



# Pavel Dráber

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LABORATORY OF

## BIOLOGY OF CYTOSKELETON

modulation of microtubule organization, microtubule proteins,  $\gamma$ -tubulin, signal transduction

### In the picture:

1. Vadym Sulimenko | 2. Tetyana Sulimenko | 3. Vladimíra Sládková | 4. Irena Michová | 5. Ladislav Čupák | 6. Anastasiya Klebanovych | 7. Pavel Dráber | 8. Zuzana Hájková | 9. Eduarda Dráberová

### Not in the picture:

Jana Uhlířová | Markéta Černohorská | Věra Vosecká

The long-term research programme of the laboratory has been focused on studying the structure-function relationships of microtubule (MT) proteins in cells under normal and pathological conditions. The organization of dynamic MT networks is controlled by MT organizing centres (MTOCs). One of the key components of MTOCs is  $\gamma$ -tubulin, which is necessary for nucleation of MT. Our current work focuses on understanding the modulation of MT nucleation by signal transduction molecules. Our results demonstrate that G protein-coupled receptor kinase-interacting protein 1 (GIT1), p21-activated kinase interacting exchange factor ( $\beta$ PIX), and p21 protein [Cdc42/Rac]-activated kinase 1 (PAK1) are in complexes with  $\gamma$ -tubulin in various cell lines and associate with centrosomes. Microtubule regrowth and phenotypic rescue experiments showed that GIT1 with PAK1 represent positive regulators, and  $\beta$ PIX a negative regulator of MT nucleation. The regulatory roles of GIT1,  $\beta$ PIX and PAK1 in MT nucleation correlated with recruitment of  $\gamma$ -tubulin to the centrosome. Moreover, in mast cells MT nucleation is modulated by  $Ca^{2+}$ , which affects  $\gamma$ -tubulin binding properties. We have also shown that both human  $\gamma$ -tubulins differ in their properties and expression during neuronal differentiation and under oxidative stress. We have demonstrated that ectopic expressions of  $\gamma$ -tubulin complex proteins GCP2 and GCP3 may represent novel markers in the pathobiology of gliomas.

### Selected recent papers:

Černohorská M, Sulimenko V, Hájková Z, Sulimenko T, Sládková V, Vinopal S, Dráberová E, Dráber P: GIT1/ $\beta$ PIX signaling proteins and PAK1 kinase regulate microtubule nucleation. **BBA Mol. Cell Res.** 1863: 1282-1297, 2016.

Dráberová E, D'Agostino L, Caracciolo V, Sládková V, Sulimenko T, Sulimenko V, Sobol M, Maounis N F, Tzelepis E G, Mahera E, Křen L, Legido A, Giordano A, Mörk S, Hozák P, Dráber P, Katsetos C D: Overexpression and nucleolar localization of  $\gamma$ -tubulin small complex proteins GCP2 and GCP3 in glioblastoma. **J. Neuropathol. Exp. Neurol.** 74: 723-742, 2015.

Sulimenko V, Hájková Z, Černohorská M, Sulimenko T, Sládková V, Dráberová E, Vinopal S, Dráberová E, Dráber P: Microtubule nucleation in mouse bone-marrow derived mast cells is regulated by concerted action of GIT1/ $\beta$ PIX proteins and calcium. **J. Immunol.** 194: 4099-4111, 2015.

