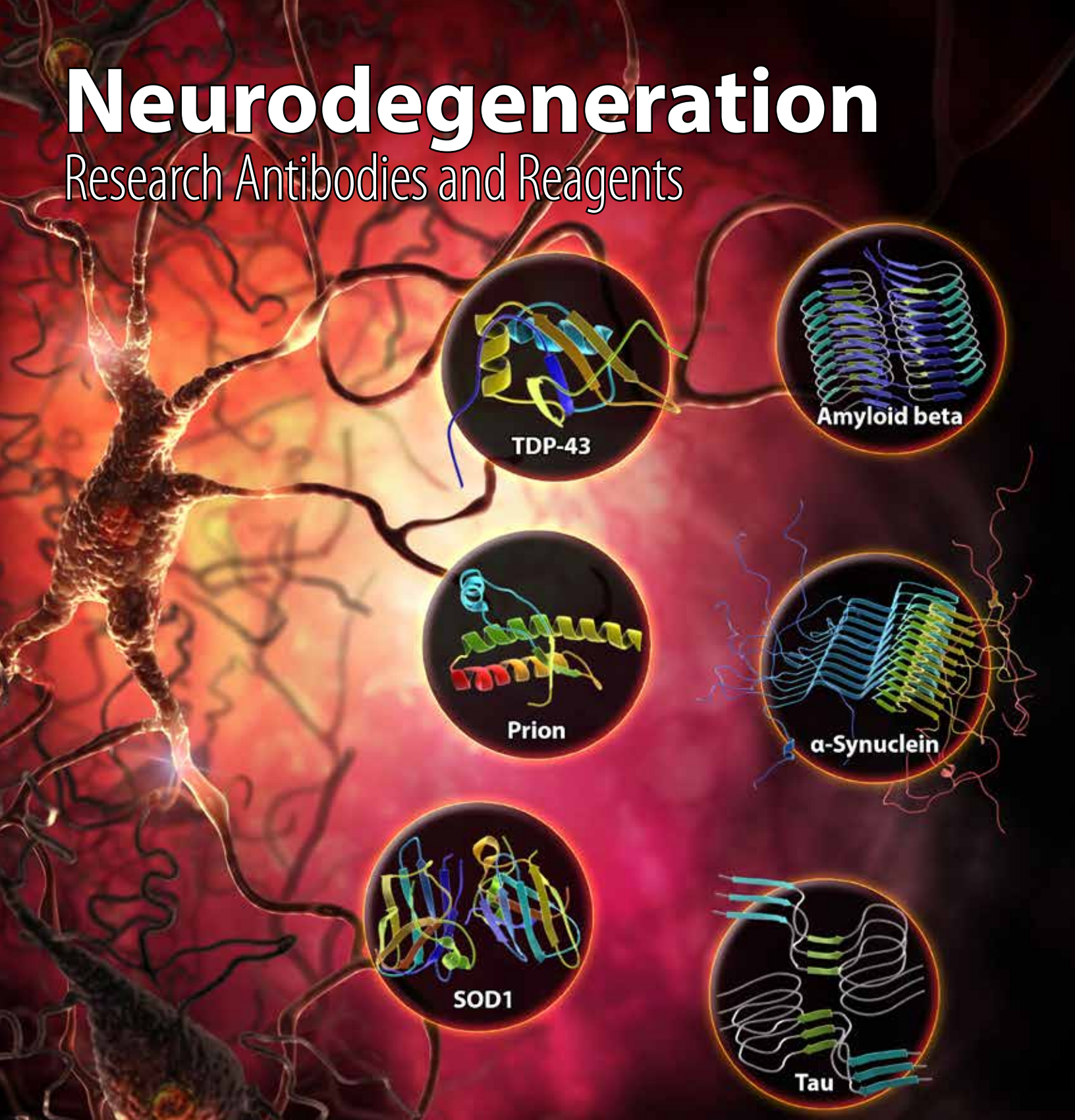
Neurodegeneration

Research Antibodies and Reagents



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BioLegend®

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Introduction

Neurodegeneration refers to the progressive deterioration of the structure or function of neurons and is a hallmark of a variety of age-associated disorders including Alzheimer's disease (AD), Parkinson's disease (PD), and Amyotrophic Lateral Sclerosis (ALS). Neurodegeneration is a complex biological process that is often defined by the presence of protein aggregates. Protein aggregation is a result of misfolded proteins forming fibrils, inclusion bodies, and other large proteinaceous inclusions such as plaques. Many neurodegenerative disorders are associated with aggregation of key target proteins including Amyloid-β (Aβ) and Tau in AD, and α-Synuclein in PD.

BioLegend is committed to advancing the research of neurodegenerative diseases by providing affordable, high-quality reagents to study protein aggregation. Our portfolio includes specific reagents to detect native, post-translationally modified, and aggregated forms of key target proteins involved in neurodegeneration. We offer an extensive collection of antibody products that can be used in a variety of applications including western blot, immunohistochemistry, immunocytochemistry, and ELISA. In addition, we've expanded our portfolio to include HRP- and fluorophore-conjugated primary antibodies to eliminate the need for additional secondary reagents. Our products undergo rigorous quality testing procedures to ensure they generate high-quality and reproducible results.

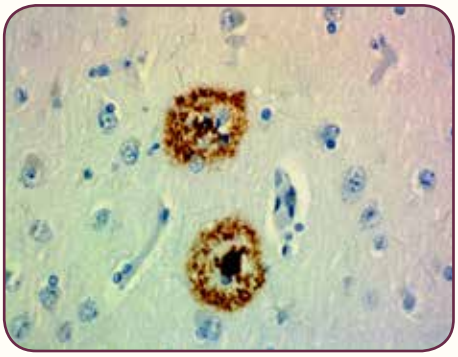
Learn more and view our complete portfolio at: biolegend.com/neuroscience

Contents

Amyloid Precursor Protein (APP) and Amyloid Beta Antibodies

The presence of proteinaceous, extracellular deposits known as amyloid plaques is a hallmark of Alzheimer's disease. Aβ, a peptide fragment generated from the aberrant processing of amyloid precursor protein (APP) by β- and γ-secretases, is the major constituent of these plaques. This peptide has a tendency to bind other Aβ molecules and form oligomers. Under disease conditions where Aβ is produced in abundance, these oligomers become insoluble and accumulate into larger aggregates that eventually give rise to amyloid plaques. These aggregates can assume different conformations depending on their state. Generation of aggregate-preferring antibodies that specifically recognize Aβ in these conformations offers a valuable tool to detect and assess these species in human disease and animal models. BioLegend is proud to offer a wide range of high-quality, well-characterized products for detection and characterization of APP and Aβ peptide fragments, in native and aggregated forms, utilized in a variety of applications including WB, IHC, and ELISA assays.

β-Amyloid 1-16

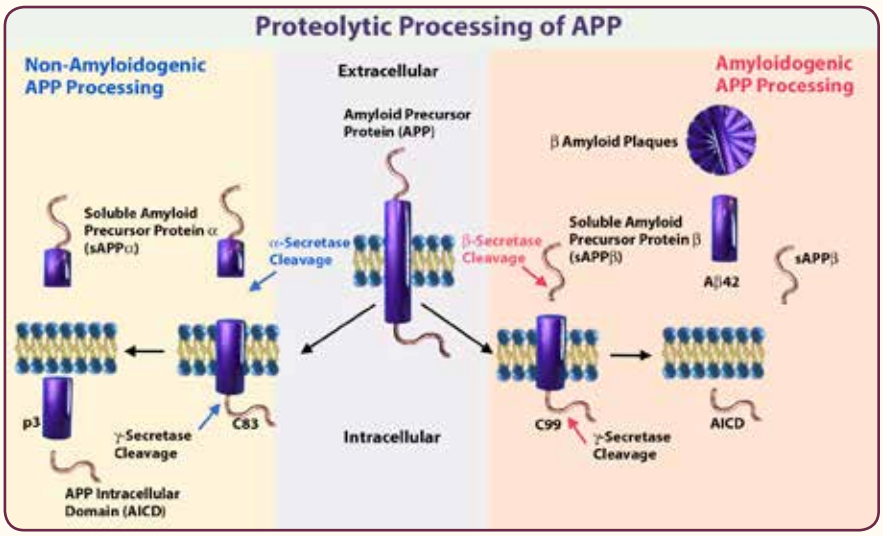


IHC staining of HRP anti-β-Amyloid, 1-16 antibody (clone 6E10) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin and bluing solution.

BioLegend offers highly specific reagents for:

- Intracellular, extracellular, and cleavage event specific APP antibodies
- Epitopes that enable discrimination between highly homologous Aβ peptides
- Broad epitopes that are universal to Aβ peptides
- Selectivity for APP, monomeric or aggregated Aβ
- Colorimetric ELISA kits for Aβ detection

Learn more at: biolegend.com/amyloid_precursor_protein



Antibodies to Amyloid Beta Peptide: N-Terminus

					Protein Cross-Reactivity								
Specificity	**Clone**	**Epitope**	**Reactivity**	**Application**	**APP**	**Aβ 1-38**	**Aβ 1-40**	**Aβ 1-42**	**Aβ 1-43**	**sAPPα**	**sAPPβ**	**AICD**	**C-Term Fragment**
β-Amyloid, 1-8	1E11‡	2-8	Hu	IHC-P	X	X	X	X	X	X			
β-Amyloid, 1-10	20.1	2-8	Hu	ELISA, WB, IHC-P, IF	X	X	X	X	X	X			
β-Amyloid, 1-11	NAB 228*	1-10	Hu	WB, IHC, IP ELISA	X	X	X	X	X	X			
β-Amyloid, 1-15	3A1	1-15	Hu	Direct ELISA, IHC-P, IHC-F		X	X	X	X				
β-Amyloid, 1-16	6E10‡*	1-11	Hu	WB, Direct ELISA, IHC-P, IHC-F, EM	X	X	X	X	X	X			
β-Amyloid, 1-16	Poly8029	3-8	Hu	WB, IHC-P , ELISA	X	X	X	X	X	X			
β-Amyloid, 1-16 (Rodent Specific)	M3.2‡*	1-16	Ms, Rat	WB, ELISA, IHC	X	X	X	X	X	X			
β-Amyloid (Rodent Specific)	Poly18058*	Unknown	Ms, Rat	ELISA, WB, IHC, IF	X	X	X	X	X	X			
β-Amyloid, 17-24	4G8‡*	18-23	Hu, Ms	WB, IHC-F, IHC-P, IP, ELISA	X	X	X	X	X				

Antibodies to Amyloid Beta Peptide: C-Terminus

					Protein Cross-Reactivity								
Specificity	**Clone**	**Epitope**	**Reactivity**	**Application**	**APP**	**Aβ 1-38**	**Aβ 1-40**	**Aβ 1-42**	**Aβ 1-43**	**sAPPα**	**sAPPβ**	**AICD**	**C-Term Fragment**
β-Amyloid, x-38	BA1-13	x-38	Hu	ELISA		X							
β-Amyloid, 1-38 (Rabbit mAb)	7-14-4*	x-38	Hu	ELISA, WB, IHC-P, IF		X							
β-Amyloid, 1-40	11A50-B10‡*	x-40	Hu, Ms, Rat	IHC-P			X						
β-Amyloid, x-40 (Rabbit mAb)	29-6	x-40	Hu, Ms, Rat	ELISA			X						
β-Amyloid, x-40 (Rabbit mAb)	139-5*	x-40	Hu	WB, IHC-P, ELISA			X						
β-Amyloid, x-42	BA3-9.R	x-42	Hu, Ms, Rat	ELISA, IHC-F, ICC				X					
β-Amyloid, x-42 (Rabbit mAb)	1-11-3*	x-42	Hu	IHC-P, ELISA				X					
β-Amyloid, 1-42	12F4‡*	x-42	Hu, Ms, Rat	IHC-F, IHC-P, Direct ELISA, WB				X					
β-Amyloid, 1-43	9C4/ Amyloid‡*	x-43	Hu, Ms	WB, IHC-P, ELISA					X				

*Multiple conjugated formats available.
‡Multiple sizes available.

Antibodies to Amyloid Precursor Protein

					Protein Cross-Reactivity								
Specificity	**Clone**	**Epitope**	**Reactivity**	**Application**	**APP**	**Aβ 1-38**	**Aβ 1-40**	**Aβ 1-42**	**Aβ 1-43**	**sAPPα**	**sAPPβ**	**AICD**	**C-Term Fragment**
Amyloid Precursor Protein (APP)	LN27‡	45-53	Hu	WB, IHC-P, IP, ELISA	X					X	X		
Amyloid Precursor Protein (APP), 573-596	1G6‡*	573-593	Hu	ELISA, WB, IHC, IP	X					X	X		
Amyloid Precursor Protein (APP), 61-77	D3B10‡	61-67	Hu	WB, IHC-P, ELISA	X					X	X		
sAPPα	Poly8135	Unknown	Hu	ELISA, IP						X			
sAPPβ	Poly8134	Unknown	Hu, Rodent	WB, ELISA							X		

Antibodies to Gamma Secretase Cleavage Fragments

					Protein Cross-Reactivity								
Specificity	**Clone**	**Epitope**	**Reactivity**	**Application**	**APP**	**Aβ 1-38**	**Aβ 1-40**	**Aβ 1-42**	**Aβ 1-43**	**sAPPα**	**sAPPβ**	**AICD**	**C-Term Fragment**
AICD (APP Intracellular Domain)	Poly8119	Unknown	Hu	ELISA, IHC, WB, IF								X	
APP C-Terminal Fragment	Poly8250	Unknown	Hu	ELISA, WB	X							X	X
APP C-Terminal Fragment	C1/6.1‡	676-696	Hu, Ms, Rat	WB, ICC, IP	X							X	X

Antibodies to Additional Key Targets

Specificity	**Clone**	**Reactivity**	**Application**
Insulin Degrading Enzyme (IDE)	9B12.225*	Hu, Rat, Hamster, Monkey	WB, ICC, IP
	Poly18403	Hu, Rat, Hamster, Monkey	WB, ICC

Other Antibodies to APP/Amyloid Beta

Specificity	**Clone**	**Reactivity**	**Application**
Amyloid Fibril (pan reactive)	B10AP	Several species	IHC-P, ELISA
β-Amyloid (Rodent Specific)	Poly18268	Ms, Rat	IHC, ELISA
β-Amyloid Pyroglutamyl (Glu3)	337.48	Hu, Ms, Rat	WB, IHC-F, IHC-P

*Multiple conjugated formats available.
‡Multiple sizes available.

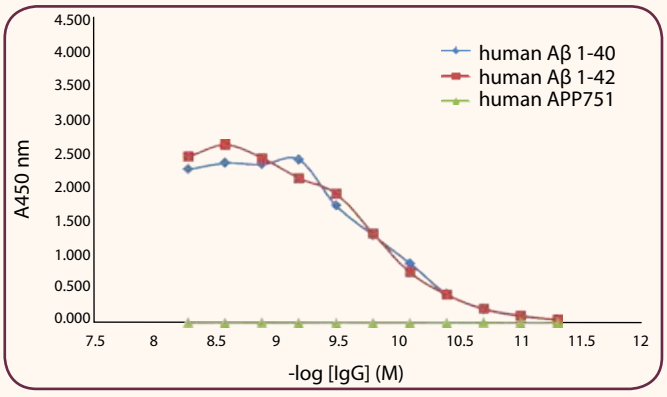
Secretase Antibodies

Specificity	**Clone**	**Reactivity**	**Application**
Aph-1a, 245-265 (C terminus)	Poly18231	Hu	WB, IF
BACE1	A17035K‡	Hu	WB, Direct ELISA
BACE1 (CO2 terminus)	Poly8401	Hu, Ms, Rat	WB, ICC, IP
Nicastrin	9C3‡	Hu, Ms, Rat	WB, IHC-P
Presenilin 1 (NH2 terminus)	NT1‡	Hu	WB
	Poly18111	Hu	WB, ICC, IP
Presenilin 2	PS2‡*	Hu	WB, ICC

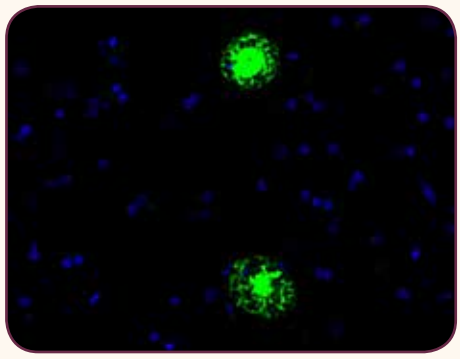
ELISAs

Description
LEGEND MAX™ β-Amyloid x-40 ELISA Kit with Pre-coated Plate
LEGEND MAX™ β-Amyloid x-42 ELISA Kit with Pre-coated Plate

β-Amyloid, 17-24

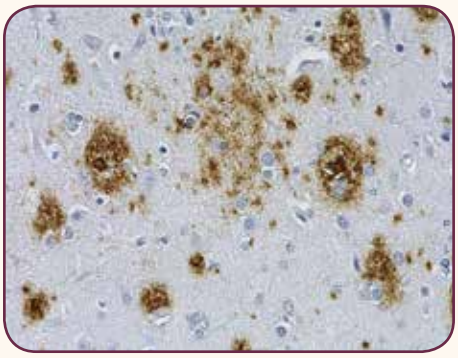


Direct ELISA of Biotin anti-β-Amyloid, 17-24 antibody (clone 4G8) binding to plate-immobilized human Aβ 1-40, human Aβ 1-42, and recombinant human APP751 protein.

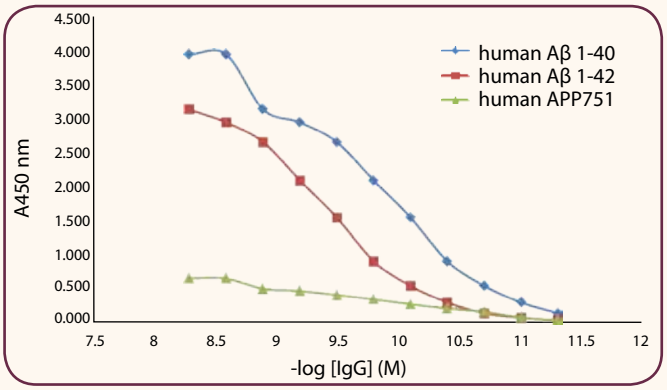


IHC staining of Alexa Fluor® 488 anti-β-Amyloid, 17-24 antibody (clone 4G8) on FFPE human Alzheimer's disease brain tissue. The tissue was counterstained with DAPI.

β-Amyloid, 1-10

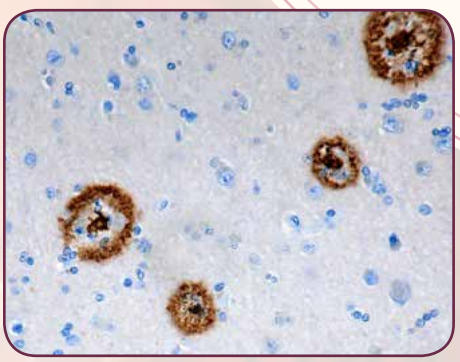


IHC staining of purified anti-β-Amyloid, 1-10 antibody (clone 20.1) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.



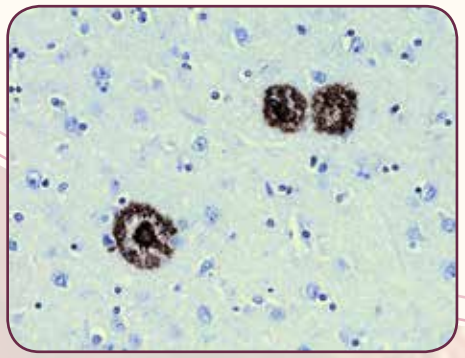
Direct ELISA of purified anti-β-Amyloid, 1-10 antibody (clone 20.1) binding to plate-immobilized human Aβ 1-40, human Aβ 1-42, and human APP751 protein.

β-Amyloid, 1-11



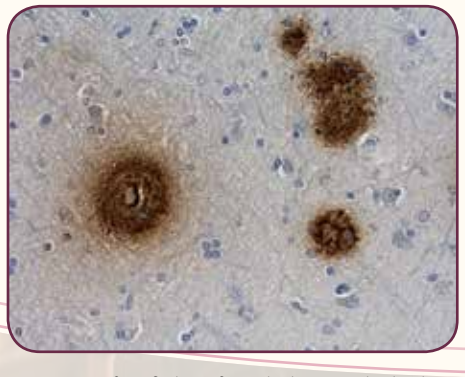
IHC staining of purified anti-β-Amyloid, 1-11 antibody (clone NAB 228) on FFPE human Alzheimer's disease neocortical brain tissue. The section was counterstained with hematoxylin.

β-Amyloid, 1-42

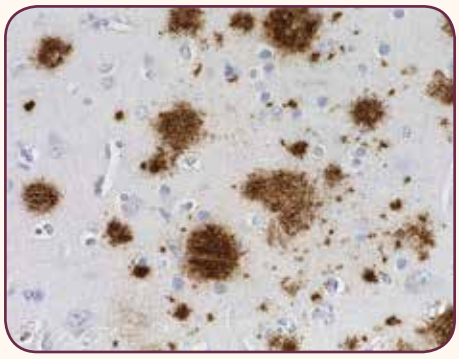


IHC staining of Biotin anti-β-Amyloid, 1-42 antibody (clone 12F4) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin and bluing solution.

β-Amyloid, x-42

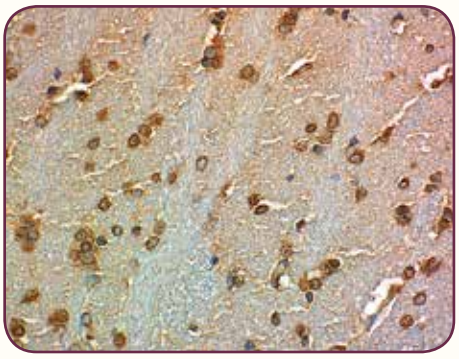


IHC staining of purified anti-β-Amyloid, x-42 antibody (clone 1-11-3) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.



IHC staining of purified anti-β-Amyloid, 17-24 antibody (clone 4G8) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.

Nicastrin



IHC staining of purified anti-Nicastrin antibody (clone 9C3) on FFPE rat brain tissue. The section was counterstained with hematoxylin.

Aggregate-Preferring Antibody for Amyloid Beta, Clone 3A1

Cross-reactivity between Aβ and APP due to sequence homology creates a challenge in interpreting antibody immunoreactivity results. Therefore, antibodies that demonstrate minimal to no cross-reactivity with full-length APP are a valuable tool to characterize the relationship between Aβ immunoreactivity and disease pathology.

BioLegend's clone 3A1 detects pathologic forms of Aβ in the form of protein aggregates and amyloid plaques. This clone offers unique advantages over other gold standard antibodies for Aβ detection such as clones 6E10 and 4G8:

- Detects C-terminally processed fragments of APP (Aβ 1-40, Aβ 1-42, Aβ 1-43)
- Demonstrates no cross-reactivity with full-length APP
- Shows preference for aggregated Aβ
- Clone 3A1 is offered in two sizes: 25 µg and 100 µg

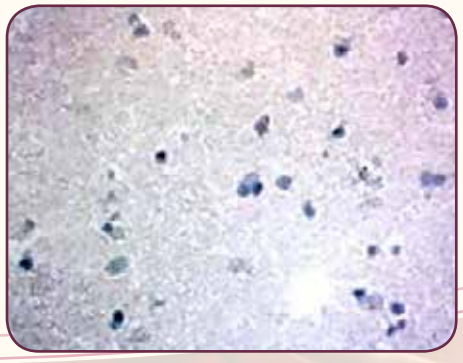
Applications:

- Suitable for use in ELISA and IHC

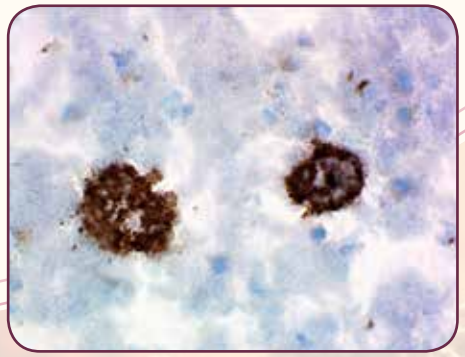
Validated using:

- Frozen Alzheimer's disease brain tissues for IHC
- Direct ELISA using human and rodent Aβ 1-40, and recombinant full-length APP
- Capture ELISA using Aβ 1-40 confomers

Normal Brain



AD Brain



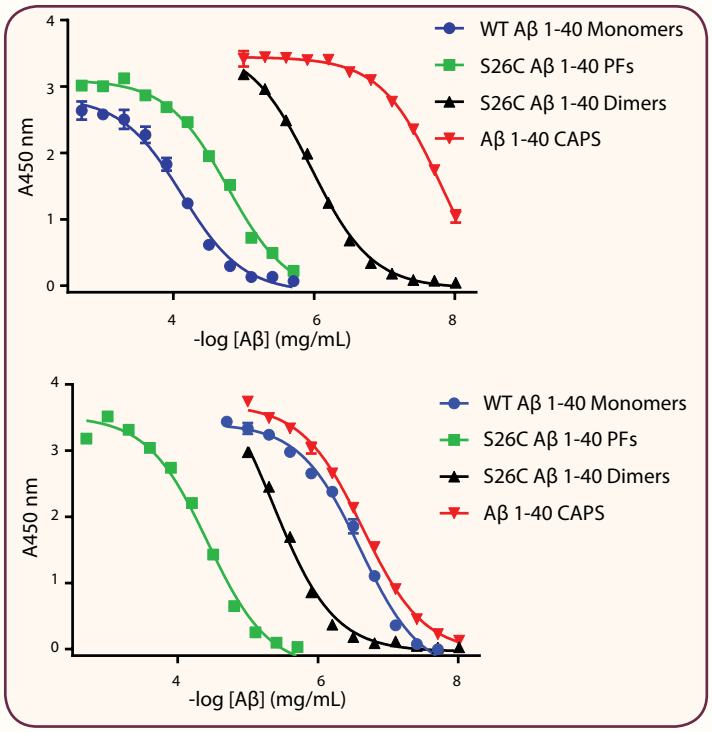
3A1 detects Amyloid Plaques by IHC staining

The tissue specificity of this clone was validated in normal (left panel) and AD (right panel) frozen brain tissue sections where 3A1 was shown to immunostain amyloid plaques in AD tissue. As expected, no reactivity was observed in normal brain tissue.

3A1 preferentially binds to aggregated over monomeric Aβ 1-40

Capture ELISA demonstrating the binding specificity of clone 3A1 towards Aβ 1-40 confomers. The wells were coated with 100 ng of 3A1(top panel) or 6E10 (bottom panel). The wells were then incubated at 37°C for 1 h with serially diluted Aβ 1-40 confomers, followed by incubation with HRP-labeled 4G8 as the detection antibody. TMB (Cat. No. 421501) was used as the detection system. S26C dimers= Oxidized S26C Aβ 1-40 monomers treated to form disulfide cross-linked dimers; CAPS=dityrosine cross-linked Aβ 1-40 dimers (immunogen to generate 3A1); Protofibrils (PFs)=Aggregates formed from S26C dimers.

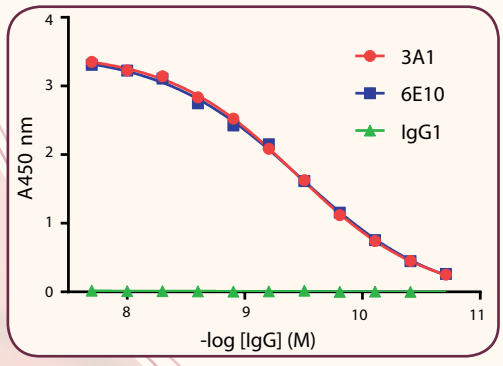
Clone 3A1 shows a greater binding affinity to Aβ 1-40 CAPS and S26C Aβ 1-40 dimers. In contrast, 6E10 binds equally to Aβ 1-40 monomers and CAPS, but significantly weaker to S26C Aβ 1-40 dimers and PFs. 6E10 binds to full-length APP and Aβ peptides.

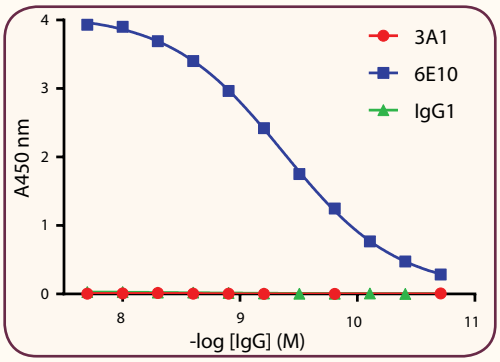


3A1 reacts with Aβ 1-40 but shows no cross-reactivity with APP

The binding specificity of clone 3A1 towards Aβ 1-40 or APP was determined by direct ELISA. The wells were coated with 100 ng of Aβ 1-40 peptide (left panel) or full-length recombinant APP (right panel). The wells were then incubated with clones 3A1, 6E10 or mouse IgG at 37°C for 45 minutes, followed by incubation with horseradish peroxidase labeled goat anti-mouse IgG secondary antibody. TMB (Cat. No. 421501) was used as the detection system.

As shown, 3A1 only reacts with Aβ 1-40 peptide. Clone 6E10 was included as a control for cross-reactivity with Aβ 1-40 and APP. 6E10 is known to interact with full-length APP as well as Aβ peptides.

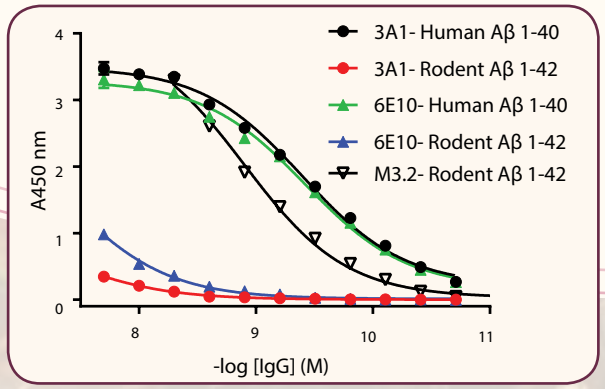




3A1 shows negligible cross-reactivity with rodent Aβ 1-42

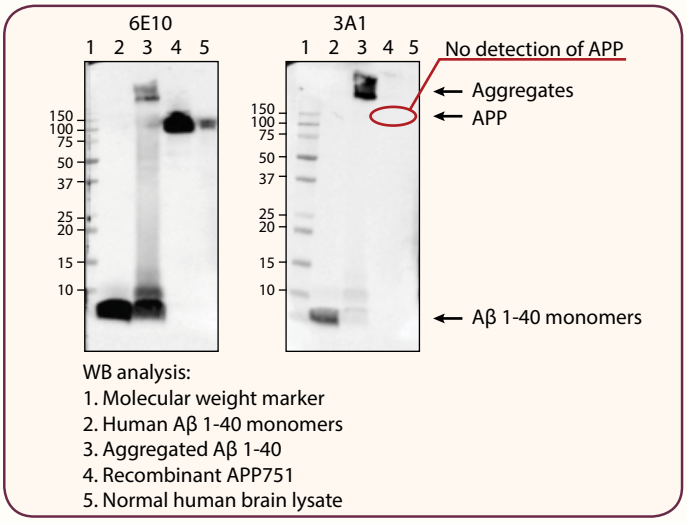
The binding specificity of clone 3A1 towards human Aβ 1-40 or rodent Aβ 1-42 was assessed by direct ELISA. The wells were coated with 100 ng of human Aβ 1-40 or rodent Aβ 1-42 peptides. The wells were then incubated with clones 3A1, 6E10, or M3.2 at 37°C for 45 minutes, followed by incubation with HRP-labeled secondary antibody. TMB (Cat. No. 421501) was used as the detection system.

While 3A1 and 6E10 bind to human Aβ 1-40, they do not cross-react with rodent Aβ 1-42. Clone M3.2 (rodent-specific antibody for Aβ) was included as a control for cross-reactivity with rodent Aβ 1-42.



3A1 preferentially detects aggregated Aβ 1-40 by WB

The specificity of clone 3A1 was tested against human Aβ 1-40 monomers, aggregated Aβ 1-40, recombinant human APP751 and normal human brain lysate in WB. In contrast to clone 6E10, 3A1 does not cross-react with APP (lanes 4 & 5) and strongly reacts with Aβ 1-40 aggregates (lane 3). Compared to 6E10, clone 3A1 demonstrates weaker reactivity to monomeric Aβ 1-40 (lanes 2 & 3).



Tau Antibodies and Reagents

Tau, also known as MAPT (microtubule-associated protein Tau), belongs to a family of proteins that bind to microtubules, and stabilize their formation. Tau is expressed abundantly in neurons of the central nervous system (CNS), and at lower levels in astrocytes and oligodendrocytes. In the human brain, Tau exists as 6 isoforms that are generated by alternative splicing of the MAPT gene. In addition, Tau protein undergoes a variety of post-translational modifications (PTMs) which serve to regulate its function. These modifications include phosphorylation, cleavage or truncation, nitration, ubiquitination, oxidation, and aggregation. Differential post-translational modification of Tau may affect its binding to other proteins and regulate its subcellular localization. PTMs that lead to aggregation and tangle formation have been associated with Tau-related pathologies observed in disorders such as Alzheimer's disease. BioLegend provides a wide range of antibodies that recognize all (pan-isoform) or specific (isoform-specific) isoforms of Tau. We also offer a great selection of antibodies that detect unmodified and modified (methylated, nitrated, phosphorylated, truncated, aggregated) forms of Tau protein.

To learn more about our products, visit: biolegend.com/tau

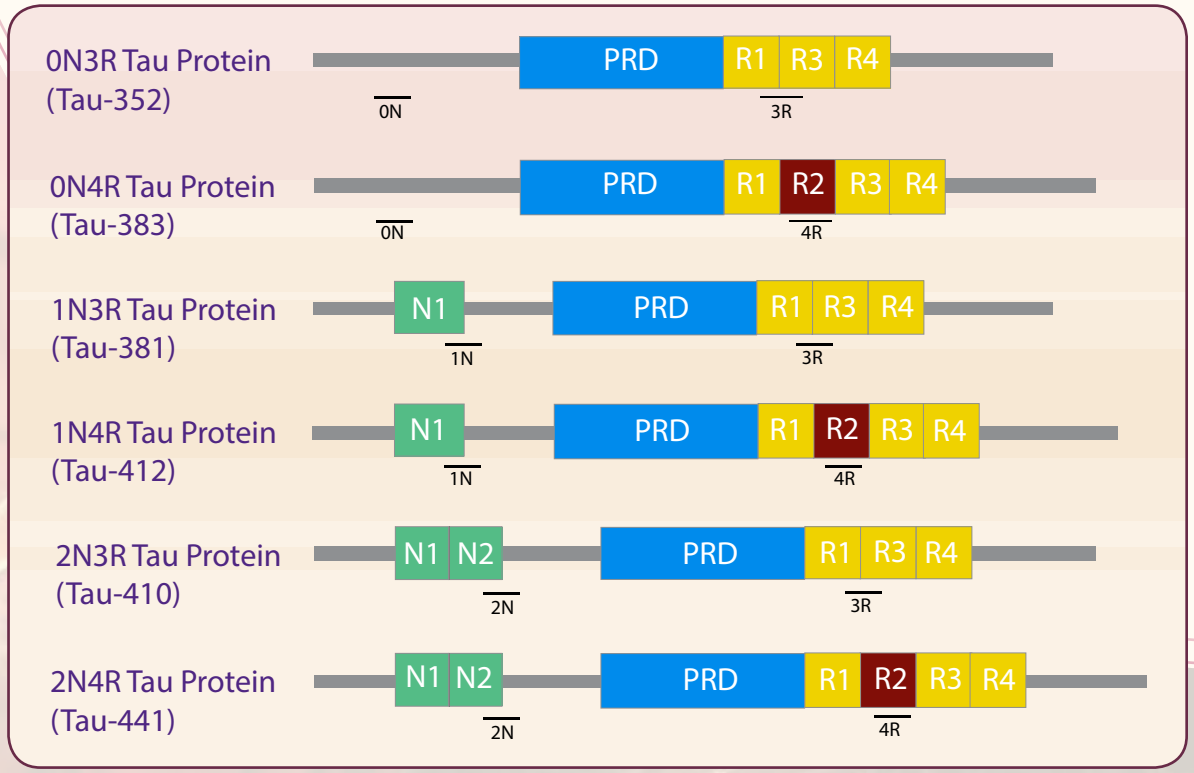
Anti-Tau Antibodies

Specificity	Clone	Epitope	Reactivity	Modification	Application	Cat. No.
0N Tau	3H6.H7‡	0N	Hu	Isoform-Specific	WB, IHC-P	823801
1N Tau	4H5.B9‡	1N	Hu	Isoform-Specific	WB, IHC-P	823901
2N Tau	71C11‡	2N	Hu, Rat	Isoform-Specific	WB, IHC-P	816801
4R Tau	5F9‡	4R	Hu, Ms, Rat	Isoform-Specific	WB, IHC-P	823701
Tau, 185-195	77E9‡	185-195	Hu	Unmodified	WB, IHC-P	814401
Tau, 189-195	39E10‡*	189-195	Hu, Ms, Rat	Unmodified	WB	814301
Tau, 157-168	2G9.F10‡	157-168	Hu	Unmodified	WB, IHC-P	824601
Tau, 1-100	43D‡*	1-100	Hu	Unmodified	WB, IHC-P	816601
Tau, 267-278	5C7‡	267-278	Hu	Unmodified	WB, IHC-P	814501
Tau, 316-355	77G7‡	316-355	Hu, Rat	Unmodified	WB, IHC-P	816701 | 816702
Tau, 6-18	Tau 12‡	6-18	Hu	Unmodified	WB, IHC-P, ELISA	806501 | 806502
Tau, 20-35	TAU-13*	20-35	Hu	Unmodified	WB, IHC, IF, IP	835201
Tau, 404-421	Tau46‡	404-421	Hu	Unmodified	WB, IHC, ELISA	806601
Tau, 210-230	Tau 5‡	210-230	Hu	Unmodified	WB, IHC-P	806401 | 806402 | 806403
Tau (Rodent Specific)	Poly8296	448-460	Ms, Rat	Unmodified	WB	829601
Tau, x-421	C3‡	x-421	Hu	Truncation	IHC-P, IF, WB	806301 | 806302
Tau, 95-108 (PHF)	SMI 51	PHF	Hu, Bovine	Aggregation	WB, IHC-P, ICC, ELISA	836101
Tau	Tau 2‡*	PHF	Hu, Bovine	Aggregation	WB, IHC-P, ELISA	806701
Tau Dimethyl (Lys281)	1C9.G6	K281	Hu, Ms, Rat	Methylation	WB, IHC-P	819501
Tau Dimethyl (Lys311)	7G5.F4‡	K311	Hu, Ms, Rat	Methylation	WB, IHC	819601
Tau Nitrated (Tyr18)	Tau-nY18‡	Y18	Hu	Nitration	WB, IHC, IF, ELISA	829701
Tau Nitrated (Tyr29)	Tau-nY29‡	Y29	Hu	Nitration	WB, IHC, IF, ELISA	829801
Tau Phospho (Ser396)	PHF-13‡	S396	Hu	Phosphorylation	WB	829001
Tau Phospho (Thr181)	M7004D06‡*	T181	Hu	Phosphorylation	IHC-P, Direct ELISA, WB	846602
Tau Phospho (Thr231)	PHF-6‡	T231	Hu	Phosphorylation	WB	828901
Tau Phospho (Ser262)	A15091A*	S262	Hu	Unmodified	IHC-P, Direct ELISA	849501 | 849502
Tau, 269-281	A16040D	269-281	Hu	Unmodified	WB, IHC-P	850601 | 850602
Tau, 419-433	A16097D*	419-433	Hu, Ms, Rat	Unmodified	WB, Direct ELISA, IHC-P	851001 | 851002
Tau, 425-441	A16097E*	425-441	Hu, Ms	Unmodified	WB, Direct ELISA, IHC-P	851101 | 851102
Tau, 368-441	A16097F*	368-441	Hu	Unmodified	WB, Direct ELISA, IHC-P	851201 | 851202
Tau, 1-223	A16103A*	1-223	Hu	Unmodified	WB, Direct ELISA, IHC-P	851301 | 851302
Tau, 359-373	A16097B*	359-373	Hu, Ms	Unmodified	WB, Direct ELISA, IHC-P	851401 | 851402

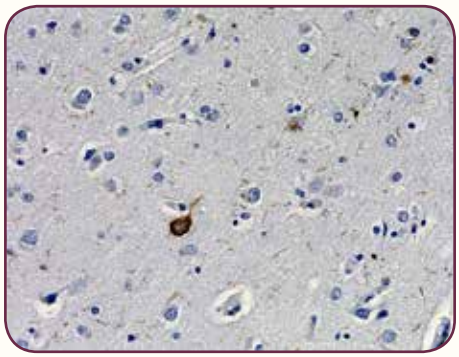
*Multiple conjugated formats available.
‡Multiple sizes available.

Isoform-Specific Tau Antibodies

The six isoforms of Tau are the products of alternative splicing of exons 2, 3, and 10 of the MAPT gene. Tau protein isoforms are designated as 352, 381, 383, 410, 412 and 441. These isoforms are distinguished by the number of tubulin binding domains, 3 (3R) or 4 (4R), in the C-terminal of the protein and by one (1N), two (2N), or no (0N) inserts in the N-terminal domain. Tau isoforms are differentially expressed during development and in different regions of the brain. The C-terminal repeat domains are believed to be important for microtubule binding as well as aggregation of Tau into paired helical filaments (PHFs), which are the major building blocks of neurofibrillary lesions. BioLegend offers isoform-specific Tau antibodies that are suitable for IHC, WB, and ELISA applications.

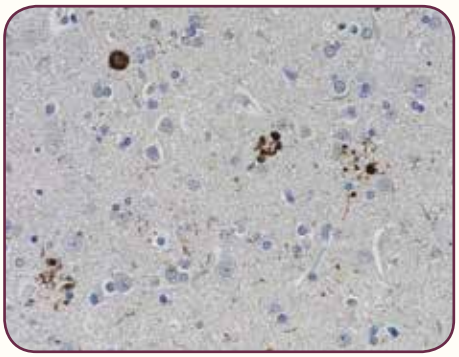


1N Tau



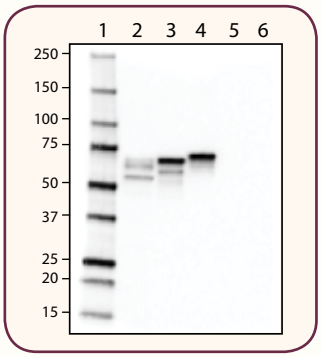
IHC staining of purified anti-1N Tau antibody (clone 4H5.B9) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.

2N Tau



IHC staining of purified anti-2N Tau antibody (clone 71C11) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.

2N Tau

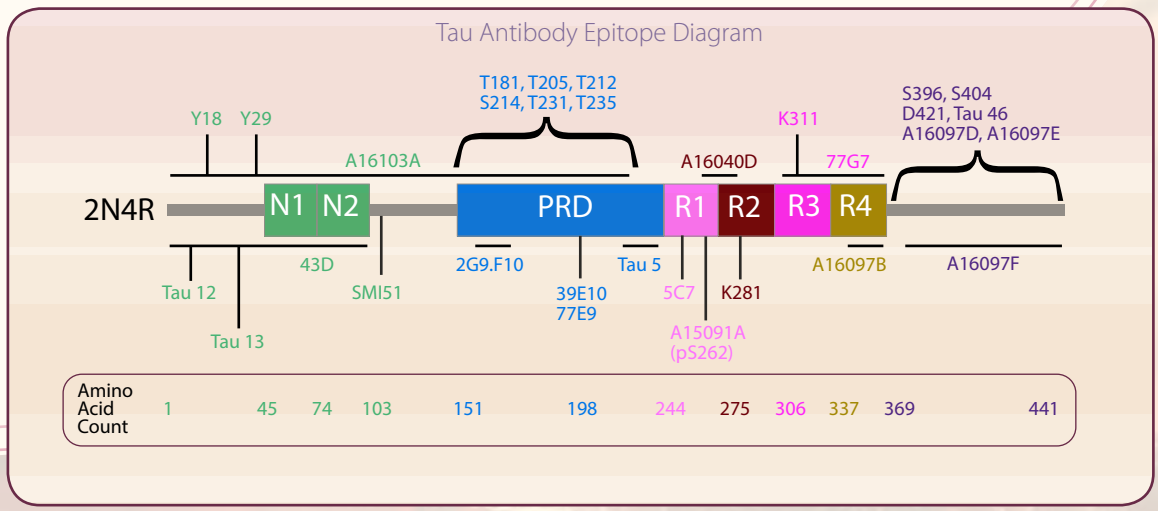


Western blot of purified anti-2N Tau antibody (clone 71C11). Lane 1: Molecular weight marker; Lane 2: 20 µg of human brain lysate; Lane 3: 0.1 µg of 2N3R Recombinant Tau protein; Lane 4: 0.1 µg of 2N4R Recombinant Tau protein; Lane 5: 0.1 µg of 0N3R Recombinant Tau protein; Lane 6: 0.1 µg of 1N3R Recombinant Tau protein.

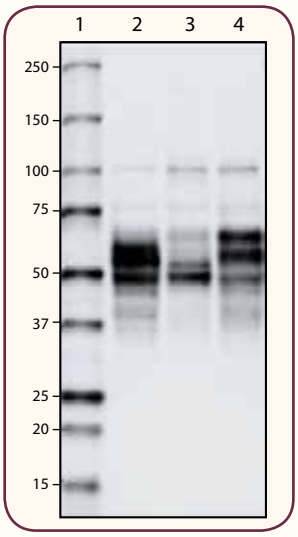
Pan-Isoform & Modified Tau Antibodies

In addition to our isoform-specific antibodies, we have a wide selection of antibodies that recognize all six isoforms of Tau (pan-isoform). These antibodies can also recognize unmodified and modified species of Tau.

Phosphorylation of Tau is an important PTM that impacts its biological and pathogenic function. Under normal physiological conditions, Tau can be phosphorylated on approximately 30 sites. The normal levels of Tau phosphorylation are dynamically regulated by the action of kinases and phosphatases. Glycogen-synthase kinase-3β (GSK-3β) and cyclin-dependent protein kinase 5 (CDK5) are among the major Tau kinases. Protein phosphatase 2A (PP2A) is among the well-known Tau phosphatases. Hyperphosphorylation of Tau is one of the leading causes of reduction in binding affinity and its dissociation from microtubules. This in turn affects structural integrity of axons. Furthermore, excess levels of unbound Tau protein leads to abnormal aggregation of Tau, and formation of insoluble fibrils and tangles. In addition to hyperphosphorylation, alterations of Tau itself, such as mutations in the MAPT gene, play an important role in its propensity to form Tau protein aggregates.

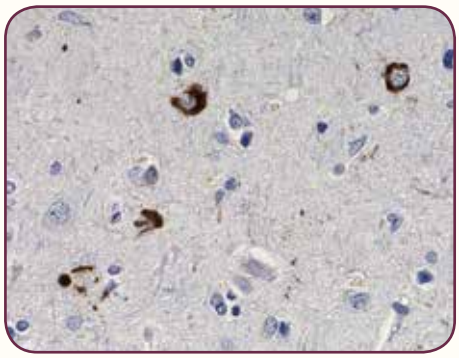


Tau, 189-195



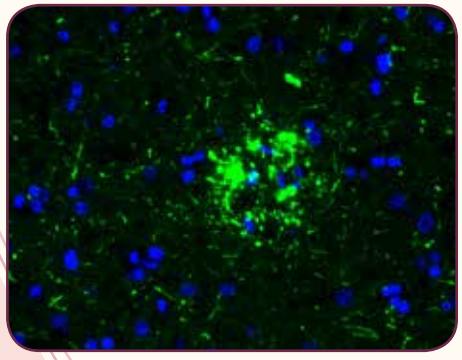
Western blot of HRP anti-Tau, 189-195 antibody (clone 39E10). Lane 1: Molecular weight marker; Lane 2: 20 µg of normal human brain lysate; Lane 3: 20 µg of mouse brain lysate; Lane 4: 20 µg of rat brain lysate.

Tau 2



IHC staining of purified anti-Tau antibody (clone Tau 2) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.

Tau, 1-100

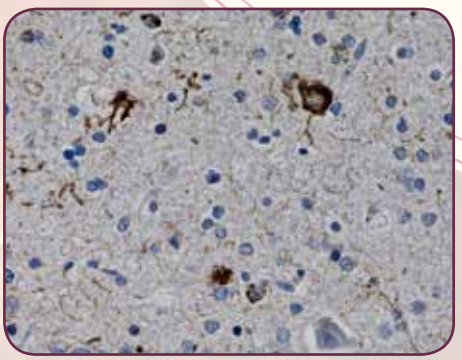


IHC staining of Alexa Fluor® 488 anti-Tau, 1-100 antibody (clone 43D) on FFPE human Alzheimer's disease brain tissue. Nuclei were counterstained with DAPI.

Tau Phospho (Ser262)

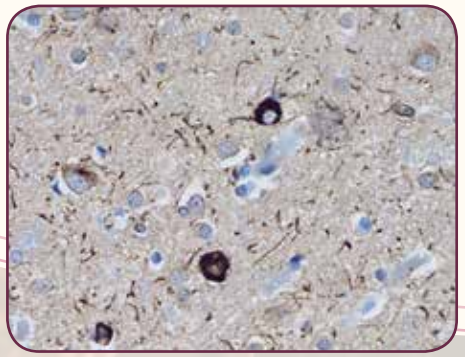
IHC staining of purified anti-Tau Phospho (Ser262) antibody (clone A15091A) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.

Tau Phospho (Ser396)



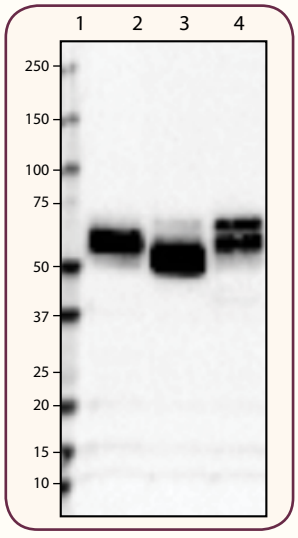
IHC staining of purified anti-Tau Phospho (Ser396) antibody (clone PHF-13) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.

Tau, 210-230



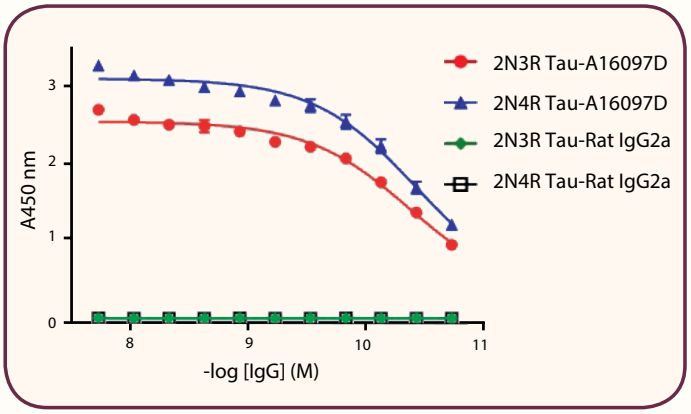
IHC staining of purified anti-Tau, 210-230 antibody (clone Tau 5) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.

Tau, 419-433



Western blot of purified anti-Tau, 419-433 antibody (clone A16097D). Lane 1: Molecular weight marker; Lane 2: 20 µg of human brain lysate; Lane 3: 20 µg of mouse brain lysate; Lane 4: 20 µg of rat brain lysate.

Tau, 419-433

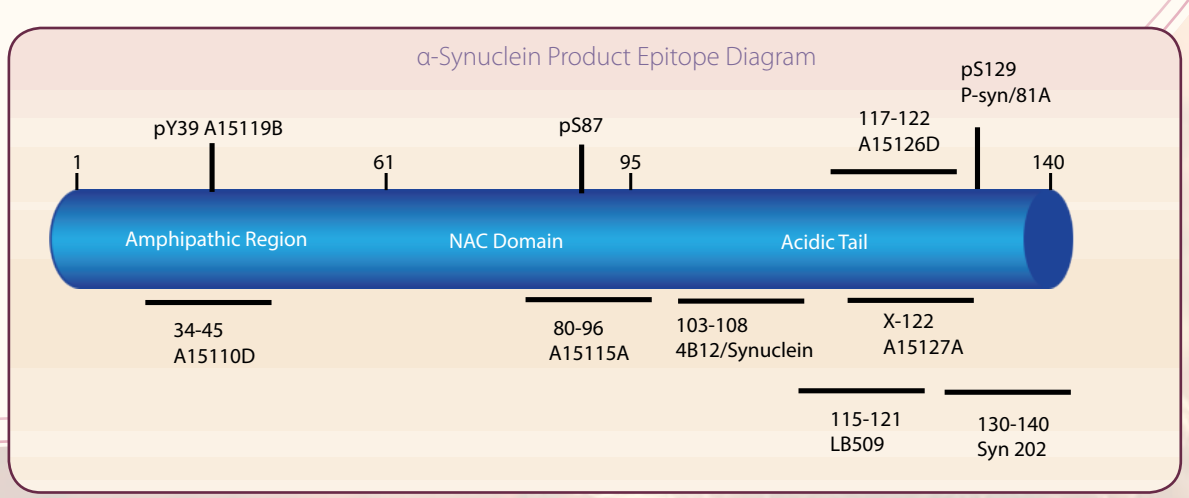


Direct ELISA of purified anti-Tau, 419-433 antibody (clone A16097D) and rat IgG2a isotype control binding to plate-immobilized recombinant human 2N3R and 2N4R Tau proteins.

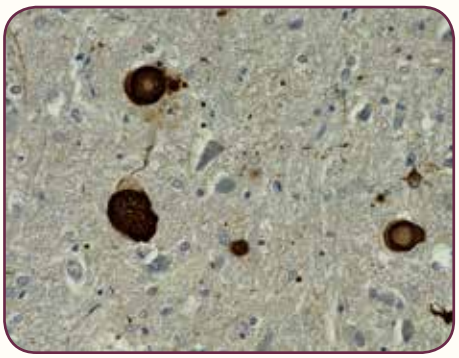
α-Synuclein Antibodies and ELISAs

α-Synuclein is a major biomarker for PD as its aberrant accumulation and aggregation, accompanied by neuronal degeneration and loss, is a pathological hallmark of this disorder. Under normal physiological conditions, natively folded α-Synuclein is soluble and capable of binding to a variety of cellular membranes where it assumes an α-helical conformation. Under pathophysiological conditions or at high concentrations, unfolded monomers undergo a conformational change to assume β-sheet-like structures which can self-associate to form small oligomeric species (*e.g.* dimers), high molecular weight insoluble fibrils, and trans-membrane pore-like structures composed of ring-like cytosolic oligomers.

Lewy bodies, composed of abnormal intracellular protein aggregates such as α-Synuclein, are commonly found in a range of neurodegenerative disorders including PD and Lewy body dementias (LBDs). The aggregated and fibrillar forms of α-Synuclein are known to be highly toxic, interfering with cellular functions that lead to neurodegeneration. Furthermore, the ring-like pores can damage membrane integrity and disturb intracellular calcium homeostasis, contributing to neuronal toxicity. α-Synuclein peptides can also be found as components of amyloid plaques in AD, as well as in glial cytoplasmic inclusions in Multiple System Atrophy. Levels of α-Synuclein in cerebrospinal fluid (CSF) or plasma is currently being investigated as a potentially useful biomarker for disease diagnosis or prognosis.

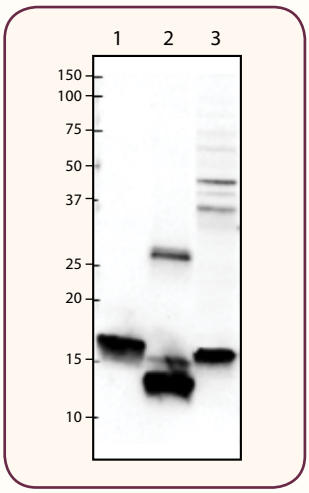


α-Synuclein, 117-122



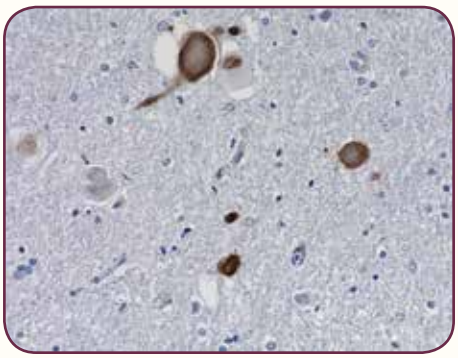
IHC staining of purified anti-α-Synuclein, 117-122 antibody (clone A15126D) on FFPE human Parkinson's disease brain tissue. The section was counterstained with hematoxylin.

α-Synuclein, 117-122



Western blot of anti-α-Synuclein antibody (clone A15126D). Lane 1: 50 ng of recombinant human α-Synuclein; Lane 2: 50 ng of recombinant C-terminally truncated human α-Synuclein (1-122); Lane 3: 20 µg of normal human brain lysate.

α-Synuclein, 115-121



IHC staining of purified anti-α-Synuclein, 115-121 antibody (clone LB509) on FFPE human Parkinson's disease brain tissue. The section was counterstained with hematoxylin.

α-Synuclein Antibodies

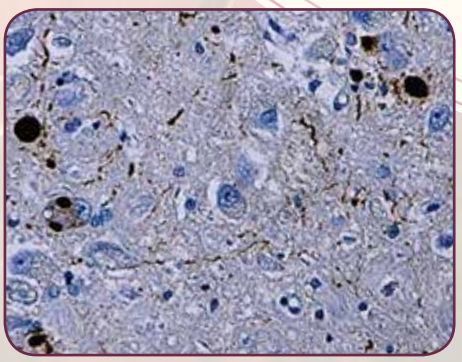
Specificity	Clone	Epitope	Reactivity	Modification	Application
α-Synuclein, aggregated	Syn-O2‡	Unknown	Hu	Aggregation	IHC-P, Dot Blot
α-Synuclein, aggregated	Syn-O3	Unknown	Hu	Aggregation	IHC-P, Dot Blot
α-Synuclein, aggregated	Syn-O4	Unknown	Hu	Aggregation	IHC-P, Dot Blot
α-Synuclein, aggregated	Syn-F1	Unknown	Hu	Aggregation	IHC-P, Dot Blot
α-Synuclein	4D6*	Unknown	Hu, Ms, Rat	None	WB, IHC, ELISA
α-Synuclein	Syn 204*	1-130	Hu	None	ELISA, WB, IP, IHC-P, IF
α-Synuclein	Syn303	Unknown	Hu	Nitration/Oxidation	IHC-P
α-Synuclein, 34-45	A15110D‡	Unknown	Hu	None	IHC-P, Direct ELISA
α-Synuclein, 80-96	A15115A‡	Unknown	Hu	None	IHC-P, Direct ELISA, WB
α-Synuclein (C-Terminal Truncated x-122)	A15127A	Unknown	Hu	None	IHC-P, Direct ELISA
α-Synuclein, 103-108	4B12/Synuclein‡*	103-108	Hu	None	IHC-P, ELISA, WB
α-Synuclein, 115-121	LB509*	115-121	Hu	None	ELISA, WB, IHC-P
α-Synuclein, 117-122	A15126D	Unknown	Hu	None	WB, IHC-P, Direct ELISA
Synuclein-α/β, 130-140	Syn 202*	130-140	Hu, Ms	None	IHC-P, WB, EM, ICC, IP
α-Synuclein, Nitrated	Syn514	Unknown	Hu	Nitration/Oxidation	IHC-P, IF
α-Synuclein Phospho (Ser129)	P-syn/81A‡*	S129	Hu	Phosphorylation	IHC-P, ICC, IHC-F, WB
α-Synuclein Phospho (Tyr39)	A15119B	Unknown	Hu	Phosphorylation	IHC-P, Direct ELISA

ELISAs

Description
LEGEND MAX™ Human α-Synuclein ELISA Kit with Pre-coated Plate

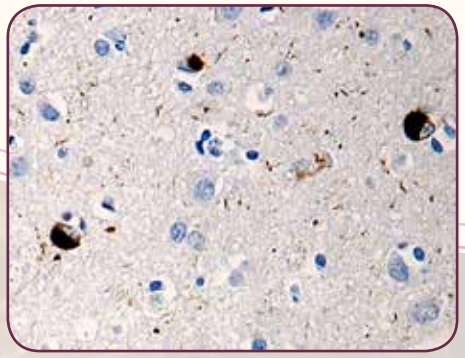
*Multiple conjugated formats available. ‡Multiple sizes available.

α-Synuclein, Nitrated



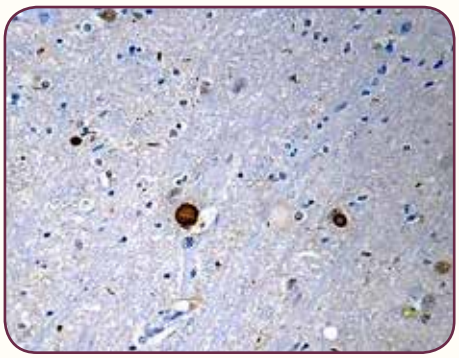
IHC staining of purified α-Synuclein, Nitrated antibody (clone Syn514) on FFPE human Parkinson's disease brain tissue. The section was counterstained with hematoxylin and bluing solution.

α-Synuclein Phospho (Ser129)



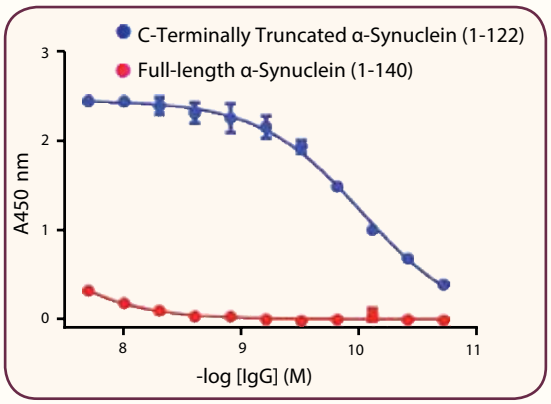
IHC staining of purified anti-α-Synuclein Phospho (Ser129) antibody (clone P-syn/81A) on FFPE human Parkinson's disease brain tissue. The section was counterstained with hematoxylin.

α-Synuclein (C-Terminal Truncated x-122)



IHC staining of α-Synuclein deposits with purified anti-α-Synuclein, C-Terminal Truncated antibody (clone A15127A) on FFPE human Parkinson's disease brain tissue. The section was counterstained with hematoxylin.

α-Synuclein (C-Terminal Truncated x-122)



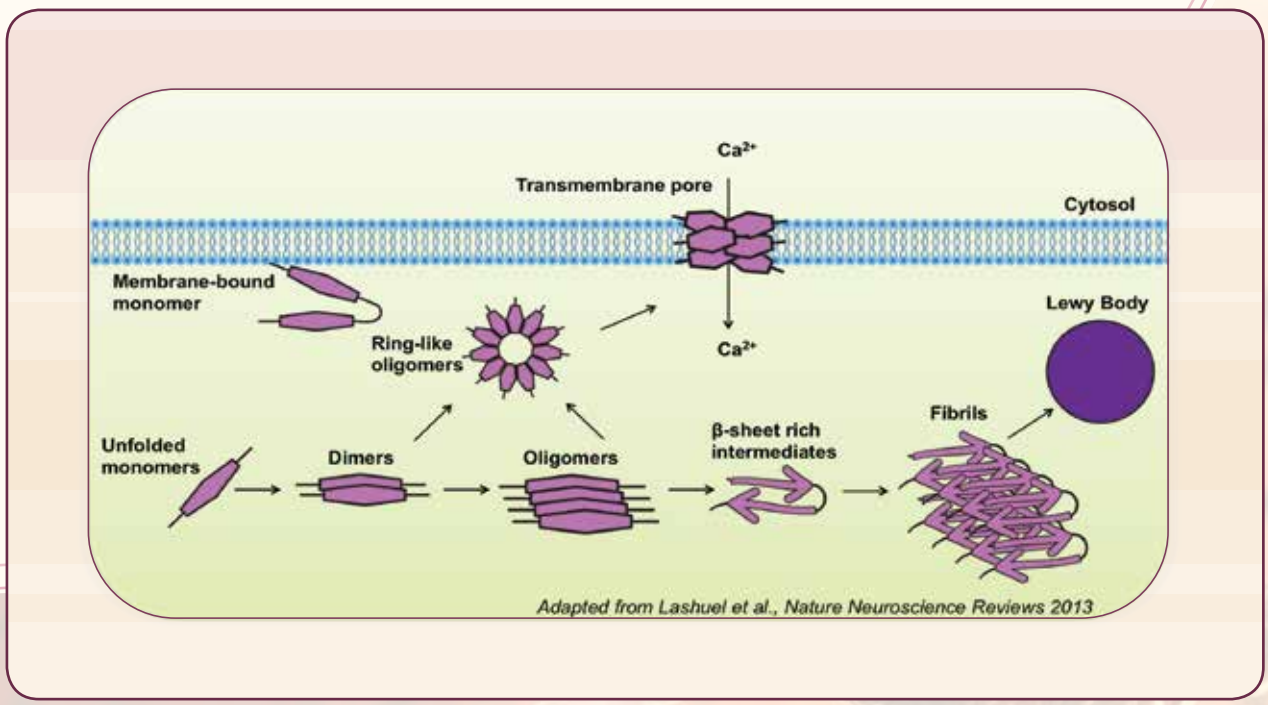
Direct ELISA of purified anti-α-Synuclein, C-Terminal Truncated antibody (clone A15127A) binding to plate-immobilized recombinant human full-length (1-140) and C-terminally truncated (1-122) α-Synuclein.

Aggregate-Specific Antibodies for α-Synuclein

Similar to aggregate-preferring antibodies for Aβ, antibodies that recognize diseased forms of α-Synuclein are highly valuable, when used in combination with applications such as IHC, WB, and ELISA, to detect and assess pathologic species of this protein in human disease and animal models. BioLegend's four α-Synuclein antibodies (clones Syn-O2, Syn-O3, Syn-O4, and Syn-F1) offer unique specificities for aggregated or fibrillar forms of α-Synuclein with minimal reactivity with its native form, and no cross-reactivity to Aβ or β- and γ-Synucleins. The specificity of these clones has been rigorously validated in:

- FFPE PD brain tissue sections for IHC
- α-Synuclein aggregates/fibrils for dot blot
- α-Synuclein aggregates and transgenic mouse tissue lysates for capture ELISAs

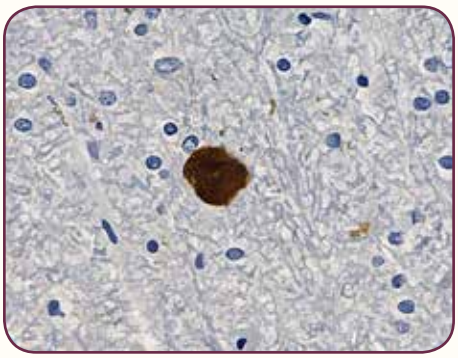
Learn more at: biolegend.com/asynuclein_aggregate_Abs
Find more information on Parkinson's at: biolegend.com/parkinsons_disease



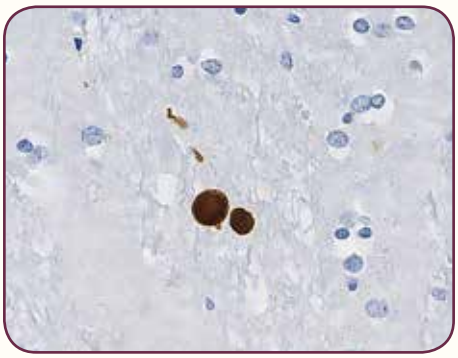
Syn-O2 detects aggregated α-Synuclein by IHC staining

The tissue specificity of Syn-O2 was validated in FFPE normal (not shown) and PD (left panel) brain tissue sections. Clone 4B12/Synuclein was included as a comparison for binding to monomeric and aggregated forms of α-Synuclein (right panel).

Clone Syn-O2

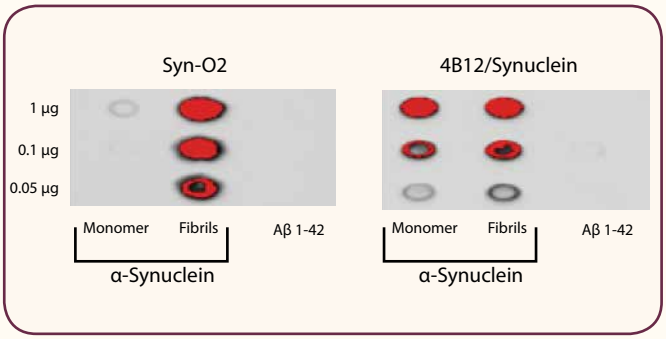


Clone 4B12/Synuclein



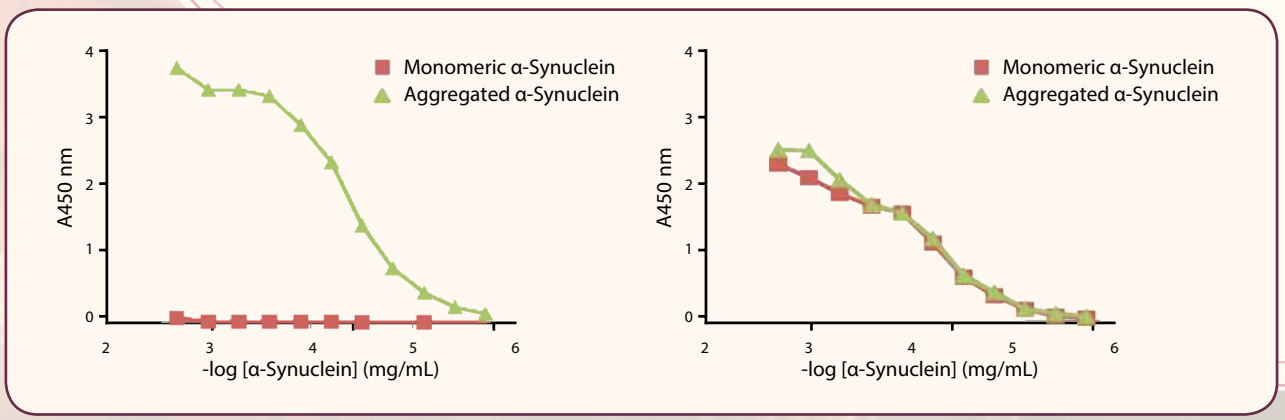
Syn-O2 detects α-Synuclein confomers by dot blot

Binding specificity of Syn-O2 towards monomeric and fibrillar α-Synuclein confomers was validated using dot blot assay. Clone 4B12/Synuclein was included as a comparison for binding to monomeric and aggregated forms of α-Synuclein. Note that clones Syn-O2 and 4B12/Synuclein do not cross-react with Aβ 1-42.



Syn-O2 binds to aggregated and not monomeric α-Synuclein

The specificity of clones Syn-O2 (left panel) and 4B12/Synuclein (right panel) towards monomeric or aggregated α-Synuclein was demonstrated by Capture ELISA. The wells were coated with each antibody followed by incubation with serially diluted monomeric or aggregated α-Synuclein, and subsequent incubation with a compatible biotinylated detection antibody and streptavidin-HRP as the detection system (SureBlue™ TMB substrate). As shown, 4B12/Synuclein binds to both monomeric and aggregated α-Synuclein, while Syn-O2 only binds to aggregated form of α-Synuclein.



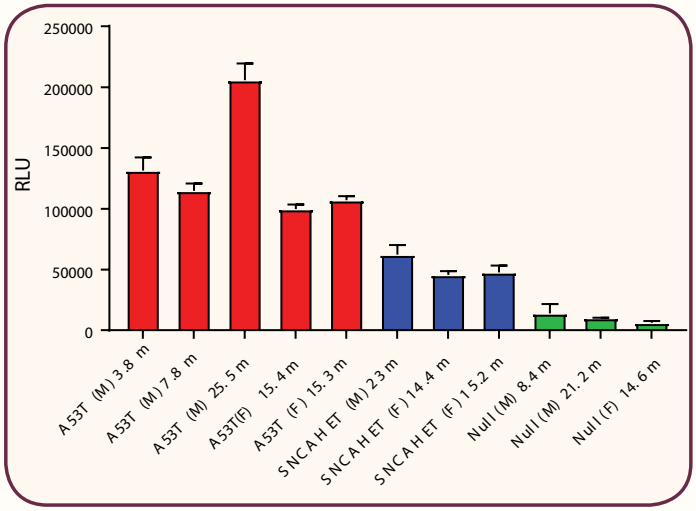
References

1. Majbour NK, *et al.* 2016. *Mol Neurodegener.* 11:7
2. Vaikath NN, *et al.* 2015. *Neurobiol Dis.* 79:81
3. Tomlinson JJ, *et al.* 2017. *J Neural Transm.* 124(6):721
4. Kuo YM, *et al.* 2010. *Hum Mol Genet.* 19(9):1633

Syn-O2 binds to aggregated α-Synuclein in mouse brain lysates

Capture ELISA demonstrating the binding specificity of clone Syn-O2 towards aggregated α-Synuclein in mouse brain lysates. Brain tissues from A53T, SNCA HET and SNCA null transgenic mice were lysed with CelLytic™ M Cell Lysis Reagent. ELISA was performed by coating wells with 100 ng of clone Syn-O2 as the capture antibody. The wells were then incubated with 67 µg of each mouse brain lysate[3,4], followed by incubation with a compatible biotinylated detection antibody and streptavidin-HRP as the detection system (SuperSignal® ELISA Femto). Brain lysates were provided by UCSF.

RLU: Relative light unit; m: month; M: male; F: female; SNCA: α-Synuclein; A53T: doublePAC-Tg(SNCAA53T)$^{+/+}$; Snca$^{-/-}$ (4 insertions of the PAC-Tg(SNCAA53T) transgene); SNCA HET: double-PAC-Tg(SNCAA53T)$^{+/+}$; Snca$^{-/-}$ (2 insertions of the PAC-Tg(SNCAA53T) transgene); SNCA null: SNCA $^{-/-}$ Snca$^{-/-}$.



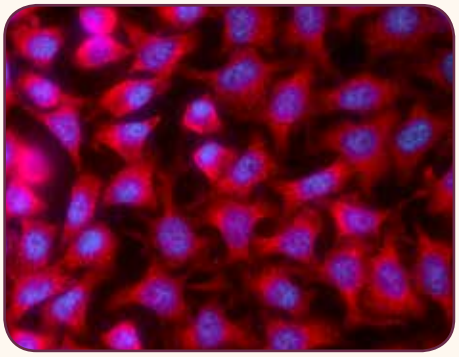
Related Neurodegeneration Antibodies

Protein Misfolding & Aggregation Antibodies

Specificity	Clone	Reactivity	Application
DJ-1 (PARK7)	A16125E‡*	Hu	WB, IHC-P, Direct ELISA
	E2.19‡	Hu, Zebrafish	WB, IHC, ELISA
FMRP	5C2	Hu, Ms	WB, IHC-P, ICC
FUS	10F7	Hu, Ms, Rat	WB
LRRK2	MC.028.83.76.242	Hu	IHC-P, Direct ELISA
	8G10‡	Hu, Ms, Rat	WB, ELISA
PARIS (ZNF746)	N196/16	Hu, Ms, Rat	IHC-P, WB
Parkin	Prk 8‡	Hu, Ms	WB, ELISA
	Prk 109	Hu, Ms	WB, ELISA
PINK1	DU46-1.1	Hu	WB, IHC-P, IP
Prion (CD230)	3F4‡*	Hu, Hamster, Feline	WB, IHC, IP, ELISA
	7D9‡	Ms, Rat	WB
	6D11‡	Hu	FC
SOD1	O98B10‡*	Hu, Ms, Rat	WB, IHC-P
TDP43	TDP2H4‡*	Hu, Ms, Rat	WB, IHC-P, Direct ELISA
TDP43 Phospho (Ser409/410)	1D3/TDP-43	Hu, Rat	WB, IHC-P, ICC
Transthyretin, 31-50	CPTC-TTR-1‡	Hu	WB, Direct ELISA
Transthyretin, aggregated	TA5F4‡	Hu	IHC-P, ELISA Capture, Direct ELISA
	2T5C9‡	Hu	IHC-P, ELISA Capture, Direct ELISA

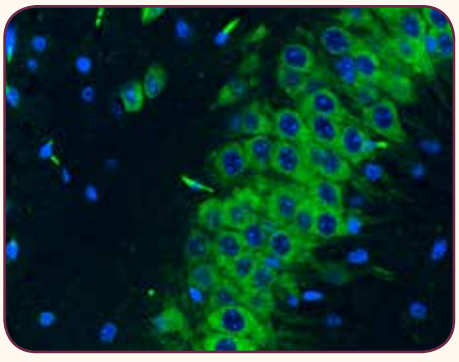
*Multiple conjugated formats available. ‡Multiple sizes available.

FMRP



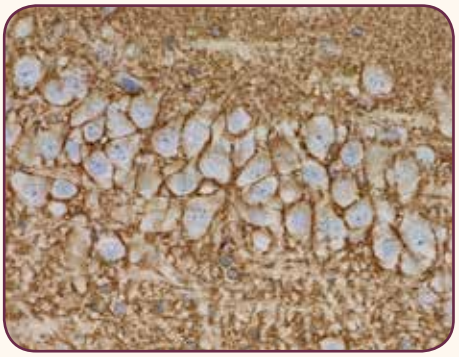
ICC staining of purified anti-FMRP antibody (clone 5C2) on HeLa cells. Nuclei were counterstained with DAPI.

FMRP



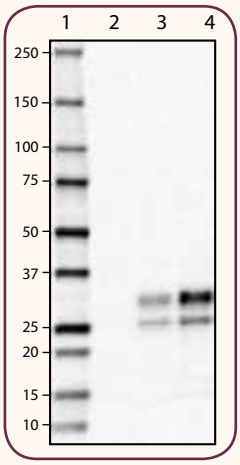
IHC staining of purified anti-FMRP antibody (clone 5C2) on FFPE mouse brain tissue. Nuclei were counterstained with DAPI.

PARIS



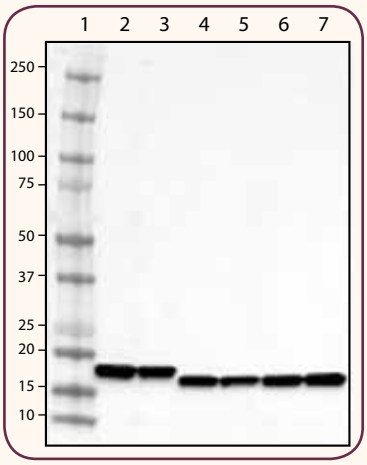
IHC staining of purified anti-PARIS (ZNF746) antibody (clone N196/16) on FFPE rat brain tissue. The section was counterstained with hematoxylin.

Prion



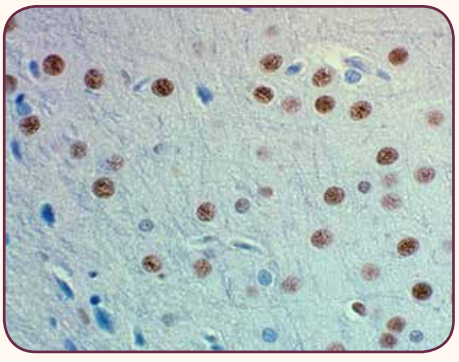
Western blot of purified anti-CD230 (Prion) antibody (clone 7D9). Lane 1: Molecular weight marker; Lane 2: 30 µg of human brain lysate; Lane 3: 30 µg of mouse brain lysate; Lane 4: 30 µg of rat brain lysate.

SOD1



Western blot of HRP anti-SOD1 antibody (clone O98B10). Lane 1: Molecular weight marker; Lanes 2 & 3: 20 µg of human brain lysates; Lanes 4 & 5: 20 µg of rat brain lysates; Lanes 6 & 7: 20 µg of mouse brain lysates.

TDP43



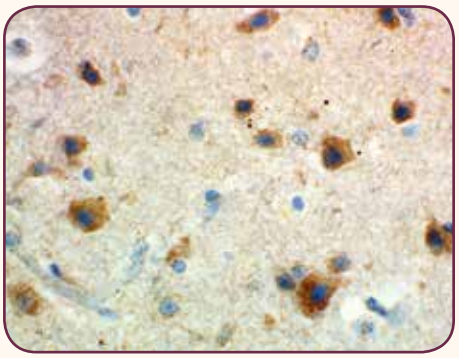
IHC staining of Biotin anti-TDP43 antibody (clone TDP2H4) on FFPE rat brain tissue. The section was counterstained with hematoxylin.

Protein Trafficking & Degradation Antibodies

Specificity	Clone	Reactivity	Application
ATF6	W17028A‡*	Hu	WB, ICC
ATF6β	W17035A‡	Hu	WB, ICC
ATG5	177.19‡*	Hu, Ms, Rat	WB, ICC, IHC-P, Direct ELISA
Beclin-1	O93F3‡*	Hu, Ms, Rat	WB
c-Abl	8E9	Hu, Ms	WB
Cathepsin A	15D2C93	Hu	WB
Cathepsin B	15D10C39	Hu	WB
Cathepsin D	16E12C58	Hu	WB
Clathrin Heavy Chain (CLTCL2)	TD.1	Hu	WB
Clathrin Light Chain (CLTA)	CON.1	Mammalian	WB, IHC-P, ICC, IP
E1 Ubiquitin Activating Enzyme	2G2.3.5*	Hu, Ms	WB, ICC
Flotillin-1	W16108A‡*	Hu, Ms, Rat	WB
HSC70 (HSPA8)	9/2	Hu	WB
HSF1	4B4	Hu, Ms	WB, IHC-P, ICC
HSF2	3E2	Hu, Ms, Rat	WB
HSP60	P83G8*	Hu, Ms, Rat	WB, ICC
Hsp70	4F8	Hu	WB, IHC-P
	W27‡*	Hu, Ms	WB
Hsp90α	K41007	Hu	WB, ICC, ELISA
Hsp90α/β	3H3C27*	Hu, Ms, Rat	WB, IP
	K3720A	Hu, Ms	WB, ICC, ELISA
Insulin Degrading Enzyme (IDE)	9B12.225‡*	Hu, Ms, Rat	WB, ICC, IP
	Poly18403	Hu, Ms, Rat	WB, ICC
LAMP1 (CD107a)	1D4B‡*	Ms	IHC-P, ICC, FC
	H4A3‡*	Hu, NHP	WB, ICC, FC
LAMP2 (CD107B)	ABL-93	Ms	WB, IHC-P
	H4B4‡*	Hu	WB, IHC-P, ICC, FC
	M3/84‡*	Ms	ICC, FC
LC3	A15143K‡	Hu, Ms	IHC-P, ICC
P62	Poly6477‡	Hu	WB
	1B5.H9‡	Hu	IHC, WB
Rab7A	W16034A‡*	Hu, Ms, Rat	WB, IHC-P, ICC, Direct ELISA
Sortilin	W16078A‡	Hu, Rat	WB, IHC-P
TFAM	18G102B2E11‡*	Hu	WB, IHC-P
TFEB	A17106A‡	Hu, Ms, Rat	WB
	A17106C‡*	Hu, Ms, Rat	WB
TPP1	2E12‡	Hu	WB, IHC-P, ICC
Ubiquitin	P4D1‡*	All species	WB, IP, IHC
	P4G7‡	Human, Extensive (Yeast to Human)	WB
Ubiquitin, 50-65 (bound)	3-39	Mammalian	WB, IHC-P, IP, ELISA
Ubiquitin, 64-76 (free/bound)	5-25	Mammalian	WB, IHC-P, ELISA, EM

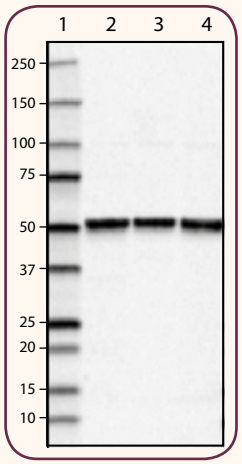
*Multiple conjugated formats available.
‡Multiple sizes available.

TFAM



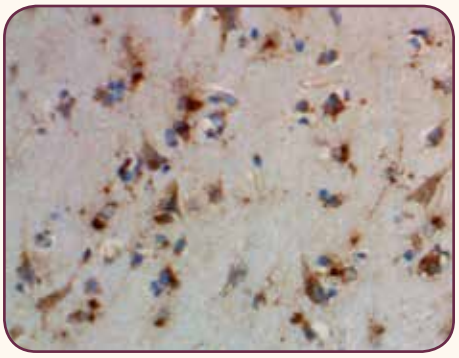
IHC staining of HRP anti-TFAM antibody (clone 18G102B2E11) on FFPE human brain tissue. The section was counterstained with hematoxylin and bluing solution.

TFEB



Western blot of HRP anti-TFEB antibody (clone A17106C). Lane 1: Molecular weight marker; Lane 2: 20 µg of human brain lysate; Lane 3: 20 µg of mouse brain lysate; Lane 4: 20 µg of rat brain lysate.

TPP1



IHC staining of purified anti-TPP1 antibody (clone 2E12) on FFPE human brain tissue. The section was counterstained with hematoxylin and bluing solution.

Protein Phosphatases & Inhibitors Antibodies

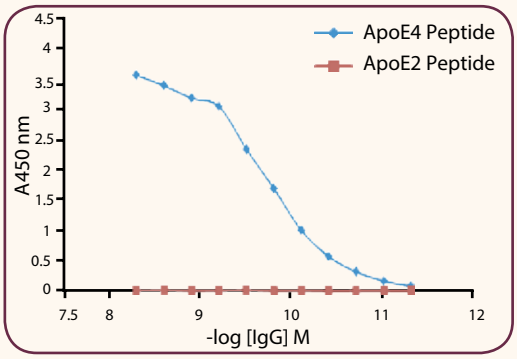
Specificity	Clone	Reactivity	Application
PP2AC	7A6/PP2AC	Hu, Ms	WB
PP2AC (Leu309)	1D7	Hu, Ms, Rat	WB, IHC-P
PP2AC Methyl (Leu 309)	2A10	Hu, Ms, Yeast	WB
PP2Aα	5H4/PP2Aa	Hu, Ms	IHC-P, IP
PPP2R1A	6G3	Hu, Ms, Bovine	WB, IP
	6F9	Hu, Ms	WB
	2G9	Hu, Ms, Rat	WB
PPP2R4 (PTPA)	5G3	Hu, Ms	WB, IHC-P
PPP2R5D	H5-D12	Hu, Rat	WB
PPP2R5E	5A5-F3	Hu, Ms	WB, IHC-P
I1PP2A	5A2	Hu, Rat	WB, IHC-P
	5A10	Hu, Rat	WB, IHC-P
	3F2	Hu	WB, IHC-P
PME-1	8A6-F8	Hu, Ms, Rat	WB, IHC-P
	20G3SC‡	Hu	WB

Phagocytic & Lipid Metabolism Antibodies

Specificity	Clone	Reactivity	Application
Apo E	D6E10‡	Hu	WB
	E6D7‡	Hu	WB, IHC-P, IP, ELISA
Apo E, 109-116	A17067B‡	Hu	WB, Direct ELISA
Apo E, 154-162	A17065A‡	Hu	WB, Direct ELISA
Apo E4	5B5/ApoE4‡	Hu	IHC-P, ELISA
	5A9	Hu	IHC-P, ELISA
	5G7	Hu	WB, ELISA
	9D11‡	Hu	WB, ELISA
Clusterin	A15113A‡*	Hu	WB, IHC-P, Direct ELISA

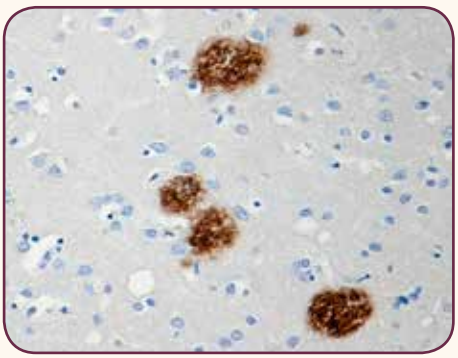
*Multiple conjugated formats available.
‡Multiple sizes available.

Apo E4



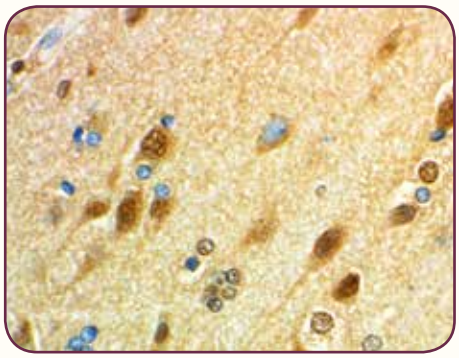
Direct ELISA of purified anti-Apo E4 (clone 5A9) antibody binding to the plate-immobilized ApoE4 and ApoE2 peptides.

Apo E4

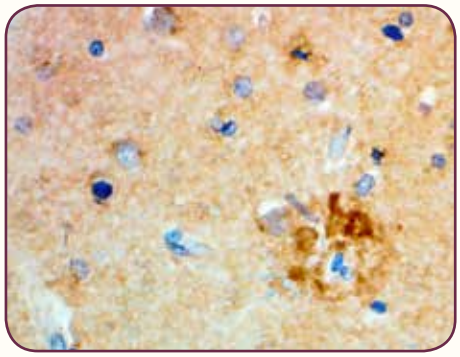


IHC staining of purified anti-Apo E4 antibody (clone 5A9) on FFPE human Alzheimer's disease brain tissue. The section was counterstained with hematoxylin.

Normal Brain



AD Brain



IHC staining of HRP anti-Clusterin antibody (clone A15113A) on FFPE normal (left panel) and Alzheimer's disease (right panel) human brain tissues. The sections were counterstained with hematoxylin and bluing solution.

Recombinant Proteins and Peptides

BioLegend is a provider of high-quality and purity recombinant proteins and peptides. These reagents are suitable for use as control protein markers for WB or antigen detection by immunoassay.

Recombinant Proteins & Peptides

Human	
Description	**Application**
sAPPbeta (APP751 isoform)	WB, ELISA
APP751	WB, ELISA
APP770	WB, ELISA
β-Amyloid Peptide (1-40)	Direct ELISA
β-Amyloid Peptide (1-42)	Direct ELISA
BACE1	Bioassay
DJ-1	WB, ELISA
0N3R Tau-352	WB, ELISA
0N4R Tau-383	WB, ELISA
1N3R Tau-381	WB, ELISA
1N4R Tau-412	WB, ELISA
2N3R Tau-410	WB, ELISA
2N4R Tau-441	WB, ELISA
Tau-352 (0N3R)	WB, ELISA
Tau-381 (1N3R)	WB, ELISA
Tau-383 (0N4R)	WB, ELISA
Tau-410 (2N3R)	WB, ELISA
Tau-412 (1N4R)	WB, ELISA
Tau-441 (2N4R)	WB, ELISA
Mouse	
Description	**Application**
BACE1	Bioassay

ELISA Kits

BioLegend's LEGEND MAX™ ELISA Kits are suitable for chemiluminescent detection of α-Synuclein, or colorimetric detection of Aβ 1-40 or Aβ 1-42 peptides. Our ELISA Kits offer ultra-sensitivity and highly reproducible results for your research needs. The LEGEND MAX™ Human α-Synuclein ELISA Kit demonstrates no cross-reactivity with β- or γ-Synucleins. The LEGEND MAX™ x-40 Kit is specific for both the human and rodent x-40 isoform of Aβ, and demonstrates negligible cross-reactivity with the x-42 isoform. Likewise, the LEGEND MAX™ x-42 Kit is specific for the human and rodent x-42 isoform of Aβ, and shows minimal cross-reactivity with the x-40 isoform of Aβ. These ELISA kits are compatible with biological samples and tissue lysates.

ELISAs

Description
LEGEND MAX™ β-Amyloid x-40 ELISA Kit with Pre-coated Plate
LEGEND MAX™ β-Amyloid x-42 ELISA Kit with Pre-coated Plate
LEGEND MAX™ Human α-Synuclein ELISA Kit with Pre-coated Plate

Antibody Sampler Kits

BioLegend's antibody sampler kits offer flexibility for sampling and detection of key brain cells and targets in neurodegeneration. Our Tau and α-Synuclein sampler kits are ideal for visualization of native and post-translationally modified forms of these proteins, and provide specificity for detection of full-length, truncated and phosphorylated specifies of Tau and α-Synuclein. The β/γ Secretase Antibody Sampler Kit contains antibodies against essential components in the processing of amyloid precursor protein and generation of Aβ peptide. In addition, our Glial Marker Antibody Sampler Kit includes cellular marker antibodies used for identification of microglia, astrocytes, and oligodendrocytes, cells that are implicated in the pathology of CNS disorders. The sampler kits provide 25 µg sizes of antibodies that are suitable for IHC and WB applications.

Antibody Sampler Kits

Description	**Specificity**	**Clones**	**Reactivity**	**Application**
α-Synuclein Antibody Sampler Kit	Total α-Synuclein, α-Synuclein Phospho (Tyr39),α-Synuclein Phospho (Ser87), α-Synuclein Phospho (Ser129), α-Synuclein (C-Terminal Truncated x-122)	A15119B, A15115A, A15127A, P-syn/81A, A15126D	Hu	WB, IHC-P, ELISA
β/γ Secretase Antibody Sampler Kit	β- and γ-secretase proteases	AA10, 9C3, A17035K, PS2, NT1	Hu, Ms, Rat	WB, IHC-P
Glial Cell Marker Antibody Sampler Kit	P2RY12, CX3CR1, GFAP, Myelin CNPase, Myelin Basic Protein	S16007D, 8E10. D9, SMI 24, SMI 91, P82H9	Hu, Ms, Rat	WB, IHC-P
Tau Antibody Sampler Kit	Total Tau, Tau Phospho (Ser262), Tau Phospho (Thr181)	A15091A, M7004D06, A16103A, A16097F	Hu	WB, IHC-P, ELISA

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