For bats and dolphins, hearing gene prestin adapted for echolocation

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A little over a decade ago, prestin was found to be a key gene responsible for hearing in mammals. Prestin makes a protein found in the hair cells of the inner ear that contracts and expands rapidly to transmit signals that help the cochlea, like an antique phonograph horn, amplify sound waves to make hearing more sensitivity.

Now, in a new study published in the advanced online edition of *Molecular Biology and Evolution*, Peng Shi, et al., have shown that prestin has also independently evolved to play a critical role in the ultrasonic hearing range of animal sonar, or echolocation, to help dolphins navigate through murky waters or bats find food in the dark.

Although both toothed whales and echolocating bats can emit high frequency echolocation calls, which show a substantial diversity in terms of their shape, duration, and amplitude, they receive and analyze the echoes returned from objects by their high-frequency hearing. The research team finely dissected the function of the prestin protein from 2 sonar guided bats and the bottlenose dolphin compared with non-sonar mammals.

Evolutionary analyses of the prestin protein sequences showed that a single amino acid change in prestin, from a threonine (Thr or T) in all sonar mammals to an asparagine (Asn or N) in all non-sonar mammals, was subject to parallel evolution, suggesting that it may play a critical role for mammalian echolocation. Further experiments supported this assumption and identified 4 key amino acid differences amongst the

sonar mammals, which may contribute to their unique features . Taken along side evolutionary analyses, these findings offered the first functional evidence supporting the notion that the hearing gene of prestin evolved to play a key role in the sonar system of mammals.

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