

Platelet-activating factor receptor in GtoPdb v.2023.1

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Abstract

Platelet-activating factor (PAF, 1-*O*-alkyl-2-acetyl-sn-glycero-3-phosphocholine) is an ether phospholipid mediator associated with platelet coagulation, but also subserves inflammatory roles. The PAF receptor (**provisional nomenclature recommended by NC-IUPHAR [38]**) is activated by PAF and other suggested endogenous ligands are oxidized phosphatidylcholine [74] and lysophosphatidylcholine [98]. It may also be activated by bacterial lipopolysaccharide [91].

Contents

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Receptors

References

1. Albert DH, Conway RG, Magoc TJ, Tapang P, Rhein DA, Luo G, Holms JH, Davidsen SK, Summers JB and Carter GW. (1996) Properties of ABT-299, a prodrug of A-85783, a highly potent platelet activating factor receptor antagonist. *J Pharmacol Exp Ther* **277**: 1595-606 [PMID:8667228]
2. Albert DH, Magoc TJ, Tapang P, Luo G, Morgan DW, Curtin M, Sheppard GS, Xu L, Heyman HR and Davidsen SK *et al.* (1997) Pharmacology of ABT-491, a highly potent platelet-activating factor receptor antagonist. *Eur J Pharmacol* **325**: 69-80 [PMID:9151941]
3. Aliberti JC, Machado FS, Gazzinelli RT, Teixeira MM and Silva JS. (1999) Platelet-activating factor induces nitric oxide synthesis in Trypanosoma cruzi-infected macrophages and mediates resistance to parasite infection in mice. *Infect Immun* **67**: 2810-4 [PMID:10338485]
4. Aoki Y, Nakamura M, Kodama H, Matsumoto T, Shimizu T and Noma M. (1995) A radioreceptor binding assay for platelet-activating factor (PAF) using membranes from CHO cells expressing human PAF receptor. *J Immunol Methods* **186**: 225-31 [PMID:7594622]
5. Asano K, Taniguchi S, Nakao A, Watanabe T and Kurokawa K. (1996) Distribution of platelet activating factor receptor mRNA along the rat nephron segments. *Biochem Biophys Res Commun* **225**: 352-7 [PMID:8753768]
6. Bachi AL, Dos Santos LC, Nonogaki S, Jancar S and Jasiulionis MG. (2012) Apoptotic cells contribute to melanoma progression and this effect is partially mediated by the platelet-activating factor receptor. *Mediators Inflamm* **2012**: 610371 [PMID:22577252]
7. Bartemes KR, McKinney S, Gleich GJ and Kita H. (1999) Endogenous platelet-activating factor is critically involved in effector functions of eosinophils stimulated with IL-5 or IgG. *J Immunol* **162**: 2982-2989 [PMID:10072549]
8. Bazan NG, Fletcher BS, Herschman HR and Mukherjee PK. (1994) Platelet-activating factor and retinoic acid synergistically activate the inducible prostaglandin synthase gene. *Proc Natl Acad Sci USA* **91**: 5252-6 [PMID:8202477]
9. Beaudoux JL, Said T, Ninio E, Ganné F, Soria J, Delattre J, Soria C, Legrand A and Peynet J. (2004) Activation of PAF receptor by oxidised LDL in human monocytes stimulates chemokine releases but not urokinase-type plasminogen activator expression. *Clin Chim Acta* **344**: 163-71 [PMID:15149885]
10. Benveniste J, Henson PM and Cochrane CG. (1972) Leukocyte-dependent histamine release from rabbit platelets. The role of IgE, basophils, and a platelet-activating factor. *J Exp Med* **136**: 1356-77 [PMID:4118412]
11. Bito H, Honda Z, Nakamura M and Shimizu T. (1994) Cloning, expression and tissue distribution of rat platelet-activating-factor-receptor cDNA. *Eur J Biochem* **221**: 211-8 [PMID:8168510]
12. Brochériou I, Stengel D, Mattsson-Hultén L, Stankova J, Rola-Pleszczynski M, Koskas F, Wiklund O, Le Charpentier Y and Ninio E. (2000) Expression of platelet-activating factor receptor in human carotid atherosclerotic plaques: relevance to progression of atherosclerosis. *Circulation* **102**: 2569-75 [PMID:11085958]
13. Brown SL, Jala VR, Raghuvanshi SK, Nasser MW, Haribabu B and Richardson RM. (2006) Activation and regulation of platelet-activating factor receptor: role of G(i) and G(q) in receptor-mediated chemotactic, cytotoxic, and cross-regulatory signals. *J Immunol* **177**: 3242-9 [PMID:16920964]
14. Buneman P, Christie G, Davies JA, Dimitrellou R, Harding SD, Pawson AJ, Sharman JL and Wu Y. (2020) Why data citation isn't working, and what to do about it *Database* **2020** [PMID:32367113]
15. Bussolati B, Biancone L, Cassoni P, Russo S, Rola-Pleszczynski M, Montrucchio G and Camussi G. (2000) PAF produced by human breast cancer cells promotes migration and proliferation of tumor cells and neo-angiogenesis. *Am J Pathol* **157**: 1713-25 [PMID:11073830]
16. Castor MG, Rezende BM, Resende CB, Bernardes PT, Cisalpino D, Vieira AT, Souza DG, Silva TA, Teixeira MM and Pinho V. (2012) Platelet-activating factor receptor plays a role in the pathogenesis of graft-versus-host disease by regulating leukocyte recruitment, tissue injury, and lethality. *J Leukoc Biol* **91**: 629-39 [PMID:22301794]
17. Cellai C, Laurenzana A, Vannucchi AM, Caporale R, Paglierani M, Di Lollo S, Pancrazzi A and Paoletti F. (2006) Growth inhibition and differentiation of human breast cancer cells by the PAFR antagonist WEB-

2086. *Br J Cancer* **94**: 1637-42 [PMID:16721373]
18. Chami O, Evans G and O'Neill C. (2004) Components of a platelet-activating factor-signaling loop are assembled in the ovine endometrium late in the estrous cycle. *Am J Physiol Endocrinol Metab* **287**: E233-40 [PMID:15271646]
 19. Chase PB, Halonen M and Regan JW. (1993) Cloning of a human platelet-activating factor receptor gene: evidence for an intron in the 5'-untranslated region. *Am J Respir Cell Mol Biol* **8**: 240-4 [PMID:8383507]
 20. Chen C, Magee JC, Marcheselli V, Hardy M and Bazan NG. (2001) Attenuated LTP in hippocampal dentate gyrus neurons of mice deficient in the PAF receptor. *J Neurophysiol* **85**: 384-90 [PMID:11152738]
 21. Chen R, Chen X, Salomon RG and McIntyre TM. (2009) Platelet activation by low concentrations of intact oxidized LDL particles involves the PAF receptor. *Arterioscler Thromb Vasc Biol* **29**: 363-71 [PMID:19112165]
 22. Clark GD, Happel LT, Zorumski CF and Bazan NG. (1992) Enhancement of hippocampal excitatory synaptic transmission by platelet-activating factor. *Neuron* **9**: 1211-6 [PMID:1334422]
 23. Cundell DR, Gerard NP, Gerard C, Idanpaan-Heikkila I and Tuomanen EI. (1995) Streptococcus pneumoniae anchor to activated human cells by the receptor for platelet-activating factor. *Nature* **377**: 435-8 [PMID:7566121]
 24. Curtin ML. (1998) Current status of platelet-activating factor antagonists. *Expert Opinion on Therapeutic Patents* **8**: 703-711
 25. Davies SS, Pontsler AV, Marathe GK, Harrison KA, Murphy RC, Hinshaw JC, Prestwich GD, Hilaire AS, Prescott SM and Zimmerman GA *et al.* (2001) Oxidized alkyl phospholipids are specific, high affinity peroxisome proliferator-activated receptor gamma ligands and agonists. *J Biol Chem* **276**: 16015-23 [PMID:11279149]
 26. de Oliveira SI, Andrade LN, Onuchic AC, Nonogaki S, Fernandes PD, Pinheiro MC, Rohde CB, Chammas R and Jancar S. (2010) Platelet-activating factor receptor (PAF-R)-dependent pathways control tumour growth and tumour response to chemotherapy. *BMC Cancer* **10**: 200 [PMID:20465821]
 27. de Oliveira SI, Fernandes PD, Amarante Mendes JG and Jancar S. (2006) Phagocytosis of apoptotic and necrotic thymocytes is inhibited by PAF-receptor antagonists and affects LPS-induced COX-2 expression in murine macrophages. *Prostaglandins Other Lipid Mediat* **80**: 62-73 [PMID:16846787]
 28. Del Maschio A, Evangelista V, Rajtar G, Chen ZM, Cerletti C and De Gaetano G. (1990) Platelet activation by polymorphonuclear leukocytes exposed to chemotactic agents. *Am J Physiol* **258**: H870-9 [PMID:2156456]
 29. Deo DD, Bazan NG and Hunt JD. (2004) Activation of platelet-activating factor receptor-coupled G alpha q leads to stimulation of Src and focal adhesion kinase via two separate pathways in human umbilical vein endothelial cells. *J Biol Chem* **279**: 3497-508 [PMID:14617636]
 30. Desplat V, Besse A, Faucher JL, Praloran V and Denizot Y. (1999) Expression of platelet-activating factor receptor transcript-1 but not transcript-2 by human bone marrow cells. *Stem Cells* **17**: 121-4 [PMID:10195573]
 31. Drolet AM, Thivierge M, Turcotte S, Hanna D, Maynard B, Stanková J and Rola-Pleszczynski M. (2011) Platelet-activating factor induces Th17 cell differentiation. *Mediators Inflamm* **2011**: 913802 [PMID:22013287]
 32. Fadok VA, Bratton DL, Konowal A, Freed PW, Westcott JY and Henson PM. (1998) Macrophages that have ingested apoptotic cells in vitro inhibit proinflammatory cytokine production through autocrine/paracrine mechanisms involving TGF-beta, PGE2, and PAF. *J Clin Invest* **101**: 890-8 [PMID:9466984]
 33. Fecchio D, Russo M, Sirois P, Braquet P and Jancar S. (1990) Inhibition of Ehrlich ascites tumor in vivo by PAF-antagonists. *Int J Immunopharmacol* **12**: 57-65 [PMID:2303318]
 34. Fernandes ES, Passos GF, Campos MM, Araújo JG, Pesquero JL, Avellar MC, Teixeira MM and Calixto JB. (2003) Mechanisms underlying the modulatory action of platelet activating factor (PAF) on the upregulation of kinin B1 receptors in the rat paw. *Br J Pharmacol* **139**: 973-81 [PMID:12839871]
 35. Fernández-Gallardo S, Ortega MP, Priego JG, de Casa-Juana ME, Sunkel C and Sánchez Crespo M. (1990) Pharmacological actions of PCA 4248, a new platelet-activating factor receptor antagonist: in vivo studies. *J Pharmacol Exp Ther* **255**: 34-9 [PMID:2170626]
 36. Ferreira MA, Barcelos LS, Campos PP, Vasconcelos AC, Teixeira MM and Andrade SP. (2004) Sponge-induced angiogenesis and inflammation in PAF receptor-deficient mice (PAFR-KO). *Br J Pharmacol* **141**: 1185-92 [PMID:15023865]

37. Flickinger BD and Olson MS. (1999) Localization of the platelet-activating factor receptor to rat pancreatic microvascular endothelial cells. *Am J Pathol* **154**: 1353-8 [PMID:10329588]
38. Foord SM, Bonner TI, Neubig RR, Rosser EM, Pin JP, Davenport AP, Spedding M and Harmar AJ. (2005) International Union of Pharmacology. XLVI. G protein-coupled receptor list. *Pharmacol Rev* **57**: 279-88 [PMID:15914470]
39. Fukunaga K, Ishii S, Asano K, Yokomizo T, Shiomi T, Shimizu T and Yamaguchi K. (2001) Single nucleotide polymorphism of human platelet-activating factor receptor impairs G-protein activation. *J Biol Chem* **276**: 43025-30 [PMID:11560941]
40. Galan J, Mondelli J and Coradazzi JL. (1976) Marginal leakage of two composite restorative systems. *J Dent Res* **55**: 74-6 [PMID:1107383]
41. Ganeshan L, Li A and O'Neill C. (2010) Transformation-related protein 53 expression in the early mouse embryo compromises preimplantation embryonic development by preventing the formation of a proliferating inner cell mass. *Biol Reprod* **83**: 958-64 [PMID:20739669]
42. Goldring WP, Alexander SP, Kendall DA and Pattenden G. (2005) Novel phomactin analogues as PAF receptor ligands. *Bioorg Med Chem Lett* **15**: 3263-6 [PMID:15922596]
43. Grandel KE, Farr RS, Wanderer AA, Eisenstadt TC and Wasserman SI. (1985) Association of platelet-activating factor with primary acquired cold urticaria. *N Engl J Med* **313**: 405-9 [PMID:2410790]
44. Handley DA, Van Valen RG, Melden MK, Houlihan WJ and Saunders RN. (1988) Biological effects of the orally active platelet activating factor receptor antagonist SDZ 64-412. *J Pharmacol Exp Ther* **247**: 617-23 [PMID:3183958]
45. Heon Seo K, Ko HM, Kim HA, Choi JH, Jun Park S, Kim KJ, Lee HK and Im SY. (2006) Platelet-activating factor induces up-regulation of antiapoptotic factors in a melanoma cell line through nuclear factor-kappaB activation. *Cancer Res* **66**: 4681-6 [PMID:16651419]
46. Herbert JM, Laplace MC, Cailleau C and Maffrand JP. (1993) Effect of SR 27417 on the binding of [3H]PAF to rabbit and human platelets and human polymorphonuclear leukocytes. *J Lipid Mediat* **7**: 57-78 [PMID:8395255]
47. Heuer HO, Casals-Stenzel J, Muacevic G and Weber KH. (1990) Pharmacologic activity of bepafant (WEB 2170), a new and selective hexazepinoic antagonist of platelet activating factor. *J Pharmacol Exp Ther* **255**: 962-8 [PMID:2262914]
48. Hikiji H, Ishii S, Shindou H, Takato T and Shimizu T. (2004) Absence of platelet-activating factor receptor protects mice from osteoporosis following ovariectomy. *J Clin Invest* **114**: 85-93 [PMID:15232615]
49. Honda Z, Ishii S and Shimizu T. (2002) Platelet-activating factor receptor. *J Biochem* **131**: 773-9 [PMID:12038971]
50. Honda Z, Nakamura M, Miki I, Minami M, Watanabe T, Seyama Y, Okado H, Toh H, Ito K and Miyamoto T. (1991) Cloning by functional expression of platelet-activating factor receptor from guinea-pig lung. *Nature* **349**: 342-6 [PMID:1846231]
51. Hwang SB, Lam MH, Alberts AW, Bugianesi RL, Chabala JC and Ponpipom MM. (1988) Biochemical and pharmacological characterization of L-659,989: an extremely potent, selective and competitive receptor antagonist of platelet-activating factor. *J Pharmacol Exp Ther* **246**: 534-41 [PMID:2841449]
52. Im SY, Ko HM, Kim JW, Lee HK, Ha TY, Lee HB, Oh SJ, Bai S, Chung KC and Lee YB *et al.* (1996) Augmentation of tumor metastasis by platelet-activating factor. *Cancer Res* **56**: 2662-5 [PMID:8653713]
53. Ishii S, Kuwaki T, Nagase T, Maki K, Tashiro F, Sunaga S, Cao WH, Kume K, Fukuchi Y and Ikuta K *et al.* (1998) Impaired anaphylactic responses with intact sensitivity to endotoxin in mice lacking a platelet-activating factor receptor. *J Exp Med* **187**: 1779-88 [PMID:9607919]
54. Ishii S, Matsuda Y, Nakamura M, Waga I, Kume K, Izumi T and Shimizu T. (1996) A murine platelet-activating factor receptor gene: cloning, chromosomal localization and up-regulation of expression by lipopolysaccharide in peritoneal resident macrophages. *Biochem J* **314 (Pt 2)**: 671-8 [PMID:8670084]
55. Ishii S, Nagase T, Shindou H, Takizawa H, Ouchi Y and Shimizu T. (2004) Platelet-activating factor receptor develops airway hyperresponsiveness independently of airway inflammation in a murine asthma model. *J Immunol* **172**: 7095-102 [PMID:15153532]
56. Ishii S, Nagase T, Tashiro F, Ikuta K, Sato S, Waga I, Kume K, Miyazaki J and Shimizu T. (1997) Bronchial hyperreactivity, increased endotoxin lethality and melanocytic tumorigenesis in transgenic mice overexpressing platelet-activating factor receptor. *EMBO J* **16**: 133-42 [PMID:9009274]
57. Ivanov AI, Patel S, Kulchitsky VA and Romanovsky AA. (2003) Platelet-activating factor: a previously

- unrecognized mediator of fever. *J Physiol (Lond.)* **553**: 221-8 [PMID:14565987]
58. Izaki S, Yamamoto T, Goto Y, Ishimaru S, Yodate F, Kitamura K and Matsuzaki M. (1996) Platelet-activating factor and arachidonic acid metabolites in psoriatic inflammation. *Br J Dermatol* **134**: 1060-4 [PMID:8763425]
 59. Jin XL and O'Neill C. (2011) Regulation of the expression of proto-oncogenes by autocrine embryotropins in the early mouse embryo. *Biol Reprod* **84**: 1216-24 [PMID:21248291]
 60. Kamata K, Numazawa T and Kasuya Y. (1996) Characteristics of vasodilatation induced by acetylcholine and platelet-activating factor in the rat mesenteric arterial bed. *Eur J Pharmacol* **298**: 129-136 [PMID:8867099]
 61. Kaminski JJ, Carruthers NI, Wong SC, Chan TM, Billah MM, Tozzi S and McPhail AT. (1999) Conformational considerations in the design of dual antagonists of platelet-activating factor (PAF) and histamine. *Bioorg Med Chem* **7**: 1413-23 [PMID:10465415]
 62. Karabina SA and Ninio E. (2006) Plasma PAF-acetylhydrolase: an unfulfilled promise? *Biochim Biophys Acta* **1761**: 1351-8 [PMID:16807087]
 63. Konger RL, Marathe GK, Yao Y, Zhang Q and Travers JB. (2008) Oxidized glycerophosphocholines as biologically active mediators for ultraviolet radiation-mediated effects. *Prostaglandins Other Lipid Mediat* **87**: 1-8 [PMID:18555720]
 64. Kunz D, Gerard NP and Gerard C. (1992) The human leukocyte platelet-activating factor receptor. cDNA cloning, cell surface expression, and construction of a novel epitope-bearing analog. *J Biol Chem* **267**: 9101-6 [PMID:1374385]
 65. Lacerda-Queiroz N, Rodrigues DH, Vilela MC, Rachid MA, Soriani FM, Sousa LP, Campos RD, Quesniaux VF, Teixeira MM and Teixeira AL. (2012) Platelet-activating factor receptor is essential for the development of experimental cerebral malaria. *Am J Pathol* **180**: 246-55 [PMID:22079430]
 66. Lefebvre JS, Marleau S, Milot V, Lévesque T, Picard S, Flamand N and Borgeat P. (2010) Toll-like receptor ligands induce polymorphonuclear leukocyte migration: key roles for leukotriene B4 and platelet-activating factor. *FASEB J* **24**: 637-47 [PMID:19843712]
 67. Lehr HA, Weyrich AS, Saetzler RK, Jurek A, Arfors KE, Zimmerman GA, Prescott SM and McIntyre TM. (1997) Vitamin C blocks inflammatory platelet-activating factor mimetics created by cigarette smoking. *J Clin Invest* **99**: 2358-64 [PMID:9153277]
 68. Lemjabbar H and Basbaum C. (2002) Platelet-activating factor receptor and ADAM10 mediate responses to *Staphylococcus aureus* in epithelial cells. *Nat Med* **8**: 41-6 [PMID:11786905]
 69. Lonardon MV, Russo M and Jancar S. (2000) Essential role of platelet-activating factor in control of *Leishmania (Leishmania) amazonensis* infection. *Infect Immun* **68**: 6355-61 [PMID:11035745]
 70. Lu J, Pierce M, Franklin A, Jilling T, Stafforini DM and Caplan M. (2010) Dual roles of endogenous platelet-activating factor acetylhydrolase in a murine model of necrotizing enterocolitis. *Pediatr Res* **68**: 225-30 [PMID:20531249]
 71. Lukashova V, Asselin C, Krolewski JJ, Rola-Pleszczynski M and Stanková J. (2001) G-protein-independent activation of Tyk2 by the platelet-activating factor receptor. *J Biol Chem* **276**: 24113-21 [PMID:11309383]
 72. Lukashova V, Chen Z, Duhé RJ, Rola-Pleszczynski M and Stanková J. (2003) Janus kinase 2 activation by the platelet-activating factor receptor (PAFR): roles of Tyk2 and PAFR C terminus. *J Immunol* **171**: 3794-800 [PMID:14500680]
 73. Ma X, Ottino P, Bazan HE and Bazan NG. (2004) Platelet-activating factor (PAF) induces corneal neovascularization and upregulates VEGF expression in endothelial cells. *Invest Ophthalmol Vis Sci* **45**: 2915-21 [PMID:15326102]
 74. Marathe GK, Davies SS, Harrison KA, Silva AR, Murphy RC, Castro-Faria-Neto H, Prescott SM, Zimmerman GA and McIntyre TM. (1999) Inflammatory platelet-activating factor-like phospholipids in oxidized low density lipoproteins are fragmented alkyl phosphatidylcholines. *J Biol Chem* **274**: 28395-404 [PMID:10497200]
 75. Marathe GK, Harrison KA, Murphy RC, Prescott SM, Zimmerman GA and McIntyre TM. (2000) Bioactive phospholipid oxidation products. *Free Radic Biol Med* **28**: 1762-70 [PMID:10946218]
 76. Marathe GK, Johnson C, Billings SD, Southall MD, Pei Y, Spandau D, Murphy RC, Zimmerman GA, McIntyre TM and Travers JB. (2005) Ultraviolet B radiation generates platelet-activating factor-like phospholipids underlying cutaneous damage. *J Biol Chem* **280**: 35448-57 [PMID:16115894]
 77. Marques SA, Dy LC, Southall MD, Yi Q, Smietana E, Kapur R, Marques M, Travers JB and Spandau DF. (2002) The platelet-activating factor receptor activates the extracellular signal-regulated kinase

- mitogen-activated protein kinase and induces proliferation of epidermal cells through an epidermal growth factor-receptor-dependent pathway. *J Pharmacol Exp Ther* **300**: 1026-35 [PMID:11861812]
78. Marquis O, Robaut C and Cavero I. (1988) [3H]52770 RP, a platelet-activating factor receptor antagonist, and tritiated platelet-activating factor label a common specific binding site in human polymorphonuclear leukocytes. *J Pharmacol Exp Ther* **244**: 709-15 [PMID:2831350]
 79. Marrache AM, Gobeil F, Bernier SG, Stankova J, Rola-Pleszczynski M, Choufani S, Bkaily G, Bourdeau A, Sirois MG and Vazquez-Tello A *et al.*. (2002) Proinflammatory gene induction by platelet-activating factor mediated via its cognate nuclear receptor. *J Immunol* **169**: 6474-81 [PMID:12444157]
 80. McIntyre TM. (2012) Bioactive oxidatively truncated phospholipids in inflammation and apoptosis: Formation, targets, and inactivation. *Biochim Biophys Acta* **1818**: 2456-64 [PMID:22445850]
 81. Melnikova VO, Villares GJ and Bar-Eli M. (2008) Emerging roles of PAR-1 and PAFR in melanoma metastasis. *Cancer Microenviron* **1**: 103-11 [PMID:19308689]
 82. Michel L, Denizot Y, Thomas Y, Jean-Louis F, Heslan M, Benveniste J and Dubertret L. (1990) Production of paf-acether by human epidermal cells. *J Invest Dermatol* **95**: 576-81 [PMID:2230220]
 83. Mori M, Aihara M, Kume K, Hamanoue M, Kohsaka S and Shimizu T. (1996) Predominant expression of platelet-activating factor receptor in the rat brain microglia. *J Neurosci* **16**: 3590-600 [PMID:8642404]
 84. Morita K, Morioka N, Abdin J, Kitayama S, Nakata Y and Dohi T. (2004) Development of tactile allodynia and thermal hyperalgesia by intrathecally administered platelet-activating factor in mice. *Pain* **111**: 351-9 [PMID:15363879]
 85. Morphy R and Rankovic Z. (2005) Designed multiple ligands. An emerging drug discovery paradigm. *J Med Chem* **48**: 6523-43 [PMID:16220969]
 86. Murphy RC. (1996) Free radical-induced oxidation of glycerophosphocholine lipids and formation of biologically active products. *Adv Exp Med Biol* **416**: 51-8 [PMID:9131126]
 87. Nagase T, Ishii S, Katayama H, Fukuchi Y, Ouchi Y and Shimizu T. (1997) Airway responsiveness in transgenic mice overexpressing platelet-activating factor receptor. Roles of thromboxanes and leukotrienes. *Am J Respir Crit Care Med* **156**: 1621-7 [PMID:9372685]
 88. Nagase T, Ishii S, Kume K, Uozumi N, Izumi T, Ouchi Y and Shimizu T. (1999) Platelet-activating factor mediates acid-induced lung injury in genetically engineered mice. *J Clin Invest* **104**: 1071-6 [PMID:10525045]
 89. Nagase T, Ishii S, Shindou H, Ouchi Y and Shimizu T. (2002) Airway hyperresponsiveness in transgenic mice overexpressing platelet activating factor receptor is mediated by an atropine-sensitive pathway. *Am J Respir Crit Care Med* **165**: 200-5 [PMID:11790655]
 90. Nakamura M, Honda Z, Izumi T, Sakanaka C, Mutoh H, Minami M, Bito H, Seyama Y, Matsumoto T and Noma M *et al.*. (1991) Molecular cloning and expression of platelet-activating factor receptor from human leukocytes. *J Biol Chem* **266**: 20400-5 [PMID:1657923]
 91. Nakamura M, Honda Z, Waga I, Matsumoto T, Noma M and Shimizu T. (1992) Endotoxin transduces Ca²⁺ signaling via platelet-activating factor receptor. *FEBS Lett* **314**: 125-9 [PMID:1333988]
 92. Negrão-Corrêa D, Souza DG, Pinho V, Barsante MM, Souza AL and Teixeira MM. (2004) Platelet-activating factor receptor deficiency delays elimination of adult worms but reduces fecundity in *Strongyloides venezuelensis*-infected mice. *Infect Immun* **72**: 1135-42 [PMID:14742561]
 93. Ninio E, Tregouet D, Carrier JL, Stengel D, Bickel C, Perret C, Rupprecht HJ, Cambien F, Blankenberg S and Tiret L. (2004) Platelet-activating factor-acetylhydrolase and PAF-receptor gene haplotypes in relation to future cardiovascular event in patients with coronary artery disease. *Hum Mol Genet* **13**: 1341-51 [PMID:15115767]
 94. O'Neill C. (2005) The role of paf in embryo physiology. *Hum Reprod Update* **11**: 215-28 [PMID:15790601]
 95. O'Neill C. (2008) Phosphatidylinositol 3-kinase signaling in mammalian preimplantation embryo development. *Reproduction* **136**: 147-56 [PMID:18515313]
 96. O'Neill C. (2008) The potential roles for embryotrophic ligands in preimplantation embryo development. *Hum Reprod Update* **14**: 275-88 [PMID:18281694]
 97. O'Neill C, Li Y and Jin XL. (2012) Survival signaling in the preimplantation embryo. *Theriogenology* **77**: 773-84 [PMID:22325248]
 98. Ogita T, Tanaka Y, Nakaoka T, Matsuoka R, Kira Y, Nakamura M, Shimizu T and Fujita T. (1997) Lysophosphatidylcholine transduces Ca²⁺ signaling via the platelet-activating factor receptor in macrophages. *Am J Physiol* **272**: H17-24 [PMID:9038918]
 99. Onuchic AC, Machado CM, Saito RF, Rios FJ, Jancar S and Chammas R. (2012) Expression of PAFR as part

of a prosurvival response to chemotherapy: a novel target for combination therapy in melanoma. *Mediators Inflamm* **2012**: 175408 [PMID:22570511]

100. Osoegawa M, Miyagishi R, Ochi H, Nakamura I, Niino M, Kikuchi S, Murai H, Fukazawa T, Minohara M and Tashiro K *et al.* (2005) Platelet-activating factor receptor gene polymorphism in Japanese patients with multiple sclerosis. *J Neuroimmunol* **161**: 195-8 [PMID:15748960]
101. Parent JL, Gouill CL, Escher E, Rola-Pleszczynski M and Staková J. (1996) Identification of transmembrane domain residues determinant in the structure-function relationship of the human platelet-activating factor receptor by site-directed mutagenesis. *J Biol Chem* **271**: 23298-303 [PMID:8798529]
102. Patel KD, Zimmerman GA, Prescott SM and McIntyre TM. (1992) Novel leukocyte agonists are released by endothelial cells exposed to peroxide. *J Biol Chem* **267**: 15168-75 [PMID:1321830]
103. Perry SW, Hamilton JA, Tjoelker LW, Dbaiibo G, Dzenko KA, Epstein LG, Hannun Y, Whittaker JS, Dewhurst S and Gelbard HA. (1998) Platelet-activating factor receptor activation. An initiator step in HIV-1 neuropathogenesis. *J Biol Chem* **273**: 17660-4 [PMID:9651362]
104. Prescott SM, Zimmerman GA, Stafforini DM and McIntyre TM. (2000) Platelet-activating factor and related lipid mediators. *Annu Rev Biochem* **69**: 419-45 [PMID:10966465]
105. Pégrier S, Stengel D, Durand H, Croset M and Ninio E. (2006) Oxidized phospholipid: POVPC binds to platelet-activating-factor receptor on human macrophages. Implications in atherosclerosis. *Atherosclerosis* **188**: 433-43 [PMID:16386258]
106. Ramos G, Kazimi N, Nghiem DX, Walterscheid JP and Ullrich SE. (2004) Platelet activating factor receptor binding plays a critical role in jet fuel-induced immune suppression. *Toxicol Appl Pharmacol* **195**: 331-8 [PMID:15020195]
107. Reinhardt JC, Cui X and Roudebush WE. (1999) Immunofluorescent evidence of the platelet-activating factor receptor on human spermatozoa. *Fertil Steril* **71**: 941-2 [PMID:10231061]
108. Rijneveld AW, Weijer S, Florquin S, Speelman P, Shimizu T, Ishii S and van der Poll T. (2004) Improved host defense against pneumococcal pneumonia in platelet-activating factor receptor-deficient mice. *J Infect Dis* **189**: 711-6 [PMID:14767826]
109. Rios FJ, Koga MM, Ferracini M and Jancar S. (2012) Co-stimulation of PAFR and CD36 is required for oxLDL-induced human macrophages activation. *PLoS ONE* **7**: e36632 [PMID:22570732]
110. Row BW, Kheirandish L, Li RC, Guo SZ, Brittian KR, Hardy M, Bazan NG and Gozal D. (2004) Platelet-activating factor receptor-deficient mice are protected from experimental sleep apnea-induced learning deficits. *J Neurochem* **89**: 189-96 [PMID:15030403]
111. Sahu RP, Turner MJ, DaSilva SC, Rashid BM, Ocana JA, Perkins SM, Konger RL, Touloukian CE, Kaplan MH and Travers JB. (2012) The environmental stressor ultraviolet B radiation inhibits murine antitumor immunity through its ability to generate platelet-activating factor agonists. *Carcinogenesis* **33**: 1360-7 [PMID:22542595]
112. Sato S, Kume K, Ito C, Ishii S and Shimizu T. (1999) Accelerated proliferation of epidermal keratinocytes by the transgenic expression of the platelet-activating factor receptor. *Arch Dermatol Res* **291**: 614-21 [PMID:10638335]
113. Seyfried CE, Schweickart VL, Godiska R and Gray PW. (1992) The human platelet-activating factor receptor gene (PTAFR) contains no introns and maps to chromosome 1. *Genomics* **13**: 832-4 [PMID:1322356]
114. Shah BH, Rasheed H, Rahman IH, Shariff AH, Khan FL, Rahman HB, Hanif S and Saeed SA. (2001) Molecular mechanisms involved in human platelet aggregation by synergistic interaction of platelet-activating factor and 5-hydroxytryptamine. *Exp Mol Med* **33**: 226-33 [PMID:11795484]
115. Shimizu T. (2009) Lipid mediators in health and disease: enzymes and receptors as therapeutic targets for the regulation of immunity and inflammation. *Annu Rev Pharmacol Toxicol* **49**: 123-50 [PMID:18834304]
116. Shindou H, Hishikawa D, Nakanishi H, Harayama T, Ishii S, Taguchi R and Shimizu T. (2007) A single enzyme catalyzes both platelet-activating factor production and membrane biogenesis of inflammatory cells. Cloning and characterization of acetyl-CoA:LYSO-PAF acetyltransferase. *J Biol Chem* **282**: 6532-9 [PMID:17182612]
117. Singh TP, Huettner B, Koefeler H, Mayer G, Bambach I, Wallbrecht K, Schön MP and Wolf P. (2011) Platelet-activating factor blockade inhibits the T-helper type 17 cell pathway and suppresses psoriasis-like skin disease in K5.hTGF- β 1 transgenic mice. *Am J Pathol* **178**: 699-708 [PMID:21281802]

118. Smiley PL, Stremler KE, Prescott SM, Zimmerman GA and McIntyre TM. (1991) Oxidatively fragmented phosphatidylcholines activate human neutrophils through the receptor for platelet-activating factor. *J Biol Chem* **266**: 11104-11110 [PMID:1645725]
119. Snyder F. (1995) Platelet-activating factor: the biosynthetic and catabolic enzymes. *Biochem J* **305 (Pt 3)**: 689-705 [PMID:7848265]
120. Soares AC, Pinho VS, Souza DG, Shimizu T, Ishii S, Nicoli JR and Teixeira MM. (2002) Role of the platelet-activating factor (PAF) receptor during pulmonary infection with gram negative bacteria. *Br J Pharmacol* **137**: 621-8 [PMID:12381675]
121. Sreevidya CS, Khaskhely NM, Fukunaga A, Khaskina P and Ullrich SE. (2008) Inhibition of photocarcinogenesis by platelet-activating factor or serotonin receptor antagonists. *Cancer Res* **68**: 3978-84 [PMID:18483284]
122. Strømgaard K, Saito DR, Shindou H, Ishii S, Shimizu T and Nakanishi K. (2002) Ginkgolide derivatives for photolabeling studies: preparation and pharmacological evaluation. *J Med Chem* **45**: 4038-46 [PMID:12190325]
123. Sugimoto T, Tsuchimochi H, McGregor CG, Mutoh H, Shimizu T and Kurachi Y. (1992) Molecular cloning and characterization of the platelet-activating factor receptor gene expressed in the human heart. *Biochem Biophys Res Commun* **189**: 617-24 [PMID:1281995]
124. Summers JB and Albert DH. (1995) Platelet activating factor antagonists. *Adv Pharmacol* **32**: 67-168 [PMID:7748804]
125. Svetlov S and Nigam S. (1993) Evidence for the presence of specific high affinity cytosolic binding sites for platelet-activating factor in human neutrophils. *Biochem Biophys Res Commun* **190**: 162-6 [PMID:8380690]
126. Talvani A, Santana G, Barcelos LS, Ishii S, Shimizu T, Romanha AJ, Silva JS, Soares MB and Teixeira MM. (2003) Experimental Trypanosoma cruzi infection in platelet-activating factor receptor-deficient mice. *Microbes Infect* **5**: 789-96 [PMID:12850205]
127. Terashita Z, Imura Y and Nishikawa K. (1985) Inhibition by CV-3988 of the binding of [3H]-platelet activating factor (PAF) to the platelet. *Biochem Pharmacol* **34**: 1491-5 [PMID:2986648]
128. Tokuoka SM, Ishii S, Kawamura N, Satoh M, Shimada A, Sasaki S, Hirotsune S, Wynshaw-Boris A and Shimizu T. (2003) Involvement of platelet-activating factor and LIS1 in neuronal migration. *Eur J Neurosci* **18**: 563-70 [PMID:12911752]
129. Travers JB, Edenberg HJ, Zhang Q, Al-Hassani M, Yi Q, Baskaran S and Konger RL. (2008) Augmentation of UVB radiation-mediated early gene expression by the epidermal platelet-activating factor receptor. *J Invest Dermatol* **128**: 455-60 [PMID:17928889]
130. Travers JB, Harrison KA, Johnson CA, Clay KL and Morelli JG. (1996) Platelet-activating factor biosynthesis induced by various stimuli in human HaCaT keratinocytes. *J Invest Dermatol* **107**: 88-94 [PMID:8752845]
131. Travers JB, Huff JC, Rola-Pleszczynski M, Gelfand EW, Morelli JG and Murphy RC. (1995) Identification of functional platelet-activating factor receptors on human keratinocytes. *J Invest Dermatol* **105**: 816-23 [PMID:7490477]
132. Velasquez LA, Maisey K, Fernandez R, Valdes D, Cardenas H, Imarai M, Delgado J, Aguilera J and Croxatto HB. (2001) PAF receptor and PAF acetylhydrolase expression in the endosalpinx of the human Fallopian tube: possible role of embryo-derived PAF in the control of embryo transport to the uterus. *Hum Reprod* **16**: 1583-7 [PMID:11473946]
133. Vogensen SB, Stromgaard K, Shindou H, Jaracz S, Suehiro M, Ishii S, Shimizu T and Nakanishi K. (2003) Preparation of 7-substituted ginkgolide derivatives: potent platelet activating factor (PAF) receptor antagonists. *J Med Chem* **46**: 601-608 [PMID:12570381]
134. Walterscheid JP, Ullrich SE and Nghiem DX. (2002) Platelet-activating factor, a molecular sensor for cellular damage, activates systemic immune suppression. *J Exp Med* **195**: 171-9 [PMID:11805144]
135. Wolverson JE, Al-Hassani M, Yao Y, Zhang Q and Travers JB. (2010) Epidermal platelet-activating factor receptor activation and ultraviolet B radiation result in synergistic tumor necrosis factor-alpha production. *Photochem Photobiol* **86**: 231-5 [PMID:19769579]
136. Wu C, Stojanov T, Chami O, Ishii S, Shimizu T, Li A, O'Neill C and Shimizu T. (2001) Evidence for the autocrine induction of capacitation of mammalian spermatozoa. *J Biol Chem* **276**: 26962-8 [PMID:11350972]
137. Yao Y, Harrison KA, Al-Hassani M, Murphy RC, Rezanian S, Konger RL and Travers JB. (2012) Platelet-

- activating factor receptor agonists mediate xeroderma pigmentosum A photosensitivity. *J Biol Chem* **287**: 9311-21 [PMID:22303003]
138. Yost CC, Weyrich AS and Zimmerman GA. (2010) The platelet activating factor (PAF) signaling cascade in systemic inflammatory responses. *Biochimie* **92**: 692-7 [PMID:20167241]
 139. Zhang L, Wang D, Jiang W, Edwards D, Qiu W, Barroilhet LM, Rho JH, Jin L, Seethappan V and Vitonis A *et al.*. (2010) Activated networking of platelet activating factor receptor and FAK/STAT1 induces malignant potential in BRCA1-mutant at-risk ovarian epithelium. *Reprod Biol Endocrinol* **8**: 74 [PMID:20576130]
 140. Zhang Q, Mousdicas N, Yi Q, Al-Hassani M, Billings SD, Perkins SM, Howard KM, Ishii S, Shimizu T and Travers JB. (2005) Staphylococcal lipoteichoic acid inhibits delayed-type hypersensitivity reactions via the platelet-activating factor receptor. *J Clin Invest* **115**: 2855-61 [PMID:16184199]
 141. Zhang Q, Yao Y, Konger RL, Sinn AL, Cai S, Pollok KE and Travers JB. (2008) UVB radiation-mediated inhibition of contact hypersensitivity reactions is dependent on the platelet-activating factor system. *J Invest Dermatol* **128**: 1780-7 [PMID:18200048]