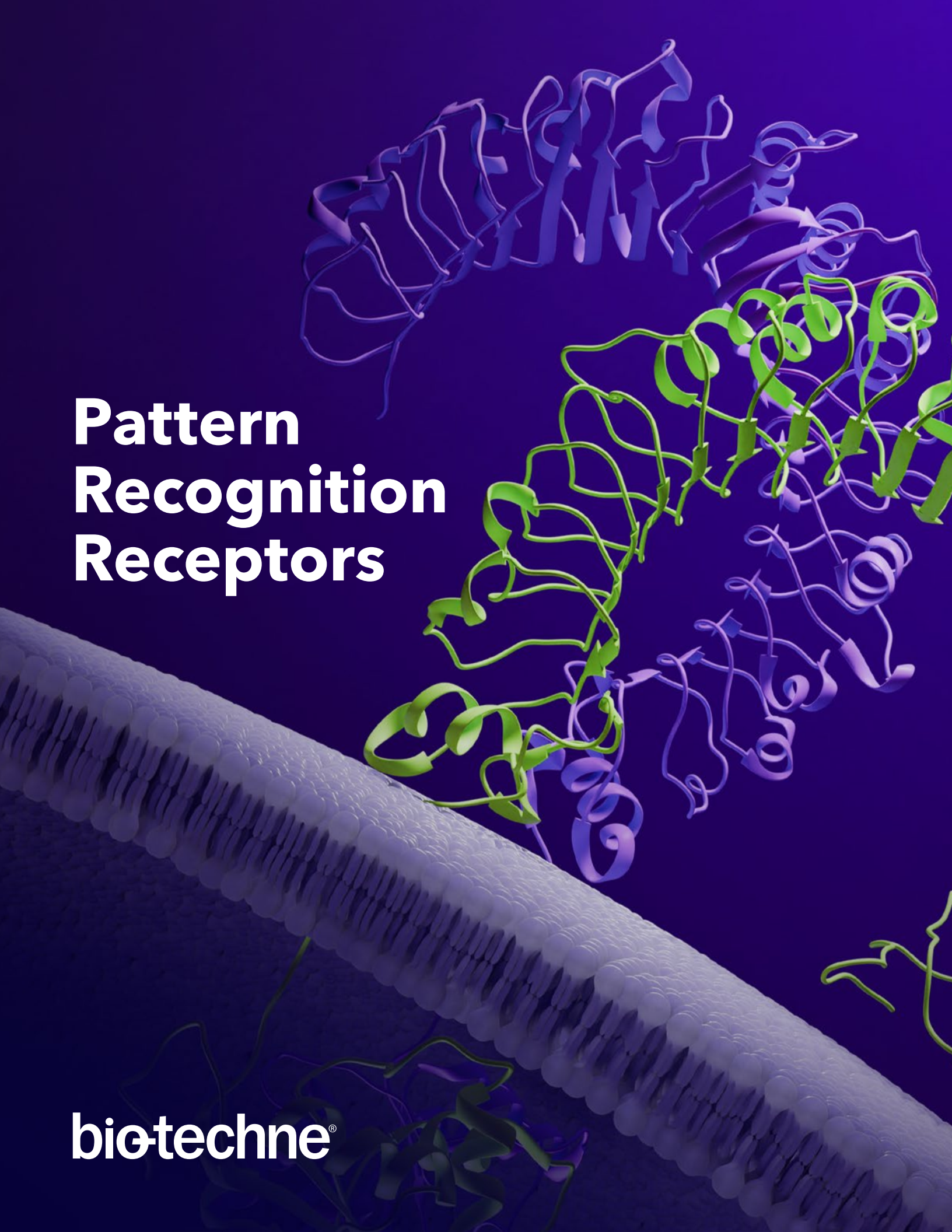


Pattern Recognition Receptors

biotechne®



Pattern Recognition Receptors

Pattern recognition receptors (PRRs) are essential for detecting invading pathogens and initiating the innate and adaptive immune response. There are multiple families of PRRs including the membrane-associated Toll-like receptors (TLRs) and C-type lectin receptors (CLRs), and the cytosolic NOD-like receptors (NLRs), RIG-I-like receptors (RLRs), and AIM2-like receptors (ALRs). PRRs are activated by specific pathogen-associated molecular patterns (PAMPs) present in microbial molecules or by damage-associated molecular patterns (DAMPs) exposed on the surface of, or released by, damaged cells. In most cases, ligand recognition by PRRs triggers intracellular signal transduction cascades that result in the expression of pro-inflammatory cytokines, chemokines, and antiviral molecules.¹ In contrast, activation of some ALRs and NLRs leads to the formation of multiprotein inflammasome complexes that serve as platforms for the cleavage and activation of Caspase-1.² Caspase-1 promotes the maturation and secretion of IL-1 β and IL-18, which further amplifies the pro-inflammatory immune response. Since a single pathogen can simultaneously activate multiple PRRs, crosstalk between different receptors may also play a role in enhancing or inhibiting the immune response.³ Therefore, tight regulation of PRR signaling is required in order to eliminate infectious pathogens and at the same time, prevent aberrant or excessive PRR activation, which can lead to the development of inflammatory and autoimmune disorders.⁴

References

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Select Pattern Recognition Receptor Agonists

Toll-like Receptors (TLRs)		
TLRs	Agonist(s)	Source
TLR1/TLR2	Triacyl lipopeptides	Bacteria
TLR2	Lipoproteins	Multiple Pathogens
	Peptidoglycan (PGN)	Bacteria
	Porins	Bacteria
	Zymosan	Fungi
	β -Glycan	Fungi
	GPI-mucin	Protozoa
	Envelope glycoproteins	Viruses
TLR2/TLR6	Diacyl lipopeptides	Bacteria
	Lipoteichoic acid (LTA)	Bacteria
TLR3	Double-stranded RNA	Viruses
	Poly (I:C)	Synthetic analog of double-stranded RNA
TLR4	Lipopolysaccharide (LPS)	Bacteria
	Glycoinositol-phospholipids	Protozoa
	Envelope glycoproteins	Viruses
	Host-derived HMGB1 and HSPs	Endogenous
TLR5	Flagellin	Bacteria
TLR7	Single-stranded RNA	Viruses
TLR8	Single-stranded RNA	Viruses
TLR9	Unmethylated CpG DNA	Bacteria
		Protozoa
		Viruses
TLR9	Mitochondrial DNA	Endogenous
		Endogenous
TLR10	Unknown	Unknown

RIG-I-like Receptors (RLRs)		
RLRs	Agonist(s)	Source
RIG-I	Short 5' triphosphate single-stranded RNA containing some double-stranded regions	Viruses
MDA5	Long double-stranded RNA	Viruses
LGP2	Unknown	RNA Viruses

C-type Lectin Receptors (CLRs)		
CLRs	Agonist(s)	Source
BDCA-2	Mannose, fucose	Unknown
CLEC-1	Unknown	Unknown
CLEC-2	Unknown	Endogenous podoplanin (PDPN); HIV; Snake venom protein rhodocytin
CLEC4D/CLECSF8	Unknown	Unknown
CLEC9a	Filamentous form of actin	Necrotic cells
CLEC12B	Unknown	Unknown
DCAR/CLEC4B	Unknown	Unknown
DCIR/CLEC4A	Mannose, fucose	HIV
DC-SIGN/CD209	High mannose, fucose	<i>Candida albicans</i> , Cytomegalovirus, Dengue virus, filoviruses, HIV, <i>Leishmania</i> spp., measles virus, <i>Mycobacterium</i> spp., SARS, <i>Schistosoma mansoni</i> egg antigen
Dectin-1/CLEC7A	β -1,3 glucans	Fungi, mycobacteria
Dectin-2/CLEC6A	High mannose; α -mannans	<i>Aspergillus fumigatus</i> , <i>Candida albicans</i> , <i>Cryptococcus neoformans</i> , <i>Histoplasma capsulatum</i> , <i>Microsporium audouinii</i> , <i>Mycobacterium tuberculosis</i> , <i>Paracoccidioides brasiliensis</i> , <i>Saccharomyces cerevisiae</i> , <i>Trichophyton rubrum</i>
LOX-1/OLR1	Oxidized low density lipoprotein (ox-LDL); modified lipoproteins	Endogenous; Bacteria; Also activated by aged cells, advanced glycation end products, and HSP70
MDL-1/CLEC5A	Unknown	Dengue virus
MICL/CLEC12A	Unknown	Unknown
Mincle/CLEC4E	α -mannose, glycolipids, SAP130 (endogenous)	<i>Candida albicans</i> , <i>Malassezia</i> spp., <i>Mycobacterium tuberculosis</i> , dead cells
SIGNR3/CD209d	High mannose, fucose	<i>Mycobacterium tuberculosis</i>

Cover Illustration: A model of the ligand-bound TLR1/TLR2 heterodimer based on the crystal structure [Adapted from Jin, M.S. *et al.* (2007) Cell 130:1071.]

NOD-like Receptors (NLRs)		
NLRs	Agonist(s)	Source
NOD1 (NLRC1)	Meso-diaminopimelic acid (Meso-DAP)	Bacteria
NOD2 (NLRC2)	Muramyl dipeptide (MDP)	Bacteria
CIITA	Unknown	
NAIP	<i>Legionella pneumophila</i> ; Flagellin (Naip5)	
NLRC3	Unknown	
NLRC4 (IPAF)	<i>Legionella pneumophila</i> ; <i>Pseudomonas aeruginosa</i> ; <i>Salmonella typhimurium</i> ; <i>Shigella flexneri</i>	
NLRC5	Unknown	
NLRP1/NALP1	<i>Bacillus anthracis</i> lethal toxin; Muramyl dipeptide (MDP)	
NLRP2/NALP2	Unknown	

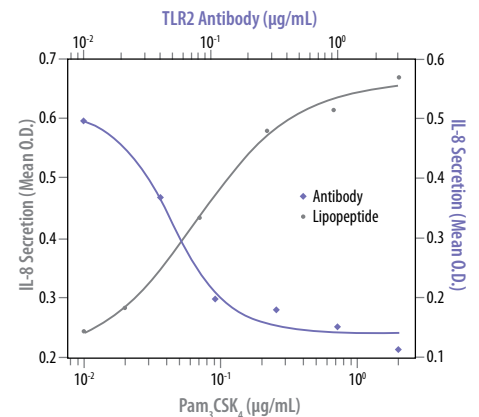
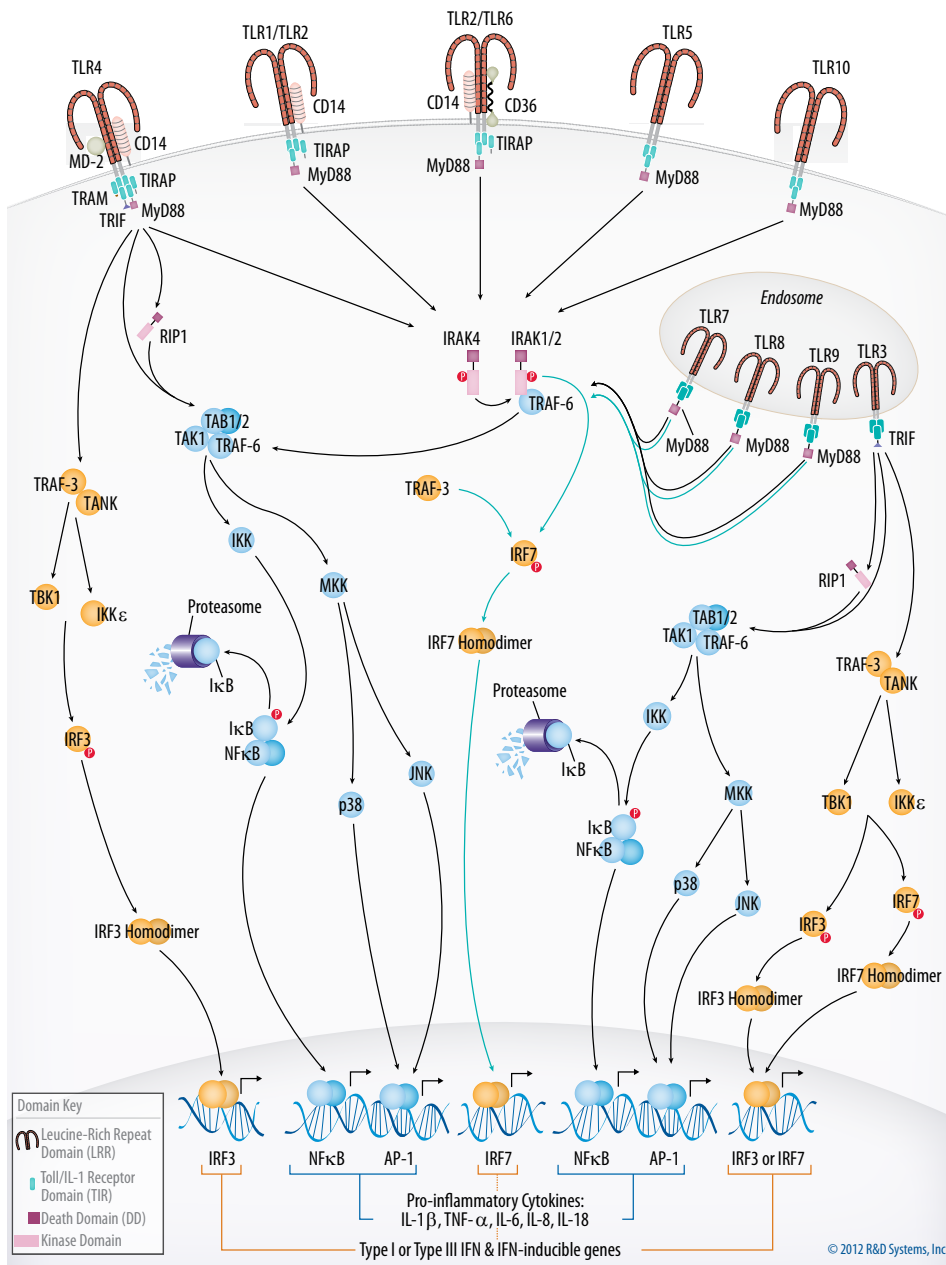
NOD-like Receptors (NLRs)		
NLRs	Agonist(s)	Source
NLRP3/NALP3	Adenoviral DNA; Bacterial RNA; <i>Candida albicans</i> / <i>Saccharomyces cerevisiae</i> ; Damage signals: Extracellular ATP, NAD ⁺ , β -amyloid, and particulates such as calcium pyrophosphate dihydrate and monosodium urate; Pore-forming toxins: Hemolysins, Listeriolysin O, Nigericin, Pneumolysin; Xenogenous compounds: Silica, asbestos, alum, and uric acid; Influenza and Sendai virus RNA; Lipopolysaccharide (LPS); <i>Klebsiella pneumoniae</i> , <i>Mycobacterium tuberculosis</i> , <i>Salmonella typhimurium</i> , <i>Schistosoma mansoni</i>	
NLRP4-14/NALP4-14	Unknown	
NLRX1	Unknown	

Toll-like Receptors

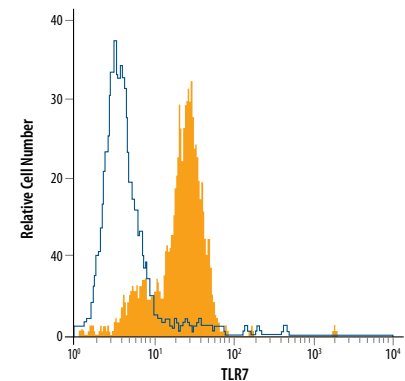
Toll-like receptors (TLRs) are a family of type I transmembrane pattern recognition receptors (PRRs) that are expressed by a number of different immune and non-immune cell types including monocytes, macrophages, dendritic cells, neutrophils, B cells, T cells, fibroblasts, endothelial cells, and epithelial cells.¹ TLRs initiate the immune response following recognition of either conserved, pathogen-associated molecular patterns (PAMPs) present in microbial molecules or damaged-associated molecular patterns (DAMPs) present in molecules released by damaged cells. There are ten functional TLRs in humans and twelve in mice.² Of the human TLRs, TLR1, 2, 4, 5, 6, and 10 are expressed on the cell surface and primarily recognize microbial membrane and/or cell wall components, while TLR3, 7, 8, and 9 are expressed in the membranes of endolysosomal compartments and recognize nucleic acids.³ TLRs have a variable number of ligand-sensing, leucine-rich repeats at their N-terminal ends and a cytoplasmic Toll/IL-1 R (TIR) domain. The TIR domain mediates interactions between TLRs and adaptor proteins involved in regulating TLR signaling including MyD88, TRIF, TRAM, and TIRAP/MAL. Signaling pathways activated downstream of these adaptor molecules promote the expression of pro-inflammatory cytokines, chemokines, and type I and type III interferons. As a result, additional immune cells are recruited to the infection site and pathogenic microbes and infected cells are eliminated. Although TLRs provide protection against a wide variety of pathogens, inappropriate or unregulated activation of TLR signaling can lead to chronic inflammatory and autoimmune disorders.⁴

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4. Midwood, K.S. *et al.* (2009) *Curr. Drug Targets* 10:1139.



TLR2 Ligand-induced IL-8 Secretion and Neutralization using an Anti-Human TLR2 Antibody. The HEK293 human embryonic kidney cell line transfected with human TLR2 was treated with increasing concentrations of the synthetic tri-palmitoylated lipopeptide Pam₃CSK₄. IL-8 secretion was measured using the Human CXCL8/IL-8 Quantikine® ELISA Kit (Catalog # D8000C; gray line). The stimulatory effect induced by 0.5 μ g/mL Pam₃CSK₄ was neutralized by treating the cells with increasing concentrations of a Mouse Anti-Human TLR2 Monoclonal Antibody (Catalog # MAB2616; purple line).



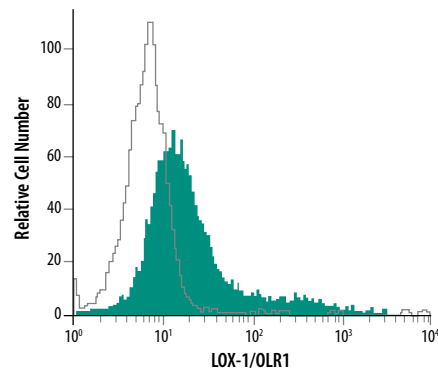
Intracellular Detection of TLR7 by Flow Cytometry. The Ramos human Burkitt's lymphoma cell line was stained with a PE-conjugated Mouse Anti-Human TLR7 Monoclonal Antibody (Catalog # IC5875P; filled histogram) or a PE-conjugated Mouse IgG_{2a} Isotype Control (Catalog # IC003P; open histogram).

C-type Lectin Receptors

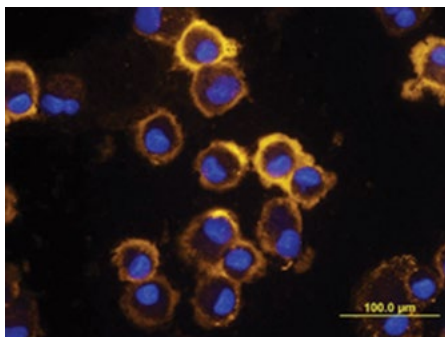
C-type lectin receptors (CLRs) are a diverse family of soluble and transmembrane proteins that contain one or more C-type lectin-like domain (CTLD). Multiple members of the CLR family are considered to be pattern recognition receptors (PRRs) due to their ability to recognize pathogen-associated molecules and induce intracellular signaling pathways that regulate the immune response. With the exception of DC-SIGN, most CLRs that function as PRRs belong to either the Dectin-1 (Dectin-1, CLEC-1, CLEC-2, CLEC9a, CLEC12B, LOX-1/OLR1, and M1CL/CLEC12A) or Dectin-2 (Dectin-2, BDCA-2, CLEC4D/CLECSF8, DCAR, DCIR, and Mincle) subgroups.¹ Members of these subgroups are transmembrane proteins that are primarily expressed by monocytes, macrophages, and dendritic cells, and recognize fucose, mannose, or glucan carbohydrate structures. Signaling pathways activated by CLRs either directly regulate gene expression or modulate TLR signaling.² Dectin-1 and Dectin-2 are two well-characterized CLRs that function as PRRs. Both receptors have been shown to promote canonical NF κ B signaling through activation of spleen tyrosine kinase (SYK) and a multiprotein complex consisting of CARD9, Bcl-10, and MALT1.¹⁻⁴ While Dectin-1 directly interacts with SYK through its cytoplasmic, immunoreceptor tyrosine-based activation motif (ITAM), Dectin-2 interacts with SYK through the ITAM-containing adaptor protein, FcR γ . Dectin-1 also regulates NF κ B activity through the NIK-dependent, non-canonical NF κ B signaling pathway, and through Raf-1-mediated phosphorylation and acetylation.⁴ In addition, both Dectin-1 and Dectin-2 activate NFAT and AP-1.² As a result, signaling initiated by either receptor can precisely control the expression of numerous cytokines that direct the innate and adaptive immune response. Other CLRs do not directly regulate cytokine expression, but instead modulate TLR-induced signaling pathways. DCIR/CLEC4A, M1CL/CLEC12A, and CLEC12B are CLRs that contain an immunoreceptor tyrosine-based inhibitory motif (ITIM) in their cytoplasmic domains. Upon activation, DCIR and M1CL recruit the phosphatases, SHP-1 or SHP-2, and inhibit TLR8 or TLR9 signaling by an undefined mechanism.^{2,4} In contrast, BDCA-2 and DC-SIGN/CD209 do not contain a cytoplasmic ITIM motif but have also been shown to modulate TLR signaling through alternate pathways.^{2,4} CLRs are particularly important for antifungal immunity.³ This is highlighted by the fact that targeted deletion of specific CLRs in mice, as well as polymorphisms or mutations in human Dectin-1 or CARD9, respectively, are associated with an increased susceptibility to a variety of fungal pathogens.^{2,3,5}

References

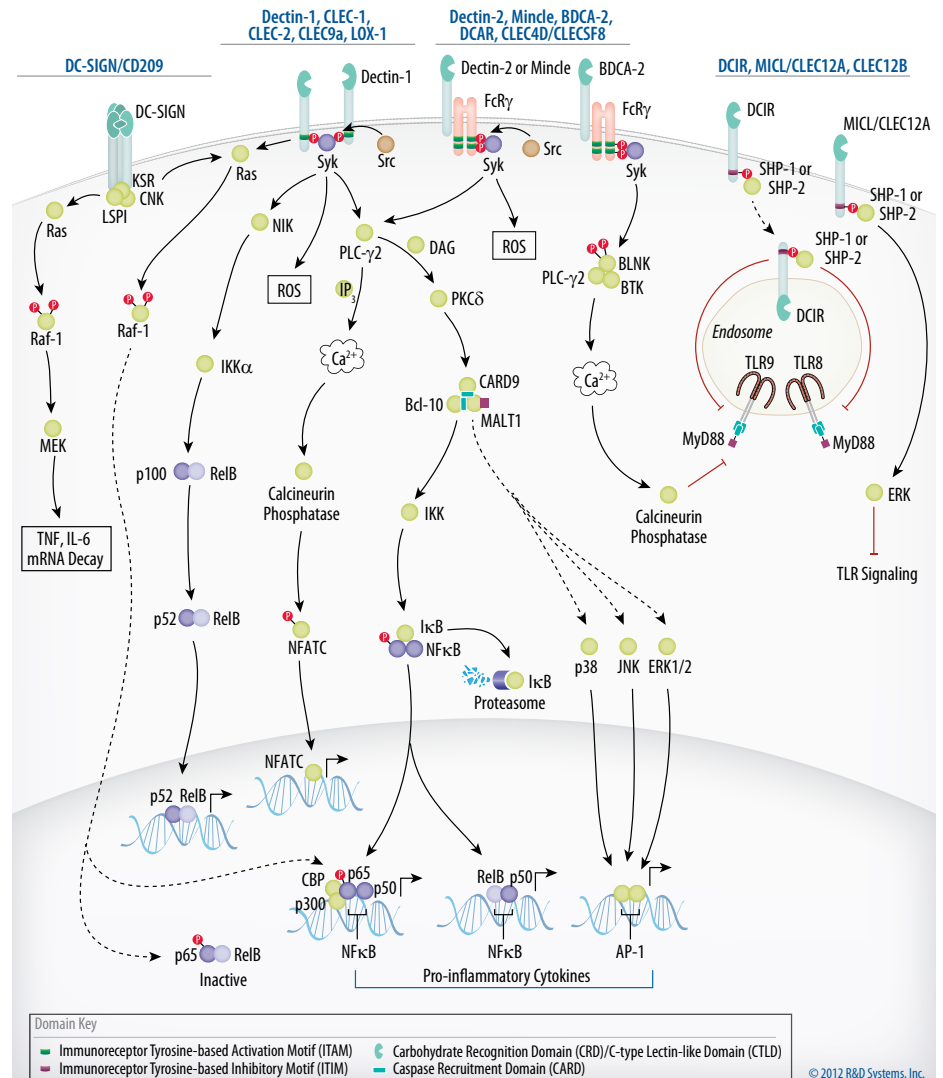
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3. Drummond, R.A. *et al.* (2011) *Eur. J. Immunol.* 41:276.
4. Geijtenbeek, T.B. & S.I. Gringhuis (2009) *Nat. Rev. Immunol.* 9:465.
5. Hardison, S.E. & G.D. Brown (2012) *Nat. Immunol.* 13:817.



Detection of LOX-1/OLR1 by Flow Cytometry. The RAW264.7 mouse monocyte/macrophage cell line was stained with a PE-conjugated Rat Anti-Mouse LOX-1/OLR1 Monoclonal Antibody (Catalog # FAB1564P; filled histogram) or a PE-conjugated Rat IgG_{2a} Isotype Control (Catalog # IC006P; open histogram).



DC-SIGN in Human Dendritic Cells. DC-SIGN was detected in immersion-fixed mature human dendritic cells using a Mouse Anti-Human DC-SIGN/CD209 Monoclonal Antibody (Catalog # MAB161). Cells were stained using the NorthernLights™ 557-conjugated Anti-Mouse IgG Secondary Antibody (Catalog # NLO07; yellow) and counterstained with DAPI (blue).



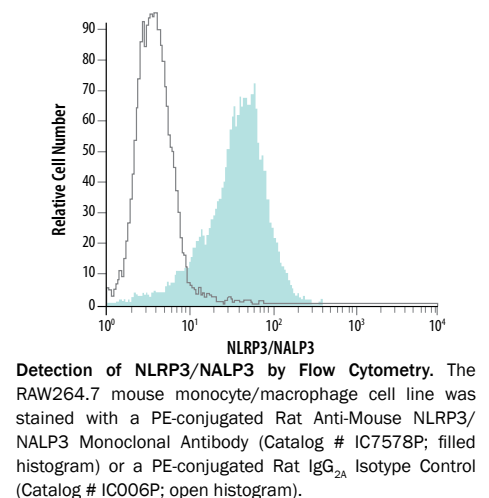
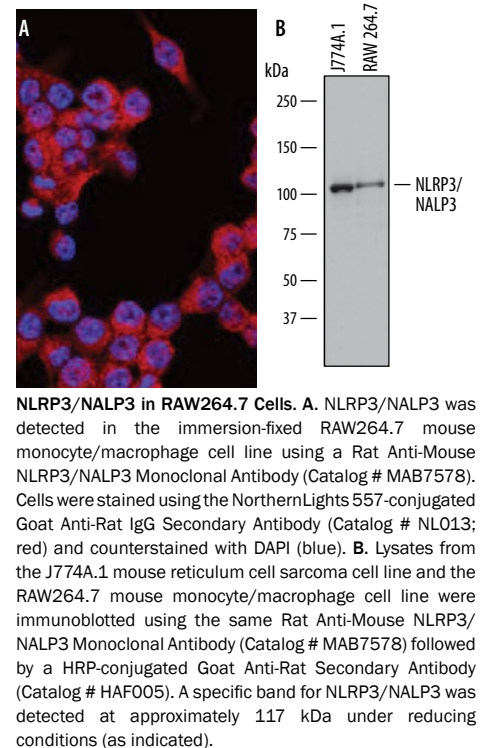
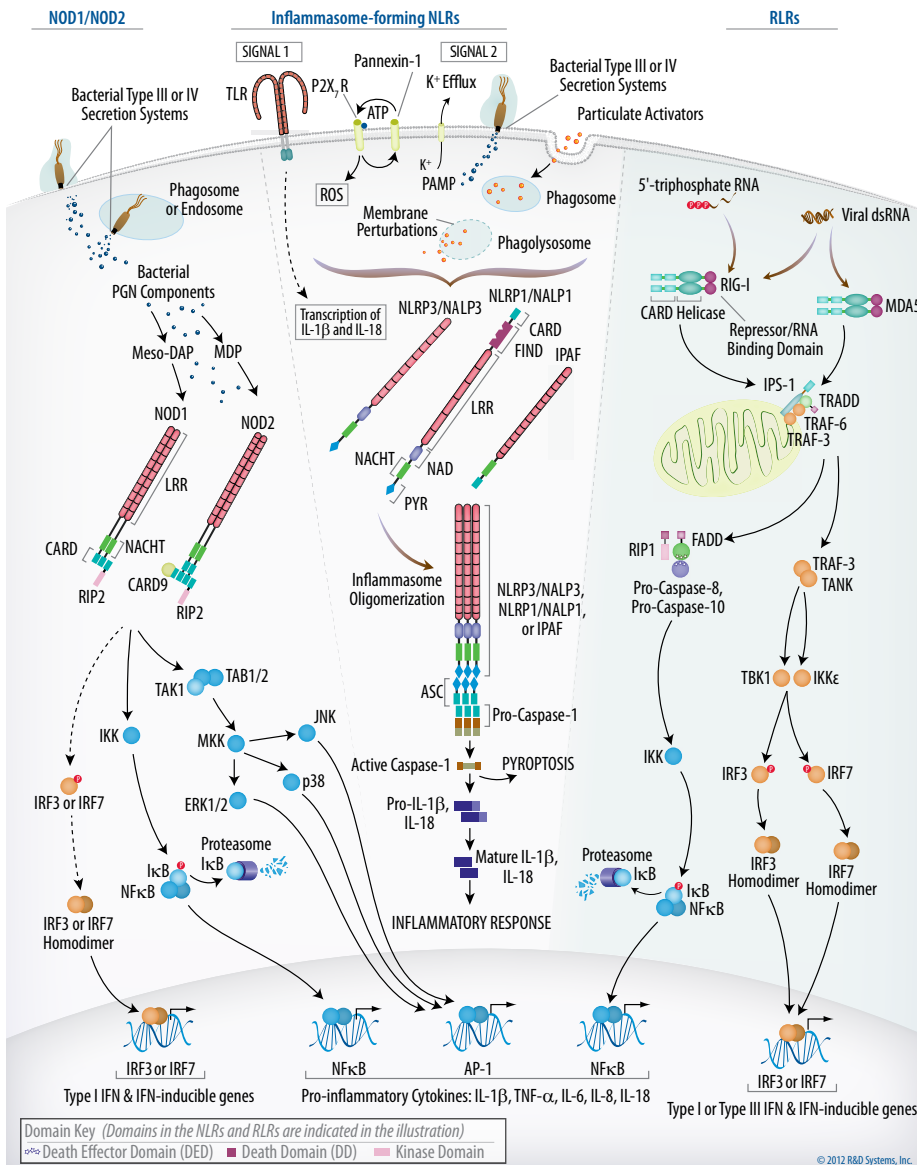
NOD-like Receptors & RIG-I-like Receptors

Nucleotide-binding, oligomerization domain (NOD)-like receptors (NLRs) and retinoic acid-inducible gene-I (RIG-I)-like receptors (RLRs) are cytosolic receptors that provide a second line of defense against invading pathogens. The NLR family consists of twenty-two human proteins and at least thirty-four mouse proteins that are divided into subfamilies (NLRA, NLRB, NLRC, NLRP, NLRX) based on their N-terminal protein-interacting domains.¹ In addition to this domain, all NLRs contain a central nucleotide-binding/oligomerization domain (NACHT) and a variable number of ligand-sensing, leucine-rich repeats at their C-terminal ends. NOD1 and NOD2 are two well-characterized NLRs belonging to the NLRC subfamily that recognize components of bacterial peptidoglycan (PGN). Upon activation, they homo-oligomerize and recruit signaling molecules that drive the NF κ B/AP-1-dependent expression of pro-inflammatory cytokines and the IRF3/IRF7-dependent expression of type I interferons.² Other NLRs, including NLRP1, NLRP3, and NLRC4, are activated by a number of different pathogens or damage signals and oligomerize to form multiprotein inflammasome complexes.³ Inflammasome oligomerization induces the cleavage and activation of Caspase-1, which promotes the processing and secretion of IL-1 β and IL-18, and may induce an inflammatory form of cell death known as pyroptosis. Similar to TLR signaling, inflammasome activation is tightly regulated. Constitutive inflammasome activation and the overproduction of IL-1 β and IL-18 have been linked to autoinflammatory and autoimmune disorders.⁴

RIG-I-like receptors (RLRs) are a subset of cytosolic pattern recognition receptors (PRRs) that detect viral RNA. The RLR family consists of three members: RIG-I, MDA5, and LGP2. RIG-I and MDA5 contain two N-terminal caspase recruitment domains (CARDs), an internal RNA helicase domain, and a C-terminal repressor/RNA-binding domain. Signaling through both receptors activates NF κ B- and IRF3/IRF7-dependent gene expression. In contrast, LGP2 has not been shown to bind to RNA and lacks the N-terminal CARD domains required for signaling. It is currently thought to serve as a regulator of viral RNA recognition by RIG-I and MDA5.⁵

References

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Products for Pattern Recognition Receptor Research

R&D Systems® Recombinant Proteins

Molecule	Species	Source	Catalog #
CLEC-1	Human	NSO	1704-CL
CLEC-2/CLEC1B	Human	NSO	1718-CL
	Mouse	NSO	9117-CL
CLEC9a	Human	NSO	6049-CL
	Mouse	CHO	6776-CL
DC-SIGN/CD209	Human	NSO	161-DC
	Human	CHO	9136-DC
Dectin-1/CLEC7A	Human	NSO	1859-DC
	Mouse	NSO	1756-DC
Dectin-2/CLEC6A	Human	NSO	3114-DC
	Mouse	NSO	1525-DC
LOX-1/OLR1	Human	NSO	1798-LX
	Mouse	NSO	1564-LX
MDL-1/CLEC5A	Human	NSO	8544-CL
	Mouse	NSO	8438-CL
Mincle/CLEC4E	Human	CHO	8995-CL
MMR/CD206	Human	NSO	2534-MR
	Mouse	NSO	2535-MM

Molecule	Species	Source	Catalog #
TLR1	Human	NSO	1484-TR
	Mouse	NSO	1476-TR
TLR2	Human	NSO	2616-TR
	Mouse	Sf21 (baculovirus)	1530-TR
TLR3	Human	NSO	1487-TR
	Mouse	NSO	3005-TR
TLR4	Human	NSO	1478-TR
	Mouse	CHO	9149-TR
TLR4/MD-2	Human	NSO	3146-TM
TLR5	Mouse	CHO	7915-TR
TLR6	Human	CHO	7755-TR
	Mouse	Sf21 (stably transfected)	1533-TR
TLR9	Mouse	CHO	7960-TR
TLR10	Human	CHO	6619-TR
TLR11	Mouse	CHO	7640-TR
TLR12	Mouse	CHO	8086-TR

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Tocris® Small Molecule TLR or NLR Agonists or Inhibitors

Toll-like Receptors		
Small Molecule	Description	Catalog #
CU-T12-9	Potent TLR1/2 agonist	5414
Pam ₃ CSK ₄	TLR1/2 agonist	4633
Pam ₃ CSK ₄ Biotin	Biotinylated Pam3CSK4	4636
CU CPT 22	Selective TLR1/2 inhibitor	4884
Pam ₂ CSK ₄	TLR2/6 agonist	4637
Pam ₂ CSK ₄ Biotin	Biotinylated Pam2CSK4	4638
Poly (I:C)	TLR3 agonist	4287
CU CPT 4a	Selective TLR3 inhibitor	4883
RS 09 New!	TLR4 peptide agonist	5928
C34	TLR4 inhibitor	5373
DSR 6434	Potent TLR7 agonist	4809
Imiquimod	TLR7 agonist	3700
Resiquimod	TLR7 agonist	4536
RWJ 21757	TLR7 agonist	2719
SM 324405 New!	Potent TLR7 agonist	5445
Hydroxychloroquine sulfate	TLR9 inhibitor	5648
GIT 27	Interferes with TLR4, TLR2/6 signaling	3270

NOD-like Receptors		
Small Molecule	Description	Catalog #
ML 130	Inhibits NOD1-induced NFκB activation	4354
CRID3 sodium salt	Potent NLRP3 inflammasome inhibitor	5479
Z-VAD-FMK	Irreversible caspase inhibitor	2163

Select R&D Systems® or Novus Biologicals® Antibodies for Detecting Toll-like Receptors (TLRs)

	Molecule	Species	Clone	Unlabeled Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
	TLR1	Human	Polyclonal	AF1484 (FC, WB)	FAB1484A, P (FC)
		Mouse	Polyclonal	AF1475 (FC, WB)	FAB1475P (FC)
		Mouse	285923	MAB1475 (WB)	
		Human/Mouse	Polyclonal	NB100-56563 (FC, IHC, WB)	
	TLR2	Human	383936	MAB2616 (B/N, FC)	FAB2616A, C, F, N, P (FC)
		Human	383936		FAB2616G, R, S, T, U, V (FC)
		Human	Polyclonal	AF2616 (E, FC, WB)	
		Human	TL2.1	NB100-56722 (B/N, FA, FC, ICC/IF, IHC, IP)*	NB100-56726AF405, AF488, AF647, AF700, PCP, NB100-56058, NBP2-24909 (FC)
		Human/Mouse	T2.5	NBP1-42362 (FC, IHC, IP)	NBP2-30096 (FC)
		Mouse	203325	MAB1530 (FC)	FAB1530A, F (FC)
		Mouse	203325		FAB1530G, N, R, S, T, U, V (FC)
		Mouse	Polyclonal	AF1530 (WB)	
		Mouse	11G5	NBP2-27165 (FC, WB)*	NBP2-27166AF647, AF700, APC, PE, PCP, NBP2-27165AF405, AF488 (FC)
	TLR3	Human	512505	MAB1487 (WB)	
		Human	Polyclonal	AF1487 (WB)	IC1487A (FC)
		Human/Mouse	40C1285.6	NBP2-24875 (FC, ICC/IF, IHC, IP, WB)*	NBP2-24875AF405, AF488, AF647, AF700, APC, PCP, NBP2-24899, NBP2-24902 (FC)
		Human/Mouse	TLR3.7		NBP1-49623, NBP2-00250 (FC)
		Mouse	313129	MAB3005 (WB)	IC3005A, P (FC)
		Mouse	Polyclonal	AF3005 (WB)	
	TLR4	Human	610029	MAB14782 (WB)	
		Human	610017	MAB14783 (IHC)	
		Human	610015	MAB6248 (FC)	FAB6248A, C, F, N, P (FC)
		Human	610015		FAB6248G, R, S, T, U, V (FC)
		Human	Polyclonal	AF1478 (B/N, FC, ICC/IF, IHC, WB)	
		Human	HTA125	NB100-56723 (B/N, FC, FC, ICC/IF, IP, IV)*	NB100-56727AF405, AF647, AF700, APC, PCP, NBP2-24897, NB100-56059, NB100-56062 (FC)
		Human/Mouse	76B357.1	NB100-56566 (FC, ICC/IF, IHC, ChIP, WB)*	NBP2-27149AF405, AF488, AF647, AF700, APC, PCP, NB100-55951, NBP2-27149PE (FC)
		Mouse	267518	MAB2759 (FC, ICC/IF)	FAB2759A, P (FC)
		Mouse	267518		FAB2759G, N, R, S, T, U, V
		Mouse	1203B	MAB27591 (FC, ICC/IF)	
	TLR5	Human	624915	MAB6704 (FC, IHC)	FAB6704G (FC)
		Human	624915		FAB6704N, R, S, T, U, V (FC)
		Human/Mouse	85B152.5	NBP1-97728 (FC, WB)*	NBP1-97728AF405, AF488, AF647, AF700, APC, NB200-571, NBP2-24959 (FC)
		Human/Mouse	19D759.2	NBP2-24787 (FC, IHC, WB)*	NBP2-24787AF405, AF488, AF647, AF700, APC, PCP, NBP2-24784, NBP2-24783 (FC)
	TLR6	Human	86B1153.2	NB100-56536 (FC, IHC)*	NBP100-56536AF405, AF488, AF647, AF700, APC, PCP, NBP2-24971, NBP2-24969 (FC)
		Human	hPer6	NBP1-43142 (FC, WB)*	NBP1-43142APC, PCP, PE (FC)
		Human	TLR6.127	NBP1-51493 (FC, ICC/IF, IHC, IP)	
		Mouse	418601	MAB1533 (FC)	FAB1533A, P (FC)
		Mouse	418601		FAB1533G, N, R, S, T, U, V (FC)
		Mouse	Polyclonal	AF1533 (WB)	

* In addition to the fluorochrome-conjugated forms listed, these antibodies are also available in one or more DyLight®-conjugated forms. DyLight conjugates include DyLight 350, 405, 405LS, 488, 550, 650, 680, 755. Please visit novusbio.com for more information.

Indicates an antibody available from R&D Systems Indicates an antibody available from Novus Biologicals Antibody Application Key and Fluorochrome Key on page 10.

Select R&D Systems® or Novus Biologicals® Antibodies for Detecting Toll-like Receptors (TLRs)

	Molecule	Species	Clone	Unlabeled Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
	TLR7	Human	533707	MAB5875 (FC)	IC5875C, G, P (FC)
		Human	533707		IC5875N, R, S, T, U, V (FC)
		Human/Mouse	4G6	NBP2-27332 (FC, ICC/IF, WB)*	NBP2-25274AF405, AF488, AF647, AF700, APC, PCP, NBP2-27251 (FC)
		Human/Mouse	Polyclonal	NBP2-24906 (FC, ICC/IF, IHC, WB)	
		Mouse	726606	MAB7156 (WB)	
	TLR8	Human	935166	MAB8999 (FC)	
		Human	935166		IC8999R, T (FC)
		Human/Mouse	44C143	NBP2-24917 (FC, IHC, SW, WB)*	NBP2-24917AF405, AF488, AF647, AF700, APC, PCP, NBP2-24972, NBP2-24817 (FC)
		Human/Mouse	Polyclonal	NBP1-77203 (E, ICC/IF, WB)	
	TLR9	Human	229106	MAB3658 (FC)	
		Human	229106		IC3658G, N, R, S, T, U, V (FC)
		Human	eB72-1665	NBP1-43140 (FC, IHC, IP, WB)*	NBP1-43140APC, PE, PCP (FC)
		Human	Polyclonal	AF3658 (FC, IHC)	IC7108G (FC)
		Human/Mouse	26C593.2	NBP2-24729 (E, FA, FC, ICC/IF, IHC, IP, IV, SW, WB)*	NBP2-24729AF405, AF488, AF647, AF700, APC, PCP, NBP2-24908, NBP2-24907 (FC)
		Mouse	1138D	MAB7960 (FC, ICC/IF)	
		Mouse	M9.D6	NBP1-43141 (FC, WB)*	NBP1-43141AF405, AF488, AF647, AF700, APC, PE, PerCP, NBP1-43919 (FC)
	TLR10	Human	670719	MAB6619 (WB)	
		Human	3C10C5	NBP1-70343 (FC)*	NBP2-27214AF405, AF488, AF647, AF700, APC, PCP, NBP2-27244 (FC)
	TLR11	Mouse	786404	MAB7640 (FC)	IC7640A, P (FC)
		Mouse	786404		IC7640G, N, R, S, T, U, V (FC)
	TLR12	Mouse	1229C	MAB8086 (FC, WB)	IC8086P, R (FC)
	TLR13	Mouse	Polyclonal	NBP2-24539 (FC, WB)	
* In addition to the fluorochrome-conjugated forms listed, these antibodies are also available in one or more DyLight®-conjugated forms. DyLight conjugates include DyLight 350, 405, 405LS, 488, 550, 650, 680, 755. Please visit novusbio.com for more information. Indicates an antibody available from R&D Systems Indicates an antibody available from Novus Biologicals Antibody Application Key and Fluorochrome Key on page 10.					

Select R&D Systems® or Novus Biologicals® Antibodies for Detecting NOD-like Receptors (NLRs)

	Molecule	Species	Clone	Unlabeled Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
	NAIP	Human	541609 or Polyclonal	MAB829 (IHC, WB); AF829 (WB)	
		Mouse	Polyclonal	AF7608 (WB)	
	NLRP1/NALP1	Human	Polyclonal	AF6788 (WB)	
	NLRP2/NALP2	Human	443625 or Polyclonal	MAB4684 (WB); AF4684 (WB)	
	NLRP3/NALP3 (aa 4–223)	Human	Polyclonal	AF6789 (ICC/IF, WB)	
	NLRP3/NALP3 (aa 540–689)	Human	Polyclonal	AF7010 (ICC/IF)	
		Human	652514	MAB6789 (ICC/IF)	
		Human/Mouse	768319	MAB7578 (FC, ICC/IF, WB)	IC7578A, C, G, N, P (FC)
		Human/Mouse	768319		IC7578R, S, T, U, V (FC)
	NLRP6/NALP6	Human	920631	MAB9145 (FC)	IC9145P (FC)
	NLRP10/Pynod/NALP10	Human/Mouse	578502	MAB6606 (WB)	
	NOD1	Human	626919	MAB7090 (IHC, WB)	
	NOD2	Human/Mouse	2D9	NB100-524 (ICC/IF, IHC, IP, WB)	NB100-524AF405, AF488, AF647, AF700, APC, F, PCP, PE
	RIG-I	Human	Polyclonal	AF4859 (WB)	
Indicates an antibody available from R&D Systems Indicates an antibody available from Novus Biologicals Antibody Application Key and Fluorochrome Key on page 10.					

Select R&D Systems® or Novus Biologicals® Antibodies for Detecting C-type Lectin Receptors (CLRs)

	Molecule	Species	Clone	Unlabeled Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
	CLEC-1	Human	219003 or Polyclonal	MAB1704 (WB); AF1704 (WB)	
	CLEC-2/CLEC1B	Human	219150	MAB1718 (WB)	FAB1718A (FC)
		Human/Mouse	Polyclonal	AF1718 (WB)	
	CLEC4D/CLECSF8	Human	413512 or Polyclonal	MAB2806 (FC, WB); AF2806 (FC, WB)	FAB2806A, P (FC)
		Human	413512		FAB2806G, N, R, S, T, U, V (FC)
	CLEC9a	Human	683409 or Polyclonal	MAB6049 (B/N, FC); AF6049 (B/N, IHC, WB)	FAB6049A, G, N, P (FC)
		Human	683409		FAB6049R, S, T, U, V (FC)
		Mouse	7H11, 700517, or Polyclonal	MAB67761 (FC, ICC/IF, WB); MAB6776 (IHC); AF6776 (IHC)	FAB67761A, P (FC)
		Mouse	7H11		FAB67761G, N, R, S, T, U, V (FC)
	DCAR/CLEC4B	Mouse	349214 or Polyclonal	MAB2757 (FC); AF2757 (FC, WB)	
		Mouse	349214		FAB2757G, N, R, S, T, U, V (FC)
	DCIR/CLEC4A	Human	216110 or Polyclonal	MAB1748 (FC, WB); AF1748 (FC, WB)	FAB1748A, F, P (FC)
		Human	216110		FAB1748G, N, R, S, T, U, V (FC)
		Mouse	320511 or 320507	MAB2617 (WB)	FAB26171P (FC)
	DC-SIGN/CD209	Human	120507 or Polyclonal	MAB161 (B/N, FC, ICC/IF, IHC, WB); AF161 (WB)	FAB161A, C, F, N, P (FC)
		Human	120507		FAB161G, R, S, T, U, V (FC)
		Mouse	MMD3	MAB83451 (FC)	FAB83451A (FC)
		Mouse	902404	MAB8345 (FC)	FAB8345P (FC)
		Mouse	902404		FAB8345G, N, R, S, T, U, V (FC)
	Dectin-1/CLEC7A	Human	259931 or Polyclonal	MAB1859 (B/N, FC, ICC/IF); AF1859 (B/N, WB)	FAB1859A, C, F, N, P (FC)
		Human	259931		FAB1859G, R, S, T, U, V (FC)
		Mouse	218820 or Polyclonal	MAB17561 (B/N, FC); AF1756 (B/N, FC, WB)	FAB17561A, C, G, N, P (FC)
		Mouse	218820		FAB17561R, S, T, U, V (FC)
	Dectin-2/CLEC6A	Human	545943 or Polyclonal	MAB3114 (FC); AF3114 (FC, WB)	FAB3114A, F, N, P (FC)
		Human	545943		FAB3114G, R, S, T, U, V (FC)
		Mouse	217611 or Polyclonal	MAB1525 (WB); AF1525 (WB)	FAB1525A (FC)
	DLEC/CLEC4C/BDCA-2	Human	Polyclonal	AF1376 (FC, IHC, WB)	FAB1376A, P (FC)
	LOX-1/OLR1	Human	331212, 331219, or Polyclonal	MAB1798 (B/N, FC, WB); MAB17981 (B/N, E); AF1798 (B/N, IHC, WB)	FAB1798A, C, G, P (FC)
		Human	331212		FAB1798G, N, R, S, T, U, V (FC)
		Mouse	214012 or Polyclonal	MAB1564 (FC, WB); MAB15641 (E); AF1564 (B/N, WB)	FAB1564P (FC)
		Mouse	214012		FAB1564G, N, R, S, T, U, V (FC)
	MDL-1/CLEC5A	Human	283834 or Polyclonal	MAB2384 (FC, WB); AF2384 (FC, IHC, WB)	FAB2384A, C, G, N, P (FC)
		Human	283834		FAB2384R, S, T, U, V (FC)
		Mouse	226402 or Polyclonal	MAB1639 (FC); AF1639 (ICC/IF, WB)	FAB1639A, P (FC)
		Mouse	226402		FAB1639G, N, R, S, T, U, V (FC)
	MICL/CLEC12A	Human	687317 or Polyclonal	MAB2946 (FC); AF2946 (ICC/IF, WB)	FAB2946A, C, G, N, P (FC)
		Human	687317		FAB2946R, S, T, U, V (FC)
		Mouse	Polyclonal	AF2950 (FC, ICC/IF, WB)	
	MMR/CD206	Human	685641	MAB25342 (FC, WB)	FAB25342A, G, P (FC)
		Human	685641		FAB25342N, R, S, T, U, V (FC)
		Human	309210, 685645, or Polyclonal	MAB2534 (ICC/IF); MAB25341 (IHC, SW, WB); AF2534 (ICC/IF, WB)	
		Mouse	310301 or Polyclonal	MAB2535 (WB); AF2535 (FC, IHC, WB)	FAB2535A, C, G, N, P (FC)
		Mouse	857615	MAB25351 (FC)	FAB25351A (FC)
		Mouse	857615		FAB25351G, N, R, S, T, U, V (FC)
	SIGNR3/CD209d	Mouse	728804 or Polyclonal	MAB7220 (WB); AF7220 (WB)	
Indicates an antibody available from R&D Systems Indicates an antibody available from Novus Biologicals Antibody Application Key and Fluorochrome Key on page 10.					

Proteins & Antibodies for Studying Regulators of CLR, NLR, or TLR Signaling

R&D Systems® Proteins				R&D Systems® or Novus Biologicals® Antibodies			
Molecule	Species	Source	Catalog #	Species	Clone	Unlabeled Antibodies Catalog # (Applications)	Fluorochrome-conjugated Antibodies Catalog # (Applications)
CD14	Human	CHO	383-CD	Human	134620	MAB3832 (B/N, FC, WB)	FAB3832A, C, F, N, P, R, S, T, V (FC)
				Human	HCD14	NB100-78083 (FC)	NB100-78083AF405, AF488, AF647, AF700, APC, PCP, PE (FC)
				Human	M5E2	NB100-77758 (FC, ICC/IF, IHC)	NB100-77758AF405, AF488, AF647, AF700, APC, PCP, PE (FC)
	Mouse	NS0	982-CD	Mouse	159010	MAB982 (FC, WB)	FAB982A, C, N (FC)
CD36/SR-B3	Human	Sf21 (baculovirus)	1955-CD	Human	255606	MAB19551 (FC, ICC/IF)	FAB19551A, F, P (FC)
				Human	255606		FAB19551G, N, R, S, T, U, V (FC)
				Human	877346 or Polyclonal	MAB19552 (IHC, SW, WB); AF1955 (SW, WB)	
	Mouse	CHO	2519-CD	Mouse	324205	MAB25191 (FC, IHC)	FAB25191A (FC)
				Mouse	324205		FAB25191G, N, R, S, T, U, V (FC)
				Mouse	324216 or Polyclonal	MAB2519 (WB); AF2519 (E, FC, WB)	
MARCO	Human	CHO	7586-MA	Human	Polyclonal	AF7586 (WB)	
	Mouse	NS0	2956-MA	Mouse	579511	AF2956 (WB)	FAB2956A, F, P (FC)
MD-1	Human	NS0	925-MD	Human	153014 or Polyclonal	MAB925 (WB); AF925 (FC, IHC, WB)	
	Mouse	NS0	130-MD	Mouse	142004 or Polyclonal	MAB130 (WB); AF130 (WB)	
MD-2	Human	<i>E. coli</i>	1787-MD	Human	288307 or Polyclonal	MAB1787 (WB); AF1787 (WB)	
PRAT4A	Human	NS0	7484-PR				
	Mouse	NS0	4429-PR	Mouse	Polyclonal	AF4429 (WB)	
PRAT4B				Mouse	Polyclonal	AF5015 (FC, WB)	
RP105/CD180				Human	MHR73-11	NBP1-49025 (FC, IHC, IP)	NBP1-49025AF405, AF488, AF647, AF700, APC, PCP, PE
	Mouse	Sf21 (stably transfected)	1378-RP				
SARM1				Human	Polyclonal	AF7037 (ICC/IF, IP, WB)	
				Human	754711	MAB7037 (ICC/IF)	
SR-AI/MSR	Human	NS0	2708-MS	Human	351615	MAB2708 (FC, WB)	FAB2708A, N, P (FC)
				Human	351615		FAB2708G, R, S, T, U, V (FC)
				Human	351620 or Polyclonal	MAB27081 (B/N, WB) or AF2708 (B/N, WB)	
	Mouse	NS0	1797-MS	Mouse	268318	MAB1797 (FC, WB)	FAB1797A, F, P (FC)
				Mouse	268318		FAB1797G, N, R, S, T, U, V (FC)
				Mouse	Polyclonal	AF1797 (B/N, WB)	
SREC-I/SCARF1	Human	NS0	2409-SR	Human	373606 or Polyclonal	MAB2409 (FC, WB); AF2409 (B/N, FC, WB)	
				Human	373606		FAB2409G, N, R, S, T, U, V (FC)

Indicates an antibody available from R&D Systems

Indicates an antibody available from Novus Biologicals

Antibody Application Key and Fluorochrome Key listed below.

Antibody Application Key

B/N Blocking/Neutralization

ChIP Chromatin Immunoprecipitation

FA Functional Assay

FC Flow Cytometry

ICC/IF Immunocytochemistry/Immunofluorescence

IHC Immunohistochemistry

IP Immunoprecipitation

SW Simple Western

WB Western blot

Fluorochrome Key for FAB/IC Catalog Numbers Ending In:

A: Allophycocyanin

C: PerCP

F: Fluorescein

G: Alexa Fluor® 488

N: Alexa Fluor®700

P: Phycoerythrin

R: Alexa Fluor® 647

S: Alexa Fluor® 750

T: Alexa Fluor® 594

U: Alexa Fluor® 350

V: Alexa Fluor® 405

Select Antibodies, ELISA Kits, and Multiplex Assays for Detecting Adaptor Proteins and Signaling Molecules Involved in PRR Signaling

		R&D Systems® or Novus Biologicals® Antibodies		R&D Systems® ELISA/ Activity Assay Kits	R&D Systems® Multiplex Array Kits	Tocris Small Molecule Activators/Inhibitors Available
	Molecule	Species	Catalog # (Applications)	Catalog #	Catalog #	
	ASC	Human	AF3805 (SW, WB)		ARY029	
		Human/Mouse/Rat	NBP1-78977 (ICC/IF, IHC, SW, WB)			
		Human/Mouse/Rat	NBP1-78977AF405, AF488, AF647, AF700, APC, F, PE (ICC/IF, IHC)			
	Bcl-10	Human	AF2889 (ICC/IF, WB)		ARY029	
		Human/Mouse	NBP1-51524 (E, FC, ICC/IF, IHC, WB)			
		Human/Mouse	NBP1-51524AF405, AF488, AF647, AF700, APC, PCP, PE (E, FC, ICC/IF, IHC, WB)			
		Human/Mouse/Rat	MAB2889 (WB)			
	BLNK	Human	AF4966 (IHC, WB)			
	BTK	Human	MAB5807 (ICC/IF, WB)			
	Phospho-BTK (Y223)	Human	MAB7205 (ICC/IF, WB)			
	Phospho-BTK (Y551)	Human	MAB7659 (SW, WB)			
	CARD9	Human	AF5248 (WB)			
	Caspase-1	Human	AF6215 (ICC/IF, SW, WB)	DCA100		
		Human	MAB6215 (ICC/IF, WB)			
		Human/Mouse/Rat	NB100-56565 (IHC, SW, WB)			
		Human/Mouse/Rat	NB100-56565AF405, AF488, AF647, AF700, APC, PCP, PE (IHC, WB)			
	IκB-α	Human	MAB4299 (SW, WB)	DYC4299	ARY029; ARY027	
		Human/Mouse	AF4299 (WB)			
		Human/Mouse/Rat	NB100-56507 (FC, ICC/IF, IHC, IP, SW, WB)			
		Human/Mouse/Rat	NB100-56507AF405, AF488, AF647, AF700, APC, PCP, PE (FC, ICC/IF, IHC, IP, WB)			
	Phospho-IκB-α (S32/S36)	Human	AF4809 (WB)			
	IκB-β	Human/Rat	MAB3425 (WB)			
		Human/Mouse	AF5225 (WB)			
	IκB-ε	Human	MAB4300 (WB)		ARY029; ARY027	
		Human	AF4300 (IHC)			
		Mouse	AF4637 (WB)			
	IKK-α	Human/Mouse/Rat	AF3768 (ICC/IF, WB)		ARY029	
		Human/Mouse	NB100-56704 (FC, ICC/IF, IHC, IP, SW, WB)			
		Human/Mouse	NBP2-27409AF405, AF488, AF647, AF700, APC, PCP, PE (FC, IHC, WB)			
	Phospho-IKK-α (S176/S180)	Human	MAB3768 (WB)			
	IKK-β	Human	AF4535 (WB)		ARY029	
		Human/Mouse	NB100-56509 (FC, ICC/IF, IHC, IP, SW, WB)			
		Human/Mouse	NBP100-56509AF405, AF488, AF647, AF700, APC, PCP, PE (FC, IHC, IP, WB)			
		Mouse	MAB7155 (WB)			
	IKK-γ	Human/Mouse/Rat	AF2684 (ICC/IF, SW, WB)			
		Human/Mouse/Rat	AF4365 (WB)			
		Human	NB100-56532 (FC, WB)			
		Human	NB100-56532AF405, AF488, AF647, AF700, APC, PCP, PE (FC, WB)			
	IKK-ε	Human	AF3199 (ICC/IF, WB)			
		Human/Mouse/Rat	MAB3199 (ICC/IF, WB)			

Indicates an antibody available from R&D Systems Indicates an antibody available from Novus Biologicals Antibody Application Key and Fluorochrome Key on page 10.

Select Antibodies, ELISA Kits, and Multiplex Assays for Detecting Adaptor Proteins and Signaling Molecules Involved in PRR Signaling

		R&D Systems® or Novus Biologicals® Antibodies		R&D Systems® ELISA/ Activity Assay Kits	R&D Systems® Multiplex Array Kits	Tocris Small Molecule Activators/Inhibitors Available
	Molecule	Species	Catalog # (Applications)	Catalog #	Catalog #	
	IRAK1	Human	AF4048 (WB)		ARY029, ARY027	
	IRAK2	Human	MAB6690 (WB)			
	IRAK3	Human	AF6264 (WB)			
	IRAK4	Human	AF3919 (ICC/IF, WB)			
	JNK Pan Specific	Human/Mouse/Rat	AF1387 (IHC, WB)	DYC1205		
		Human/Mouse/Rat	MAB1387 (WB)			
	Phospho-JNK Pan Specific	Human/Mouse/Rat		DYC1387B	ARY002B; ARY003B	
	Phospho-JNK (T183/Y185)	Human/Mouse/Rat	AF1205 (IHC, SW, WB)		ARY018	
		Human/Mouse/Rat	MAB1205 (ICC/IF, SW, WB)			
	JNK1	Human/Mouse/Rat	MAB17761 (ICC/IF, WB)			
		Human/Mouse/Rat	MAB1776 (WB)			
	Phospho-JNK1 (T183/Y185)	Human			ARY002B	
	JNK1/2	Human/Mouse/Rat	MAB2076 (ICC/IF, WB)		ARY029	
	JNK2	Human/Mouse/Rat	MAB1846 (ICC/IF, WB)	DYC1846	ARY029	
		Human/Mouse/Rat	AF1846 (WB)			
	Phospho-JNK2 (T183/Y185)	Human/Mouse/Rat		DYC2236	ARY002B	
	Phospho-JNK3 (T221/Y223)	Human			ARY002B	
	MALT1	Human	MAB4850 (SW, WB)			
	MKK3	Human/Mouse/Rat	MAB2515 (ICC/IF, WB)			
	Phospho-MKK3 (S218/T222)	Human		DYC5585	ARY002B	
	MKK3/MKK6	Human/Mouse/Rat	MAB2514 (WB)			
	MKK4	Human	MAB3390 (ICC/IF)			
	Phospho-MKK4 (S257/T261)	Human/Mouse/Rat	AF2990 (ICC/IF, WB)			
	MKK6	Human/Mouse/Rat	MAB1604 (ICC/IF, WB)			
		Human/Mouse/Rat	AF16041 (WB)			
		Human/Mouse/Rat	AF1604 (WB)			
	Phospho-MKK6 (S207/T211)	Human		DYC5586	ARY002B	
	MKK7	Human	AF3579 (IHC, WB)			
		Human	MAB3579 (IHC)			
	MyD88	Human	AF2928 (FC, ICC/IF, SW, WB)	DY2928	ARY029	
		Human	MAB2928 (ICC/IF)			
		Human	MAB29281 (FC)			
		Human/Mouse	NBP2-27369 (FC, ICC/IF, WB)			
		Human/Mouse	NBP2-27369AF405, AF488, AF647, AF700, APC, PCP, PE (FC, ICC/IF, WB)			
		Mouse/Rat	AF3109 (FC, ICC/IF, SW, WB)			
		Mouse	MAB3109 (ICC/IF)			
	Phospho-p38 (T180/Y182)	Human/Mouse		KCB869		
	p38α	Human/Mouse/Rat	AF8691 (IHC, SW, WB)	DYC8691B		
		Human/Mouse/Rat	MAB869 (WB)			

Indicates an antibody available from R&D Systems Indicates an antibody available from Novus Biologicals Antibody Application Key and Fluorochrome Key on page 10.

	R&D Systems® or Novus Biologicals® Antibodies		R&D Systems® ELISA/ Activity Assay Kits	R&D Systems® Multiplex Array Kits	Tocris Small Molecule Activators/Inhibitors Available
Molecule	Species	Catalog # (Applications)	Catalog #	Catalog #	
Phospho-p38 α (T180/Y182)	Human	MAB8691 (WB)	DYC869B	ARY002B; ARY003B; ARY018	
	Human	MAB8692 (ICC/IF)			
p38 β	Human	MAB3274 (ICC/IF)			
Phospho-p38 β (T180/Y182)	Human			ARY002B	
p38 γ	Human/Mouse/Rat	AF1347 (IHC, SW, WB)			
	Human/Mouse/Rat	MAB1347 (SW, WB)			
	Human/Mouse/Rat	AF1644 (WB)			
Phospho-p38 γ (T183/ Y185)	Human/Mouse		DYC1664	ARY002B	
p38 δ	Human	AF1519 (IHC, WB)			
	Human	MAB1519 (WB)			
Phospho-p38 δ (T180/Y182)	Human			ARY002B	
PKC δ	Human	AF4585 (WB)			
PLC- γ 2	Human/Mouse	MAB3716 (ICC/IF, WB)			
Phospho-PLC- γ 2 (Y753)	Human	MAB37161 (WB)			
Phospho-PLC- γ 2 (Y759)	Human	MAB7377 (ICC/IF, WB)			
Raf-1	Human/Mouse/Rat	MAB4540 (IHC, WB)			
RIP1/RIPK1	Human/Mouse/Rat	MAB3585 (SW, WB)		ARY027	
SHP-1	Human/Mouse/Rat	AF1878 (SW, WB)	DYC2808		
	Human	MAB1878 (ICC/IF)		ARY004B	
SHP-2	Human/Mouse/Rat	AF1894 (WB)	DYC1894; DYC2809	ARY004B	
	Human/Mouse/Rat	MAB1894 (WB)			
Phospho-SHP-2 (Y542)	Human/Mouse	AF3790 (ICC/IF, SW, WB)	DYC3790		
Src	Human/Mouse/Rat	AF3389 (IHC, SW, WB)			
	Human	MAB3807 (IHC)			
Phospho-Src (Y416)	Human	MAB2685 (ICC/IF, SW, WB)			
Phospho-Src (Y419)	Human	AF2685 (IHC, SW, WB)	DYC2685	ARY003B	
SYK (SH2D2 Domain)	Human	MAB7166 (SW, WB)			
Phospho-SYK (Y525/Y526)	Human	MAB6459 (WB)			
TAB1	Human/Mouse	AF3578 (ICC/IF, WB)			
TAK1	Human	MAB5307 (WB)			
TANK	Human/Mouse	AF4755 (WB)			
TRAF-3 Isoform 2	Human	AF3278 (WB)		ARY027	
	Human/Mouse/Rat	MAB3278 (WB)			
TRAF-6	Human	AF3284 (WB)		ARY027	
TRAM/TICAM2	Human/Mouse/Rat	AF4348 (FC, ICC/IF, WB)			
	Mouse	MAB43481 (ICC/IF)			
	Mouse	MAB4348 (WB)			
TRIF/TICAM1	Human	AF6216 (ICC/IF, WB)			
	Human	MAB6216 (WB)			
	Mouse	NB120-13810 (ICC/IF, SW, WB)			

Indicates an antibody available from R&D Systems Indicates an antibody available from Novus Biologicals Antibody Application Key and Fluorochrome Key on page 10.

Select Products for Studying PRR-related Transcription Factors

		R&D Systems® or Novus Biologicals® Antibodies		R&D Systems® Multiplex Array Kits	Tocris Small Molecule Activators/Inhibitors Available
	Molecule	Species	Catalog # (Applications)	Catalog #	
	c-Fos	Human	AF7254 (WB)		
	FosB/G0S3	Human	AF2214 (IHC, WB)		
		Human/Mouse	MAB2214 (WB)		
	FRA-1	Human	AF4935 (IHC, WB)		
		Human	MAB4935 (WB)		
	IRF3	Human	AF4019 (FC, ICC/IF, WB)	ARY027	
		Human	MAB4019 (FC, WB)		
		Human	IC4019A, G, P (FC)		
		Mouse	AF4454 (WB)		
	IRF7	Human/Mouse/Rat	NBP1-77263 (E, ICC/IF, IHC, WB)		
	c-Jun	Human	MAB2670 (ICC/IF, WB)		
		Human	AF2670 (WB)		
	Phospho-c-Jun (S63)	Human	MAB8930 (ICC/IF, SW, WB)	ARY003B	
	JunB	Human	MAB4456 (WB)		
		Human	AF4456 (WB)		
	JunD	Human/Mouse	MAB5526 (WB)		
		Human/Mouse	AF5526 (WB)		
	NFATc1	Human	AF5640 (SW, WB)		
	Phospho-NFATc1 (S172)	Human	MAB5640 (WB)		
	NFATc2	Human	MAB6499 (WB)		
		Human/Mouse/Rat	NB300-504 (ChIP, E, GS, ICC/IF, IHC, IP, WB)		
		Human/Mouse/Rat	NB300-504AF405, AF488, AF647, AF700, APC, PCP, PE (GS, ICC/IF, IHC, IP, WB)		
	NFATc3	Human/Mouse/Rat	AF5834 (WB)		
		Human	MAB5834 (WB)		
	NFκB1	Human	MAB2697 (WB)	ARY018; ARY029	
		Human/Mouse	AF2697 (ChIP, WB)		
	NFκB2	Human	MAB28881 (ChIP, ICC/IF, WB)	ARY029	
	c-Rel	Human	MAB4606 (ICC/IF, WB)	ARY029	
		Human/Mouse	AF2699 (ChIP, ICC/IF, SW, WB)		
		Mouse	MAB2699 (WB)		
	RelA/NFκB p65	Human	MAB50781 (FC)	ARY029	
		Human/Mouse	MAB5078 (FC, ICC/IF, WB)		
		Human/Mouse	IC5078A, G, P (FC)		
		Human/Mouse	AF5078 (ChIP, SW, WB)		
		Human/Mouse/Rat	NB100-56712 (FC, IHC, SW, WB)		
		Human/Mouse/Rat	NBP2-27416AF405, AF488, AF647, AF700, APC, PCP, PE (FC, IHC, WB)		
	Phospho-RelA/NFκB p65 (S529)	Human	MAB7624 (WB)	ARY029	
	Phospho-RelA/NFκB p65 (S536)	Human	MAB7226 (ICC/IF, WB)		
		Human	MAB72261 (ICC/IF, SW, WB)		
	RelB	Human	MAB2698 (ICC/IF, IHC, WB)		

Indicates an antibody available from R&D Systems

Indicates an antibody available from Novus Biologicals

Antibody Application Key and Fluorochrome Key on page 10.

Select R&D Systems® Products for Studying Cytokines Regulated by Pattern Recognition Receptors

	Recombinant Proteins		Quantikine® ELISA Kits	Quantikine® HS ELISA Kits	DuoSet®/Other ELISA Kits	Unlabeled Antibodies	Fluorochrome-conjugated Antibodies
Molecule	Species	Catalog #	Catalog #	Catalog #	Catalog #	Catalog # (Applications)	Catalog # (Applications)
IFN- α (Multiple Isoforms)	Human	11200-1			41100-1/ 41105-1/ 41110-1	21100-1 (B/N, E, WB)	21112-3 (FC, IHC)
	Mouse	12100-1			42120-1	22100-1 (B/N, E)	22100-3 (FC, IHC)
IFN- β	Human	8499-IF			41410-1	MAB814 (B/N, WB); MAB8142 (ICC/IF)	21400-3 (FC, IHC)
	Human	11415-1					
	Mouse	12400-1			42400-1	32400-1 (B/N)	22400-3 (FC, IHC)
	Mouse	12405-1					
	Mouse	8234-MB					
IFN- γ	Human	285-IF	DIF50		DY285	MAB285 (B/N, ICC/IF); MAB2851 (B/N, FC, ICC/IF)	IC285A, C, F, G, P (FC); IC2851S, T, V (FC)
	Mouse	485-MI	MIF00		DY485	MAB485 (B/N, FC, WB); MAB4851 (B/N, ICC/IF)	IC485A, F, N, P (FC)
IL-1 β /IL-1F2	Human	201-LB	DLB50	HSLB00C/ HSLB00D	DY201	AF-201-NA (B/N, ICC/IF, WB); MAB201 (B/N, FC, ICC/IF, WB)	IC201A, C, F, P (FC); IC8406A, P (FC)
	Mouse	401-ML	MLB00C		DY401	AF-401-NA (B/N, ICC/IF, IHC, SW, WB); MAB4012 (B/N, IP, WB); MAB4013 (FC); MAB401R (B/N, ICC/IF)	IC4013A, C, F, P (FC)
IL-6	Human	206-IL	D6050	HS600B	DY206	AF-206-NA (B/N, ICC/IF, WB); MAB206 (B/N, E, IHC, WB); MAB2061R (B/N, FC, ICC/IF)	IC206F, P (FC); IC2062A, G, P (FC)
	Human	7270-IL					
	Mouse	406-ML	M6000B		DY406	AF-406-NA (B/N, ICC/IF, WB); MAB406 (B/N, E, WB);	IC406F, P (FC)
IL-8/CXCL8	Human	208-IL	D8000C	HS800	DY208	AF-208-NA (B/N, ICC/IF, IHC, WB); MAB208 (B/N, E, FC, ICC/IF, WB)	IC208F, P (FC)
	Human	618-IL					
	Human	968-IL					
IL-18	Human	9124-IL			7620	D044-3 (B/N, E, IP); AF2548 (B/N, ICC/IF, WB);	
	Human	B001-5					
	Mouse	B002-5			7625	D048-3 (B/N, IP); D046-3 (WB)	
IL-28A/IFN- λ 2	Human	1587-IL			DY1587	AF1587 (B/N, ICC/IF, WB)	
	Human	8417-IL					
	Mouse	4635-ML				AF4635 (B/N, WB); MAB4635 (B/N)	
IL-28A/B	Mouse				DY1789B	MAB17892 (B/N, E)	
IL-28B/IFN- λ 3	Human	5259-IL	D28B00		DY5259		
	Mouse	1789-ML					
IL-29/IFN- λ 1	Human	1598-IL			DY7246	AF1598 (B/N, WB); MAB15981 (B/N, E)	
IL-29/IL-28B	Human				DY1598B		
TNF- α	Human	210-TA	DTA00C	HSTA00D	DY210	AF-210-NA (B/N, ICC/IF, WB); MAB610 (B/N, E, ICC/IF, WB); MAB2101R (B/N, ICC/IF)	FAB210F, P (FC); IC210F, P (FC)
	Mouse	410-MT	MTA00B		DY410	AF-410-NA (B/N, E, FC, ICC/IF, WB); MAB4101 (B/N)	IC410F, P (FC)
TNF- α (Hyperactive)	Human	8599-TA					
Indicates an antibody available from R&D Systems Indicates an antibody available from Novus Biologicals Antibody Application Key and Fluorochrome Key on page 10.							

Multiplex Assays from R&D Systems

In addition to our single analyte Quantikine® and DuoSet® ELISA Kits for detecting cytokines regulated by pattern recognition receptors, R&D Systems also offers Proteome Profiler™ Antibody Arrays and Luminex® Bead-Based Assays for researchers that are interested in simultaneously profiling the levels of multiple analytes in a single sample.

Proteome Profiler™ Antibody Arrays

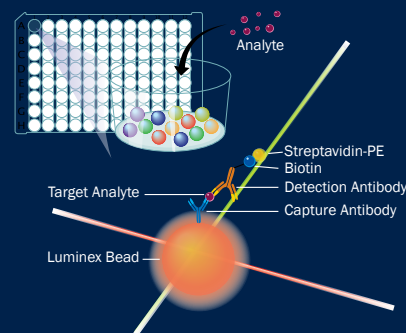
Proteome Profiler Antibody Arrays are available for determining the relative levels of cytokines, chemokines, phosphorylated MAPKs, and NFκB-related analytes in a single sample.

Please see the product tables inside for the specific arrays that can be used to detect your analyte of interest. Visit rndsystems.com/ProteomeProfiler for a complete list of analytes detected by each array and the qualified sample types.

Luminex® Assays

R&D Systems offers two versions of our Luminex® bead-based assays. Our standard Luminex Assays offer the largest, customizable menu of analytes for bead-based multianalyte profiling using cell culture supernatants, serum, or plasma samples. These assays allow up to 100 analytes to be simultaneously profiled using polystyrene microparticles or 50 analytes using magnetic particles. Please visit rndsystems.com/LuminexAssay to see our industry-leading selection of analyte combinations.

Luminex High Performance Assays offer defined analyte panels for bead-based multianalyte profiling. These assays rely on panel-optimized diluents that provide maximum performance for a smaller group of analytes than our standard Luminex Assays. Each assay is fully validated for all sample types indicated for a given panel. In-house testing demonstrates that analyte concentrations determined using our Luminex High Performance Assays correlate closely with those obtained using our single analyte Quantikine® ELISA Kits. Please visit rndsystems.com/LuminexPerformance to view a list of available kits.



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