Set your manufacturing up for consistency

PeproGMP cytokines: optimized for use in your cell therapy workflows with exceptional lot-to-lot purity and bioactivity

gibco

PeproGMP cytokines: future-ready therapeutics manufacturing

Cytokines, including growth factors, play an integral role in the development and manufacture of both autologous and allogeneic cell therapies. Their role as intercellular and intracellular signaling molecules is critical for expansion and differentiation of a variety of stem and immune cells, such as T cells, NK cells, and iPSC-derived stem cells, in the *ex vivo* processing of patient cells to develop disease-specific therapies. The manufacturing of cell therapies requires stringent control and meticulous attention to the quality of raw materials to help ensure the safety, efficacy, and consistency of the final product. Choosing your GMP cytokines in early-stage process development enables a smooth transition to scale-up during manufacturing.

Consistent performance across discovery, development, and manufacturing

Gibco™ PeproTech™ products include a range of PeproGMP™ qualified cytokines and growth factors offering lot-to-lot consistency for bioactivity and purity, and allowing scaling in your cell therapy manufacturing. Our selection of PeproGMP cytokines is also available as Research Use Only (RUO) and Animal Origin–Free (AOF) versions for research purposes. These additional grades have been developed for easy transition from research to process development formulation, offering consistency in quality and supply over time.

Product and regulatory documentation to rely on, from discovery to commercialization

Research use only
Wide array of *E. coli*, mammalian, and insect cell line–derived recombinant proteins

Animal origin–free
Raw materials free of animal-derived components to help minimize the risk of biological hazards such as TSE and BSE

PeproGMP cytokines
Manufactured for use as ancillary materials under USP Chapter <1043> compliance

Consistent, stringent quality control criteria with traceability

Purity—minimize confounding experimental factors (low endotoxins)

Activity—get more for less with high bioactivity

Identity—carrier- and tag-free for biosimilarity to native proteins

Advanced manufacturing capabilities

In response to our clients' needs and the requirements of the cell and gene therapy markets, PeproGMP cytokines and growth factors are manufactured in specialized GMP suites in our advanced manufacturing facilities. Our team is responsive in providing products and services with a focus on quality and consistency to help ensure success in your process development and manufacturing.

The rapidly evolving field of regenerative medicine offers exciting opportunities to develop new solutions for an array of diseases, injuries, and genetic disorders. Thermo Fisher Scientific offers GMP proteins that can help you seamlessly scale your cell production process while meeting clinical requirements. PeproGMP cytokines are designed and manufactured to support end-to-end manufacturing of cell therapies and other biotherapeutics. With the recent addition of our PeproTech product manufacturing facility in Cranbury, New Jersey, we are able to meet the demand of the advancing markets in cell, gene, and tissue therapies worldwide. This 65,000 square foot facility has ample space for our ISO 9001:2015 GMP clean rooms and supports the manufacturing of our *E. coli*–derived GMP-grade human cytokines, and expansion into mammalian cell culture–derived GMP products.

PeproGMP cytokines are manufactured for use as ancillary materials by applying applicable principles of GMP and quality control requirements from United States Pharmacopeia (USP) Chapter <1043> Ancillary Materials for Cell, Gene, and Tissue-Engineered Products.

Quality management

We affirm that all aspects of our quality management system—from management of raw materials and equipment to facilities maintenance (environmental monitoring), manufacturing processes, audits, and inspection processes—are in compliance with relevant GMPs and all applicable standards and regulatory requirements.

The benefits of our rigorous process are clear: PeproGMP cytokines offer safety, purity, and simplified use in *ex vivo* manufacturing processes, as described in USP Chapter <1043> Ancillary Materials for Cell, Gene, and Tissue-Engineered Products.

All PeproGMP cytokines and growth factors are manufactured using materials free of animal-derived components

- ISO 9001:2015 quality management standard
- Controlled and certified ISO Class 7 and Class 8 clean rooms
- Qualification and validation program
- Materials management, including supplier qualification, and controlled and qualified raw materials
- 100% traceability
- Personnel training program
- Environmental monitoring
- Equipment calibration and maintenance
- Rigorous quality control program
- Documentation control and records
- Stability program
- Controlled processes
- QA review and support
- Master quality and supply agreement
- Aseptic techniques and sterile filtration
- Management review
- Procedures for complaints and recalls

Quality control

We perform extensive quality control testing to verify that PeproGMP cytokines meet rigorous standards for purity, identity, safety, activity, and lot-to-lot consistency.

Identity and purity

- N-terminal amino acid sequence analysis
- Molecular weight determination by mass spectrometry
- Reversed-phase HPLC analysis
- SDS-PAGE
- Western blotting

Protein content

- UV spectroscopy
- SDS-PAGE

Safety testing

- Residual *E. coli* DNA testing
- Sterility testing (USP standards): beginning, middle, and end processes
- Endotoxins
- Mycoplasmas

Biological activity

- Specific activity determined by a product-specific *in vitro* bioassay against a reference standard and, when applicable, against standards of the World Health Organization (WHO), to help ensure lot-to-lot consistency
- PeproGMP cytokines are tested for biological activity and potency in a cell proliferation assay; lot-to-lot comparisons demonstrate consistent potency of PeproGMP cytokines

Documentation

- Certificate of Analysis (COA)
- Certificate of Origin (COO)
- Safety Data Sheet (SDS)

Lot-to-lot consistency and performance continuity of PeproGMP cytokines

We have designed our recombinant cytokines for reproducible bioactivity across grades for easy transition as your research moves forward to process development and manufacturing (Figure 1). PeproGMP cytokines undergo comparative testing between lots to help ensure your manufacturing formulations achieve consistent performance each and every time (Figure 2).

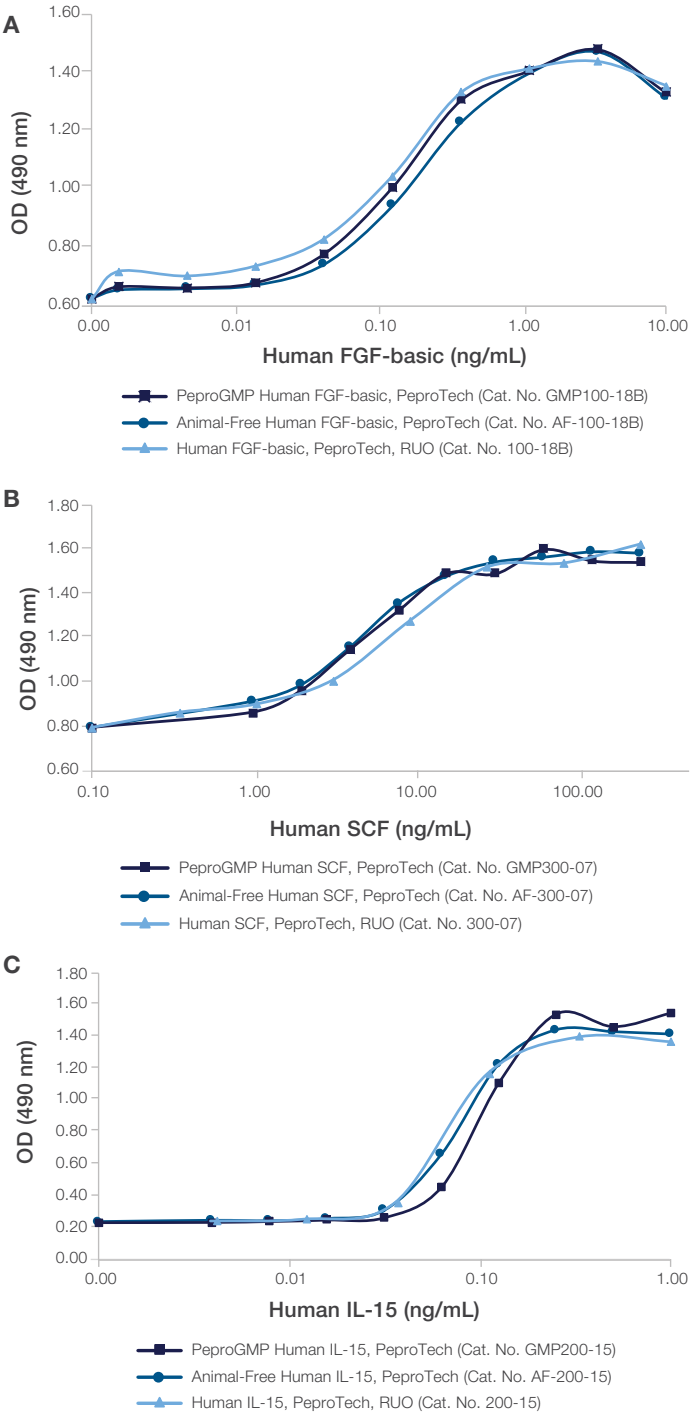

Figure 1. Consistency in bioactivity across GMP, AOF, and RUO grades of PeproTech cytokines. Cell proliferation assays were performed using **(A)** human FGF-basic and mouse 3T3 cells, **(B)** human SCF and TF-1 cells, and **(C)** human IL-15 and mouse CTLL-2 cells.

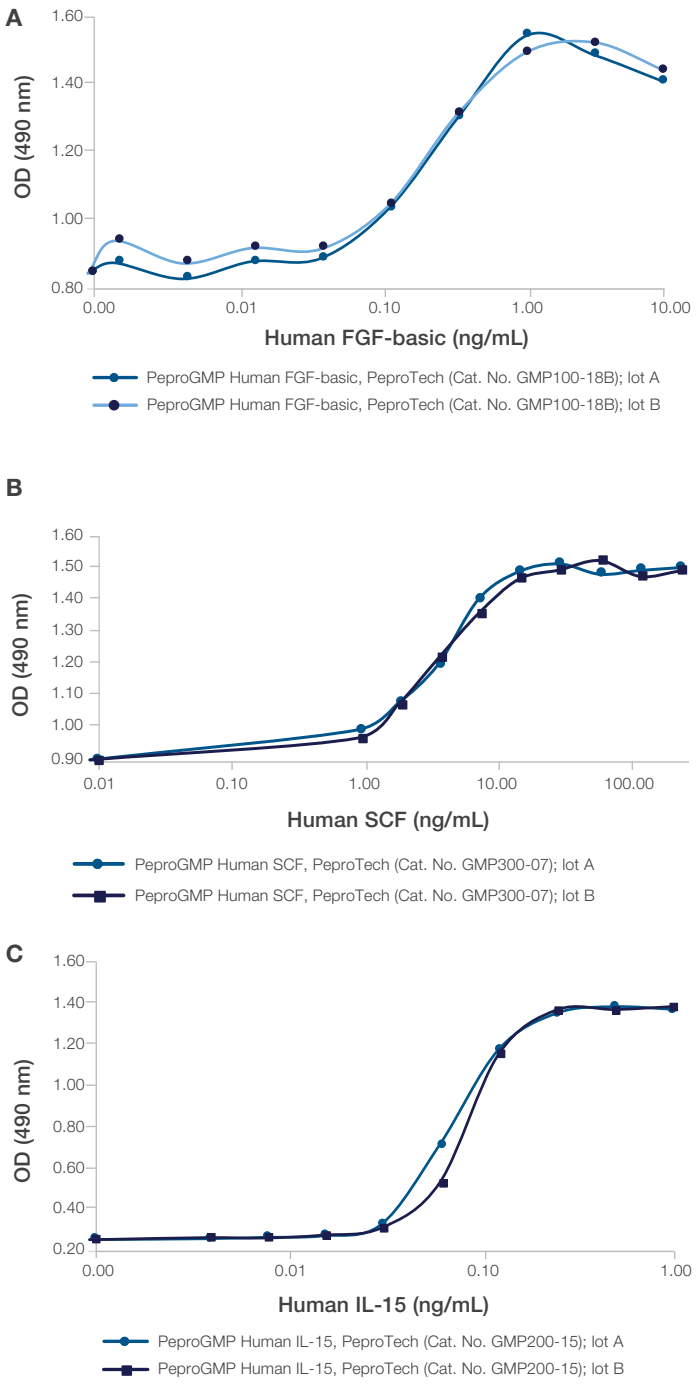

Figure 2. Lot-to-lot consistency of PeproGMP cytokines. Cell proliferation assays were performed using **(A)** human FGF-basic and mouse 3T3 cells, **(B)** human SCF and TF-1 cells, and **(C)** human IL-15 and mouse CTLL-2 cells.

Performance of PeproGMP Human FGF-basic in growth, maintenance, and differentiation potential of human iPSCs

Induced pluripotent stem cells (iPSCs) passaged with PeproGMP Human FGF-basic maintain key pluripotency markers, as demonstrated by immunocytochemistry and flow cytometry (Figure 3). No chromosomal aberrations were found using an Applied Biosystems™ KaryoStat™ Assay (Figure 4). PeproGMP Human FGF-basic does not interfere with the downstream differentiation of iPSCs, as cells expressed the expected ectoderm, endoderm, and mesoderm markers (Figure 5).

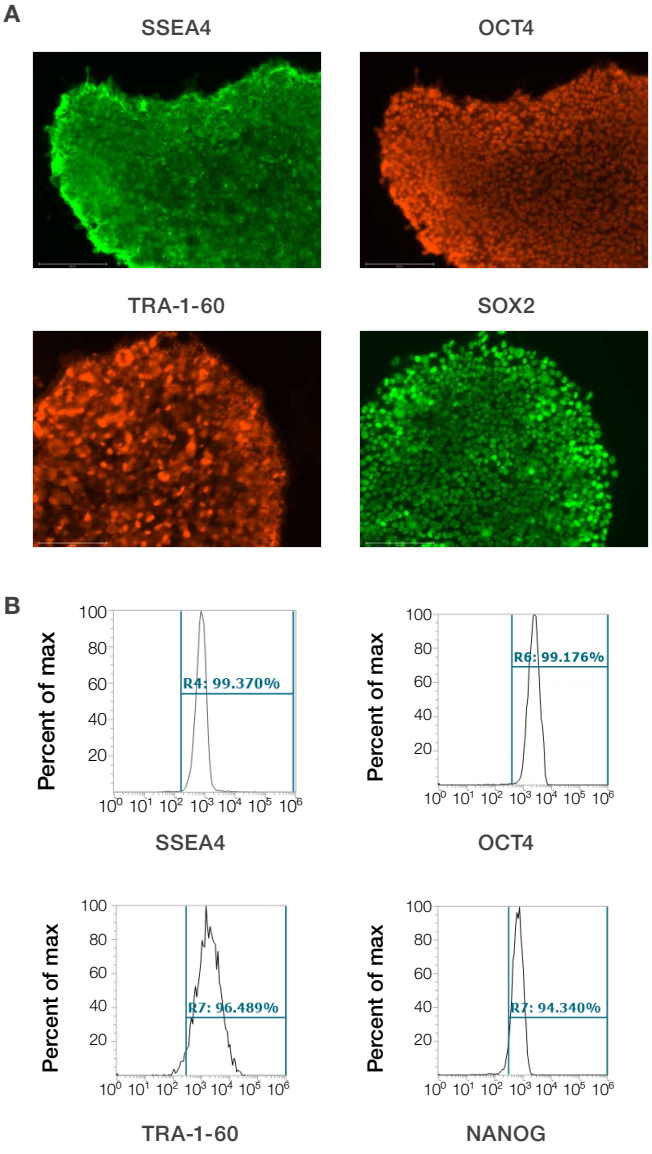

Figure 3. PeproGMP Human FGF-basic in iPSC expansion maintains key pluripotency markers. iPSCs reprogrammed from human dermal fibroblasts were cultured for 10 passages in the presence of PeproGMP Human FGF-basic. **(A)** Immunocytochemistry (ICC) indicates expression of key markers of iPSC pluripotency at passage 5. Data are not shown for passage 10, but results were consistent. **(B)** Flow cytometry indicates expression of key markers of iPSC pluripotency at passage 10. Data are not shown for passage 5, but results were consistent.

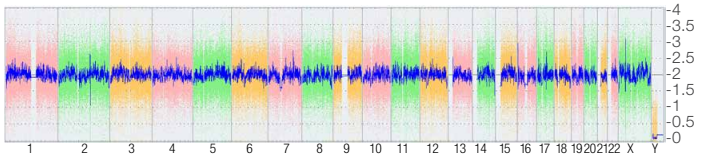

Figure 4. No chromosomal aberrations in iPSCs expanded with PeproGMP Human FGF-basic, passage 10, in KaryoStat Assay. This whole-genome view shows all somatic and sex chromosomes in frame with high-level copy number. A value of 2 on the y-axis represents a normal copy number state (CN = 2). The pink, green, and yellow colors indicate the raw signal for each individual chromosome probe, while the blue signal represents the normalized probe signal, which is used to identify copy number and aberrations (if any). No chromosomal aberrations were found when comparing against the reference dataset.

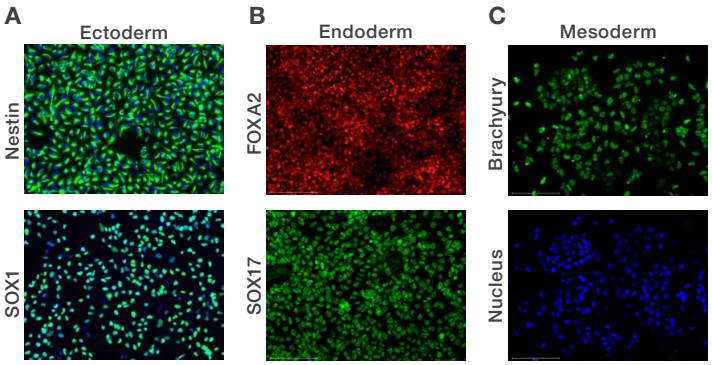

Figure 5. Confirmation of trilineage potential of iPSCs maintained using PeproGMP Human FGF-basic. Specialized induction media were used on passage 10 iPSCs, previously maintained using PeproGMP Human FGF-basic. ICC demonstrates the expression of specific commitment biomarkers for ectoderm, endoderm, and mesoderm. **(A)** Ectoderm lineage confirmed with differentiation into neural stem cell lineage with expression of nestin and SOX1. **(B)** Endoderm lineage differentiation confirmed with expression of FOXA2 and SOX17. **(C)** Mesoderm lineage differentiation confirmed with expression of brachyury. Expression of respective markers was also confirmed by flow cytometry (not shown).

PeproGMP cytokine FAQs

1. Can I use PeproGMP cytokines for GMP manufacturing of investigational products, and for manufacturing commercial therapeutic products?

Yes, PeproGMP cytokines are intended for use in GMP manufacturing of investigational or marketed clinical products, such as cell therapy, gene therapy, and tissue-engineered products; combination products; or other advanced therapy medicinal products.

PeproGMP cytokines are not, however, therapeutic products or excipients, and hence are not suitable for direct administration to humans. See USP Chapter <1043> Ancillary Materials for Cell, Gene, and Tissue-Engineered Products for more information, or contact PeproTech product technical support at peprotech.qualityassurance@thermofisher.com.

2. What is the risk classification for PeproGMP cytokines?

PeproGMP cytokines are classified as Tier 2 under USP Chapter <1043>:

Tier 1: Low-risk, highly qualified materials (therapeutic drug or biologic, medical device)

Tier 2: Low-risk, well-characterized materials, produced in compliance with GMPs, and intended to be used as ancillary materials

Tier 3: Moderate-risk, not for use as ancillary materials

Tier 4: High-risk materials

3. Are PeproGMP cytokines animal origin–free and human origin–free?

Yes. Cytokines in the PeproGMP product line are manufactured using defined media, enzymes, and chemicals, none of which are derived from animal or human origins.

4. Do PeproGMP cytokines have the same biological properties as the research-grade PeproTech cytokines I have been using for R&D studies?

Yes. PeproGMP cytokines are functionally equivalent to their research-grade counterparts.

5. How are PeproGMP cytokines shipped?

The products are lyophilized, making them stable at a wide range of temperatures. Shipping is at ambient temperature. Upon request and at an additional cost, these products can be shipped on ice packs or dry ice.

Resources

- USP Chapter <1043> Ancillary Materials for Cell, Gene, and Tissue-Engineered Products
- FDA Guidance: Content and Review of Chemistry, Manufacturing, and Control (CMC) Information for Human Somatic Cell Therapy Investigational New Drug Applications (INDs)
- FDA Guidance: Content and Review of Chemistry, Manufacturing, and Control (CMC) Information for Human Gene Therapy Investigational New Drug Applications (INDs)
- EC Regulation 1394/2007 on Advanced Therapy Medicinal Products
- EC Directive 2009/120/EC—Medicinal Products for Human Use as Regards Advanced Therapy Medicinal Products
- ISO 9001:2015 quality management standard
- Ph. Eur. General Chapter 5.2.12, Raw Materials of Biological Origin for the Production of Cell-Based and Gene Therapy Medicinal Products

ThermoFisher SCIENTIFIC

Product quality policy statement

We are committed to supplying our customers with high-quality products and services to achieve customer satisfaction, as well as to help ensure compliance with the requirements of a quality management system and its continued improvement.

PeproGMP cytokines and growth factors

Product	Size	Cat. No.
PeproGMP Human Activin A	50 µg	GMP120-14E-50UG
	100 µg	GMP120-14E-100UG
PeproGMP Human BDNF	25 µg	GMP450-02-25UG
PeproGMP Human BMP-4	50 µg	GMP120-05ET-50UG
PeproGMP Human IL-2	50 µg	GMP200-02-50UG
	100 µg	GMP200-02-100UG
	1 mg	GMP200-02-1MG
PeproGMP Human IL-3	50 µg	GMP200-03-50UG
	100 µg	GMP200-03-100UG
	1 mg	GMP200-03-1MG
PeproGMP Human IL-6	10 µg	GMP200-06-10UG
	100 µg	GMP200-06-100UG
PeproGMP Human IL-7	50 µg	GMP200-07-50UG
	100 µg	GMP200-07-100UG
PeproGMP Human IL-15	50 µg	GMP200-15-50UG
	100 µg	GMP200-15-100UG
PeproGMP Human IL-21	50 µg	GMP200-21-50UG
	100 µg	GMP200-21-100UG
	1 mg	GMP200-21-1MG
PeproGMP Human EGF	100 µg	GMP100-15-100UG
	500 µg	GMP100-15-500UG
	1 mg	GMP100-15-1MG
PeproGMP Human FGF-basic	25 µg	GMP100-18B-25UG
	100 µg	GMP100-18B-100UG
	1 mg	GMP100-18B-1MG

Product	Size	Cat. No.
PeproGMP Human Flt3-Ligand	50 µg	GMP300-19-50UG
	100 µg	GMP300-19-100UG
	1 mg	GMP300-19-1MG
PeproGMP Human Heregulin β-1	50 µg	GMP100-03-50UG
	100 µg	GMP100-03-100UG
	1 mg	GMP100-03-1MG
PeproGMP Human KGF (FGF-7)	50 µg	GMP100-19-50UG
	100 µg	GMP100-19-100UG
	1 mg	GMP100-19-1MG
PeproGMP Human LIF	50 µg	GMP300-05-50UG
	100 µg	GMP300-05-100UG
PeproGMP Human PDGF-AA	50 µg	GMP100-13A-50UG
	100 µg	GMP100-13A-100UG
PeproGMP Human SCF	50 µg	GMP300-07-50UG
	100 µg	GMP300-07-100UG
	1 mg	GMP300-07-1MG
PeproGMP Human TPO	50 µg	GMP300-18-50UG
	100 µg	GMP300-18-100UG
PeproGMP Human VEGF-165	50 µg	GMP100-20-50UG
	100 µg	GMP100-20-100UG
	1 mg	GMP100-20-1MG

Explore our extensive cell therapy solutions

Learn more at **thermofisher.com/peprogmp**

gibco