

Supplementary Table 1

Category	Marker	Description	Notes	Reference
Core	FUT4	Carbohydrate epitope prominently on mature granulocytes; supports granulocytic ID.	Can appear on monocytes and some epithelial/tumor cells	[1]
Core	CEACAM8	Granulocyte-restricted GPI protein stored in specific granules; classic neutrophil surface marker.	Highly specific for granulocytes; sheds/secreted upon activation	[2]
Core	ITGAM / ITGB2	β 2-integrin heterodimer crucial for neutrophil adhesion/activation; strongly expressed in neutrophils.	Also on monocytes; activation-responsive	[3]
Core	FCGR3B	Neutrophil-specific Fc γ receptor (GPI-anchored).	Distinct from FCGR3A (CD16a) on NK/mono;	[4]
Core	CXCR1 / CXCR2	Co-expressed on human neutrophils; mediate IL-8–directed chemotaxis.	Low levels possible elsewhere; activation-dependent modulation	[5]
Core	CSF3R	Master receptor driving granulopoiesis and neutrophil function.	Pathologic mutations occur in neutrophil disorders	[6]
Core	MPO	Canonical azurophilic granule enzyme; hallmark of neutrophil lineage.	Low expression possible in monocytes	[7]
Core	ELANE	Primary granule serine protease; strong neutrophil lineage signal.		[8]
Core	PRTN3	Primary granule protease; PR3-ANCA autoantigen—neutrophil-defining.		[9]
Core	CTSG	Primary granule protease enriched in neutrophils.	Some monocyte expression	[10]
Core	AZU1	Primary (azurophilic) granule antimicrobial protein.	Closely linked locus with ELANE/PRTN3	[11]
Core	DEFA4	Neutrophil defensin family member in primary granules.		[12]

Core	LCN2	Specific/gelatinase granule cargo; neutrophil-associated lipocalin.	Also induced in epithelia during injury	[13]
Core	LTF	Specific granule hallmark; classic neutrophil protein.	Can be secreted; transcripts low in resting PBMCs	[14]
Core	S100A12	Predominantly expressed/secreted by neutrophils; activation-responsive.	Low monocyte expression possible	[15]
Core	ARG1	Frequently up in granulocytic/PMN-MDSC programs; neutrophil granule content.		[16]
Core	NAMPT	Modulates neutrophil survival/priming; elevated in myeloid contexts.	Not neutrophil-exclusive	[17]
Booster	CD177	Neutrophil activation marker; subset-restricted but highly specific.	Expression heterogeneous across donors	[18]
Booster	MME	Marker of mature neutrophils; distinguishes immature CD10 ⁺ cells.	Absent on immature/emergency granulopoiesis	[19]
Booster	SELL	High on resting neutrophils; rapidly shed on activation.	Also on lymphocytes	[20]
Booster	MMP8	Neutrophil-enriched metalloproteinase; granule cargo.	Can be induced in other contexts	[21]
Booster	MMP25	Neutrophil-specific, GPI-anchored MMP in granules.	Activation-regulated release	[22]
Booster	CAMP	Cathelicidin antimicrobial peptide stored in neutrophils; released on NETosis.	Can be expressed by epithelia	[23]
Booster	BPI	Azurophilic granule protein; neutrophil hallmark.	ANCA target in vasculitis; strong but activation-sensitive	[24]
Booster	OLFM4	Marks a distinct subset of human neutrophils (specific-granule glycoprotein).	Subset-restricted (1–70%); absence doesn't exclude neutrophils	[25]
Booster	PADI4	Enzyme driving histone citrullination during NETosis.	Inducible; not constitutively high in all neutrophils	[26]

Booster	ADGRG3	GPCR highly expressed in human neutrophils; supports antimicrobial function.		[27]
Booster	CD24	Myeloid maturation/apoptosis-linked signal; present on neutrophils.	Also on B cells/others	[28]
Exclusion	CD14	Monocyte LPS co-receptor; use as negative to avoid monocyte calls.	Granulocytes are CD14 low/negative	[29]
Exclusion	HLA-DRA	Antigen presentation; monocytes/DCs; neutrophils are HLA-DR– at baseline.	Can be induced by IFN- γ in rare contexts	[30]
Exclusion	CST3	Enriched in DCs/mononuclear phagocytes; non-granulocyte.	Helps avoid DC mis-annotation	[31]
Exclusion	MS4A7	Canonical monocyte/microglia MS4A family member.	Strong monocyte marker in scRNA-seq	[32]
Exclusion	CD3D	Invariant TCR/CD3 complex subunit; T-cell lineage.	Robust negative for neutrophils	[33]

Supplementary Table 1 references

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