Gene name: **GATA3**

External Ids for GATA3 Gene: HGNC: 4172 NCBI Gene: 2625 Ensembl: ENSG00000107485
OMIM®: 131320 UniProtKB/Swiss-Prot: P23771
NCBI Gene Summary: This gene encodes a protein which belongs to the GATA family of transcription factors. The protein contains two GATA-type zinc fingers and is an important regulator of T-cell development and plays an important role in endothelial cell biology. Defects in this gene are the cause of hypoparathyroidism with sensorineural deafness and renal dysplasia.

GeneCards Summary: GATA3 (GATA Binding Protein 3) is a Protein Coding gene. Diseases associated with GATA3 include Hypoparathyroidism, Sensorineural Deafness, And Renal Dysplasia Syndrome and Hypoparathyroidism-Deafness-Renal Disease Syndrome. Among its related pathways are Gene expression (Transcription) and ESR-mediated signaling. Gene Ontology (GO) annotations related to this gene include *DNA-binding transcription factor activity* and *transcription factor binding*. An important paralog of this gene is GATA2.

UniProtKB/Swiss-Prot Summary : Transcriptional activator which binds to the enhancer of the T-cell receptor alpha and delta genes. Binds to the consensus sequence 5'-AGATAG-3'. Required for the T-helper 2 (Th2) differentiation process following immune and inflammatory responses. Positively regulates ASB2 expression (By similarity). Coordinates macrophage transcriptional activation and UCP2-dependent metabolic reprogramming in response to IL33. Upon tissue injury, acts downstream of IL33 signaling to drive differentiation of inflammation-resolving alternatively activated macrophages. (GATA3_HUMAN,P23771)
Cellular localization: mostly in nucleus.

Full Name: GATA Binding Protein 3

Protein Type: Zinc-finger transcription factor

Primary Functions: Master regulator of Th2 cell differentiation, promoting the expression of cytokines like IL-4, IL-5, and IL-13 and essential for the development and function of Innate Lymphoid Cells type 2 (ILC2s).

🔬 Biological Function of GATA3

GATA3 plays pivotal roles in both the **adaptive** and **innate** immune systems:

1. Adaptive Immunity

- **Th2 Differentiation:** GATA3 is crucial for the differentiation of naive CD4+ T cells into Th2 cells, which are involved in humoral immunity and allergic responses.
- **Cytokine Regulation:** It directly regulates the transcription of Th2 cytokines, including IL-4, IL-5, and IL-13, which are essential for combating extracellular pathogens and in allergic inflammation.

2. Innate Immunity: **ILC2 Development:** GATA3 is indispensable for the development and function of ILC2s, which produce type 2 cytokines and play roles in mucosal immunity and tissue repair.

3. Vascular Endothelium

- **Coagulo Fibrinolytic Balance:** In endothelial cells, GATA3 regulates the expression of tissue-type plasminogen activator (tPA) and plasminogen activator inhibitor-1 (PAI-1), maintaining the balance between coagulation and fibrinolysis.

🦠 Role of GATA3 in Sepsis

Sepsis is characterized by a dysregulated immune response to infection, leading to systemic inflammation and organ dysfunction. GATA3's role in sepsis involves multiple facets:

1. Endothelial Function and Coagulation: **Protective Role:** A study demonstrated that endothelial-specific GATA3-deficient mice exhibited increased susceptibility to sepsis-induced pulmonary embolism. This was associated with elevated PAI-1 levels, reduced tPA expression, and decreased plasmin activity, leading to impaired fibrinolysis and increased thrombosis.

2. Immune Regulation: **Th2 Response:** GATA3 promotes Th2 responses, which can counterbalance the pro-inflammatory Th1 responses often seen in early sepsis. This modulation may help prevent excessive inflammation and tissue damage.

3. Biomarker Potential: **Gene Expression Studies:** Bioinformatics analyses have identified GATA3 as one of the differentially expressed genes in sepsis, suggesting its potential as a biomarker for disease progression and prognosis.

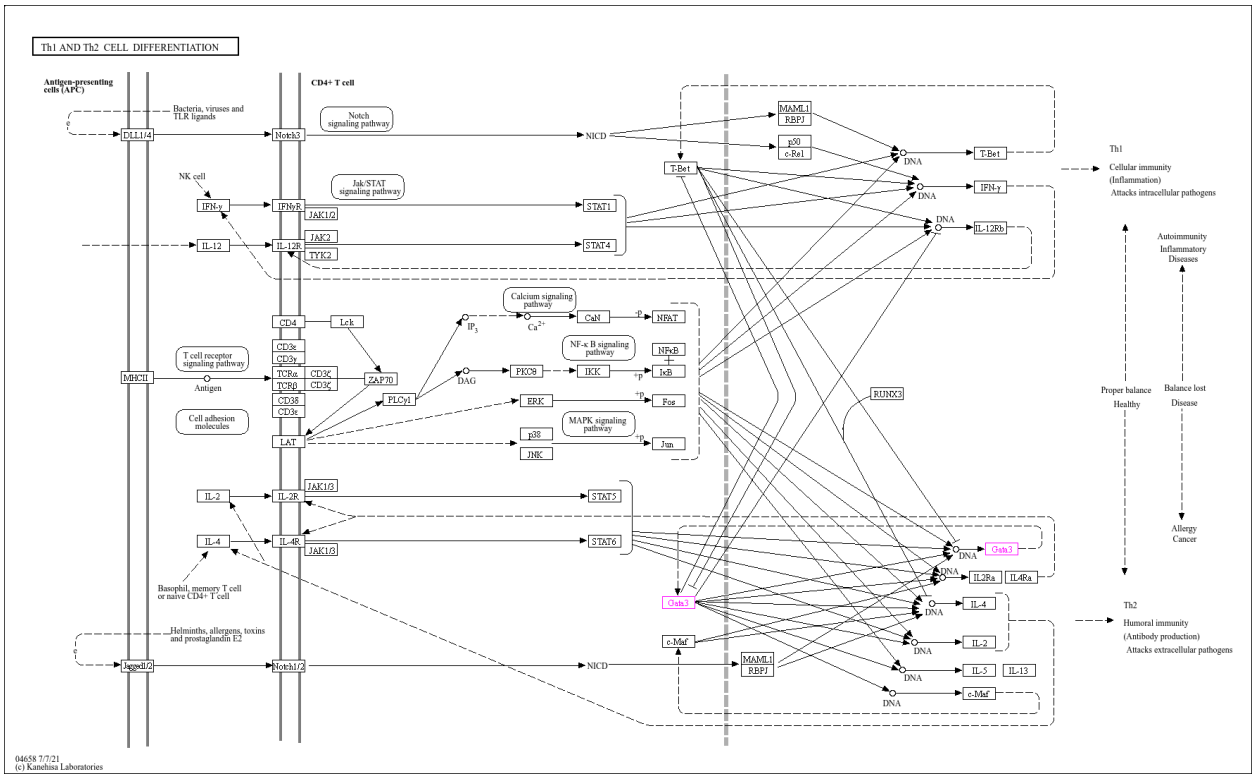
📈 Diagnostic and Prognostic Value

- **Diagnostic Potential:** Altered expression levels of GATA3 in sepsis patients indicate its potential utility in early diagnosis.
- **Prognostic Significance:** Given its role in maintaining endothelial function and modulating immune responses, GATA3 expression levels may correlate with disease severity and outcomes in sepsis patients.

🧪 Supporting Literature

DOI: 10.1538/expanim.24-0079
DOI: 10.1097/CCM.0000000000003269
DOI: 10.3389/fimmu.2017.01571

KEGG:



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