

# MITOCHONDRIAL MARKERS

---

[www.ptglab.com](http://www.ptglab.com)



# INTRODUCTION

Mitochondria are important cellular organelles that maintain cellular energy balance, contain key regulators of cell death processes, and play a significant role in cellular oxidative stress generation and maintenance of calcium homeostasis.

Links to cancer, apoptosis, autophagy, and hypoxia have brought mitochondria to the forefront of scientific studies in recent years.

Knowledge of the subcellular location of a protein may reveal the potential role it plays in a variety of cellular processes. Proteintech® offers approximately all the antibodies needed for mitochondria research.

## What's Inside

3-4

Mitochondrial Markers

5

Citric Acid Cycle

6-7

Mitochondrial Respiratory Complexes

8

Mitochondrial Fission

Mitochondrial Fusion

9

Mitochondrial Mediated Apoptosis

10

Mitochondrial Autophagy

11

Mitochondrial Translation

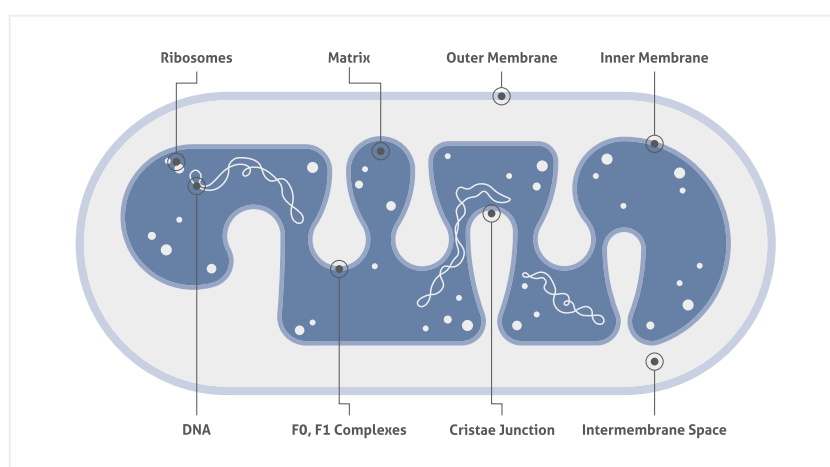
Mitochondrial Protein Import

12

Contact Us

## Mitochondrial Markers

Mitochondria are composed of the inner and outer membranes, the intermembrane space, the cristae, and the matrix, and they contain their own DNA separated from the nucleus. Knowledge of the subcellular location of a protein may reveal the potential role it plays in a variety of cellular processes. Colocalization with one of the organelle-specific markers listed here can confirm the subcellular location of a mitochondrial protein of interest.



## Related Antibodies

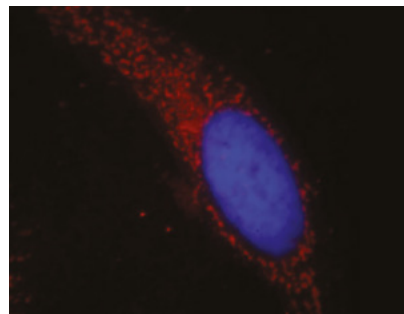
Antibody Name	Catalog Number	Type	Applications
AIF	<b>7</b> 17984-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
AK2	<b>2</b> 11014-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
ALDH1B1	22220-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
ATP5A1	<b>11</b> 14676-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
ATP5F1	<b>5</b> 15999-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
ATP5H	17589-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
BCS1L	60212-1-Ig	Mouse Mono	ELISA, IF, IHC, WB
CLPP	<b>5</b> 15698-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
COX2	<b>26</b> 12375-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
COX5B	<b>2</b> 11418-2-AP	Rabbit Poly	ELISA, IF, IHC, WB
COX7A2L	<b>3</b> 11416-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
COXIV	<b>23</b> 11242-1-AP	Rabbit Poly	ELISA, FC, IF, IHC, IP, WB
COXIV	60251-1-Ig	Mouse Mono	ELISA, FC, IF, IHC, WB
CPT1A	<b>30</b> 15184-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
ECH1	<b>1</b> 11385-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
ECHS1	<b>13</b> 11305-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
ETFA	<b>3</b> 12262-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
FIS1	<b>21</b> 10956-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
GCSH	<b>1</b> 16726-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
GLUD2	14462-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
HADHA	<b>6</b> 10758-1-AP	Rabbit Poly	ELISA, FC, IF, IHC, IP, WB

**00** This number shows the amount of times our antibody has been cited in a publication.

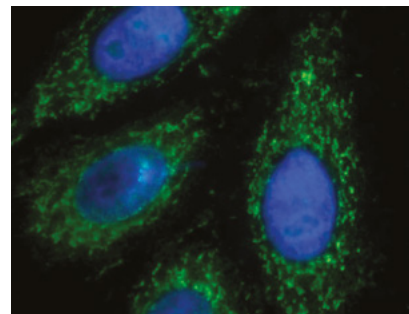
## Related Antibodies

Antibody Name	Catalog Number	Type	Applications
HSP60	<b>2</b> 66041-1-Ig	Mouse Mono	ELISA, FC, IF, IHC, WB
MFF	<b>19</b> 17090-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
MFN2	<b>8</b> 12186-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
Mitofilin	<b>13</b> 10179-1-AP	Rabbit Poly	ELISA, FC, IF, IHC, WB
NDUFV2	15301-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
NLRX1	<b>4</b> 17215-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
ATP50	10994-1-AP	Rabbit Poly	ELISA, FC, IF, IHC, WB
OXCT1	<b>6</b> 12175-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
PMPCB	<b>2</b> 16064-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
SLC25A20	19363-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
SMCR7L	<b>12</b> 20164-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
SURF1	15379-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
SYNJ2BP	15666-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
TOM20	<b>17</b> 11802-1-AP	Rabbit Poly	ELISA, FC, IHC, IP, WB
TOM40	<b>2</b> 18409-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
UQCRC1	21705-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB

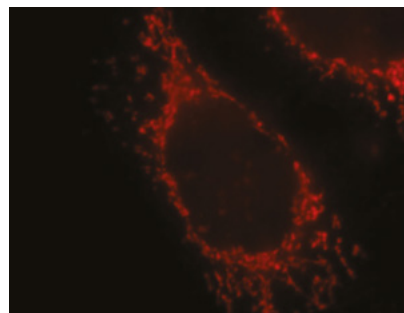
**00** This number shows the amount of times our antibody has been cited in a publication.



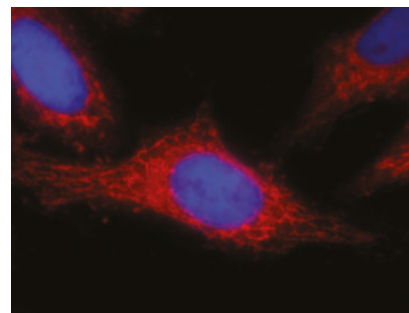
IF analysis of HeLa cells, using HSPD1 antibody (66041-1-Ig) at a dilution of 1:50 and Rhodamine-labeled goat anti-mouse IgG (red).



IF analysis of HepG2 cells, using AIFM1 antibody (17984-1-AP) at a dilution of 1:50 and FITC-labeled donkey anti-rabbit IgG (green).



IF analysis of MCF-7 cells, using SCOT antibody (12175-1-AP) at a dilution of 1:50 and Rhodamine-labeled goat anti-mouse IgG (red).



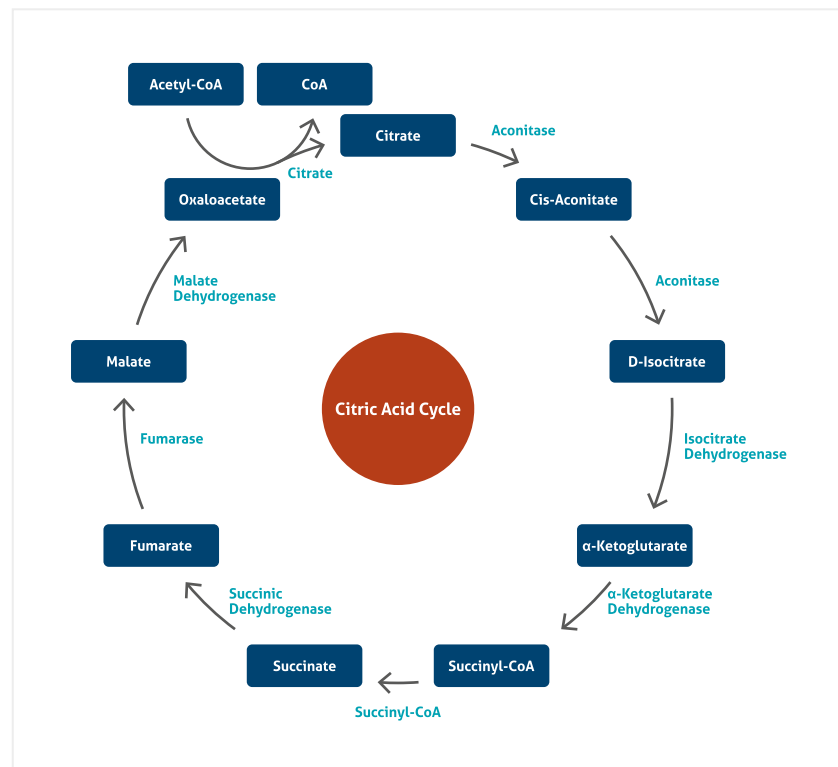
IF analysis of HepG2 cells, using TOMM40 antibody (18409-1-AP) at dilution of 1:25 and Rhodamine-Goat anti-Rabbit IgG (red).



## Citric Acid Cycle

The citric acid cycle – also known as the tricarboxylic acid (TCA) cycle or the Krebs cycle – is a series of chemical reactions used by all aerobic organisms to generate energy through the oxidation of acetate derived from carbohydrates, fats, and proteins into carbon dioxide and chemical energy in the form of adenosine triphosphate (ATP). In addition, the cycle provides precursors of certain amino acids as well as the reducing agent NADH that is used in numerous other biochemical reactions.

In eukaryotic cells, the citric acid cycle occurs in the matrix of the mitochondrion. The reactions of the cycle are carried out by 8 enzymes that completely oxidize acetate, in the form of acetyl-CoA, into water and two molecules of carbon dioxide.



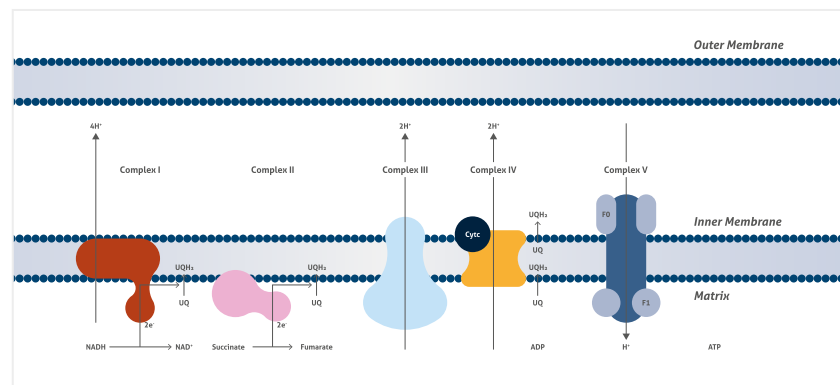
## Related Antibodies

Antibody Name	Catalog Number	Type	Applications
Aconitase 2	<b>2</b> 11134-1-AP	Rabbit Poly	ELISA, IHC, WB
Citrate synthase	<b>12</b> 16131-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
DLD	<b>1</b> 16431-1-AP	Rabbit Poly	ELISA, IHC, IP, WB
Fumarase	<b>3</b> 11375-1-AP	Rabbit Poly	ELISA, IHC, IP, WB
IDH2	<b>6</b> 15932-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
IDH3A	<b>2</b> 15909-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
MDH1	<b>4</b> 15904-1-AP	Rabbit Poly	ELISA, FC, IF, IP, WB
OGDH	<b>4</b> 15212-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
OGDHL	<b>1</b> 17110-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
SdhA	<b>4</b> 14865-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB

**00** This number shows the amount of times our antibody has been cited in a publication.

## Mitochondrial Respiratory Complexes

Cellular respiration is the process that releases energy from food and supplies energy for life processes. The mitochondrial respiratory chain is the final and most important step for cellular respiration and is located on the inner membrane of the mitochondrion and comprises four large trans-membrane protein complexes (respiratory chain Complexes I, II, III, and IV) (CI, CII, CIII, CIV) as well as ubiquinone between CI/II and III and cytochrome c between CIII and IV. The function of the mitochondrial respiratory chain is biological oxidation by transferring electrons from NADH and succinate to oxygen and then generating proton gradient across the inner membrane.



## Related Antibodies

### Complex I Related Antibodies

Antibody Name	Catalog Number	Type	Applications
NDUFS7	<b>2</b> 15728-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
NDUFS3	<b>6</b> 15066-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
NDUFV1	<b>3</b> 11238-1-AP	Rabbit Poly	ELISA, IHC, WB
NDUFS1	<b>6</b> 12444-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
ND1	<b>3</b> 19703-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
NDUFA4L2	<b>2</b> 16480-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
NDUFV3	<b>1</b> 13430-1-AP	Rabbit Poly	ELISA, IHC, WB

### Complex II Related Antibodies

Antibody Name	Catalog Number	Type	Applications
SdhA	<b>1</b> 14865-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
SdhB	10620-1-AP	Rabbit Poly	ELISA, IHC, IP, WB
SdhC	14575-1-AP	Rabbit Poly	ELISA, IHC, WB

**00** This number shows the amount of times our antibody has been cited in a publication.

[Continue for further related antibodies](#)

## Related Antibodies

Complex III Related Antibodies				
Antibody Name		Catalog Number	Type	Applications
CYC1	9	10242-1-AP	Rabbit Poly	ELISA, IHC, WB
UQCRFS1	1	18443-1-AP	Rabbit Poly	ELISA, IHC, IP, WB
UQCRC1	4	21705-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
UQCRB	3	10756-1-AP	Rabbit Poly	ELISA, IHC, IP, WB
UQCRQ	1	14975-1-AP	Rabbit Poly	ELISA, IHC, WB

Complex IV Related Antibodies				
Antibody Name		Catalog Number	Type	Applications
COX1	1	13393-1-AP	Rabbit Poly	ELISA, IHC, WB
COX2	2	55070-1-AP	Rabbit Poly	ELISA, FC, IHC, WB
COXIV	13	11242-1-AP	Rabbit Poly	ELISA, FC, IF, IHC, IP, WB
COX412	5	11463-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
COX5a	4	11448-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
COX5b	2	11418-2-AP	Rabbit Poly	ELISA, IF, IHC, WB
COX6a2	1	11421-1-AP	Rabbit Poly	ELISA, WB
COX7a1	2	11413-1-AP	Rabbit Poly	ELISA, IF, IHC, WB

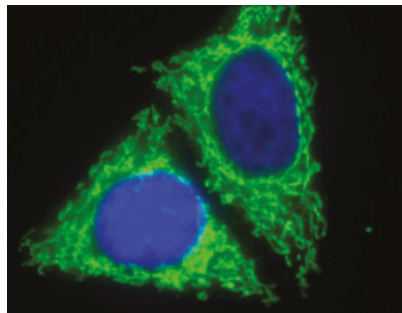
Complex V Related Antibodies				
Antibody Name		Catalog Number	Type	Applications
ATP5A1	11	14676-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
ATP5A1	1	66037-1-Ig	Mouse Mono	ELISA, FC, IF, IHC, WB
ATP5B	5	17247-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
ATP5F1	5	15999-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
ATP6AP2	1	10926-1-AP	Rabbit Poly	ELISA, IHC, WB

00 This number shows the amount of times our antibody has been cited in a publication.

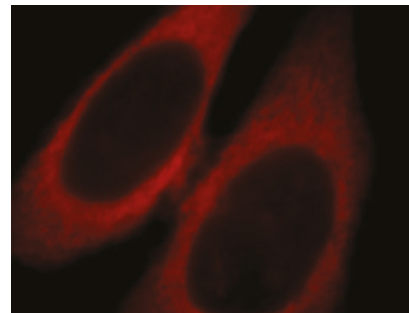
## Mitochondrial Fission

Mitochondria are integral to cellular function and are responsible for energy production in eukaryotes, synthesis of metabolites, phospholipids, and heme, and maintenance of calcium homeostasis. Mitochondria are remarkably dynamic organelles undergoing frequent fusion and fission events. The opposing processes of fission and fusion maintain mitochondrial morphology and it is this equilibrium that ensures maintenance of mtDNA and metabolic mixing, bioenergetic functionality, and organelle number.

### Related Antibodies



IF analysis of (10% Formaldehyde) fixed HepG2 cells using MFF antibody (17090-1-AP) at dilution of 1:100 and Alexa Fluor 488-conjugated AffiniPure Goat Anti-Rabbit IgG(H+L) (green).



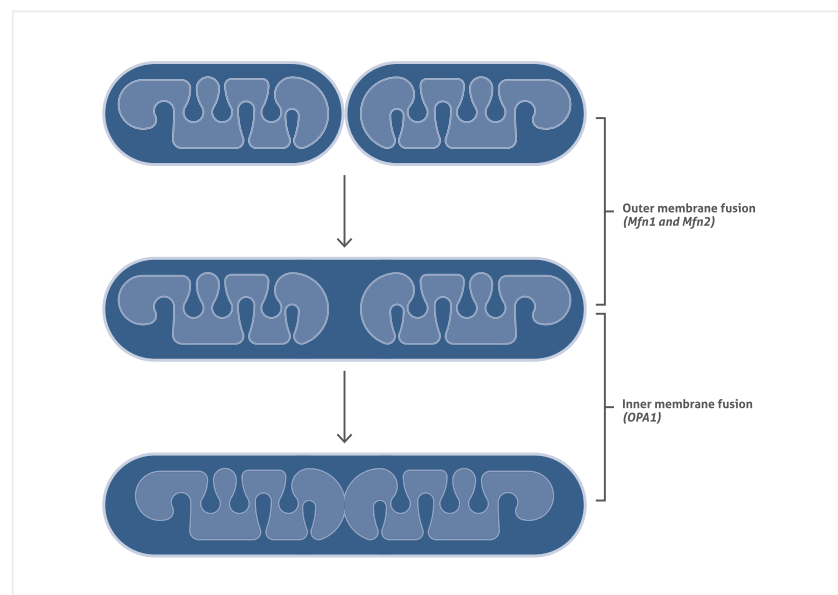
IF analysis of HeLa cells, using SMCR7L antibody (20164-1-AP) at 1:25 dilution and Rhodamine-labeled goat anti-rabbit IgG (red).

## Mitochondrial Fusion

Mitochondrial fusion occurs in three stages:

1. Docking of two mitochondria via their outer membranes.
2. Fusion of outer membranes
3. Fusion of inner membranes.

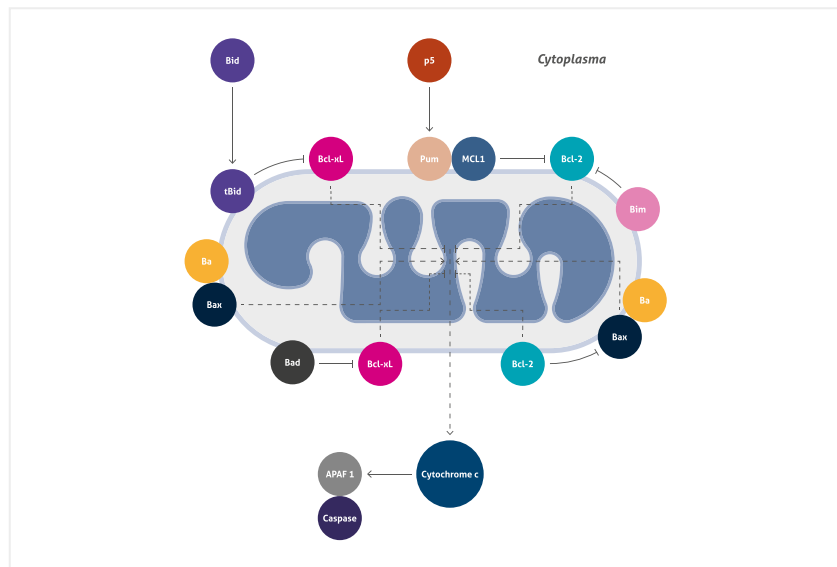
The first two stages are mediated by the mitofusion proteins: Mfn1 and Mfn2 in mammals. The next stage – fusion of the inner mitochondrial membranes – is mediated by the dynamin-related GTPase OPA1.





## Mitochondrial Mediated Apoptosis

Apoptosis is the process of programmed cell death (PCD) that plays a central role in animal development and tissue homeostasis. There are two major apoptotic pathways known to date, initiated by either the mitochondria (the 'intrinsic' pathway) or the cell surface receptors (the 'extrinsic' pathway). Mitochondria-mediated apoptosis occurs in response to a wide range of death stimuli, including activation of tumor suppressor proteins (such as p53) and oncogenes (such as c-Myc), DNA damage, chemotherapeutic agents, serum starvation, and ultraviolet radiation.



This pathway is initiated within the cell and results in increased mitochondrial permeability leading to release of pro-apoptotic molecules Cytochrome c into the cytoplasm.

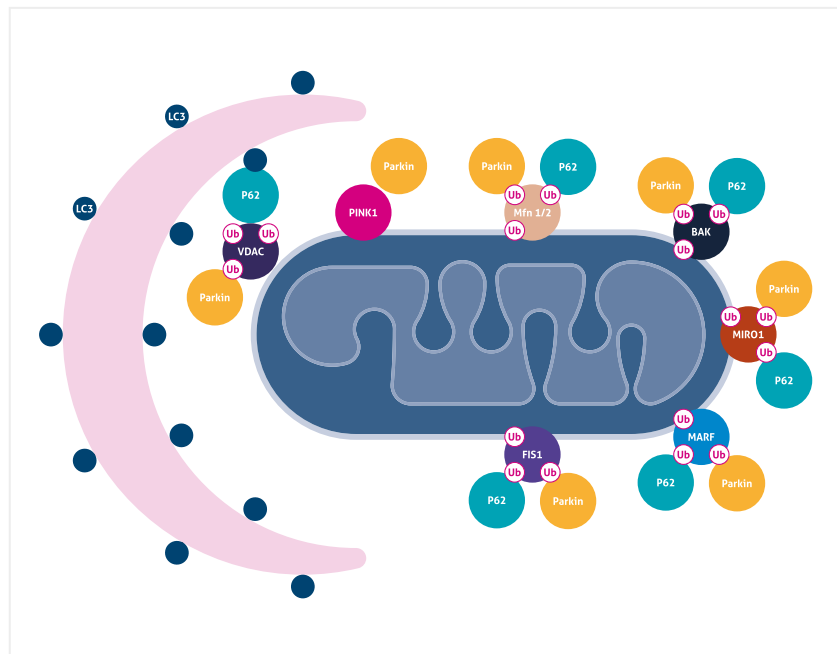
## Related Antibodies

Antibody Name	Catalog Number	Type	Applications
Bcl-2	<b>128</b> 12789-1-AP	Rabbit Poly	ELISA, FC, IF, IHC, IP, WB
Bcl-2	<b>4</b> 60178-1-Ig	Mouse Mono	ELISA, FC, IHC, IP, WB
Bcl-xL	<b>39</b> 10783-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
Bcl-xL	66020-1-Ig	Mouse Mono	ELISA, IF, IHC, WB
Cytochrome c	<b>2</b> 10993-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
Cytochrome c	66264-1-Ig	Mouse Mono	ELISA, IHC, WB
Bad	<b>6</b> 10435-1-AP	Rabbit Poly	ELISA, IHC, WB
Bid	<b>16</b> 10988-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
Bid	60301-1-Ig	Mouse Mono	ELISA, IF, WB
Bax	<b>122</b> 50599-2-Ig	Rabbit Poly	ELISA, FC, IF, IHC, IP, WB
Bax	<b>9</b> 23931-1-AP	Rabbit Poly	ELISA, IHC, WB
Bax	<b>2</b> 60267-1-Ig	Mouse Mono	ELISA, WB
PUMA	<b>2</b> 55120-1-AP	Rabbit Poly	ELISA, IHC, IP, WB
APAF 1	<b>5</b> 21710-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
MCL1	<b>11</b> 16225-1-AP	Rabbit Poly	ELISA, IHC, IP, WB
MCL1	<b>2</b> 66026-1-Ig	Mouse Mono	ELISA, IF, IHC, WB

**00** This number shows the amount of times our antibody has been cited in a publication.

## Mitochondrial Autophagy

Mitochondrial autophagy is the process of selective removal of damaged mitochondria by autophagosomes and subsequent catabolism by lysosomes. One common mechanism is that mitochondrial depolarization results in PINK1 stabilization and Parkin recruitment to the mitochondria. Parkin can ubiquitinate Mitofusins 1 and 2 (MFN1 and 2), hexokinases, TOM complex components, FIS1, BAK, MIRO, as well as VDAC, which may either be degraded through the proteasome or serve as binding partners for p62. p62 may in turn act as an adaptor molecule through direct interaction with LC3 to recruit autophagosomal membranes to the mitochondria. Parkin can also interact with Ambra1, which in turn activates the PI3K complex around mitochondria to facilitate selective mitophagy.



## Related Antibodies

Antibody Name	Catalog Number	Type	Applications
BAK	<b>22</b> 14673-1-AP	Rabbit Poly	ELISA, IF, IHC, WB
Beclin 1	<b>37</b> 11306-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
FIS1	<b>21</b> 10956-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
Mfn1	<b>7</b> 13798-1-AP	Rabbit Poly	ELISA, IHC, WB
Mfn2	<b>8</b> 12186-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
NDP52	<b>1</b> 12229-1-AP	Rabbit Poly	ELISA, IHC, IP, WB
OPTN	<b>7</b> 10837-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
p62	<b>37</b> 18420-1-AP	Rabbit Poly	ELISA, FC, IF, IHC, IP, WB
Parkin	<b>1</b> 14060-1-AP	Rabbit Poly	ELISA, IF, WB
PINK1	<b>1</b> 23274-1-AP	Rabbit Poly	ELISA, WB
VDAC1	<b>16</b> 10866-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
VDAC2	<b>5</b> 11663-1-AP	Rabbit Poly	ELISA, IF, IHC, IP, WB
VDAC3	55260-1-AP	Rabbit Poly	ELISA, IHC, IP, WB

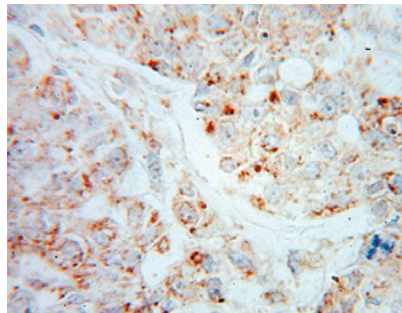
**00** This number shows the amount of times our antibody has been cited in a publication.

## Mitochondrial Translation

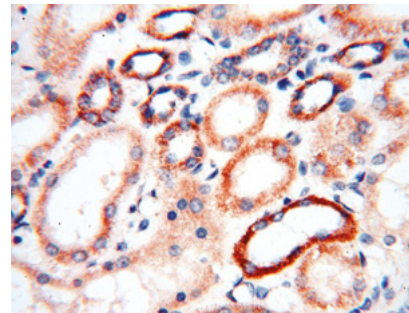
The mitochondria contain their own DNA separated from the nucleus. During the course of evolution, most of the mitochondrial protein-coding genes have been transferred to the nuclear genome. However, a few genes have been retained in the genome of the modern organelle.

We now know that the mitochondrial genome (mtDNA), which is housed in the mitochondrial matrix, contains the blueprint for thirteen proteins and all the RNA molecules believed to be necessary and sufficient for intra-mitochondrial protein synthesis. All the other required components for intra-mitochondrial protein synthesis are imported from the cytosol after their synthesis in the cytoplasm. Central to the process of mitochondrial protein synthesis is the mitochondrial ribosome.

### Related Antibodies



*IHC of paraffin-embedded human breast cancer, using MRPS18B antibody (16139-1-AP) at dilution of 1:50 (40x objective).*



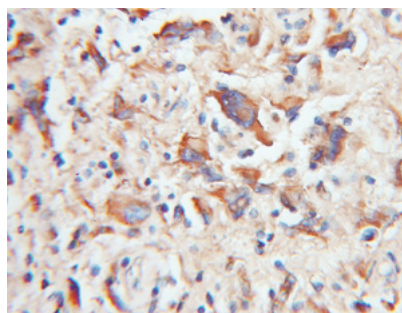
*IHC of paraffin-embedded human kidney, using MRPS27 antibody (17280-1-AP) at dilution of 1:100 (40x objective).*

## Mitochondrial Protein Import

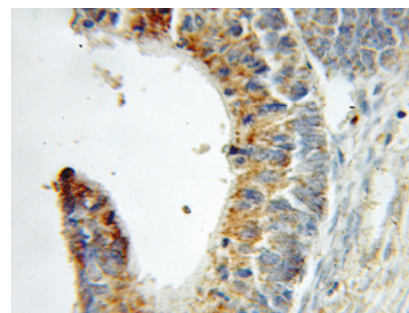
Though mitochondria possess their own genome and translation machinery, only a small number of mitochondrial proteins, including a few core constituents of the respiratory chain complexes, are encoded by mtDNA and synthesized within the organelle. Thus, the vast majority of mitochondrial proteins are nuclear-encoded and have to be imported into the organelle.

Upon synthesis on free ribosomes, mitochondrial precursor proteins reach the surface of the organelle in a process that is guided by cytosolic chaperones. Subsequently, they are imported by specialized protein import machineries and sorted to the designated submitochondrial destination in the outer membrane, inner membrane, intermembrane space, or matrix.

### Related Antibodies



*IHC of paraffin-embedded human gliomas, using TOM20 antibody (11802-1-AP) at a dilution of 1:100 (10x objective).*



*IHC of paraffin-embedded human ovary tumor, using TIMM23 antibody (11123-1-AP) at a dilution of 1:50 (10x objective).*

# CONTACT US

<b>Proteintech Group</b> <i>US Head Office</i>	<b>PHONE</b>	1 (888) 4PTGLAB (1-888-478-4522) (toll free in USA), or 1(312) 455-8498 (outside USA)
	<b>FAX</b>	1 (312) 455-8408
	<b>ADDRESS</b>	Proteintech Group, Inc. 5400 Pearl Street, Suite 300, Rosemont, IL 60018, USA
	<b>EMAIL</b>	proteintech@ptglab.com

<b>Proteintech Europe</b> <i>United Kingdom</i>	<b>PHONE</b>	+44 (161) 8393007
	<b>FAX</b>	+44 (161) 2413103
	<b>ADDRESS</b>	Proteintech Europe, Ltd. 4th Floor, 196 Deansgate, Manchester, M3 3WF
	<b>EMAIL</b>	europe@ptglab.com

<b>Proteintech Europe</b> <i>Germany</i>	<b>EMAIL</b>	germany@ptglab.com
	<b>Sales and technical support only.</b>	

<b>Proteintech</b> <i>China Office</i>	<b>PHONE</b>	027-87531629 or 4006-900-926
	<b>FAX</b>	027-87531627
	<b>ADDRESS</b>	Wuhan Sanying Biotechnologies D3-3, No.666 Gaoxin Avenue, Wuhan East Lake Hi-tech Development Zone Wuhan, Hubei, P.R.C
	<b>EMAIL</b>	service@ptglab.com

## Support

Available 24 hours via Live Chat and 9-5 (CDT) via phone.

Email support also available.

**LIVE CHAT**  
[www.ptglab.com](http://www.ptglab.com)

**TWITTER**  
[@proteintech](https://twitter.com/proteintech)

**BLOG**  
[www.ptglab.com/news/blog](http://www.ptglab.com/news/blog)

**YOUTUBE**  
[www.youtube.com/Proteintech](http://www.youtube.com/Proteintech)



We are ISO 9001 and ISO 13485 accredited.