

# Melanophores and microtubule monorails: insights into rapid



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Fish and amphibians are able to change their color rapidly in response to a change of their surroundings. This phenomenon is done by melanophores, containing a pigment cell called melanin, being travelled along microtubules in their cells (Levi, Serpinskaya, Gratton, & Gelfand, 2006, p. 318). A

microtubule, which is made of proteins located in cytoskeleton, is one of three filaments that is long, hollow stiff tube and responsible for intracellular transport. This transport system is driven by kinesin and dynein in

microtubules and myosin in actin filaments, which are called motor proteins.

Gross, Tuma, Deacon, Serpinskaya, Reilein, & Gelfand, 2002, p. 855). To

understand how those movements along microtubules can make the rapid colour change possible, it is necessary first to find out how each component mentioned above carries out their roles in detailed in their specific area.

Melanosomes move along microtubules by protein motors throughout the cell by aggregation and dispersion and the direction of their traveling is also changed frequently.

In microtubules, most kinesins move towards the plus-end of the microtubule, which is called dispersion and dyneins move towards the minus-end of the microtubule, which is called aggregation. (Bouzat, Levi, & Bruno, 2012, p. 1). These dispersion and aggregation of melanosomes are affected by certain hormones such as melatonin and MSH and it make the color of their skin become darker or lighter depending on where they are (Bouzat et al. p. 10). One significant discovery is that those microtubule- and actin-based transport systems are in a tug-of-war.

For instance, microtubule-based transport system can be altered by a loss of myosin function, which is actin-based transport system (Gross et al. , 2002,

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p. 855). This competition regulates their transport functions without a hitch and thus, it allows the movement along microtubules to constantly go on. Due to traveling of melanophores through those two filaments in cytoskeleton by motor proteins, fish, amphibian and reptiles are able to change their color very rapidly. Those are at any times ready for a response to a change of their surroundings and it directly happens as soon as they get something to trigger those functions start working.