Gene name: **PTX3** **Previous HGNC Symbols for PTX3 Gene:** TNFAIP5

External Ids for PTX3 Gene: HGNC: 9692 NCBI Gene: 5806 Ensembl: ENSG00000163661 OMIM®: 602492 UniProtKB/Swiss-Prot: P26022

NCBI Gene Summary: This gene encodes a member of the pentraxin protein family. The expression of this protein is induced by inflammatory cytokines in response to inflammatory stimuli in several mesenchymal and epithelial cell types, particularly endothelial cells and mononuclear phagocytes. The protein promotes fibrocyte differentiation and is involved in regulating inflammation and complement activation. It also plays a role in angiogenesis and tissue remodeling. The protein serves as a biomarker for several inflammatory conditions.

GeneCards Summary: PTX3 (Pentraxin 3) is a Protein Coding gene. Diseases associated with PTX3 include Adiponectin Deficiency and Atypical Hemolytic-Uremic Syndrome. Among its related pathways are Innate Immune System and Complement cascade. Gene Ontology (GO) annotations related to this gene include *virion binding* and *(1->3)-beta-D-glucan binding*. An important paralog of this gene is NPTX2.

UniProtKB/Swiss-Prot Summary: Plays a role in the regulation of innate resistance to pathogens, inflammatory reactions, possibly clearance of self-components and female fertility.

Cellular localization: mainly extracellular region.

Pentraxin 3 (PTX3) is a member of the long pentraxin family, encoded by the **PTX3** gene located on chromosome 3q25. Unlike short pentraxins such as C-reactive protein (CRP), which are primarily produced in the liver, PTX3 is rapidly synthesized by various cell types—including mononuclear phagocytes, dendritic cells, fibroblasts, and endothelial cells—in response to inflammatory signals like Toll-like receptor engagement, tumor necrosis factor-alpha (TNF-α), and interleukin-1 beta (IL-1β). PTX3 plays a crucial role in the innate immune response by recognizing pathogens, activating complement pathways, and modulating inflammation.

Function in Sepsis:

- **Pattern Recognition:** PTX3 acts as a soluble pattern recognition receptor, binding to various pathogens, including bacteria, fungi, and viruses, thereby facilitating their recognition and clearance by the immune system.
- **Complement Activation:** By interacting with complement components such as C1q, PTX3 can activate the classical complement pathway, enhancing opsonization and promoting pathogen elimination.
- **Regulation of Inflammation:** PTX3 modulates inflammatory responses by binding to P-selectin, influencing leukocyte recruitment, and limiting excessive inflammation, which is critical in preventing tissue damage during sepsis.

Diagnostic and Prognostic Role:

- **Biomarker for Sepsis Severity:** Elevated plasma levels of PTX3 have been observed in patients with sepsis and septic shock, correlating with disease severity and organ dysfunction. Studies

have demonstrated that higher PTX3 concentrations are associated with increased mortality, suggesting its utility as a prognostic biomarker.
- **Early Indicator:** PTX3 levels rise rapidly in response to inflammatory stimuli, often preceding increases in traditional markers like CRP, making it a potential early indicator of sepsis.

Therapeutic Implications:

- **Target for Modulation:** Modulating PTX3 levels or function could influence the course of sepsis. However, while elevated PTX3 reflects disease severity, its exact role—whether protective or detrimental—in sepsis progression requires further investigation before therapeutic strategies can be developed.
- **Adjunctive Therapy:** Monitoring PTX3 levels could aid in tailoring adjunctive therapies aimed at modulating the immune response in septic patients.