

hPPL *Human platelet lysate*

PAN-Biotech Serum Replacements

Made in Germany since 1988



Xeno-free

Low risk

No ethical concerns

Reproducible results

Improved proliferation

Suitable for various cell types

ISO certified production



PANTM
BIOTECH

hPL is produced from human donor platelet concentrates, which is activated and sterile filtered under the highest quality standards. The raw material is exclusively sourced from certified EU suppliers. **hPL** is a xeno-free serum replacement, containing a wide range of bioactive molecules and growth factors (See Table 1), especially suitable for the proliferation of mesenchymal stem cells, endothelial cells, osteocytes, myocytes and various animal and human immortalized cell lines.

Platelets play an essential role in primary hemostasis, wound healing and tissue regeneration. A broad range of bioactive components are stored in the platelets, including chemokines [J.W. Semple et al., *Nat. Rev. Immunol.* 11 (2011) 264-274] and growth factors, such as EGF, VEGF, TGF, HGF, TGF- β etc. [E.M. Golebiewska et al., *Blood Rev.* 29 (2015) 153-162].

- Platelets are considered to be able to stimulate the migration and proliferation of fibroblasts, smooth muscle cells and endothelial cells [E.M. Golebiewska et al., *Blood Rev.* 29 (2015) 153-162].
- The growth factors in the platelets can promote endothelial cell survival and vasculogenesis *in vivo* in the absence of pericytes [H. Kim et al., *Microvasc. Res.* 101 (2015) 72-81].
- Activated platelets were also shown to be responsible for alveolar regeneration in mice after pneumonectomy [S. Rafii et al., *Nat. Cell Biol.* 17 (2015) 123-136].
- Platelets are known to contain Serotonin, which is capable to support liver regeneration [M. Lesurtel, et al., *Science* 312 (2006) 104-107, A. Myronovych, et al., *J. Hepatol.* 49 (2008) 363-372].

Table 1: Typical contents of proteins and growth factors in hPLs

[T. Burnouf et al., *Biomaterials* 76 (2016) 371-387].

Protein	Concentration	Unit
Total protein	55 - 65	[mg/mL]
Albumin	35 - 40	[mg/mL]
IgG	8 - 12	[mg/mL]
IGF-1	50 - 200	[ng/mL]
PDGF-AB	50 - 300	[ng/mL]
PDGF-BB	10 - 30	[ng/mL]
PDGF-AA	1 - 10	[ng/mL]
TGF- β 1	50 - 300	[ng/mL]
TGF- β 2	- 0.5	[ng/mL]
BDNF	10 - 50	[ng/mL]
VEGF	5 - 10	[ng/mL]
b-FGF	1 - 5	[ng/mL]

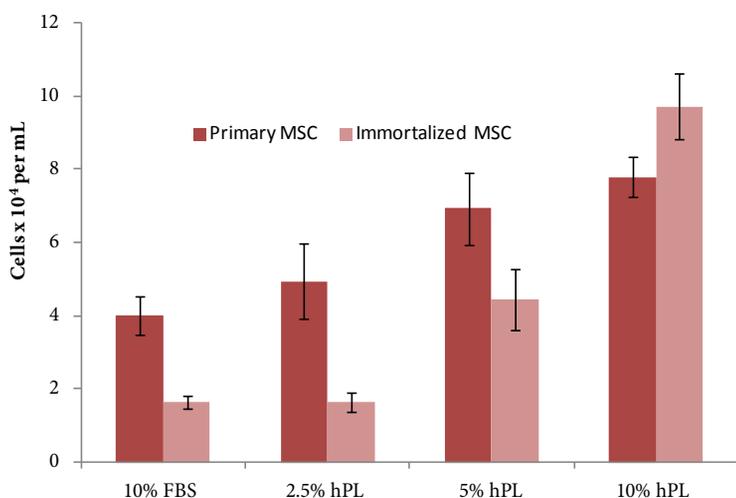


Figure 1: Proliferation of primary MSC and immortalized MSC in media with different concentrations. The cell densities were measured at day 7.

hPL can be used to fully replace FBS in the cell culture media. As demonstrated in the Figure 1, only 2.5% hPL can effectively replace 10% FBS in the MSC cultures. With the same concentration (10%) of hPL as FBS, the proliferation can be improved 2 to 6 fold.



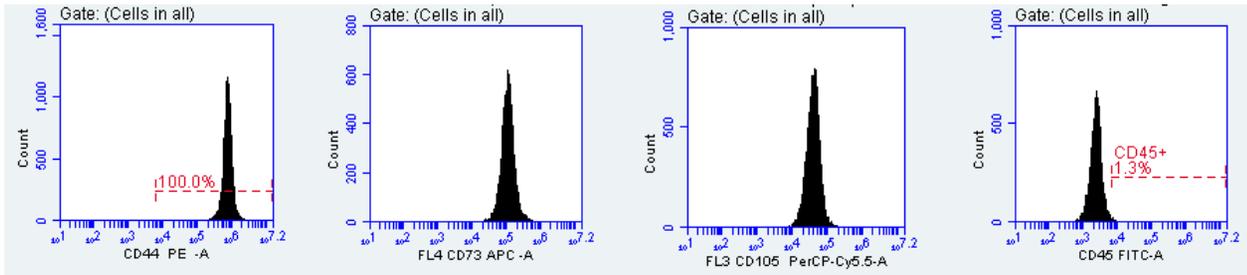


Figure 2: Flow cytometry analysis of hMSC expanded under xeno-free conditions. hMCs grown in 5% hPL for three weeks. Maintains surface marker CD44, CD73, CD 105.

Advantages

- Xeno-free (low risk, no ethical concerns)**
 Minimized the risks of microbial contamination, transmission of pathogens and immunological reactions [A. Bartholomew et al., *Exp. Hematol.*30, 42-48]. In compliance with GMP, GTP and GLP standards. No ethical concerns associated with FBS.
- Sourced from certified EU suppliers**
 The thrombocytes are collected, processed and verified under ISO 9001 and ISO 13485.
- Reproducible results**
 PAN Biotech is a professional manufacturer of cell culture media products with over 30 years experience. hPLs are produced under the highest quality standards, which guarantee reproducible data.
- Excellent economical benefit compared to FBS and recombinant growth factors**
 hPLs are a rich source of growth factors and bioactive molecules. It is considered that most of the potent mitogenic factors in FBS are derived from activated thrombocytes [G. Gstraunthaler et al., *ALTEX* 28, 4/2011].
- Improved proliferation**
 Improved proliferation behavior compared to FBS, especially in MSC culture, was observed (See Figure 1).
- Suitable for various cell types**
- Flexible packaging**
 hPLs produced by PAN Biotech can be delivered in different packaging (See Figure 3)



Figure 3: PAN hPLs can also be delivered in disposable bags

Do you know?

Serum introduces several severe unknown variables into the cell culture procedure, as serum (a) is a poorly defined supplement [Bjare, 1992; Gstraunthaler, 2003]; (b) batches show typically qualitative variations and different amount of endotoxins, haemoglobin and other factors [Price and Gregory, 1982]; (c) can be a potential source of contamination [Dormont, 1999; Eliot, 1999; Wessman and Levings, 1999] and (d) does not represent physiological conditions. Therefore, FBS may alter the experimental output or the performance of assays.



hPL can be applied for a broad range of cell types:

- **Human MSCs** [C. Rauch et al., *J. Adv. Biotechnol. Bioeng.*, 2014, 2, 39-48; K. Bieback et al., *Transfus Med Hemother.*, 2013; 40: 326-335]
- **Human gingival fibroblasts** [T. Burnouf et al., *Biologicals* 40 (2012) 21-30; E. Anitua et al., *J. Periodontol.* 83 (2012) 1028-1037]
- **Peridontal ligament cells** [T. Burnouf et al., *Biologicals* 40 (2012) 21-30]
- **Meniscal fibrochondrocytes** [V.K. Gonzales et al., *Tissue Eng. Part C. Methods* 19 (2013) 892-899]
- **Chondrocytes** [C. Kaps et al., *Med. Biol. Eng. Comput.* 40 (2002) 485-490; F. Hildner et al., *J. tissue Eng. Regen. Med.* 9 (2015) 808-818]
- **Osteocytes and myocytes** [A.D. Mazzocca et al., *Am. J. Sports Med.* 40 (2012) 1742-1749]
- **Tenocytes** [A.D. Mazzocca et al., *Am. J. Sports Med.* 40 (2012) 1742-1749; X. Wang et al., *J. Orthop. Res. Off. Publ. Orthop. Res. Soc.* 30(2012)982-990]
- **Endothelial cells** [H. Kim et al., *Microvasc. Res.* 101 (2015) 72-81; A. Reinisch et al., *Blood* 113 (2009) 6716-6725; N.A. Hofmann et al., *PLoS One* 7 (2012)-44468]
- **Annulus fibrosus cells** [T.N. Pirvu et al., *Eur. Spine J.* 23 (2014) 745-753]
- **Corneal endothelial cells** [M.L. Chou et al., *PLoS One* 9 (2014)-99145; E. Anitua et al., *Exp. Eye Res.* 119 (2014) 27-34]
- **Various immortalized cells** [R. Fazzina et al., *Cytotechnology* (2015:May 6); T. Burnouf et al., *Biologicals* 40 (2012) 21-30]
- *And more ...*

Go serum-free!

The future of cell culture

Volume	Cat. No.
5 mL	P40-29005
20 mL	P40-29020
50 mL	P40-29050
100 mL	P40-29100



www.pan-biotech.com

PANTM
BIOTECH