Gene name: CCR7 **Previous HGNC Symbols for CCR7 Gene:** CMKBR7, EBI1
External Ids for CCR7 Gene: HGNC: 1608 NCBI Gene: 1236 Ensembl: ENSG00000126353
OMIM®: 600242 UniProtKB/Swiss-Prot: P32248

NCBI Gene Summary: The protein encoded by this gene is a member of the G protein-coupled receptor family. This receptor was identified as a gene induced by the Epstein-Barr virus (EBV), and is thought to be a mediator of EBV effects on B lymphocytes. This receptor is expressed in various lymphoid tissues and activates B and T lymphocytes. It has been shown to control the migration of memory T cells to inflamed tissues, as well as stimulate dendritic cell maturation. The chemokine (C-C motif) ligand 19 (CCL19/ECL) has been reported to be a specific ligand of this receptor. Signals mediated by this receptor regulate T cell homeostasis in lymph nodes, and may also function in the activation and polarization of T cells, and in chronic inflammation pathogenesis. Alternative splicing of this gene results in multiple transcript variants.
GeneCards Summary: CCR7 (C-C Motif Chemokine Receptor 7) is a Protein Coding gene. Diseases associated with CCR7 include Chronic Graft Versus Host Disease and Tetanus. Among its related pathways are Class A/1 (Rhodopsin-like receptors) and GPCR downstream signalling. Gene Ontology (GO) annotations related to this gene include *G protein-coupled receptor activity* and *chemokine (C-C motif) ligand 19 binding*. An important paralog of this gene is CCR9.

UniProtKB/Swiss-Prot Summary: Receptor for the MIP-3-beta chemokine. Probable mediator of EBV effects on B-lymphocytes or of normal lymphocyte functions. (CCR7_HUMAN,P32248)

Cellular localization: mainly in mitochondria and plasma membranes.

Full Name: *C-C Motif Chemokine Receptor 7*

Protein Type: G protein-coupled receptor (GPCR)

Biological Function of CCR7

- CCR7 encodes a chemokine receptor that plays a central role in:
    - Immune cell trafficking
    - Lymph node homing
    - T cell and dendritic cell migration

- Ligands for CCR7:

    - CCL19 (MIP-3β)
    - CCL21 (SLC)
    - Both are expressed in lymphoid tissues, especially the T cell zones of lymph nodes and high endothelial venules (HEVs).

🛠️ Main Actions of CCR7:

- Guides immune cells to secondary lymphoid organs:
  - Directs naive T cells, central memory T cells, and dendritic cells (DCs) to lymph nodes.
- Facilitates antigen presentation:
  - Enables DCs to migrate from infected tissues to lymph nodes where they prime T cells.
- Helps organize the architecture of lymphoid tissues:
  - Maintains the structure and function of T-cell zones in lymph nodes and spleen.
- Supports immune surveillance and the initiation of adaptive immune responses.

🦠 Role of CCR7 in Sepsis

- In sepsis, CCR7 is often dysregulated, which can alter immune cell localization and function:

Early Sepsis:

- CCR7 expression on DCs and T cells is critical for effective immune priming.
- Enables pathogen-loaded DCs to reach lymph nodes and activate T cells.

In Prolonged or Severe Sepsis:

- Downregulation of CCR7 can impair:
  - DC migration → reduced antigen presentation.
  - T cell homing → weakened adaptive immune response.
  - Lymphoid tissue function → contributes to immune paralysis.
- Conversely, overexpression of CCR7 in some contexts can enhance inflammation and immune cell recruitment, potentially exacerbating systemic inflammation and tissue damage.

📈 Clinical Relevance of CCR7 in Sepsis

Diagnostic Role:

- Changes in CCR7 expression can serve as a marker of immune dysfunction in septic patients.
- Low CCR7 levels on DCs and T cells may indicate loss of immune coordination and dysfunctional antigen presentation.

Prognostic Role:

- Impaired CCR7 expression correlates with:
  - Immunosuppression
  - Higher risk of secondary infections
  - Poor clinical outcomes

Therapeutic Interest:

- Strategies to restore CCR7 signaling may enhance immune responsiveness.
- Targeting CCR7 could help regulate immune cell trafficking to limit harmful inflammation or enhance pathogen clearance.

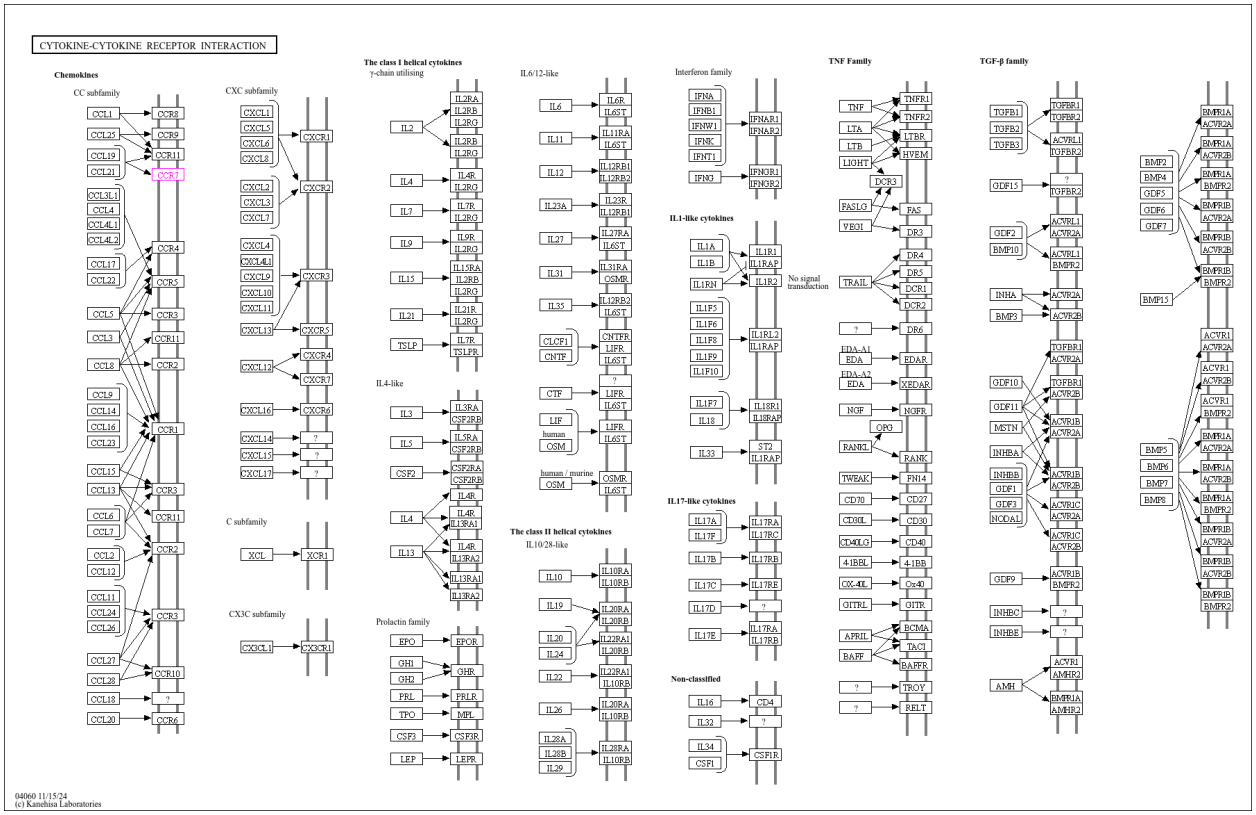
🔬 Pathways Involving CCR7

- **Chemokine signaling pathway (KEGG hsa04062)** → critical for cell migration and immune positioning.
- **Cytokine-cytokine receptor interaction (KEGG hsa04060)** → interaction with CCL19/CCL21
- **T cell receptor signaling** (indirectly via lymph node access and priming).
- **Dendritic cell maturation and migration** (important in antigen presentation during infection).

🧪 Supporting Literature

Doi: 10.1021/acsinfecdis.4c00066
Doi: 10.3389/fphar.2022.841687
Doi: 10.1128/iai.00962-09
Doi: 10.1155/2013/164246

KEGG:



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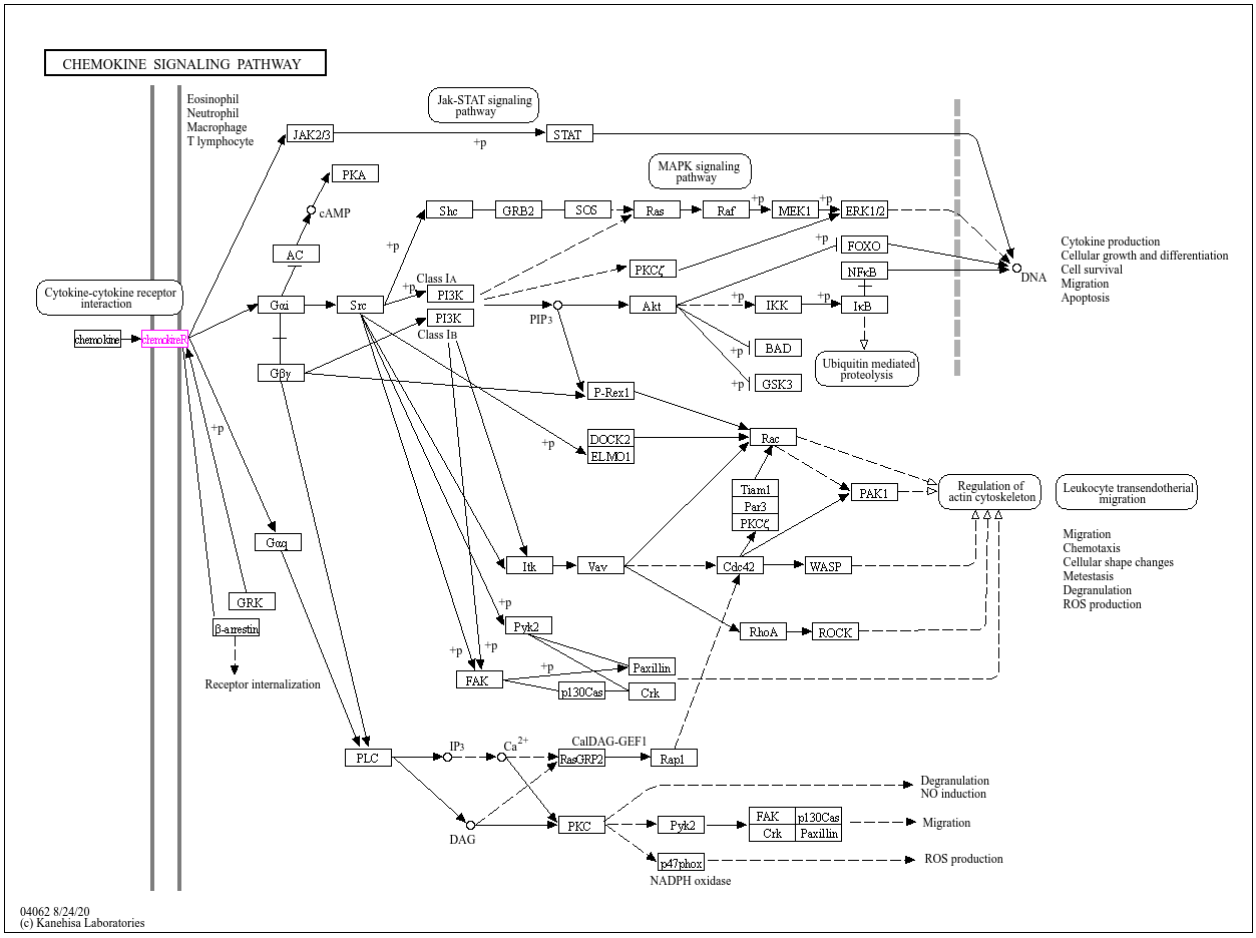

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