Gene name: **IL1B**

External Ids for IL1B Gene: HGNC: 5992 NCBI Gene: 3553 Ensembl: ENSG00000125538
OMIM®: 147720 UniProtKB/Swiss-Prot: P01584

NCBI Gene Summary: The protein encoded by this gene is a member of the interleukin 1 cytokine family. This cytokine is produced by activated macrophages as a proprotein, which is proteolytically processed to its active form by caspase 1 (CASP1/ICE). This cytokine is an important mediator of the inflammatory response, and is involved in a variety of cellular activities, including cell proliferation, differentiation, and apoptosis. The induction of cyclooxygenase-2 (PTGS2/COX2) by this cytokine in the central nervous system (CNS) is found to contribute to inflammatory pain hypersensitivity. Similarly, IL-1B has been implicated in human osteoarthritis pathogenesis. Patients with severe Coronavirus Disease 2019 (COVID-19) present elevated levels of pro-inflammatory cytokines such as IL-1B in bronchial alveolar lavage fluid samples. The lung damage induced by the Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is to a large extent, a result of the inflammatory response promoted by cytokines such as IL-1B.
GeneCards Summary: IL1B (Interleukin 1 Beta) is a Protein Coding gene. Diseases associated with IL1B include Gastric Cancer and Hereditary Diffuse Gastric Adenocarcinoma. Among its related pathways are MIF Mediated Glucocorticoid Regulation and Bacterial infections in CF airways. Gene Ontology (GO) annotations related to this gene include *protein domain specific binding* and *interleukin-1 receptor binding*. An important paralog of this gene is IL1RN.

UniProtKB/Swiss-Prot Summary: Potent pro-inflammatory cytokine (PubMed:10653850, 12794819, 28331908, 3920526). Initially discovered as the major endogenous pyrogen, induces prostaglandin synthesis, neutrophil influx and activation, T-cell activation and cytokine production, B-cell activation and antibody production, and fibroblast proliferation and collagen production (PubMed:3920526). Promotes Th17 differentiation of T-cells. Synergizes with IL12/interleukin-12 to induce IFNG synthesis from T-helper 1 (Th1) cells (PubMed:10653850). Plays a role in angiogenesis by inducing VEGF production synergistically with TNF and IL6 (PubMed:12794819). Involved in transduction of inflammation downstream of pyroptosis: its mature form is specifically released in the extracellular milieu by passing through the gasdermin-D (GSDMD) pore (PubMed:33377178, 33883744). Acts as a sensor of S.pyogenes infection in skin: cleaved and activated by pyogenes SpeB protease, leading to an inflammatory response that prevents bacterial growth during invasive skin infection (PubMed:28331908). (IL1B_HUMAN,P01584)

Cellular localization: mostly Cytoplasm, cytosol and extracellular region.

Full Name: Interleukin 1 Beta (IL-1β)

Protein Type: Pro-inflammatory cytokine

Primary Producers: Activated macrophages, monocytes, and certain dendritic cells.
IL-1β is synthesized as an inactive precursor (pro-IL-1β) and requires cleavage by caspase-1, which is activated within the inflammasome complex, to become biologically active.

🔬 Biological Function of IL-1β

IL-1β is a central mediator in the inflammatory response:

- **Fever Induction:** Acts as a pyrogen, stimulating the hypothalamus to induce fever.
- **Leukocyte Activation:** Promotes the activation and recruitment of neutrophils and other immune cells to sites of infection.
- **Cytokine Production:** Stimulates the production of other pro-inflammatory cytokines, amplifying the immune response.
- **Endothelial Activation:** Enhances the expression of adhesion molecules on endothelial cells, facilitating leukocyte transmigration.
- **Th17 Differentiation:** In combination with IL-23, promotes the differentiation of Th17 cells, which are involved in autoimmune and inflammatory responses.

🦠 Role of IL-1β in Sepsis

Sepsis is characterized by a dysregulated immune response to infection, leading to systemic inflammation and organ dysfunction. IL-1β plays a pivotal role in this process:

- **Inflammatory Amplification:** Elevated IL-1β levels contribute to the "cytokine storm" observed in sepsis, exacerbating tissue damage.
- **Endothelial Dysfunction:** IL-1β-induced endothelial activation increases vascular permeability, leading to hypotension and edema.
- **Organ Injury:** High IL-1β levels are associated with damage to vital organs, including the lungs, liver, and kidneys.
- **Immune Modulation:** While IL-1β promotes inflammation, it also influences the differentiation of regulatory immune cells, potentially impacting the resolution phase of sepsis.

📈 Diagnostic and Prognostic Value

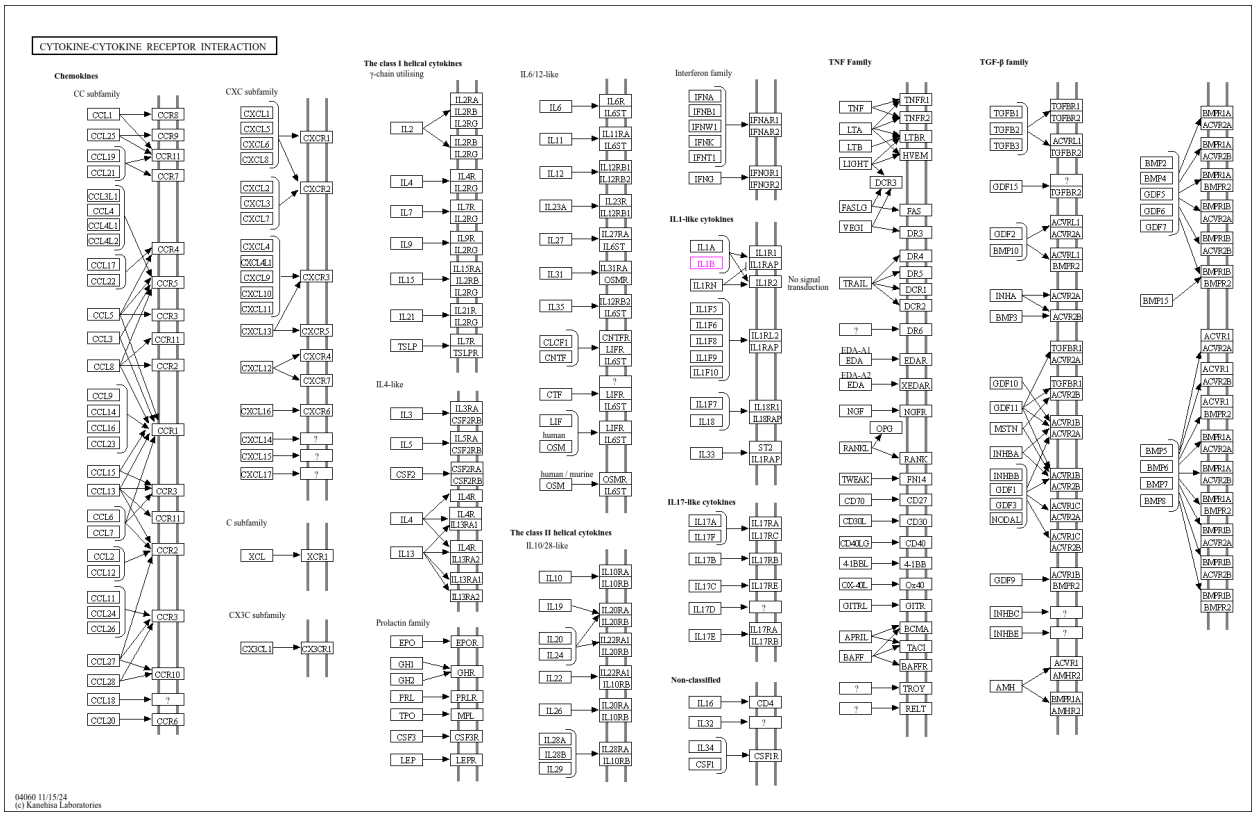
Elevated serum IL-1β levels have been correlated with sepsis severity and mortality:

- **Diagnostic Marker:** Higher IL-1β concentrations can aid in distinguishing septic patients from non-septic individuals.
- **Prognostic Indicator:** Increased IL-1β levels on admission are associated with higher 28-day mortality rates in sepsis patients.

🧪 Supporting Literature

Doi: 10.1006/cyto.1996.0186.
Doi: 10.1172/JCI116306.
Doi: 10.1007/s10753-020-01341-7.

KEGG:



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