

# Research shows rats have best bite of rodent world

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Scientists at the University of Liverpool have found that mice and rats have evolved to gnaw with their front teeth and chew with their back teeth more successfully than rodents that 'specialise' in one or other of these biting mechanisms.

Researchers designed a computer model to simulate the bite of rats to understand whether their [skull shape](#) or muscle arrangement was a major factor in their evolutionary success and global dominance, making them one of the most common [pest species](#) in the world.

Research has already shown that rats and mice can both chew and gnaw, whereas other rodents, such as squirrels, specialise in gnawing, and some, like guinea pigs, specialise in chewing. To understand whether the rat's ability to do both made its bite more effective, the Liverpool team took the [anatomical features](#) of rats, squirrels and [guinea pigs](#) and fed them into a computer model to simulate the different biting mechanisms.

They also created virtual animals with a rat skull and squirrel muscles, for example, to investigate whether it was adaptations of the skull or jaw muscles that gave rats their biting abilities. The findings, published in the journal [PLoS ONE](#), showed that it is the rat's muscles that increase bite efficiency, allowing it to gnaw and chew with more success than species that specialise in just one of these methods.

Dr Nathan Jeffery, from the University's Institute of Ageing and Chronic Disease, said: "Mice and rats belong to a group of rodents called the myomorphs, which are amongst the most successful of all mammals. With over 1000 species, comprising nearly a quarter of all known [mammal species](#), they live in a wide variety of habitats on every continent, except Antarctica."

Dr Philip Cox, co-author of the research, added: "Since the Eocene era, approximately 56 to 34 million years ago, rodents have been adapting their skulls and jaw muscles in, what we might call an evolutionary race. A group of rodents called sciuriforms, which includes the squirrel, began to specialise in gnawing adaptations, and the hystricomorphs, including the guinea pig, chose chewing. The myomorphs, the rats and the mice, however, adapted to both chewing and gnawing.

"We wanted to understand the [evolutionary success](#) of mice and rats and hypothesised that their generalised feeding behaviour played a significant role. Through using reverse engineering techniques we were able to recreate the bite of the rat, as well as test whether its success was

attributed to the arrangement of their skull or [jaw muscles](#)."

Dr Jeffery said: "We expected that the rats we created in the computer model would be more versatile, but less effective, than the specialist squirrel and guinea pig – you would not expect a triathlon swimmer to beat, for example, a dedicated 1500m swimmer.

"The results, however, showed that the way rat muscles have adapted over time, has increased their ability to chew more effectively than a guinea pig and gnaw better than a squirrel, even though these two species are specialists in these kinds of jaw movements. This goes some way to explaining why [rats](#) and mice are so successful, as well as destructive, as their versatile feeding behaviour allows them to eat through a wide variety of materials efficiently."

Provided by University of Liverpool

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