THE FEATURES OF MITOCHONDRIA BEHAVIOUR IN *NEUROSPORA CRASSA* GROWTH

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In the apical zone of the growing *N. crassa* hyphae a series of energy-dependent events take place: the transmembrane transport of ions and metabolites, the exocytosis of vesicle content and endocytosis, cytoskeletal reorganization, the synthesis of chitin and cell wall formation. Not surprisingly, that clusters of mitochondria are found by the various methods in this area. We showed that Mitotracker Red (MTR) mitochondria specific probe capable of covalently binding mitochondria matrix proteins can be traced with the hyphae for several hours [1] and studied in details the behavior of mitochondria by means of double staining of mitochondria with potential–dependent MTR and potential–independent Mitotracker Green (MTG) probes and time-lapse microscopy.

We observed the concentration of filamentous mitochondria within 30 μm of apex in growing hyphae. These mitochondrial assemblies propagate forward with the elongation of hyphae, became split and segregated with the bifurcation of the growing tip and were formed *de novo* when new branches were formed farther away from the apex. Mitochondria of *N. crassa* do not move by themselves but are transported along microtubules. In our experiments the features of mitochondrial behavior – their concentration in the growing tip, the link between the efficiency of their accumulation and rate of elongation and behavior in apical and lateral branching – were very similar to that known for microtubules. These observations allow to presume that microtubules play organizing role for mitochondrial associations in the growing tips. The efficiency of mitochondria concentration in the apical 30 μm zone was linked to the growth rate and overall size of mycelium. On the other hand the efficiency of mitochondria concentration was independent of carbon source and was identical in glucose– and sorbitol–containing mediums. These data allowed us to conclude that mitochondria in the growing tip of *N. crassa* are involved primary in sustaining elongation rate.

According to our previous data [2] we can estimate electric field strength generated along the hyphal tip as E = 100 V/m. These estimations combined both with the data on behavior of mitochondria and well–known data concerning molecular aspects of apical growth allow to suggest that electrical gradients in hyphal tips can be one of factors that orchestrate the intercellular interactions during the *N. crassa* tip growth.

References:

1. *Potapova TV, Boitzova LJu, Golyshev SA, Popinako AV*. 2011. Dynamics of mitochondria during *Neurospora crassa* tip growth. Membr Cell Biol **28**:345–353.
2. *Potapova T.V., Aslanidi K.B., Belozerskaya T.A., Levina N.N.* 1988. Transcellular ionic currents studied by intracellular potential recordings in *Neurospora crassa* hyphae. (Transfer of energy from proximal to apical cells) // FEBS Letters **241 (**12), 173–176.