

# Cytoskeleton

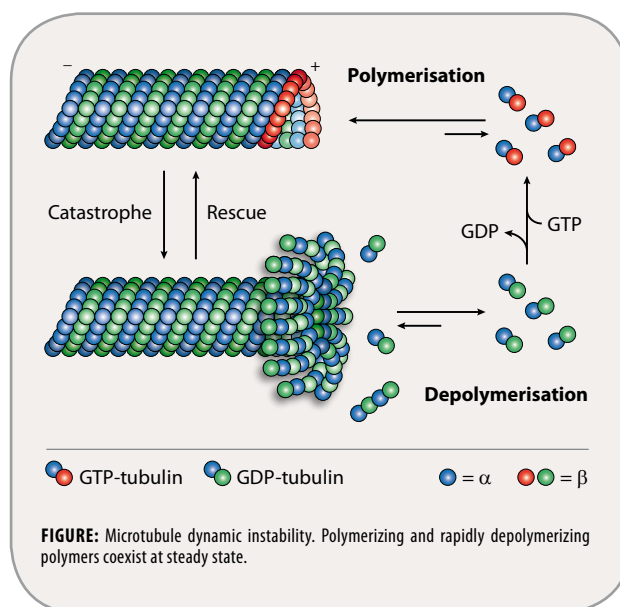
## Focus: Microtubules

The internal organization, shape, motility and life cycle of eukaryotic cells are all controlled by a complex network of polymeric filaments called the cytoskeleton, which includes actin filaments, intermediate filaments and microtubules. These polymers have important roles in arranging and maintaining the integrity of intracellular compartments.

Microtubules are the largest cytoskeletal components involved in intracellular transport (cell signaling), cell migration/trafficking, cell division and proliferation. Microtubules control differentiative processes involving intracellular rearrangements and changes in morphology. Complex microtubule structures form the core components of centrosomes and the centrioles important for mitosis, and the core structures of cilia and flagella, which are called axonemes. Despite their functional diversity, all microtubules are assembled from heterodimers of  $\alpha$ -tubulin and  $\beta$ -tubulin. Soluble  $\alpha$ -tubulin- $\beta$ -tubulin dimers polymerize into polar microtubules in the presence of GTP.

Understanding of the cell structure and function is essential for gaining deeper knowledge of normal pathways such as morphogenesis, wound healing, neurogenesis and immune response, as well as abnormal processes such as metastasis and tumor-related angiogenesis.

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**FIGURE:** Microtubule dynamic instability. Polymerizing and rapidly depolymerizing polymers coexist at steady state.

### SELECTED REVIEW ARTICLES

Post-translational regulation of the microtubule cytoskeleton: mechanisms and functions: C. Janke & J.C. Bulinski; *Nat. Rev. Mol. Cell Biol.* **12**, 773 (2011) • Rab GTPases and microtubule motors: C.P. Horgan & M.W. McCaffrey; *Biochem. Soc. Trans.* **39**, 1202 (2011) • Microtubule +TIPs at a glance: A. Akhmanova & M.O. Steinmetz; *J. Cell Sci.* **123**, 3415 (2010)

### Highlight!

#### anti-Tubulin-GTP, mAb (rec.) (MB11)

AG-27B-0009-C100

100  $\mu$ g

**CLONE:** MB11 **ISOTYPE:** Human IgG2b $\lambda$  **IMMUNOGEN:** Full length GTP- $\lambda$ -S loaded tubulin from pig brain. **SPECIFICITY:** Recognizes human, mouse, rat and drosophila tubulin-GTP. **APPLICATION:** ICC

**LIT:** A. Dimitrov, et al.; *Science* **322**, 1353 (2008) • T. Nakata, et al.; *J. Cell Biol.* **194**, 245 (2011)

# New Recombinant Antibodies for Cytoskeletal Research

## anti- $\alpha$ -Tubulin, mAb (rec.) (F2C)

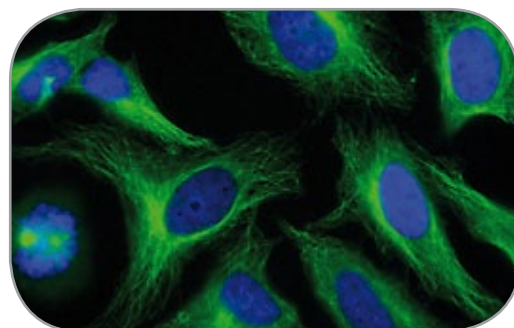
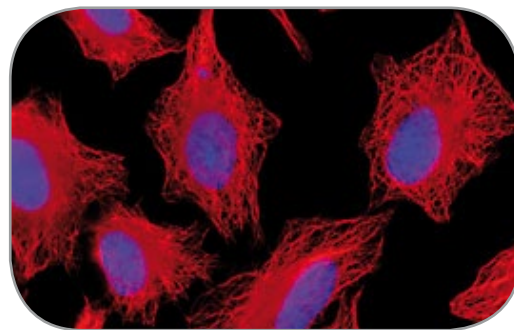
|                    |          |             |
|--------------------|----------|-------------|
| AG-27B-0005-C100   |          | 100 $\mu$ g |
| AG-27B-0005TD-C100 | ATTO 488 | 100 $\mu$ g |

|                     |  |
|---------------------|--|
| <b>Clone:</b>       | F2C  |
| <b>Isotype:</b>     | Human IgG2b $\lambda$                                |
| <b>Immunogen:</b>   | Bovine brain tubulin                                 |
| <b>Specificity:</b> | Recognizes human, mouse and bovine $\alpha$ -tubulin |
| <b>Application:</b> | ICC, WB (only AG-27B-0005)                           |

**LIT:** C. Nizak, et al.; *Traffic* 7, 739 (2003) • O. Vielemeyer, et al; *BMC Biotechnol.* 10, 59 (2010)

**FIGURE:** Human  $\alpha$ -tubulin is detected by immunocytochemistry using anti- $\alpha$ -tubulin, mAb (rec.) (F2C) (Prod. No. AG-27B-0005). Picture courtesy of Dr. Sandrine Moutel & Dr. Franck Perez Lab, Curie Institute, Paris.

**FIGURE:** Human  $\alpha$ -tubulin is detected by immunocytochemistry using anti- $\alpha$ -tubulin, mAb (rec.) (F2C) (ATTO 488) (Prod. No. AG-27B-0005TD). Picture courtesy of Dr. Sandrine Moutel & Dr. Franck Perez Lab, Curie Institute, Paris.



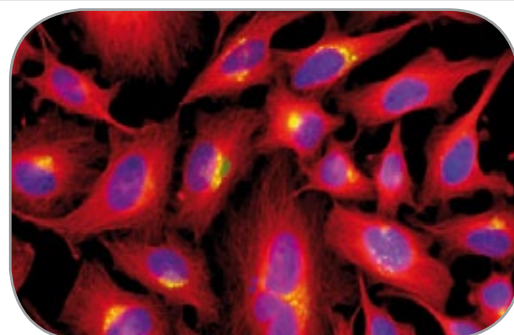
## anti- $\beta$ -Tubulin, mAb (rec.) (S11B)

|                  |  |             |
|------------------|--|-------------|
| AG-27B-0008-C100 |  | 100 $\mu$ g |
|------------------|--|-------------|

|                     |   |
|---------------------|---|
| <b>Clone:</b>       | S11B  |
| <b>Isotype:</b>     | Human IgG2b $\lambda$   |
| <b>Immunogen:</b>   | Full length tubulin from pig brain  |
| <b>Specificity:</b> | Recognizes human, mouse, rat, pig, drosophila and monkey $\beta$ -tubulin |
| <b>Application:</b> | ELISA, ICC, WB  |

**LIT:** C. Nizak, et al.; *Traffic* 7, 739 (2003)

**FIGURE:** Human  $\beta$ -tubulin is detected by immunocytochemistry using anti- $\beta$ -tubulin, mAb (rec.) (S11B) (Prod. No. AG-27B-0008). Picture courtesy of Dr. Sandrine Moutel & Dr. Franck Perez Lab, Curie Institute, Paris.



## anti-Giantin, mAb (rec.) (TA10)

|                    |          |             |
|--------------------|----------|-------------|
| AG-27B-0003-C100   |          | 100 $\mu$ g |
| AG-27B-0003TD-C100 | ATTO 488 | 100 $\mu$ g |

|                     |  |
|---------------------|--|
| <b>Clone:</b>       | SF9  |
| <b>Isotype:</b>     | Human IgG2b $\lambda$  |
| <b>Immunogen:</b>   | Full length myosin IIA from rat liver                                |
| <b>Specificity:</b> | Recognizes human, mouse, rat and drosophila myosin IIA (heavy chain) |
| <b>Application:</b> | ELISA, ICC, WB, EM   |

**LIT:** C. Nizak, et al.; *Traffic* 7, 739 (2003)

## anti-Myosin IIA (non-muscle) (HC), mAb (rec.) (SF9)

|                  |  |             |
|------------------|--|-------------|
| AG-27B-0010-C100 |  | 100 $\mu$ g |
|------------------|--|-------------|

|                     |  |
|---------------------|--|
| <b>Clone:</b>       | SF9  |
| <b>Isotype:</b>     | Human IgG2b $\lambda$  |
| <b>Immunogen:</b>   | Full length myosin IIA from rat liver                                |
| <b>Specificity:</b> | Recognizes human, mouse, rat and drosophila myosin IIA (heavy chain) |
| <b>Application:</b> | ELISA, ICC, WB, EM   |

**LIT:** C. Nizak, et al.; *Traffic* 7, 739 (2003)

## Rab1 and Rab6 are involved in Autophagy and ER stress (UPR)

Rab proteins, members of the small GTPase superfamily, are important regulators of vesicle transport via interactions with effector proteins and motor proteins. Rab1 and 6 are implicated in anterograde and retrograde trafficking in the secretory pathway. Recently, Rab1 has been shown to be involved in the formation of the pre-autophagosomal isolation membrane (phagophore). Rab6 also functions as modulator of the unfolded protein response (UPR), helping the recovery from an ER stress insult. Rab6 is upregulated in Alzheimer's disease brain.

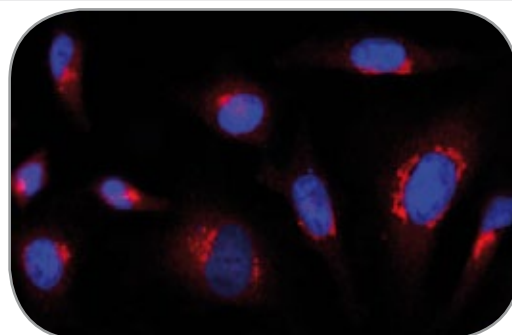
**LIT:** Rab GTPases and microtubule motors: C.P. Horgan & M.W. McCaffrey; *Biochem. Soc. Trans.* **39**, 1202 (2011) • Involvement of members of the Rab family and related small GTPases in autophagosome formation and maturation. C.E. Chua, et al.; *Cell Mol. Life Sci.* **68**, 3349 (2011) • Rab6 is a Modulator of the Unfolded Protein Response: Implications for Alzheimer's Disease. H.L. Elfrink, et al.; *J. Alzh. Disease* **28**, 1 (2011)

### anti-Rab1-GTP, mAb (rec.) (ROF7)

|                     |   |
|---------------------|---|
| AG-27B-0006-C100    | 100 µg  |
| <b>Clone:</b>       | ROF7  |
| <b>Isotype:</b>     | Human IgG2b $\lambda$   |
| <b>Immunogen:</b>   | Full length canine Rab1   |
| <b>Specificity:</b> | Recognizes human, mouse, rat and canine Rab1a-GTP and Rab1b-GTP |
| <b>Application:</b> | ICC, IP   |

**LIT:** O. Vielemeyer, et al; *BMC Biotechnol.* **10**, 59 (2010)

**FIGURE:** Rab1-GTP is detected by immunocytochemistry using anti-Rab1-GTP, mAb (ROF7) (Prod. No. AG-27B-0006). Picture courtesy of Dr. Sandrine Moutel & Dr. Franck Perez Lab, Curie Institute, Paris.

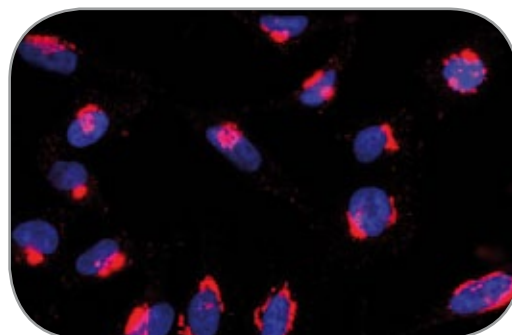


### anti-Rab6-GTP, mAb (rec.) (AA2)

|                     |  |
|---------------------|--|
| AG-27B-0004-C100    | 100 µg   |
| AG-27B-0004TD-C100  | ATTO 488<br>100 µg   |
| <b>Clone:</b>       | AA2  |
| <b>Isotype:</b>     | Human IgG2b $\lambda$  |
| <b>Immunogen:</b>   | Recombinant Rab6AQ72L, a GTP-locked mutant of Rab6A in which Gln72 is replaced by Leu                          |
| <b>Specificity:</b> | Recognizes human, mouse and drosophila GTP-bound Rab6a and Rab6b and mutant Rab6Q72L. Does not detect Rab6-GDP |
| <b>Application:</b> | ICC, WB (only AG-27B-0004)   |

**LIT:** C. Nizak, et al.; *Science* **300**, 984 (2003) • E. Del Nery, et al.; *Traffic* **7**, 394 (2006) • O. Vielemeyer, et al; *BMC Biotechnol.* **10**, 59 (2010)

**FIGURE:** Rab6-GTP is detected by immunocytochemistry using anti-Rab6-GTP, mAb (AA2) (Prod. No. AG-27B-0004). Picture courtesy of Dr. Sandrine Moutel & Dr. Franck Perez Lab, Curie Institute, Paris.



## Polyglutamylation

Polyglutamylation consists in the progressive addition of Glu residues onto the  $\gamma$ -carboxyl group of one or more Glu residues. This generates multiple negative charges that regulate the interaction of microtubules with other proteins, including both microtubule-associated proteins (MAPs) and molecular motors. Polyglutamylation may regulate microtubule stability and has a key role in neurons. Increased levels of tubulin polyglutamylation have been reported in cancer cells. Identification of polyglutamylation on substrates other than tubulin indicates that this modification could be a potential regulator of diverse cellular processes (cell cycle and cell proliferation).

**LIT:** Post-translational regulation of the microtubule cytoskeleton: mechanisms and functions. C. Janke & J.C. Bulinski; *Nat. Rev. Mol. Cell Biol.* **12**, 773 (2011)

### anti-Polyglutamylation Modification, mAb (GT335)

|                     |   |
|---------------------|---|
| AG-20B-0020-C100    | 100 µg  |
| AG-20B-0020B-C100   | Biotin<br>100 µg  |
| <b>Clone:</b>       | GT335   |
| <b>Isotype:</b>     | Mouse IgG1 $\kappa$   |
| <b>Immunogen:</b>   | Octapeptide EGEGE*EEG, modified by the addition of two glutamyl units onto the fifth E (indicated by an asterisk) |
| <b>Specificity:</b> | All Species   |
| <b>Application:</b> | ICC, IP, WB   |

**LIT:** J. van Dijk, et al.; *J. Biol. Chem.* **283**, 3915 (2008)

# Microtubule and F-actin Modulators



Microtubules and F-actin have key roles that are important in cell proliferation, trafficking, signaling and migration in eukaryotic cells. Modulators of microtubules (polymerization and depolymerization) and F-actin are desirable targets for the development of chemotherapeutic agents directed against rapidly dividing cancer cells due to their antimetabolic activity.

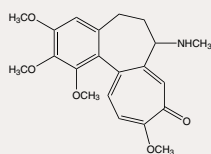
## Microtubule Modulators

### Colcemid (Microtubule assembly inhibitor)

AG-CR1-3567

1 mg | 5 mg

Formula:  $C_{21}H_{25}NO_5$   
MW: 371.4



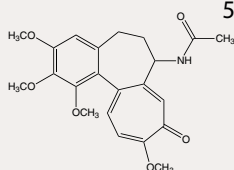
**BULK available!**

### Colchicine (Microtubule assembly inhibitor)

AG-CN2-0048

500 mg | 1 g

Formula:  $C_{22}H_{25}NO_6$   
MW: 399.4



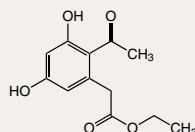
**BULK available!**

### Curvulin (Microtubule assembly inhibitor)

BVT-0097

1 mg | 5 mg

Formula:  $C_{12}H_{14}O_5$   
MW: 238.2

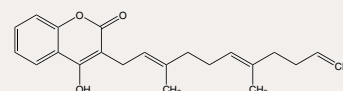


### Ferulenol (Stimulator of tubulin polymerisation)

AG-CN2-0011

1 mg | 5 mg | 10 mg

Formula:  $C_{24}H_{30}O_3$   
MW: 366.5

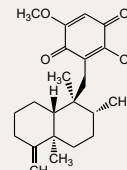


### Ilimaquinone (Microtubule inhibitor)

AG-CN2-0038

100 µg

Formula:  $C_{22}H_{30}O_4$   
MW: 358.5

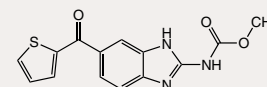


### Nocodazole (Tubulin depolymerization promoter)

AG-CR1-0019

5 mg | 10 mg | 25 mg | 50 mg

Formula:  $C_{14}H_{11}N_3O_3S$   
MW: 301.3



**BULK available!**

## F-actin Modulators

### Latrunculin A

AG-CN2-0027

**BULK available!**

100 µg | 500 µg

### Latrunculin B

AG-CN2-0031

**BULK available!**

1 mg

### 16-epi Latrunculin B

AG-CN2-0034

100 µg

### Jasplakinolide

AG-CN2-0037

50 µg | 100 µg

### Swinholide A

AG-CN2-0035

**BULK available!**

10 mg | 50 mg

### Dynasore

AG-CR1-0045

**BULK available!**

5 mg | 25 mg

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