3050 Spruce Street, St. Louis, MO 63103 USA
Tel: (800) 521-8956 (314) 771-5765 Fax: (800) 325-5052 (314) 771-5757
email: techservice@sial.com sigma-aldrich.com

Product Information

Platelet-Derived Growth Factor-BB
human, recombinant,
expressed in *Escherichia coli*

Catalog Number **P3201**
Storage Temperature –20 °C

Synonym: Synonyms

Product Description

Platelet-Derived Growth Factor (PDGF), first identified by Ross et al.,[1] is the principle mitogen present in serum for stimulating cells of mesenchymal origin.[2,3] PDGF is localized in α-granules of platelets and released during clot formation.[4] PDGF from human platelets has been purified and described as a cationic glycoprotein (pI 9.5–10.4) having a molecular mass of ~30 kDa and composed of two covalently linked subunits, designated as chains A (16 kDa) and B (14 kDa).[5-8] In platelets, ~70% of the PDGF is present as the AB dimer, with the remainder primarily BB.[9] Purified human PDGF shows substantial size heterogeneity, with multiple species between 27 and 31 kDa, probably due to the presence of isoforms, glycosylation processing, aging of the platelets, and partial proteolysis during purification. A and B chains are 40% homologous in sequence and are encoded by distinctly different genes.[10] Each chain contains 8 cysteine residues, which are involved in intra- and inter-chain disulfide bonds.[11,12] Cleavage of these bonds by reduction causes irreversible loss of biological activity.[8]

PDGF elicits multifunctional actions with a variety of cells.[13-15] It is mitogenic to mesoderm-derived cells, such as dermal and tendon fibroblasts, vascular smooth muscle cells, glial cells, and chondrocytes. PDGF is a potent chemoattractant and activator of neutrophils, monocytes, and fibroblasts. It increases the synthesis of phospholipids, cholesterol esters, glycogen, and prostaglandins, and modulates LDL receptor binding. Other actions of PDGF include its ability to regulate the synthesis and degradation of extracellular matrix proteins and to stimulate the synthesis of additional growth factors. PDGF may increase erythropoiesis and stimulate vasoconstriction. PDGF may also play a role during normal embryonic development.[14]

PDGF is believed to play an essential role in the cellular response to tissue injury, both as a stimulant of mesodermal cell growth and activity, and as a chemoattractant to other cells involved in the repair process.[16] In this role, PDGF appears to interact with Transforming Growth Factor-β1 (TGF-β1), which is released by degranulating platelets at the source of the damaged tissue.[17] The sources of PDGF during wound repair include platelets (predominantly PDGF-AB), smooth muscles (PDGF-AA),[18] monocyte-derived macrophages (PDGF-BB),[19] and endothelial cells (PDGF-BB).[20]

Pathologically, PDGF appears to be an initial mediator and a contributing sustaining factor in the development of atherosclerosis.[18-21] Abnormal cellular expression of PDGF is also associated with certain malignant transformations.[13] In fact, a transforming protein ($p28^{sis}$) encoded by the simian sarcoma virus oncogene (v-*cis*) contains a section that is virtually identical to PDGF-B in its amino acid sequence,[23] is processed into a PDGF-BB-like homodimer,[24] and exhibits biological actions identical to PDGF.[25] Detection of v-*cis* related mRNA (c-*cis* RNA) has been reported in certain malignancies of mesenchymal cell origin, including fibrosarcoma, glioblastoma, and osteosarcoma.[26,27] PDGF-A chain or both A and B chains are expressed by certain other tumor cell lines.[10,28] Other pathological conditions in which PDGF has been implicated include scleroderma, inflammatory joint disease, myelofibrosis, and pulmonary fibrosis.[9,14]

Purified PDGF activates two distinct PDGF receptors encoded by separate genes.[29,30] PDGF-AA binds only to the α-PDGF receptor, but PDGF-AB and PDGF-BB bind to both α and β receptors (i.e., the α receptor binds either A or B chain and the β receptor binds only the B chain).[29,31] The independent expression of specific receptor types and the availability of the different isoforms of PDGF may explain the diverse range of observed cellular PDGF responses.[30] For example, the PDGF-B gene has a much greater transforming potency than the PDGF-A gene when transfected into NIH 3T3 cells, but the PDGF-A gene product is more efficiently secreted into the medium.[32] The sequence domains on each chain responsible for the greater receptor activation and secretory ability have been recently mapped.[33] Furthermore, certain tumors have been found to express the PDGF β-receptor with or without the co-expression of the PDGF-B chain, indicating that a tumor may be autocrinically growth stimulated[34] or it may be stimulated by exogenous PDGF.[35] Binding of either PDGF receptor to its substrate induces receptor autophosphorylation at a tyrosine residue,[31] which then becomes detectable by immunoreaction with anti-phosphotyrosine antibodies.

This product is the homodimer of recombinant, human PDGF B chain. It is lyophilized from a buffered aqueous solution containing no carrier protein.

Molecular mass: ~25 kDa

Purity: ≥97% (SDS-PAGE)

The biological activity of human, recombinant PDGF-BB is tested in culture by measuring its ability to stimulate ^{3}H-thymidine incorporation in NR6-3T3 fibroblasts. The EC_{50} is defined as the effective concentration of growth factor that elicits a 50% increase in cell growth in a cell based bioassay.

Sterility: 0.2 μm filtered, aseptic fill

Endotoxin: <0.1 ng/μg PDGF-BB (LAL method)

Precautions and Disclaimer
This product is for R&D use only, not for drug, household, or other uses.

Preparation Instructions
To prepare a stock solution, reconstitute the vial contents in water to a concentration of 0.1–1.0 mg/ml. This solution can then be diluted into other aqueous buffers and stored at 2–8 °C for up to 1 week or for future use, store in working aliquots at –20 °C.

Storage/Stability
Prior to reconstitution, store the product at –20 °C. It retains activity for up to twelve months.

After reconstitution, it can be stored sterile at 2–8 °C for one month. For extended storage, freeze in working aliquots at –70 °C or –20 °C. Repeated freezing and thawing is not recommended.

References

1. Ross, R., and Glomset, J., Science, **180,** 1332 (1973).
2. Ross, R., et al., Proc. Natl. Acad. Sci. USA, **71,** 1207 (1974).
3. Kohler, N., and Lipton, A., Exp. Cell Res. **87,** 297 (1974).
4. Kaplan, D., et al., Blood, **53,** 1043 (1979).
5. Antoniades, H., et al., Proc. Natl. Acad. Sci. USA, **76,** 1809 (1979).
6. Heldin, C., et al., Proc. Natl. Acad. Sci. USA, **76,** 3722 (1979).
7. Deule, T., et al., J. Biol. Chem., **256,** 8896 (1981).
8. Raines, E., and Ross, R., J. Biol. Chem., **257,** 5154 (1982).
9. Ross, R., Lancet, **27**, 1179 (1989).
10. Betsholtz, C., et al., Nature, **320,** 695 (1986).
11. Giese, N., et al., Science, **236,** 1315 (1987).
12. Sauer, M., and Donoghue, D., Mol. Cell. Biol., **8,** 1011 (1988).
13. Antoniades, H., and Pantazis, P., Meth. Enzymol., **169,** 210 (1989).
14. Ross, R., et al., Cell, **46,** 155 (1986).
15. Heldin, C., et al., Mol. Cell. Endocrinol., **39,** 169 (1985).
16. Barnes, D., Meth. Enzymol., **163,** 707 (1988).
17. Pierce, G., et al., J. Cell Biol., **109,** 429 (1989).
18. Barrett, T., and Benditt, E., Proc. Natl. Acad. Sci. USA, **85,** 2810 (1988).
19. Ross, R., et al., Science, **248,** 1009 (1990).
20. Collins, T., Nature, **316,** 748 (1985).
21. Ross, R., et al., Arteriosclerosis, **1,** 293 (1981).
22. Schwartz, S., and Ross, R., Progr. Cardiovasc. Dis., **26,** 355 (1984).
23. Waterfield, M., et al., Nature, **304,** 35 (1983).
24. Robbins, K., et al., EMBO J., **4,** 1783 (1985).
25. Johnsson, A., et al., Proc. Natl. Acad. Sci. USA, **82,** 1721 (1985).
26. Graves, D., et al., Science, **226,** 972 (1984).
27. Pantazis, P., et al., Proc. Natl. Acad. Sci. USA, **82,** 2404 (1985).
28. Heldin, C.-H., et al., Nature, **319,** 511 (1986).
29. Matsui, T., et al., Science, **243,** 800 (1989).
30. Matsui, et al., Proc. Natl. Acad. Sci. USA, **86,** 8314 (1989).
31. Hart, C., et al., Science, **240,** 1529 (1988).
32. Beckmann, M., et al., Science, **241,** 1346 (1988).
33. LaRochelle, W., et al., Science, **248,** 1541 (1990).
34. Hermansson, M., et al., Proc. Natl. Acad. Sci. USA, **85,** 7748 (1988).
35. Heldin, N.-E., et al., Proc. Natl. Acad. Sci. USA, **85,** 9302 (1988).
36. Raines, E.W., et al., Meth. Enzymol., **109**, 749 1985.

JF,GS,LCM,MAM,PCG 04/20-1