Abstract

Increased intracellular pH ([pH]i) activates dynein in sea urchin and mammalian sperm and induces activation of flagellar motility. It is thought that cAMP-dependent protein phosphorylation is associated with motility activation through increasing [pH]i, but little attention has been given to the cAMP-independent phosphorylation also induced by the [pH]i increase. The present study demonstrates that the increase in [pH]i in starfish sperm induces the phosphorylation of axonemal proteins and activation of flagellar motility independently of cAMP. Flagellar motility of intact sperm was activated when the [pH]i was raised by addition of NH4Cl. Histidine, which is known to activate motility of starfish sperm, also raised the [pH]i during the motility activation. In addition, motility of demembranated sperm flagella was activated in a pH-dependent manner without cAMP. These results indicate that in starfish sperm it is the increase in [pH]i that induces activation of flagellar motility. Moreover, phosphorylation of axonemal proteins (of molecular mass 25, 32 and 45 kDa) was observed during the pH-dependent and cAMP-independent motility activation of demembranated sperm. This suggests that the increase in [pH]i regulates flagellar motility via cAMP-independent phosphorylation of axonemal proteins.

http://jeb.biologists.org/content/208/23/4411.short