



Miltenyi Biotec



Bioassays and calibration reagents used for activity calibration of MACS® Cytokines

To make cytokine activities comparable between different suppliers and laboratories, bioassays applied for activity determination are calibrated with a recognized standard reagent of known biological activity.

The resulting calibrated cytokine activity is given in international units (IU) or units (U) based on the calibration reagent applied:

- WHO international standards (IS)¹ are manufactured according to WHO guidelines. They are extensively studied by multiple international laboratories and established by the WHO Expert Committee on Biological Standardization (ECBS). WHO international standards are available for many cytokines and are distributed by the National Institute for Biological Standards and Control (NIBSC). Only activity values calibrated with these internationally recognized standards are stated in IU.

- WHO reference reagents (WRR)² are standards that have not been tested extensively enough to be defined as “international standard”. Activities given in U might be calibrated with these WHO reference reagents.
- Please note that for some cytokines (or suppliers), activities given in U might also be calibrated with internal standards of different reliability or not calibrated at all.

All MACS Premium-Grade and MACS GMP Cytokines are calibrated using NIBSC international standards or reference reagents if these are available. The specific activity for each cytokine lot is stated on the respective Certificate of Analysis (MACS Premium-Grade Cytokines) or on the Product Quality Certificate (MACS GMP Cytokines). This allows for reliable cytokine usage and maximizes comparability of experimental results with other laboratories and other publications.

The following table gives an overview of bioassays and calibration reagents used for cytokine calibration of MACS Premium-Grade and MACS GMP Cytokines.

Cytokine	Species	Quality grade	Bioassay	IS	WRR	Designation
Activin A	Human	MACS GMP, Premium grade	Inhibition assay using MPC-11 cells	n.a.	91/626	U
BMP-2	Human	Premium grade	Alkaline phosphatase assay using mouse C2C12 fibroblasts	n.a.	93/574	U
BMP-4	Human	MACS GMP*, Premium grade	Alkaline phosphatase assay using mouse C2C12 fibroblasts	No IS/WRR available		U
CD40-Ligand	Human	Premium grade	Proliferation of CD19 ⁺ B cells	No IS/WRR available		U
EGF	Human	MACS GMP, Premium grade	Proliferation assay using 3T3 cells	91/530	n.a.	IU
FGF-1	Human	Premium grade	Proliferation assay using 3T3 cells	No IS/WRR available		U
FGF-2	Human	MACS GMP, Premium grade	Proliferation assay using 3T3 cells	90/712	n.a.	IU
FGF-2 IS	Human	Premium grade	Proliferation assay using 3T3 cells	90/712	n.a.	IU
FGF-4	Human	Premium grade	Proliferation assay using 3T3 cells	No IS/WRR available		U
FGF-7	Human	Premium grade	Proliferation assay using 4MBr-5 cells	n.a.	03/150	U

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Cytokine	Species	Quality grade	Bioassay	IS	WRR	Designation
FGF-8b	Human	MACS GMP*, Premium grade	Proliferation assay using 3T3 cells	No IS/WRR available		U
FGF-8b	Mouse	Premium grade	Proliferation assay using 3T3 cells	No IS/WRR available		U
Flt3-Ligand	Human	MACS GMP, Premium grade	Proliferation assay using OCI-AML5 cells	96/532	n.a.	IU
G-CSF	Human	Premium grade	Proliferation assay using NFS-60 cells	88/502	n.a.	IU
GM-CSF	Human	MACS GMP, Premium grade	Proliferation assay using TF-1 cells	88/646	n.a.	IU
GM-CSF	Mouse	Premium grade	Proliferation assay using FDC-P1 cells	n.a.	91/658	U
IFN-γ	Mouse	Premium grade	Inhibition of WEHI-279 cells	NR-3081	n.a.	IU
IFN-γ1b	Human	Premium grade	Proliferation assay using HT-29 cells	NR-3086	n.a.	IU
IL-1β	Human	MACS GMP, Premium grade	Proliferation assay using D10.G4.1 cells	86/680	n.a.	IU
IL-1β	Mouse	Premium grade	Proliferation assay using D10.G4.1 cells	n.a.	93/668	U
IL-2 (IS)	Human	MACS GMP, Premium grade	Proliferation assay using CTLL-2 cells	86/500	n.a.	IU
IL-2 IS	Mouse	Premium grade	Proliferation assay using CTLL-2 cells	No IS/WRR available		U
IL-3	Human	MACS GMP, Premium grade	Proliferation assay using TF-1 cells	91/510	n.a.	IU
IL-3 IS	Mouse	Premium grade	Proliferation assay using 32D cells	n.a.	91/662	U
IL-4	Human	MACS GMP, Premium grade	Proliferation assay using TF-1 cells	88/656	n.a.	IU
IL-4	Mouse	Premium grade	Proliferation assay using HT-2 cells	n.a.	91/656	U
IL-6	Human	MACS GMP, Premium grade	Proliferation assay using B9 hybridoma cells	89/548	n.a.	IU
IL-7	Human	MACS GMP, Premium grade	Proliferation assay using mouse 2E8 cells	n.a.	90/530	U
IL-8	Human	Premium grade	Migration assay using neutrophils	89/520	n.a.	IU
IL-12	Human	MACS GMP, Premium grade	IFN secretion by PHA-activated T cells	n.a.	95/544	U
IL-13	Human	Premium grade	Proliferation assay using TF-1 cells	n.a.	94/622	U
IL-15	Human	MACS GMP, Premium grade	Proliferation assay using CTLL-2 cells	n.a.	95/554	U
IL-15Ra sushi	Human	Premium grade	Proliferation assay using CTLL-2 cells	No IS/WRR available		U
IL-18*	Human	MACS GMP*, Premium grade*	IFN-γ secretion by KG-1 cells	n.a.	03/200	U
IL-21	Human	MACS GMP, Premium grade	Proliferation assay using B9 hybridoma cells	No IS/WRR available		U
IL-33	Human	Premium grade	Proliferation assay using D10.G4.1 cells	No IS/WRR available		U
LIF	Mouse	Premium grade	Inhibition of M1 cells	No IS/WRR available		U
M-CSF	Human	MACS GMP, Premium grade	Proliferation assay using M-NSF-60 cells	89/512	n.a.	IU
Oncostatin M IS	Human	Premium grade	Proliferation assay using TF-1 cells	n.a.	93/564	U
PDGF-BB IS	Human	Premium grade	Proliferation assay using 3T3 cells	94/728	n.a.	IU
SCF	Human	MACS GMP, Premium grade	Proliferation assay using TF-1 cells	n.a.	91/682	U
SCF	Mouse	Premium grade	Proliferation assay using TF-1 cells	No IS/WRR available		U
SHH (C24II)	Human	MACS GMP*, Premium grade	Alkaline phosphatase assay using mouse C3H10T1/2 fibroblasts	No IS/WRR available		U
TGF-β1	Human	MACS GMP, Premium grade	Proliferation assay using TF-1 cells	n.a.	89/514	U
TNF-α	Human	MACS GMP, Premium grade	Cytotoxicity assay using L929 cells	12/154	n.a.	IU
TNF-α	Mouse	MACS GMP, Premium grade	Inhibition of L929 cells	No IS/WRR available		U
TPO	Human	MACS GMP, Premium grade	Proliferation assay using M07e cells	n.a.	03/124	U
VEGF (165) IS	Human	Premium grade	Proliferation assay using HUVE cells	n.a.	02/286	U

*In development, might be subject to change.

References:

1. https://www.nibsc.org/standardisation/international_standards.aspx
2. https://www.nibsc.org/standardisation/international_reference_reagents.aspx

MORE INFORMATION



Find our complete product lists here:

► [miltenyibiotec.com/cytokines](https://www.miltenyibiotec.com/cytokines)



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