.

UniProtKB/Swiss-Prot Summary: Receptor for the chemotactic and inflammatory peptide anaphylatoxin C5a (PubMed:10636859, 15153520, 1847994, 29300009, 7622471, 8182049, 9553099). The ligand interacts with at least two sites on the receptor: a high-affinity site on the extracellular N-terminus, and a second site in the transmembrane region which activates downstream signaling events (PubMed:7622471, 8182049, 9553099). Receptor activation stimulates chemotaxis, granule enzyme release, intracellular calcium release and superoxide anion production (PubMed:10636859, 15153520). (C5AR1_HUMAN,P21730).
Cellular localization: Cell membrane; Multi-pass membrane protein.

Full Name: Complement Component 5a Receptor 1 (C5AR1), also known as CD88.

Receptor Type: G protein-coupled receptor (GPCR).

Ligand: Binds to C5a, a potent anaphylatoxin generated during complement system activation.

Expression: Primarily on myeloid cells—including neutrophils, monocytes/macrophages, and dendritic cells—as well as on various tissue cells like hepatocytes and endothelial cells.

Biological Function of C5AR1

Upon binding to C5a, C5AR1 mediates several immune responses:

- **Chemotaxis:** Attracts neutrophils and other immune cells to sites of infection.
- **Activation:** Stimulates immune cells to release pro-inflammatory cytokines (such as, TNF-α, IL-6).
- **Vascular Effects:** Increases vascular permeability, contributing to edema.
- **Oxidative Burst:** Enhances the production of reactive oxygen species (ROS) for pathogen killing.

🦠 Role of C5AR1 in Sepsis

Sepsis involves a dysregulated immune response to infection, and C5AR1 plays a pivotal role in this process:

Pro-inflammatory Amplification: Excessive activation of C5AR1 by C5a leads to an overwhelming inflammatory response, often referred to as a "cytokine storm," which can result in tissue damage and organ failure.

Immunosuppression: Paradoxically, prolonged C5AR1 activation can suppress immune function by: Inducing apoptosis of immune cells, Impairing phagocytic activity of neutrophils and Altering cytokine profiles, increasing anti-inflammatory cytokines like IL-10.

Organ Dysfunction: C5AR1-mediated inflammation contributes to: liver injury, Acute lung injury and kidney dysfunction.

📈 Diagnostic and Prognostic Value

Diagnostic Potential

- Elevated levels of C5a and increased expression of C5AR1 have been observed in sepsis patients, correlating with disease severity.
- C5AR1 expression can serve as a biomarker for early detection and assessment of the inflammatory status in sepsis.

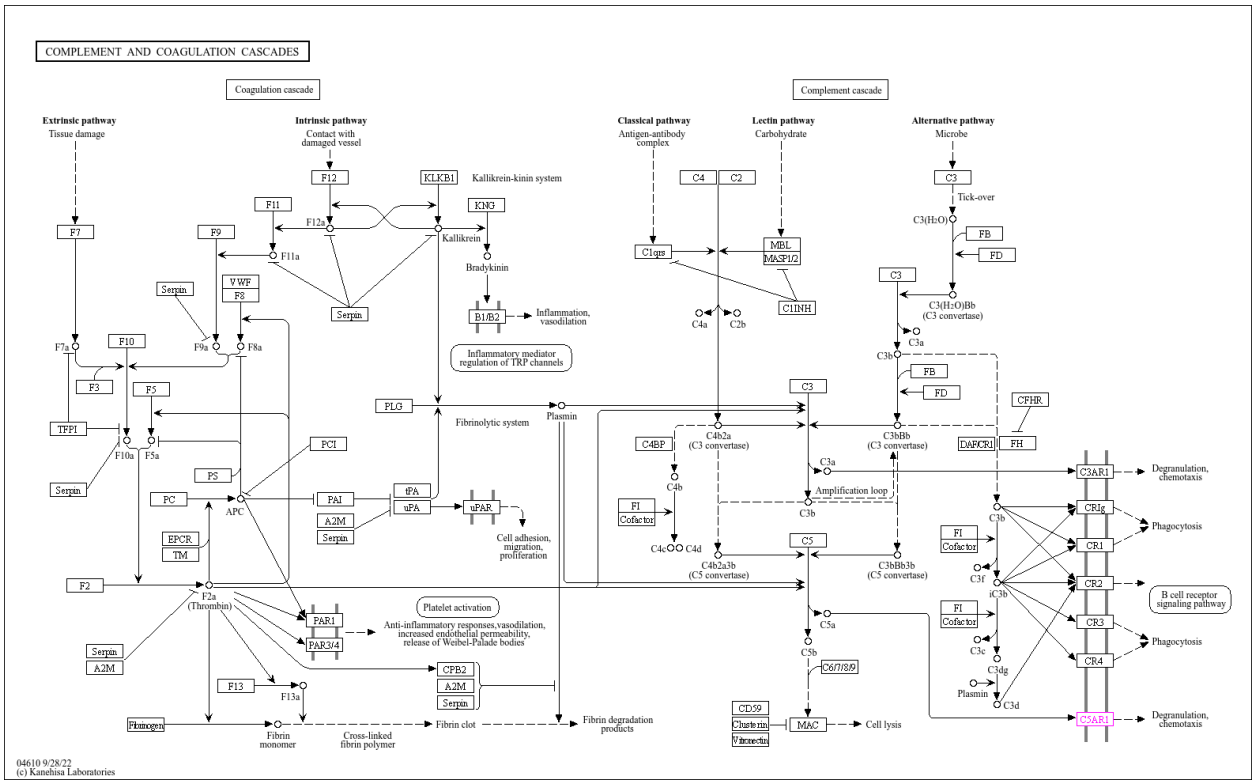
Prognostic Significance

- High C5AR1 activity is associated with:
    - Increased mortality rates.
    - Greater incidence of multiple organ dysfunction syndrome (MODS).
    - Poorer clinical outcomes.

🧪 Supporting Literature

DOI: 10.1038/s41598-020-79607-1
DOI: 10.1016/j.ymthe.2020.09.008
DOI: 10.1128/mBio.01755-17

KEGG:



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