

Gene name: **ARG1**

External Ids for ARG1 Gene: HGNC: [663](#) NCBI Gene: [383](#) Ensembl: [ENSG00000118520](#) OMIM®: [608313](#)
UniProtKB/Swiss-Prot: [P05089](#)

NCBI Gene Summary: Arginase catalyzes the hydrolysis of arginine to ornithine and urea. At least two isoforms of mammalian arginase exist (types I and II) which differ in their tissue distribution, subcellular localization, immunological cross reactivity and physiologic function. The type I isoform encoded by this gene, is a cytosolic enzyme and expressed predominantly in the liver as a component of the urea cycle.

GeneCards Summary: ARG1 (Arginase 1) is a Protein Coding gene. Diseases associated with ARG1 include [Argininemia](#) and [Urea Cycle Disorder](#). Among its related pathways are [superpathway of L-citrulline metabolism](#) and [Innate Immune System](#). Gene Ontology (GO) annotations related to this gene include *manganese ion binding* and *arginase activity*. An important paralog of this gene is [ARG2](#).

UniProtKB/Swiss-Prot Summary: Key element of the urea cycle converting L-arginine to urea and L-ornithine, which is further metabolized into metabolites proline and polyamides that drive collagen synthesis and bioenergetic pathways critical for cell proliferation, respectively; the urea cycle takes place primarily in the liver and, to a lesser extent, in the kidneys. ([ARG1_HUMAN,P05089](#))

Cellular localization: lysosome, cytosol, nucleus, extracellular.

The **ARG1** gene encodes **arginase-1**, an enzyme that catalyzes the hydrolysis of L-arginine into urea and ornithine. This reaction is a key component of the urea cycle, facilitating the removal of excess nitrogen from the body. Beyond its metabolic role, arginase-1 significantly influences immune function by modulating L-arginine availability, which in turn affects T-cell proliferation and macrophage activity.

Function in Sepsis:

- **Immune Modulation:** Elevated arginase-1 activity leads to decreased L-arginine levels, resulting in suppressed T-cell function and a shift towards an anti-inflammatory macrophage phenotype. This modulation can dampen excessive inflammation but may also contribute to immunosuppression observed in sepsis patients.
- **Nitric Oxide Regulation:** By depleting L-arginine, arginase-1 indirectly reduces nitric oxide (NO) production, as NO synthesis depends on L-arginine availability. While reduced NO levels can mitigate vasodilation and vascular permeability, essential in sepsis management, they may also impair microbial killing and tissue perfusion.

Pathways Involved in Sepsis:

Arginase-1 is involved in several critical pathways during sepsis:

- **Urea Cycle:** Facilitates the conversion of ammonia to urea, aiding in detoxification.
- **Polyamine Synthesis:** Generates ornithine, a precursor for polyamines, which are vital for cell proliferation and tissue repair.
- **Proline Synthesis:** Ornithine serves as a precursor for proline, important for collagen production and wound healing.

Diagnostic and Prognostic Role:

- **Diagnostic Marker:** Studies have identified ARG1 as a promising biomarker for sepsis diagnosis. Elevated ARG1 expression in blood samples has been associated with sepsis, distinguishing patients from healthy controls.
- **Prognostic Indicator:** Higher ARG1 levels have been correlated with increased sepsis severity and poorer outcomes. Its expression may help discriminate between uncomplicated sepsis and severe or fatal cases, as well as predict responses to early treatment interventions.