Gene name: **CCL2** **Previous HGNC Symbols for CCL2 Gene :** SCYA2

External Ids for CCL2 Gene: HGNC: 10618 NCBI Gene: 6347 Ensembl: ENSG00000108691
OMIM®: 158105 UniProtKB/Swiss-Prot: P13500

NCBI Gene Summary : This gene is one of several cytokine genes clustered on the q-arm of chromosome 17. Chemokines are a superfamily of secreted proteins involved in immunoregulatory and inflammatory processes. The superfamily is divided into four subfamilies based on the arrangement of N-terminal cysteine residues of the mature peptide. This chemokine is a member of the CC subfamily which is characterized by two adjacent cysteine residues. This cytokine displays chemotactic activity for monocytes and basophils but not for neutrophils or eosinophils. It has been implicated in the pathogenesis of diseases characterized by monocytic infiltrates, like psoriasis, rheumatoid arthritis and atherosclerosis. It binds to chemokine receptors CCR2 and CCR4.

GeneCards Summary : CCL2 (C-C Motif Chemokine Ligand 2) is a Protein Coding gene. Diseases associated with CCL2 include Human Immunodeficiency Virus Type 1 and Neural Tube Defects. Among its related pathways are MIF Mediated Glucocorticoid Regulation and TGF-Beta Pathway. Gene Ontology (GO) annotations related to this gene include *protein kinase activity* and *heparin binding*. An important paralog of this gene is CCL7.

UniProtKB/Swiss-Prot Summary: Acts as a ligand for C-C chemokine receptor CCR2 (PubMed:10529171, 10587439, 9837883). Signals through binding and activation of CCR2 and induces a strong chemotactic response and mobilization of intracellular calcium ions (PubMed:10587439, 9837883). Exhibits a chemotactic activity for monocytes and basophils but not neutrophils or eosinophils (PubMed:8195247, 8627182, 9792674). May be involved in the recruitment of monocytes into the arterial wall during the disease process of atherosclerosis (PubMed:8107690). (CCL2_HUMAN,P13500)

Cellular localization: mainly extracellular.
Full Name: *C-C Motif Chemokine Ligand 2*
Aliases: MCP-1 (*Monocyte Chemoattractant Protein-1*)
Protein Type: Small secreted chemokine (belonging to the CC family)

Biological Function of CCL2

CCL2 is a key chemokine that orchestrates the recruitment of monocytes and other immune cells to sites of inflammation or tissue injury.

1. Chemotaxis: Attracts monocytes, memory T cells, and dendritic cells via CCR2 receptor.
2. Amplifies inflammation: Stimulates pro-inflammatory cytokine release (e.g., IL-1β, TNF-α).
3. Endothelial activation: Increases vascular permeability and expression of adhesion molecules.
4. Leukocyte recruitment loop: Works with IL-6, IL-8, and other chemokines to amplify immune cell migration.

🦠 CCL2 in Sepsis

CCL2 plays a central role in sepsis pathophysiology, particularly in initiating the inflammatory cascade and driving monocyte-driven immune responses.

During Early Sepsis:

- Strongly induced by microbial products (such as., LPS) and cytokines (such as, TNF, IL-1β)
- Leads to massive monocyte and macrophage recruitment
- Enhances cytokine storm via downstream mediators (such as, IL-6, IL-8)

In Experimental Models:

- CCL2-neutralization reduces monocyte influx and systemic inflammation
- May improve organ function and reduce mortality

📈 Clinical Relevance

Diagnostic Value

- Elevated in plasma/serum of sepsis patients compared to healthy or non-septic controls
- Levels increase early after infection, before clinical deterioration

Prognostic Value

- High CCL2 levels are linked to:
    - Higher SOFA scores
    - Greater risk of mortality
    - Worse organ failure

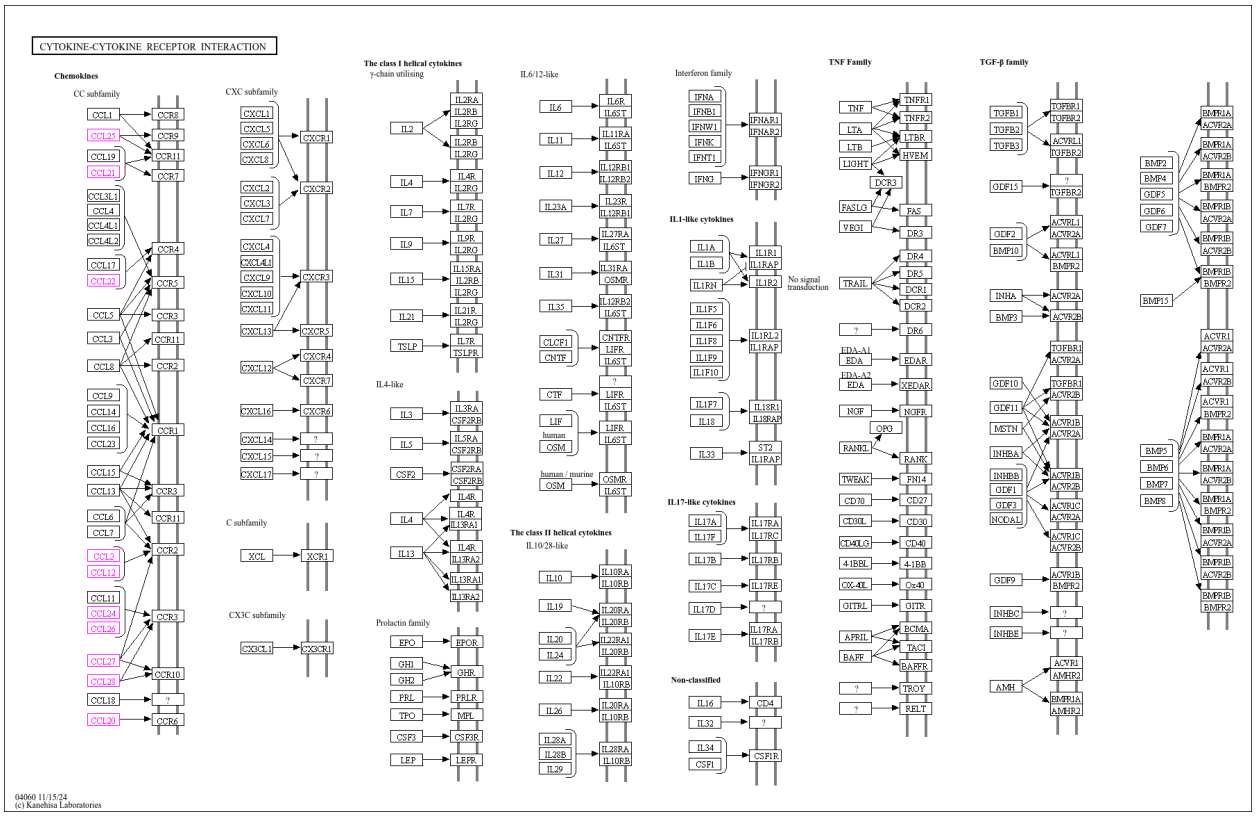
⚕️ Therapeutic Potential

- CCL2/CCR2 inhibitors are under development for:
    - Sepsis
    - Cancer
    - Atherosclerosis
    - Chronic inflammation

🧪 Supporting Literature

Doi: 10.1152/ajprenal.00037.2022
Doi: 10.1097/SHK.0b013e31827802b5.
Doi: 10.1189/jlb.0705372

KEGG:



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