JAK2 gene

The JAK2 gene, also known as Janus kinase 2, is a gene that encodes a protein involved in cell signaling and regulation of various biological processes. Mutations in the JAK2 gene have been associated with certain blood disorders, including myeloproliferative neoplasms (MPNs) such as polycythemia vera, essential thrombocythemia, and primary myelofibrosis.

Specifically, a mutation called JAK2 V617F is the most common mutation observed in these MPNs. This mutation leads to the overactivation of the JAK-STAT signaling pathway, which controls the production and maturation of blood cells. The abnormal activation of this pathway contributes to the uncontrolled growth of blood cells seen in MPNs.

The discovery of the JAK2 V617F mutation has had significant implications for the diagnosis and treatment of MPNs. Testing for this mutation can help confirm the presence of these blood disorders and guide treatment decisions.

It's important to note that the JAK2 gene and its mutations are a complex area of scientific research and medical understanding. If you have specific concerns or questions about the JAK2 gene or its related disorders, it is recommended to consult with a healthcare professional or genetic counselor who can provide you with more detailed and personalized information.

Janus kinase 2 (commonly called JAK2) is a non-receptor tyrosine kinase. It is a member of the Janus kinase family and has been implicated in signaling by members of the type II cytokine receptor family (e.g. interferon receptors), the GM-CSF receptor family (IL-3R, IL-5R and GM-CSF-R), the gp130 receptor family (e.g., IL-6R), and the single chain receptors (e.g. Epo-R, Tpo-R, GH-R, PRL-R). JAK2 signaling is activated downstream from the prolactin receptor.

The distinguishing feature between janus kinase 2 and other JAK kinases is the lack of Src homology binding domains (SH2/SH3) and the presence of up to seven JAK homology domains (JH1-JH7). Nonetheless the terminal JH domains retain a high level of homology to tyrosine kinase domains. An interesting note is that only one of these carboxy-terminal JH domains retains its function while the other, due to lacking important amino acids for kinase functionality, does not work; it is therefore termed as the pseudokinase domain.

Loss of Jak2 is lethal by embryonic day 12 in mice.

JAK2 orthologs have been identified in all mammals for which complete genome data are available.

JAK2 gene in neurosurgery

- IL4I1 knockdown inhibits the epithelial-mesenchymal transition process in glioma via downregulation of the JAK2/STAT3 signaling pathway
- Exploring the Role of Inflammation and Metabolites in Bell's Palsy and Potential Treatment Strategies
- CSF3R-AS promotes hepatocellular carcinoma progression and sorafenib resistance through the CSF3R/JAK2/STAT3 positive feedback loop

- TMEM71 is crucial for cell proliferation in lower-grade glioma and is linked to unfavorable prognosis
- Sphingosine kinase 1 promotes M2 macrophage infiltration and enhances glioma cell migration via the JAK2/STAT3 pathway
- LTBP2 silence suppresses glioblastoma proliferation and tumor growth of xenograft tumor mice through modulating JAK2/STAT2 signaling pathway
- Distinct epigenetic and transcriptional profiles of Epstein-Barr virus-positive and negative primary CNS lymphomas
- Napabucasin Inhibits Proliferation and Migration of Glioblastoma Cells (U87) by Regulating JAK2/STAT3 Signaling Pathway

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CXCL8 induced signaling through a CXCR2-JAK2/STAT3 axis in TAMs, which supported an M2-like TAM phenotype through a paracrine, cell-extrinsic pathway. Genetic- and small molecule-based inhibition of these dual complementary signaling cascades in GSCs and TAMs suppressed GBM tumor growth and prolonged survival of orthotopic xenograft-bearing mice. [1)].

The aim of a study was to investigate the pathogenesis of autophagy and apoptosis mediated by Janus kinase 2/signal transducer and activator of transcription 3 (JAK2/STAT3) signal pathway after the onset of acute spinal cord injury (ASCI). A total of 45 Sprague-Dawley adult rats of either sex were selected for this study. The age of rats ranged from 8 to 10 weeks, and the average weight was 245 g. These rats were randomly divided into three groups, i.e. sham-operated group, model group, and the AG-490 intervention group (AG-490 is an inhibitor of JAK2). Each group contained 15 rats. Models were prepared using the modified Allen method. Five rats in each group were sacrificed at 6, 12 and 24 h, respectively, and the expression levels of p-JAK2 and p-STAT3 were detected in spinal cord tissue via western blot analysis. The levels of proinflammatory cytokines interleukin-6 (IL-6) and tumor necrosis factor-α (TNF-α) were detected via ELISA, positive expression of light chain 3 (LC3)-II of microtubule-associated protein 1 via immunofluorescence labeling method, and mRNA expression levels of caspase-3 and Bax/Bcl-2 via RT-PCR. In the model group, the expression levels of p-JAK2, p-STAT3, IL-6, TNF-α and LC3-II, and the mRNA expression levels of caspase-3 and Bax/Bcl-2 at all time-points were significantly higher than those in the AG-490 intervention group, and the levels in the sham-operated group were the lowest ($p<0.05$). In the model group, peak levels of p-JAK2 and p-STAT3 were attained at 12 h, but a decline was seen at 24 h; while increasing trend was seen in other indicators. In conclusion, JAK2/STAT3 signal pathway can mediate the activity of autophagy and apoptosis in an early stage after the onset of ASCI of rat [2)].

JAK2 mutation

JAK2 mutation

JAK2 inhibitor

JAK2 inhibitor

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Yuan W, Zhang Q, Gu D, Lu C, Dixit D, Gimple RC, Gao Y, Gao J, Li D, Shan D, Hu L, Li L, Li Y, Ci S, You H, Yan L, Chen K, Zhao N, Xu C, Lan J, Liu D, Zhang J, Shi Z, Wu Q, Yang K, Zhao L, Qiu Z, Lv D, Gao W, Yang H, Lin F, Wang Q, Man J, Li C, Tao W, Agnihotri S, Qian X, Mack SC, Zhang N, You Y, Rich JN, Sun G, Wang X. Dual Role of CXCL8 in Maintaining the Mesenchymal State of Glioblastoma Stem Cells and M2-Like Tumor-Associated Macrophages. Clin Cancer Res. 2023 Sep 15;29(18):3779-3792. doi: 10.1158/1078-0432.CCR-22-3273. PMID: 37439870.

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Xia Y, Xia H, Chen D, Liao Z, Yan Y. Mechanisms of autophagy and apoptosis mediated by JAK2 signaling pathway after spinal cord injury of rats. Exp Ther Med. 2017 Aug;14(2):1589-1593. doi: 10.3892/etm.2017.4674. Epub 2017 Jun 26. PubMed PMID: 28781630; PubMed Central PMCID: PMC5526089.