1. Phylogeny  
   Tyrosine-protein kinase JAK1 is a highly conserved non-receptor tyrosine kinase that belongs to the Janus kinase (JAK) family, which comprises four members: JAK1, JAK2, JAK3, and TYK2. This family is conserved across vertebrates and is present in numerous species ranging from mammals to birds and fish, reflecting an evolutionary lineage that can be traced back to a common ancestral kinase. JAK1 is grouped within the cytoplasmic tyrosine kinase branch of the kinome, and its domain architecture—with an N‐terminal FERM domain, an SH2-like domain, a regulatory pseudokinase domain (JH2) and a catalytic kinase domain (JH1)—is a hallmark of the JAK family. Its evolutionary relationship with the other JAK family members is evidenced by the conservation of critical regulatory and catalytic sequences, as well as functional similarities in signal transduction through cytokine receptors (yamaoka2004thejanuskinases pages 1-2, rane2000januskinasescomponents pages 1-2).
2. Reaction Catalyzed  
   JAK1 catalyzes the transfer of a phosphate group from ATP to tyrosine residues on substrate proteins. The chemical reaction can be summarized as follows: ATP + [protein] – (L-tyrosine) → ADP + [protein] – (L-tyrosine)-phosphate + H⁺. This reaction is central to the activation of downstream signaling proteins, including the phosphorylation of receptor subunits and STAT transcription factors (aliceavelazquez2011theuseof pages 2-3, oshea2009januskinasesin pages 1-2).
3. Cofactor Requirements  
   The catalytic activity of JAK1 depends on the presence of divalent metal ions, most notably Mg²⁺. This cofactor is critical for the proper coordination of ATP within the active site of the kinase domain, thereby facilitating the phosphotransfer reaction (aliceavelazquez2011theuseof pages 2-3).
4. Substrate Specificity  
   JAK1 exhibits substrate specificity predominantly for tyrosine residues present in intracellular domains of cytokine receptors as well as on STAT proteins. In its action, JAK1 phosphorylates specific tyrosine sites on the interferon receptor IFNAR2 and directly on STAT proteins, thus generating docking sites that mediate subsequent signal propagation via the JAK-STAT pathway. The consensus substrate motif for JAK1-driven phosphorylation events is less well defined compared to some other tyrosine kinases; however, its substrate selection is determined by the spatial conformation of the receptor-associated sequence and the proximity to the kinase domain upon receptor engagement (oshea2009januskinasesin pages 1-2, babon2014themolecularregulation pages 1-3).
5. Structure  
   The three-dimensional structure of JAK1 is organized into distinct domains that facilitate its diverse functions. At the N-terminus, the FERM domain (comprising JH6-JH7) mediates binding to cytokine receptor intracellular domains, and the adjacent SH2-like domain (often corresponding to JH3-JH4) contributes to protein–protein interactions. Following these receptor-binding modules is the pseudokinase domain (JH2), which, although lacking full catalytic activity, plays a regulatory role by modulating the conformation and basal activity of the enzyme. The C-terminal kinase domain (JH1) is the catalytic unit that executes ATP-dependent phosphoryl transfer to target tyrosine residues. Structural studies, including high-resolution crystallography and advanced modeling approaches, have revealed key features of the kinase domain such as the classic bilobed structure, a conserved activation loop that undergoes phosphorylation-induced conformational change for activation, a well-defined catalytic cleft with the ATP-binding site, and elements such as the hydrophobic spine and C-helix that are crucial for maintaining the active conformation. Unique structural elements such as vertebrate-specific insertions within the kinase domain also provide additional regulatory interfaces that may be exploited for selective inhibitor design (yamaoka2004thejanuskinases pages 2-3, babon2014themolecularregulation pages 3-4, lupardus2014structureofthe pages 5-6).
6. Regulation  
   JAK1 activity is subject to a multilayered regulatory network that ensures appropriate signal transduction in response to cytokine binding. Post-translational modifications, particularly phosphorylation, play a central role in regulating JAK1 function. Phosphorylation of tyrosine residues on the activation loop within the JH1 domain is essential for full catalytic activation, while other phosphorylation events on the receptor–JAK complex contribute to the recruitment of downstream signaling molecules. The pseudokinase domain (JH2) exerts autoinhibitory control over the kinase domain; mutations in this region are known to disrupt this inhibition and result in constitutive activation of the kinase. Negative regulatory proteins such as the Suppressor of Cytokine Signaling (SOCS) family bind to phosphorylated JAK1 or the receptor complex, thereby inhibiting kinase activity and promoting ubiquitin-dependent degradation. In addition, protein tyrosine phosphatases can dephosphorylate key activation loop residues, serving as an off-switch for JAK1-mediated signaling. Together, these mechanisms tightly control JAK1 activity to maintain the fidelity of cytokine-induced signal transduction (babon2014themolecularregulation pages 9-11, oshea2009januskinasesin pages 20-23, raivola2019characterizationofjak1 pages 13-15).
7. Function  
   JAK1 functions as a critical mediator in the transduction of signals initiated by a wide array of cytokines. It is indispensable for the signaling pathways of type I interferons (IFN-α/β), type II interferon (IFN-γ), the interleukin (IL)-2 receptor, and the IL-10 receptor, among others. In response to interferon binding, JAK1, in association with other JAK family members, phosphorylates IFNAR2 to create docking sites for STAT proteins, which are then activated by further phosphorylation events. This cascade ultimately leads to the translocation of STAT dimers into the nucleus, where they regulate the transcription of genes involved in antiviral responses, immune modulation, cell proliferation, and apoptosis. JAK1 is ubiquitously expressed and, owing to its central role in cytokine receptor signaling, is critical for the proper function of both innate and adaptive immune responses. The kinase also acts as a transactivator by regulating the activity of other JAK kinases in certain receptor complexes, thus ensuring robust and coordinated downstream signaling (aliceavelazquez2011theuseof pages 2-3, clark2014discoveryanddevelopment pages 3-5, raivola2019characterizationofjak1 pages 1-3).
8. Other Comments  
   Several small molecule inhibitors have been developed that target the kinase domain of JAK1, as well as other members of the JAK family, and these inhibitors have been used clinically in the treatment of inflammatory and autoimmune diseases. Inhibitors such as tofacitinib, ruxolitinib, and others have demonstrated the therapeutic potential of modulating JAK1 activity by competitively binding to the ATP-binding pocket of the kinase domain. Dysregulation of JAK1, including activating mutations and aberrant phosphorylation events, has been associated with various pathological conditions such as immunodeficiencies, hematological malignancies, and inflammatory disorders. Activating mutations in the pseudokinase domain, analogous to those observed in other JAK family members, can lead to constitutive signaling independent of cytokine stimulation, thereby contributing to oncogenic transformation. Ongoing research aims to develop inhibitors that are selective for JAK1 to minimize off-target effects that occur with pan-JAK inhibitors and to further elucidate the molecular mechanisms underlying its regulation and function (rashid2015inhibitionofjanus pages 1-4, gadina2019januskinasesto pages 1-2, seavey2012themanyfaces pages 1-2).
9. References  
   aliceavelazquez2011theuseof pages 2-3; clark2014discoveryanddevelopment pages 3-5; kwon2022moleculardissectionof pages 1-2; kwon2022moleculardissectionof pages 2-4; kwon2022moleculardissectionof pages 4-6; kwon2022moleculardissectionof pages 6-8; liau2019enzymaticcharacterizationof pages 1-3; oshea2009januskinasesin pages 1-2; raivola2021januskinasesin pages 1-2; rashid2015inhibitionofjanus pages 1-4; wilks2008thejakkinases pages 9-9; williams2009dissectingspecificityin pages 1-3; yamaoka2004thejanuskinases pages 1-2; yamaoka2004thejanuskinases pages 2-3; yamaoka2004thejanuskinases pages 4-5; aliceavelazquez2011theuseof pages 1-2; aliceavelazquez2011theuseof pages 7-8; babon2014themolecularregulation pages 1-3; babon2014themolecularregulation pages 13-14; babon2014themolecularregulation pages 14-15; babon2014themolecularregulation pages 3-4; babon2014themolecularregulation pages 4-6; babon2014themolecularregulation pages 9-11; clark2014discoveryanddevelopment pages 1-2; clark2014discoveryanddevelopment pages 2-3; gadina2019januskinasesto pages 1-2; gadina2019januskinasesto pages 2-3; gadina2019januskinasesto pages 3-4; gadina2019januskinasesto pages 9-10; giordanetto2002predictionofthe pages 1-2; liau2019enzymaticcharacterizationof pages 11-14; liau2019enzymaticcharacterizationof pages 14-15; liau2019enzymaticcharacterizationof pages 15-16; lupardus2014structureofthe pages 5-6; lupardus2014structureofthe pages 6-6; oshea2009januskinasesin pages 13-15; oshea2009januskinasesin pages 2-4; oshea2009januskinasesin pages 20-23; pesu2008therapeutictargetingof pages 1-2; pesu2008therapeutictargetingof pages 4-5; pesu2008therapeutictargetingof pages 9-11; raivola2019characterizationofjak1 pages 1-3; raivola2019characterizationofjak1 pages 13-15; raivola2019characterizationofjak1 pages 17-19; raivola2019characterizationofjak1 pages 19-20; raivola2021januskinasesin pages 5-7; raivola2021januskinasesin pages 7-9; rane2000januskinasescomponents pages 1-2; rane2000januskinasescomponents pages 2-3; seavey2012themanyfaces pages 1-2.

References

1. (aliceavelazquez2011theuseof pages 2-3): Nilda L. Alicea-Velazquez and Titus J. Boggon. The use of structural biology in janus kinase targeted drug discovery. Current Drug Targets, 12:546-555, Apr 2011. URL: https://doi.org/10.2174/138945011794751528, doi:10.2174/138945011794751528. This article has 65 citations and is from a peer-reviewed journal.
2. (clark2014discoveryanddevelopment pages 3-5): James D. Clark, Mark E. Flanagan, and Jean-Baptiste Telliez. Discovery and development of janus kinase (jak) inhibitors for inflammatory diseases. Journal of Medicinal Chemistry, 57:5023-5038, Jan 2014. URL: https://doi.org/10.1021/jm401490p, doi:10.1021/jm401490p. This article has 663 citations and is from a highest quality peer-reviewed journal.
3. (kwon2022moleculardissectionof pages 1-2): Sunghark Kwon. Molecular dissection of janus kinases as drug targets for inflammatory diseases. Frontiers in Immunology, Dec 2022. URL: https://doi.org/10.3389/fimmu.2022.1075192, doi:10.3389/fimmu.2022.1075192. This article has 13 citations and is from a peer-reviewed journal.
4. (kwon2022moleculardissectionof pages 2-4): Sunghark Kwon. Molecular dissection of janus kinases as drug targets for inflammatory diseases. Frontiers in Immunology, Dec 2022. URL: https://doi.org/10.3389/fimmu.2022.1075192, doi:10.3389/fimmu.2022.1075192. This article has 13 citations and is from a peer-reviewed journal.
5. (kwon2022moleculardissectionof pages 4-6): Sunghark Kwon. Molecular dissection of janus kinases as drug targets for inflammatory diseases. Frontiers in Immunology, Dec 2022. URL: https://doi.org/10.3389/fimmu.2022.1075192, doi:10.3389/fimmu.2022.1075192. This article has 13 citations and is from a peer-reviewed journal.
6. (kwon2022moleculardissectionof pages 6-8): Sunghark Kwon. Molecular dissection of janus kinases as drug targets for inflammatory diseases. Frontiers in Immunology, Dec 2022. URL: https://doi.org/10.3389/fimmu.2022.1075192, doi:10.3389/fimmu.2022.1075192. This article has 13 citations and is from a peer-reviewed journal.
7. (liau2019enzymaticcharacterizationof pages 1-3): Nicholas P. D. Liau, Artem Laktyushin, Rhiannon Morris, Jarrod J. Sandow, Nicos A. Nicola, Nadia J. Kershaw, and Jeffrey J. Babon. Enzymatic characterization of wild-type and mutant janus kinase 1. Cancers, 11:1701, Nov 2019. URL: https://doi.org/10.3390/cancers11111701, doi:10.3390/cancers11111701. This article has 15 citations and is from a peer-reviewed journal.
8. (oshea2009januskinasesin pages 1-2): JJ O’Shea. Janus kinases in immune cell signaling. Unknown journal, 2009. URL: https://doi.org/10.1111/j.1600-065x.2008.00754, doi:10.1111/j.1600-065x.2008.00754.
9. (raivola2021januskinasesin pages 1-2): Juuli Raivola, Teemu Haikarainen, Bobin George Abraham, and Olli Silvennoinen. Janus kinases in leukemia. Cancers, 13:800, Feb 2021. URL: https://doi.org/10.3390/cancers13040800, doi:10.3390/cancers13040800. This article has 44 citations and is from a peer-reviewed journal.
10. (rashid2015inhibitionofjanus pages 1-4): Sajid Rashid, Nousheen Bibi, Zahida Parveen, and Shagufta Shafique. Inhibition of janus kinases by tyrosine phosphorylation inhibitor, tyrphostin ag-490. Journal of Biomolecular Structure and Dynamics, 33:2368-2379, Jun 2015. URL: https://doi.org/10.1080/07391102.2015.1050696, doi:10.1080/07391102.2015.1050696. This article has 20 citations and is from a peer-reviewed journal.
11. (wilks2008thejakkinases pages 9-9): Andrew F. Wilks. The jak kinases: not just another kinase drug discovery target. Seminars in Cell & Developmental Biology, 19:319-328, Aug 2008. URL: https://doi.org/10.1016/j.semcdb.2008.07.020, doi:10.1016/j.semcdb.2008.07.020. This article has 123 citations.
12. (williams2009dissectingspecificityin pages 1-3): Neal K. Williams, Rebecca S. Bamert, Onisha Patel, Christina Wang, Patricia M. Walden, Andrew F. Wilks, Emmanuelle Fantino, Jamie Rossjohn, and Isabelle S. Lucet. Dissecting specificity in the janus kinases: the structures of jak-specific inhibitors complexed to the jak1 and jak2 protein tyrosine kinase domains. Journal of molecular biology, 387 1:219-32, Mar 2009. URL: https://doi.org/10.1016/j.jmb.2009.01.041, doi:10.1016/j.jmb.2009.01.041. This article has 285 citations and is from a domain leading peer-reviewed journal.
13. (yamaoka2004thejanuskinases pages 1-2): Kunihiro Yamaoka, Pipsa Saharinen, Marko Pesu, Vance ET Holt, Olli Silvennoinen, and John J O’Shea. The janus kinases (jaks). Genome Biology, 5:253-253, Nov 2004. URL: https://doi.org/10.1186/gb-2004-5-12-253, doi:10.1186/gb-2004-5-12-253. This article has 840 citations and is from a highest quality peer-reviewed journal.
14. (yamaoka2004thejanuskinases pages 2-3): Kunihiro Yamaoka, Pipsa Saharinen, Marko Pesu, Vance ET Holt, Olli Silvennoinen, and John J O’Shea. The janus kinases (jaks). Genome Biology, 5:253-253, Nov 2004. URL: https://doi.org/10.1186/gb-2004-5-12-253, doi:10.1186/gb-2004-5-12-253. This article has 840 citations and is from a highest quality peer-reviewed journal.
15. (yamaoka2004thejanuskinases pages 4-5): Kunihiro Yamaoka, Pipsa Saharinen, Marko Pesu, Vance ET Holt, Olli Silvennoinen, and John J O’Shea. The janus kinases (jaks). Genome Biology, 5:253-253, Nov 2004. URL: https://doi.org/10.1186/gb-2004-5-12-253, doi:10.1186/gb-2004-5-12-253. This article has 840 citations and is from a highest quality peer-reviewed journal.
16. (aliceavelazquez2011theuseof pages 1-2): Nilda L. Alicea-Velazquez and Titus J. Boggon. The use of structural biology in janus kinase targeted drug discovery. Current Drug Targets, 12:546-555, Apr 2011. URL: https://doi.org/10.2174/138945011794751528, doi:10.2174/138945011794751528. This article has 65 citations and is from a peer-reviewed journal.
17. (aliceavelazquez2011theuseof pages 7-8): Nilda L. Alicea-Velazquez and Titus J. Boggon. The use of structural biology in janus kinase targeted drug discovery. Current Drug Targets, 12:546-555, Apr 2011. URL: https://doi.org/10.2174/138945011794751528, doi:10.2174/138945011794751528. This article has 65 citations and is from a peer-reviewed journal.
18. (babon2014themolecularregulation pages 1-3): Jeffrey J. Babon, Isabelle S. Lucet, James M. Murphy, Nicos A. Nicola, and Leila N. Varghese. The molecular regulation of janus kinase (jak) activation. The Biochemical journal, 462 1:1-13, Aug 2014. URL: https://doi.org/10.1042/bj20140712, doi:10.1042/bj20140712. This article has 410 citations.
19. (babon2014themolecularregulation pages 13-14): Jeffrey J. Babon, Isabelle S. Lucet, James M. Murphy, Nicos A. Nicola, and Leila N. Varghese. The molecular regulation of janus kinase (jak) activation. The Biochemical journal, 462 1:1-13, Aug 2014. URL: https://doi.org/10.1042/bj20140712, doi:10.1042/bj20140712. This article has 410 citations.
20. (babon2014themolecularregulation pages 14-15): Jeffrey J. Babon, Isabelle S. Lucet, James M. Murphy, Nicos A. Nicola, and Leila N. Varghese. The molecular regulation of janus kinase (jak) activation. The Biochemical journal, 462 1:1-13, Aug 2014. URL: https://doi.org/10.1042/bj20140712, doi:10.1042/bj20140712. This article has 410 citations.
21. (babon2014themolecularregulation pages 3-4): Jeffrey J. Babon, Isabelle S. Lucet, James M. Murphy, Nicos A. Nicola, and Leila N. Varghese. The molecular regulation of janus kinase (jak) activation. The Biochemical journal, 462 1:1-13, Aug 2014. URL: https://doi.org/10.1042/bj20140712, doi:10.1042/bj20140712. This article has 410 citations.
22. (babon2014themolecularregulation pages 4-6): Jeffrey J. Babon, Isabelle S. Lucet, James M. Murphy, Nicos A. Nicola, and Leila N. Varghese. The molecular regulation of janus kinase (jak) activation. The Biochemical journal, 462 1:1-13, Aug 2014. URL: https://doi.org/10.1042/bj20140712, doi:10.1042/bj20140712. This article has 410 citations.
23. (babon2014themolecularregulation pages 9-11): Jeffrey J. Babon, Isabelle S. Lucet, James M. Murphy, Nicos A. Nicola, and Leila N. Varghese. The molecular regulation of janus kinase (jak) activation. The Biochemical journal, 462 1:1-13, Aug 2014. URL: https://doi.org/10.1042/bj20140712, doi:10.1042/bj20140712. This article has 410 citations.
24. (clark2014discoveryanddevelopment pages 1-2): James D. Clark, Mark E. Flanagan, and Jean-Baptiste Telliez. Discovery and development of janus kinase (jak) inhibitors for inflammatory diseases. Journal of Medicinal Chemistry, 57:5023-5038, Jan 2014. URL: https://doi.org/10.1021/jm401490p, doi:10.1021/jm401490p. This article has 663 citations and is from a highest quality peer-reviewed journal.
25. (clark2014discoveryanddevelopment pages 2-3): James D. Clark, Mark E. Flanagan, and Jean-Baptiste Telliez. Discovery and development of janus kinase (jak) inhibitors for inflammatory diseases. Journal of Medicinal Chemistry, 57:5023-5038, Jan 2014. URL: https://doi.org/10.1021/jm401490p, doi:10.1021/jm401490p. This article has 663 citations and is from a highest quality peer-reviewed journal.
26. (gadina2019januskinasesto pages 1-2): Massimo Gadina, Mimi T Le, Daniella M Schwartz, Olli Silvennoinen, Shingo Nakayamada, Kunihiro Yamaoka, and John J O’Shea. Janus kinases to jakinibs: from basic insights to clinical practice. Rheumatology, 58:i4-i16, Feb 2019. URL: https://doi.org/10.1093/rheumatology/key432, doi:10.1093/rheumatology/key432. This article has 168 citations and is from a peer-reviewed journal.
27. (gadina2019januskinasesto pages 2-3): Massimo Gadina, Mimi T Le, Daniella M Schwartz, Olli Silvennoinen, Shingo Nakayamada, Kunihiro Yamaoka, and John J O’Shea. Janus kinases to jakinibs: from basic insights to clinical practice. Rheumatology, 58:i4-i16, Feb 2019. URL: https://doi.org/10.1093/rheumatology/key432, doi:10.1093/rheumatology/key432. This article has 168 citations and is from a peer-reviewed journal.
28. (gadina2019januskinasesto pages 3-4): Massimo Gadina, Mimi T Le, Daniella M Schwartz, Olli Silvennoinen, Shingo Nakayamada, Kunihiro Yamaoka, and John J O’Shea. Janus kinases to jakinibs: from basic insights to clinical practice. Rheumatology, 58:i4-i16, Feb 2019. URL: https://doi.org/10.1093/rheumatology/key432, doi:10.1093/rheumatology/key432. This article has 168 citations and is from a peer-reviewed journal.
29. (gadina2019januskinasesto pages 9-10): Massimo Gadina, Mimi T Le, Daniella M Schwartz, Olli Silvennoinen, Shingo Nakayamada, Kunihiro Yamaoka, and John J O’Shea. Janus kinases to jakinibs: from basic insights to clinical practice. Rheumatology, 58:i4-i16, Feb 2019. URL: https://doi.org/10.1093/rheumatology/key432, doi:10.1093/rheumatology/key432. This article has 168 citations and is from a peer-reviewed journal.
30. (giordanetto2002predictionofthe pages 1-2): Fabrizio Giordanetto and Romano T. Kroemer. Prediction of the structure of human janus kinase 2 (jak2) comprising jak homology domains 1 through 7. Protein Engineering, Design and Selection, 15:727-737, Sep 2002. URL: https://doi.org/10.1093/protein/15.9.727, doi:10.1093/protein/15.9.727. This article has 126 citations.
31. (liau2019enzymaticcharacterizationof pages 11-14): Nicholas P. D. Liau, Artem Laktyushin, Rhiannon Morris, Jarrod J. Sandow, Nicos A. Nicola, Nadia J. Kershaw, and Jeffrey J. Babon. Enzymatic characterization of wild-type and mutant janus kinase 1. Cancers, 11:1701, Nov 2019. URL: https://doi.org/10.3390/cancers11111701, doi:10.3390/cancers11111701. This article has 15 citations and is from a peer-reviewed journal.
32. (liau2019enzymaticcharacterizationof pages 14-15): Nicholas P. D. Liau, Artem Laktyushin, Rhiannon Morris, Jarrod J. Sandow, Nicos A. Nicola, Nadia J. Kershaw, and Jeffrey J. Babon. Enzymatic characterization of wild-type and mutant janus kinase 1. Cancers, 11:1701, Nov 2019. URL: https://doi.org/10.3390/cancers11111701, doi:10.3390/cancers11111701. This article has 15 citations and is from a peer-reviewed journal.
33. (liau2019enzymaticcharacterizationof pages 15-16): Nicholas P. D. Liau, Artem Laktyushin, Rhiannon Morris, Jarrod J. Sandow, Nicos A. Nicola, Nadia J. Kershaw, and Jeffrey J. Babon. Enzymatic characterization of wild-type and mutant janus kinase 1. Cancers, 11:1701, Nov 2019. URL: https://doi.org/10.3390/cancers11111701, doi:10.3390/cancers11111701. This article has 15 citations and is from a peer-reviewed journal.
34. (lupardus2014structureofthe pages 5-6): Patrick J. Lupardus, Mark Ultsch, Heidi Wallweber, Pawan Bir Kohli, Adam R. Johnson, and Charles Eigenbrot. Structure of the pseudokinase–kinase domains from protein kinase tyk2 reveals a mechanism for janus kinase (jak) autoinhibition. Proceedings of the National Academy of Sciences, 111:8025-8030, May 2014. URL: https://doi.org/10.1073/pnas.1401180111, doi:10.1073/pnas.1401180111. This article has 226 citations.
35. (lupardus2014structureofthe pages 6-6): Patrick J. Lupardus, Mark Ultsch, Heidi Wallweber, Pawan Bir Kohli, Adam R. Johnson, and Charles Eigenbrot. Structure of the pseudokinase–kinase domains from protein kinase tyk2 reveals a mechanism for janus kinase (jak) autoinhibition. Proceedings of the National Academy of Sciences, 111:8025-8030, May 2014. URL: https://doi.org/10.1073/pnas.1401180111, doi:10.1073/pnas.1401180111. This article has 226 citations.
36. (oshea2009januskinasesin pages 13-15): JJ O’Shea. Janus kinases in immune cell signaling. Unknown journal, 2009. URL: https://doi.org/10.1111/j.1600-065x.2008.00754, doi:10.1111/j.1600-065x.2008.00754.
37. (oshea2009januskinasesin pages 2-4): JJ O’Shea. Janus kinases in immune cell signaling. Unknown journal, 2009. URL: https://doi.org/10.1111/j.1600-065x.2008.00754, doi:10.1111/j.1600-065x.2008.00754.
38. (oshea2009januskinasesin pages 20-23): JJ O’Shea. Janus kinases in immune cell signaling. Unknown journal, 2009. URL: https://doi.org/10.1111/j.1600-065x.2008.00754, doi:10.1111/j.1600-065x.2008.00754.
39. (pesu2008therapeutictargetingof pages 1-2): M Pesu. Therapeutic targeting of janus kinases. Unknown journal, 2008. URL: https://doi.org/10.1111/j.1600-065x.2008.00644, doi:10.1111/j.1600-065x.2008.00644.
40. (pesu2008therapeutictargetingof pages 4-5): M Pesu. Therapeutic targeting of janus kinases. Unknown journal, 2008. URL: https://doi.org/10.1111/j.1600-065x.2008.00644, doi:10.1111/j.1600-065x.2008.00644.
41. (pesu2008therapeutictargetingof pages 9-11): M Pesu. Therapeutic targeting of janus kinases. Unknown journal, 2008. URL: https://doi.org/10.1111/j.1600-065x.2008.00644, doi:10.1111/j.1600-065x.2008.00644.
42. (raivola2019characterizationofjak1 pages 1-3): Juuli Raivola, Teemu Haikarainen, and Olli Silvennoinen. Characterization of jak1 pseudokinase domain in cytokine signaling. Cancers, 12:78, Dec 2019. URL: https://doi.org/10.3390/cancers12010078, doi:10.3390/cancers12010078. This article has 35 citations and is from a peer-reviewed journal.
43. (raivola2019characterizationofjak1 pages 13-15): Juuli Raivola, Teemu Haikarainen, and Olli Silvennoinen. Characterization of jak1 pseudokinase domain in cytokine signaling. Cancers, 12:78, Dec 2019. URL: https://doi.org/10.3390/cancers12010078, doi:10.3390/cancers12010078. This article has 35 citations and is from a peer-reviewed journal.
44. (raivola2019characterizationofjak1 pages 17-19): Juuli Raivola, Teemu Haikarainen, and Olli Silvennoinen. Characterization of jak1 pseudokinase domain in cytokine signaling. Cancers, 12:78, Dec 2019. URL: https://doi.org/10.3390/cancers12010078, doi:10.3390/cancers12010078. This article has 35 citations and is from a peer-reviewed journal.
45. (raivola2019characterizationofjak1 pages 19-20): Juuli Raivola, Teemu Haikarainen, and Olli Silvennoinen. Characterization of jak1 pseudokinase domain in cytokine signaling. Cancers, 12:78, Dec 2019. URL: https://doi.org/10.3390/cancers12010078, doi:10.3390/cancers12010078. This article has 35 citations and is from a peer-reviewed journal.
46. (raivola2021januskinasesin pages 5-7): Juuli Raivola, Teemu Haikarainen, Bobin George Abraham, and Olli Silvennoinen. Janus kinases in leukemia. Cancers, 13:800, Feb 2021. URL: https://doi.org/10.3390/cancers13040800, doi:10.3390/cancers13040800. This article has 44 citations and is from a peer-reviewed journal.
47. (raivola2021januskinasesin pages 7-9): Juuli Raivola, Teemu Haikarainen, Bobin George Abraham, and Olli Silvennoinen. Janus kinases in leukemia. Cancers, 13:800, Feb 2021. URL: https://doi.org/10.3390/cancers13040800, doi:10.3390/cancers13040800. This article has 44 citations and is from a peer-reviewed journal.
48. (rane2000januskinasescomponents pages 1-2): Sushil G Rane and E Premkumar Reddy. Janus kinases: components of multiple signaling pathways. Oncogene, 19:5662-5679, Nov 2000. URL: https://doi.org/10.1038/sj.onc.1203925, doi:10.1038/sj.onc.1203925. This article has 648 citations and is from a domain leading peer-reviewed journal.
49. (rane2000januskinasescomponents pages 2-3): Sushil G Rane and E Premkumar Reddy. Janus kinases: components of multiple signaling pathways. Oncogene, 19:5662-5679, Nov 2000. URL: https://doi.org/10.1038/sj.onc.1203925, doi:10.1038/sj.onc.1203925. This article has 648 citations and is from a domain leading peer-reviewed journal.
50. (seavey2012themanyfaces pages 1-2): Matthew M. Seavey and Pawel Dobrzanski. The many faces of janus kinase. Biochemical Pharmacology, 83:1136-1145, May 2012. URL: https://doi.org/10.1016/j.bcp.2011.12.024, doi:10.1016/j.bcp.2011.12.024. This article has 166 citations and is from a domain leading peer-reviewed journal.