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How Does Selection for Increased Exercise in Mice Impact Mandible and Tooth Shape and Size?

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Teeth are often the most well-preserved body part in fossils and erupt at full size while being sustained across the course of the animal's life. This allows for a variety of information to be gained upon analysis of teeth that can be useful in understanding both function and evolution. Head and tooth structure have been used to infer diet in human ancestors, however other factors might influence these traits, such as activity, food consumption, and genetics. To understand the roles of these additional factors, we investigated the relationship of activity level on mandible and teeth shape and size in a sample of male mice (n = 57) that has undergone selection for high running, a control, and a high running population with a muscle mutation resulting in smaller muscles. We predicted that there would be significant differences in shape between groups due to the differences in energy usage and distance ran.

Data was collected by placing 37 surface landmarks on surface models generated from micro-CT images. These landmarks were placed over the entirety of the skull with an emphasis on the mandible and tooth row in order to study the overall shape. To analyze the landmark data, we used linear regression of centroid size on line and wheel access and MANOVA on aligned coordinates by line and wheel access.

We found that there was no significant difference in centroid size between lines of mice or with wheel access. There were highly significant differences between the lines for overall shape, but no difference in shape depending on wheel access. This indicates that there is an effect of activity level over generations of selection on the shape of the mandible. These results support our prediction that shape would be significantly different between groups of varying activity levels.