

Compounds	Signaling modalities	Molecular targets	Clinical outcomes	Disease	Ref
Rapamycin	mTOR Attenuation	eNOS and nNOS	Reverse neurovascular uncoupling (NVC) and memory deficits	AD	[236]
Rapamycin	mTOR inhibition	-	Enhances synaptic and mitochondrial function	AD	[40]
Rapamycin	mTOR inhibition	MMP-9 and tight junction proteins	Preserves BBB integrity	AD	[241]
Magnolol	AMPK/mTOR/ULK1 pathway	Cleaved-caspase-9, Bax, Bcl-2, p62/SQSTM1, LC3II, Beclin-1, AMPK, ULK1 and mTOR	Inhibit apoptosis, promoting autophagy	AD	[242]
Pongamol	Akt/mTOR Signaling	IL-1 $\beta$ , TNF- $\alpha$ , COX-2, iNOS, Tau, A $\beta$ , NF- $\kappa$ B, Beclin 1 and LC3 II/LC3 I	Alleviates neuroinflammation and promotes autophagy	AD	[233]
Danggui Shaoyao San (DSS), Suangan (SG) and Xingan (XG)	AMPK/mTOR autophagy signaling pathway and mitophagy	PSD-95, APP and p-Tau, LC3, Beclin1, p-AMPK, P62 and p-mTOR	Improved cognitive function and ameliorated neuroinflammation	AD	[243]
Tadalafil and bergapten	PI3K/Akt, GSK-3 $\beta$ , mTOR, autophagy, Wnt/ $\beta$ -catenin, and cGMP/PKG signaling pathways	pAkt, pGSK-3 $\beta$ , beclin-1, PP2A, cyclin D1, BDNF, cGMP, PKG, Wnt3a, AMPK, $\beta$ -catenin, mTOR, IL-23, IL-27, and NF- $\kappa$ B	Reduced neuroinflammation and enhanced BDNF expression	AD	[244]
Geniposide	mTOR signaling	A $\beta$ , p-Akt/Akt, p-mTOR/mTOR, p-4E-BP1/4E-BP1, LC3-II, and Beclin1	Improved cognition and enhanced autophagic clearance of A $\beta$	AD	[111]
Tricetin	PI3K/Akt/mTOR	A $\beta$ , Tau, and NF- $\kappa$ B	Improved memory, reduced A $\beta$ and Tau pathology, modulated inflammation, and regulated autophagy	AD	[245]
Guben-Jiannao Ye	PI3K/Akt/mTOR pathway	Per1, Per2, Clock, Cry1, Cry2, Bmal1 mRNA, A $\beta$ , mTOR, Akt, and PI3K	Enhances memory, reduces A $\beta$ deposition, restores circadian gene expression	AD	[246]
Glycoprotein NMB	mTOR signal	A $\beta$ and mTOR	Improved AD-like behaviors, reduced A $\beta$ deposition, enhanced autophagy, and reduced microglial cells	AD	[247]
Cordycepin	PI3K/AKT/mTOR and ERK/JNK	MAPK, mTOR, and PI3K/AKT	Improving behavior, reducing neuroapoptosis, preserving dopaminergic neurons, promoting autophagy, and suppressing neuroinflammation	PD	[248]
Piperine	PI3K/AKT/mTOR pathway	$\alpha$ -Syn, LC3II/LC3I, p62, PI3K, AKT and mTOR	Improved motor and gastrointestinal functions, reduced $\alpha$ -synuclein ( $\alpha$ -Syn) aggregation, and preserved dopaminergic neurons	PD	[237]
Schisandra Decoction	PI3K/AKT/mTOR pathway	PTEN, PI3K, Akt, p-Akt, mTOR, p-mTOR, p70s6K, p62, LC3II / I, $\alpha$ -syn,	Reduces $\alpha$ -syn aggregation, exerts neuroprotective effects, inhibits autophagy, and improves motor function.	PD	[249]

Baicalein	miR-30b-5p/SIRT1/AMPK/mTOR signaling	miR-30b-5p, SIRT1 and AMPK	Improving dopamine levels, reducing neuronal apoptosis, and restoring mitochondrial function	PD	[234]
Kaempferol	mTOR signaling	Tyrosine hydroxylase, $\alpha$ -syn, Beclin-1, LC3, p62 and cleaved caspase-3	Improved motor behavior, preserved dopaminergic neurons, and reduced $\alpha$ -synuclein accumulation, enhanced autophagy	PD	[235]
Cilostazol	Nrf2/HO-1 antioxidant pathway, suppressing the HMGB1/TLR4 inflammatory axis, and modulating the PI3K/Akt/mTOR survival pathway	Tyrosine hydroxylase, Nrf2 and HO-1, HMGB1/TLR4, PI3K, Akt, and mTOR	Improved behavioral, histological, and biochemical outcomes	PD	[250]
Sanggenol L	PI3K/AKT/mTOR signaling pathway	ROS, Bax, cleaved caspase-12, -9, -3, and Cytc and Bcl-2	Decreased oxidative stress, ROS, and apoptosis, enhanced mitochondrial function	PD	[251]
Curcumin	mTOR/p70S6K signaling	mTOR/p70S6K and A53T $\alpha$ -synuclein protein	Reduces A53T accumulation by inhibiting mTOR/p70S6K signaling and restoring autophagy	PD	[197]
Baicalin	mTOR/AKT/GSK-3 $\beta$ pathway	$\alpha$ -SYN, mTOR, AKT, and GSK-3 $\beta$	Enhanced behavioral impairment, decreased neuronal death	PD	[252]
Osmotin	MAPK signaling, AMPK/mammalian target of rapamycin (mTOR)	MPTP- and $\alpha$ -synuclein, Nurr1, tyrosine hydroxylase, DAT, VMAT2, MAPK and mTOR	Improved motor and cognitive functions, ameliorated neuronal cell death and neuroinflammation	PD	[253]
$\beta$ -asarone	PI3K/Akt/mTOR pathway	PI3K, p-PI3K, Akt, p-Akt, mTOR, p-mTOR, Beclin-1, and p62	Improved motor and depressive symptoms, reduced $\alpha$ -synuclein levels in the striatum, inhibited autophagy, and improved the density of neuron dendritic spines	PD	[41]
Phloretin	mTOR/NRF2/p62 pathway	Cytochrome-C, Bax, $\alpha$ -SYN, tyrosine hydroxylase, NRF2, HO-1, mTOR, Atg5,7, p62, Beclin, LC3B-I/II	Improved motor and anxiety-related behaviors. PLT reduced apoptosis and $\alpha$ -synuclein expression	PD	[254]
Geniposide	Nrf2 signaling and mTOR pathway	Dopamine, DOPAC, HVA, ROS, MDA, GSH:GSSG ratio, PARP, caspase-3, Nrf2, and mTOR	Reduced oxidative stress, improved motor function, restored dopamine levels, and reduced neuronal degeneration	PD	[255]
Crocin	PI3K/Akt/mTOR signaling	p-PRAS40, mTOR and p-p70S6K, GSK-3 $\beta$ , FoxO3a, caspase-9, tyrosine hydroxylase, dopamine, $\alpha$ -synuclein, miRNA-7 and, miRNA-221	Improved behavior, elevated tyrosine hydroxylase and dopamine, while lowering $\alpha$ -synuclein	PD	[256]
Ursodeoxycholic acid	AMPK/mTOR and PINK1/Parkin pathways	ROS, ATP, AMPK, mTOR, PINK1, and Parkin	Improved motor function, protected dopaminergic neurons, enhanced cell viability, reduced oxidative stress and mitochondrial dysfunction, improved movement dysfunction, ameliorated autophagic flux, and alleviated apoptosis	PD	[257]

Asiatic acid	MAPK/P38 and PI3K/Akt/mTOR signaling pathway	NTFs, TrkB, JNK, ERK, PI3K, Akt, GSK-3 $\beta$ , and mTOR	Improved motor function, prevented dopamine loss, and restored neurotrophic factors and TrkB receptor levels	PD	[258]
Astersaponin I	Erk/mTOR and AMPK/mTOR pathways	LC3-II, p62, p-Erk, p-AMPK, p-ULK, p-mTOR, tyrosine hydroxylase, and $\alpha$ -synuclein	Enhanced autophagy markers, reversed PD-related cell damage, improved behavioral deficits, and restored dopamine and protein levels	PD	[259]
Taurochenodeoxycholic acid	AMPK/mTOR and Pink1/Parkin pathways and AKT/NF $\kappa$ B signaling	$\alpha$ -Syn, mRNA, NO, ROS, (IL)-1 $\beta$ , IL-6, TNF- $\alpha$ , TGR5, AKT, NF $\kappa$ B, I $\kappa$ B $\alpha$ , AMPK, mTOR, LC3II/LC3, and Beclin1, Pink1, and Parkin	Reduce motor dysfunction, dopaminergic neuronal loss, and $\alpha$ -synuclein accumulation, suppressed microglia and astrocyte activation, reduced inflammatory mediators, inhibited oxidative stress, promoted autophagy and mitochondrial protection	PD	[260]
Lycium barbarum polysaccharide	PTEN/AKT/mTOR signaling pathway	SOD2, CAT, GPX1, $\alpha$ -synuclein, AKT, and mTOR	Improved motor activity and cognitive performance, increased antioxidant enzyme levels, and reduced $\alpha$ -synuclein aggregation	PD	[261]
Cannabidiol	ERK and AKT/mTOR pathways	PARP-1, CB2 and TRPV1, ERK and AKT/mTOR	Improved cell viability, reduced apoptosis markers	PD	[262]
Idebenone	AKT/mTOR pathway	AKT and MAPK, $\alpha$ -synuclein, AKT/mTOR	Induces autophagy and $\alpha$ -synuclein degradation	PD	[263]
Decoction of Rehmanniae	PI3K/Akt/mTOR pathway	ROS, Bax, Cyt-c and cleaved-Caspase-12, 9 and 3, Bcl-2, PI3K, AKT and mTOR	Improved cell viability, reduced apoptosis, and ROS levels	PD	[264]
levodopa	D1R-ERK1/2-mTOR pathway	BMAL1 and CLOCK, ERK1/2, S6K1, and 4E-BP1	Partially restored these rhythms and increased the variability of BMAL1 and CLOCK expression	PD	[265]
5-hydroxytryptophan	AKT/mTOR/S6K pathway	CREB and $\Delta$ FosB	Significantly reduces LID symptoms in a mouse model without impairing L-DOPA's motor benefits	PD	[266]
Clioquinol	AKT/mTOR signaling pathway and p53 signaling	ROS, AKT/mTOR, p53	Enhanced both motor and non-motor symptoms by diminishing iron buildup and ROS	PD	[267]
Morin hydrate	mTOR/IRE1- $\alpha$ , JNK/IP3R, and cytochrome c/caspase-3 pathways	mTOR, JNK, IRE1- $\alpha$ , and IP3R, p-PGC-1 $\alpha$ and p-VDAC1, XBP1s, JNK, IP3R, PINK1, Ubiquitin, Mfn2, and cytochrome c/caspase-3	Reduced weight loss, motor dysfunction, and striatal neurodegeneration	HD	[268]
Erythropoietin and Bacillus Calmette-Guérin (BCG) vaccine	PI3K/Akt/mTOR/P70S6K pathway	p-PI3K, p-Akt, p-mTOR, p-P70S6K, BAX, MDA, NO, and cytochrome oxidase, BCL-2, SOD, GSH and the autophagy marker microtubule-associated protein light chain 3	Improved behavioral and histological outcomes	HD	[269]

CTEP, mGluR5 inhibitor	PI3K/Akt/mTOR signaling	ULK1, mTOR, CREB, BDNF, and mGluR5	Increases CREB-mediated BDNF expression, supporting neuronal survival and reducing apoptosis, decreases mHTT aggregates, and delays disease progression	HD	[270]
Nano-formulated ivabradine (nano IVA)	Rhes/mTOR-mediated autophagy pathway	Rhes, m-Tor, and b-cell lymphoma 2 protein	Improved motor, cognitive, and psychiatric symptoms	HD	[271]
Nicosamide	STAT3 and mTOR	STAT3 and mTOR	Improved neurological function, slowed disease progression, and increased survival. It reduced gliosis, motor neuron loss, muscle atrophy, and inflammation	ALS	[272]
Oleanolic acid combined with edaravone	PI3K/Akt/mTOR/STAT-3/GSK-3 $\beta$ pathways	myelin basic protein (MBP) and neurofilament light chain (NEFL)	Reduced inflammation, restored myelin and neurofilament levels, and improved motor functions and survival	ALS	[273]
Ibrutinib	mTOR/Akt/PI3K signaling	IBA-1 and GFAP	Delayed ALS symptom onset, improved survival, and reduced behavioral impairments. It also decreased muscle wasting by increasing the muscle-to-body weight ratio and lowering muscle necrosis. Also reduced pro-inflammatory cytokines and markers	ALS	[274]
Guggulsterone	STAT-3 and mTOR signaling	STAT-3, mTOR, and PPAR-gamma	Improved motor and cognitive functions, enhanced remyelination, and reduced neuroinflammation	ALS	[275]