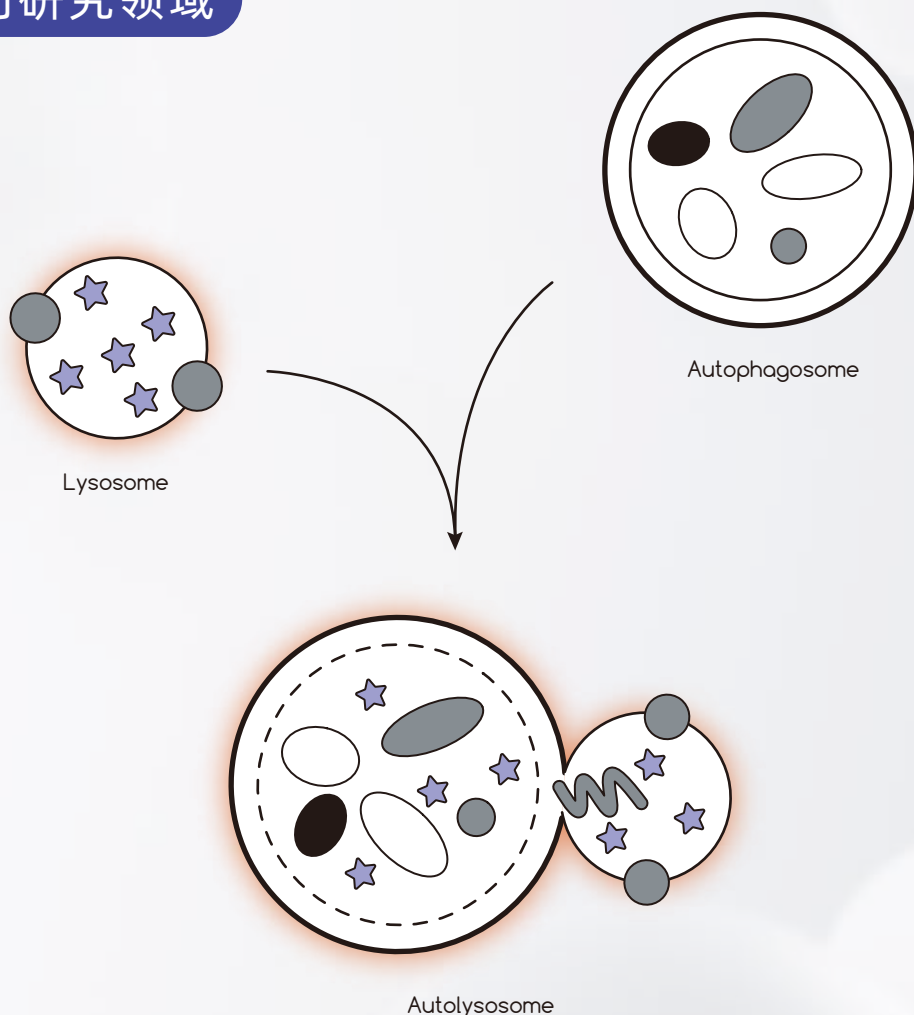


细胞自噬 Autophagy

热门研究领域



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细胞自噬

自噬是一种存在于真核生物中的高度保守的蛋白质或细胞器降解过程。自噬发生时，一些损坏的蛋白质或细胞器等被双层膜结构的自噬小泡包裹，并最终送到溶酶体中降解。降解产生的氨基酸等小分子物质可被细胞再利用，也能用于能量的产生。

细胞自噬是细胞成分降解和回收利用的基础。细胞将内部损坏、老化或功能丧失的细胞器分解，从而快速提供能量和原材料以维持细胞的正常运作。细胞自噬主要经历4个阶段：自噬诱导，自噬体的组装和形成，自噬体与溶酶体的结合与融合，最终降解。

自噬的诱导阶段

细胞在正常情况下很少发生自噬。当细胞外因素（营养成分短缺、缺氧缺血和生长因子诱导）和细胞内因素（代谢压力、细胞器老化、蛋白质错误折叠和DNA损伤）影响了细胞时，自噬会被诱导发生。其中，有5条信号通路与自噬较为相关：ERK1/2通路、PI3K通路、AMPK通路、氨基酸饥饿通路和p53通路（图1）。

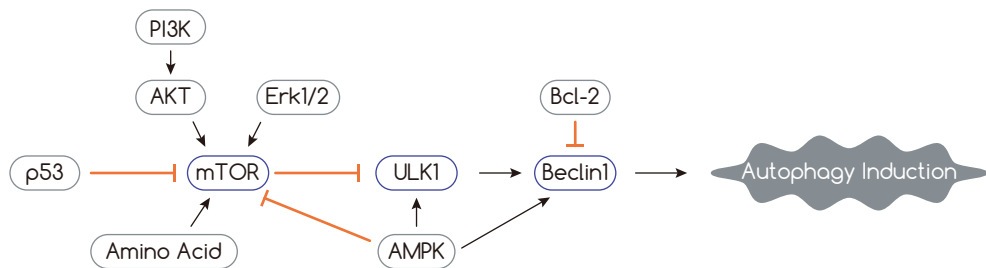


图1. 自噬的诱导

自噬体的组装阶段

在上游信号的诱导下，ATG12和ATG5先后被ATG7和ATG10分别催化而偶联，随后与ATG16L形成复合体，参与自噬小泡的组装。ATG12与ATG5形成的ATG12-ATG5复合物，其表面区域的氨基酸序列在进化上保守，从而形成保守的表面构象。这种构象是LC3脂质化所必需的条件。

LC3以前体（pro-LC3）的形式被翻译出来后，即刻被ATG4切割掉C端的一段多肽，进而暴露出甘氨酸位点，成为分布在胞浆中的LC3-I。LC3-I在ATG7和ATG3的作用下，与磷脂酰乙醇胺（PE）共价结合，形成膜结合蛋白LC3-II，并结合在自噬体膜上。LC3-II已被广泛用作自噬过程的经典标志物（图2）。

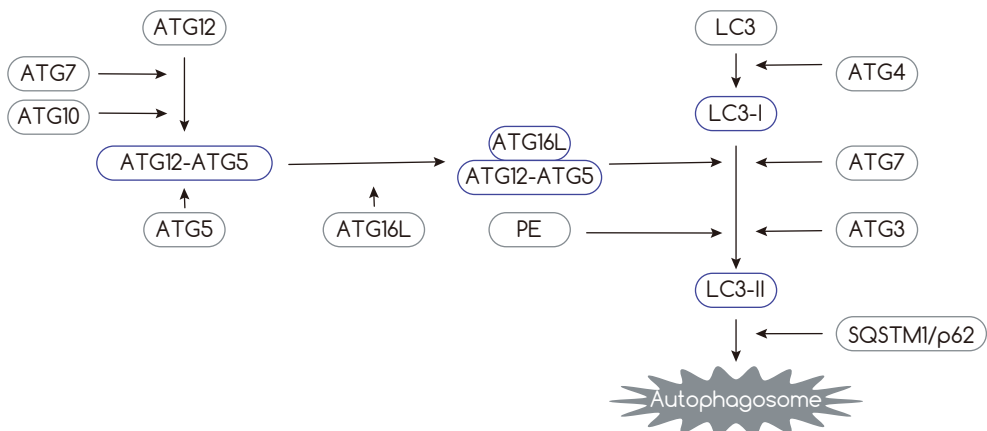


图2. 自噬体组装

自噬体的融合阶段

自噬体与溶酶体的融合是细胞发挥自噬功能以及对细胞内多余物质进行降解和再度利用的关键。Rab7是自噬体和溶酶体融合阶段的重要分子，此外，自噬体上STX17与溶酶体上VAMP8结合会介导自噬体和溶酶体的融合(图3)。

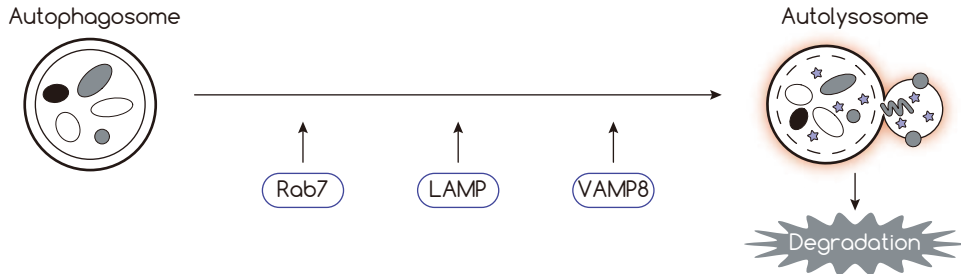


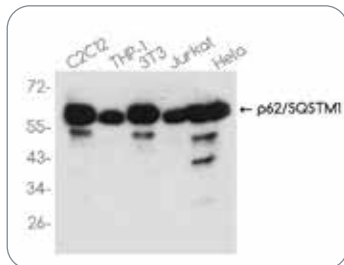
图3. 自噬溶酶体的融合

降解阶段

SQSTM-1/p62将泛素化的蛋白转运到自噬体中。经过融合阶段后，自噬溶酶体中的内容物降解，以实现细胞稳态和自我更新。

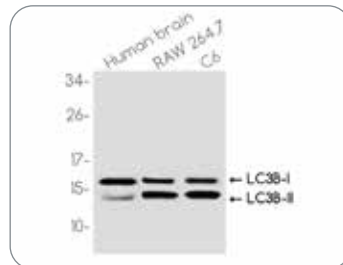
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#380612
SQSTM1/p62 Rabbit pAb



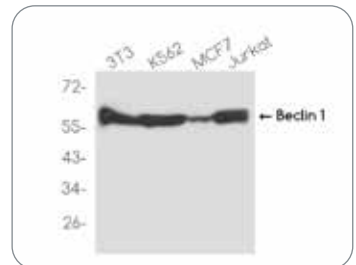
Western blot analysis of p62/SQSTM1 in C2C12, THP-1, 3T3, Jurkat and HeLa lysates using SQSTM1/p62 antibody.

#381544
LC3B Rabbit pAb



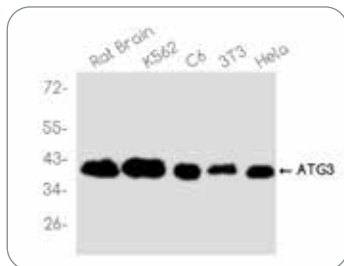
Western blot analysis of LC3B in (1) Human brain lysates; (2) RAW 264.7 lysates; (3) C6 lysates using LC3B antibody.

#381896
Beclin 1 Rabbit pAb



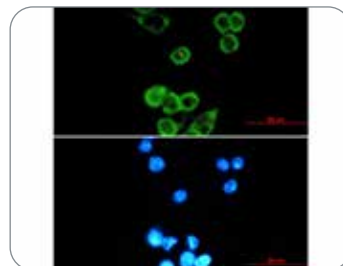
Western blot analysis of Beclin 1 in 3T3, K562, MCF-7 and Jurkat lysates using Beclin 1 antibody.

#R23552
ATG3 Rabbit mAb



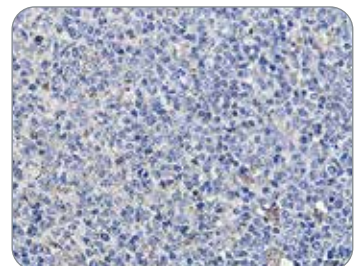
Western blot analysis of ATG3 in K562, rat Brain, C6, 3T3, HeLa lysates using ATG3 antibody.

#R23497
APG5L Rabbit mAb



Immunocytochemistry analysis of APG5L/ATG5 (green) in MCF-7 using APG5L/ATG5 antibody, and DAPI(blue)

#R24834
LAMP1 Rabbit mAb



High-pressure and temperature Sodium Citrate pH 6.0 was used for antigen retrieval.

自噬相关靶标



靶标	产品货号	产品名称	反应种属	应用
ATG12	R381893	ATG12 Rabbit mAb	Human	WB,IHC-P,ICC/IF,IP,FC
	R23496	ATG12 Rabbit mAb	Human	WB
ATG16L1	R381894	ATG16L1 Rabbit mAb	Human,Mouse,Rat	WB,IHC-P
ATG3	240125	[KO] ATG3 Mouse mAb	Human,Mouse,Rat	WB,IHC-P
	R23552	ATG3 Rabbit mAb	Human,Mouse,Rat	WB,IHC-F,IHC-P,ICC/IF
ATG5	381320	APG5L Rabbit pAb	Human,Mouse,Rat	WB,IHC-P,ICC/IF,IP
ATG7	R23498	ATG7 Rabbit mAb	Human,Mouse,Rat	WB
	382040	ATG7 Rabbit pAb	Human,Mouse,Rat	WB,ICC/IF
Bcl2	R23309	Bcl2 Rabbit mAb	Human,Mouse	WB,IHC-P
	M50117	Bcl2 Mouse mAb	Human	IHC-P
	381702	Bcl2 Rabbit pAb	Human,Mouse	WB,IHC-P,ICC/IF,FC
Beclin 1	381896	Beclin 1 Rabbit pAb	Human,Mouse,Rat	WB,IHC-P,ICC/IF
	240153	[KO] Beclin 1 Mouse mAb	Human,Mouse,Rat	WB,IHC-P,FC
	R22856	Beclin 1 Rabbit mAb	Human,Mouse,Rat	WB,IP
LAMP1	R24834	LAMP1 Rabbit mAb	Human	WB,IHC-P
LAMP2	R23340	LAMP2 Rabbit mAb	Human	WB,IHC-P
	381078	LAMP2 Rabbit pAb	Human,Mouse,Rat	WB,IHC-P,IP
LC3	306019	LC3A/B Rabbit pAb	Human,Mouse,Rat	WB
	R24913	LC3A Rabbit mAb	Human,Mouse,Rat	WB,IHC-P,IP
	381544	LC3B Rabbit pAb	Human,Mouse,Rat	WB,ICC/IF,IP
mTOR	380411	mTOR Rabbit pAb	Human,Mouse,Rat	WB,IHC-P,ICC/IF,IP,FC
	381557	Phospho-mTOR (Ser2448) Rabbit pAb	Human,Mouse,Pig	WB,IHC-P
Rab7	R25525	Rab7 Rabbit mAb	Human,Mouse	WB,IHC-P
	R25524	Rab7 Rabbit mAb	Human,Mouse,Rat	WB,IHC-F,IHC-P,ICC/IF
	240157	[KO] SQSTM1/p62 Mouse mAb	Human,Mouse,Rat	WB,IHC-P,FC
SQSTM1/p62	M50013	SQSTM1/p62 Mouse mAb	Human	IHC-P
	380612	SQSTM1/p62 Rabbit pAb	Human,Mouse,Rat	WB,ICC/IF,FC
ULK1	381887	ULK1 Rabbit pAb	Human,Mouse,Rat	WB,IHC-P,ICC/IF
VAMP8	R381612	VAMP8 Rabbit mAb	Human,Mouse,Rat	WB,IHC-P,ICC/IF,IP,FC

LC3B Rabbit pAb

#381544 / Reactivity: Human,Mouse,Rat / Application: WB,ICC/IF,IP

PMID: 34762394 / IF=9.2 / Mouse / WB,IF / ACS Applied Materials & Interfaces

PMID: 37361387 / IF=8.0 / Human / WB,IF / International Journal of Nanomedicine

PMID: 35620574 / IF=6.5 / Rat / WB / Oxidative Medicine and Cellular Longevity

PMID: 36675134 / IF=6.2 / Human / WB / INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES

SQSTM1/p62 Rabbit pAb

#380612 / Reactivity: Human,Mouse,Rat / Application: WB,ICC/IF,FC

PMID: 34214490 / IF=12.3 / Human,Mouse / IF / DEVELOPMENTAL CELL

PMID: 30352807 / IF=10.1 / Human / WB / GENOME RESEARCH

PMID: 35620574 / IF=6.5 / Rat / WB,IF / ACS Applied Materials & Interfaces

Beclin 1 Rabbit pAb

#381896 / Reactivity: Human,Mouse,Rat / Application: WB,IHC-P,ICC/IF

PMID: 36592709 / IF=6.1 / Human / WB / BIOCHEMICAL PHARMACOLOGY

PMID: 29678610 / IF=6.0 / Mouse / WB / FREE RADICAL BIOLOGY AND MEDICINE

PMID: 36596445 / IF=5.6 / Duck / WB / FOOD AND CHEMICAL TOXICOLOGY

