

Neuroinflammation-Related Genes

Microglial Activation and Immune Regulation

Gene	Function
TREM2	Regulates microglial response to damage; mutations associated with Alzheimer's disease.
CD33	Inhibits microglial phagocytosis; involved in neurodegenerative risk.
CX3CR1	Microglia-neuron communication; modulates neurotoxicity and synaptic pruning.
TLR4	Recognizes damage signals (DAMPs); activates NF-κB inflammatory pathway.
P2RY12	Homeostatic microglial marker; mediates chemotaxis.

Cytokines and Chemokines

Gene	Function
IL1B	Encodes interleukin-1β; promotes neuroinflammation and fever.
TNF	Tumor necrosis factor-α; central in acute neuroinflammatory response.
IL6	Mediates both pro- and anti-inflammatory effects in the CNS.
CCL2	Monocyte chemoattractant protein-1; attracts macrophages to CNS lesions.
CXCL10	Chemoattracts activated T-cells; elevated in autoimmune encephalitis.

Oxidative Stress and Blood-Brain Barrier Disruption

Gene	Function
NOX2	Generates ROS; contributes to oxidative neuronal damage.
MMP9	Degrades extracellular matrix; implicated in blood-brain barrier leakage.
AQP4	Water channel protein; involved in brain edema and astrocyte function.

Neurodegeneration and Clearance

Gene	Function
APP	Amyloid precursor protein; source of Aβ peptides in Alzheimer's.
PSEN1/2	γ-secretase complex components; mutations lead to abnormal amyloid processing.
ABCA7	Lipid transporter; modulates microglial phagocytosis and cholesterol homeostasis.

Common in Mendelian Randomization Studies

Gene	Function
IL6R	IL-6 receptor; instrumental variable in MR studies of inflammation.
CRP	C-reactive protein gene; systemic inflammation marker.
TREM2	See above; frequently used in genetic studies of microglial response.
MMP9	See above; associated with hemorrhagic transformation.

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