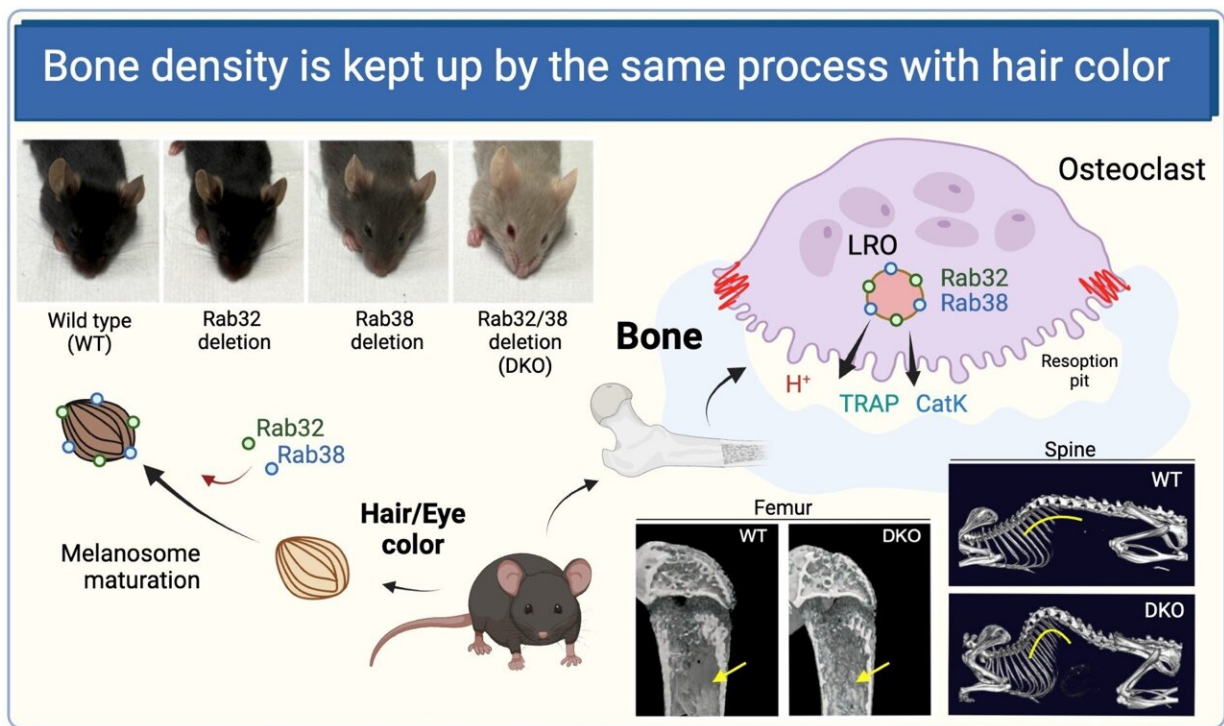


# Research shows bone density is maintained by proteins that are also involved in hair color

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Bone density is kept up by the same process with hair color. Rab32 and Rab38 associated organelle is crucial for osteoclast function and for color pigmentation of hair color. This figure is created using BioRender.com. Credit: Osaka University

Bone is maintained via a delicate balance between formation and

resorption, and its imbalance leads to bone related diseases like osteoporosis, rheumatism and periodontitis.

Researchers led by Osaka University have revealed that proteins named Rab32 and Rab38 play pivotal roles in [bone resorption](#) in osteoclasts. These proteins are also crucial for pigmentation of hair and skin.

The researchers have published two articles, "Characterization of Rab32- and Rab38-positive lysosome-related organelles in osteoclasts and macrophages" in the [Journal of Biological Chemistry](#) and "Rab32 and Rab38 maintain bone homeostasis by regulating intracellular traffic in osteoclasts" in [Cell Structure and Function](#).

Bone is resorbed by specialized cells called osteoclasts, and several substances, such as acids ( $H^+$ ) and degrading enzymes (TRAP, CatK), are secreted out to the pits where osteoclasts attach to bones and resorption occurs. Rab is a group of small proteins that regulate the logistics between cell organelles.

Over 50 Rab proteins are known in mammalian cells, and they are thought to be specifically involved in the traffic between each specific organelle. "Which Rabs are involved had been scarcely understood," says lead author of the first paper, Kazuya Noda. "To better understand the molecular mechanisms of osteoclast function, we first screened Rab proteins especially induced during osteoclast formation in [mouse](#)."

Rab38 was found to be elevated during differentiation into osteoclast. Importantly, Rab38 closely resembles partner Rab32, and both of them are known to be important for determination of hair color, by regulating the logistics to the melanosome, an organelle specialized for color pigmentation in skin and hair forming cells.

In the second paper, lead author Kanako Tokuda used a double knock

out mouse model with both Rab32 and Rab38 deleted. As expected, the double knock out mouse showed beige-like hair color and red eyes, while a wild type mouse has black hair and eyes. Interestingly, the double knock out mouse shows increased bone density, and as aging progresses, the spine becomes more bent, especially in male mice.

Significantly, bone related diseases like osteoporosis, rheumatism and periodontitis are associated with hyper activation of bone resorption by [osteoclast](#). "Therefore, understanding the underlying mechanism of [bone](#) resorption facilitated by Rab32 and Rab38 will provide us useful information regarding potential treatment target for these diseases," says senior author of the two papers, Takeshi Noda.

**More information:** Kazuya Noda et al, Characterization of Rab32- and Rab38-positive lysosome-related organelles in osteoclasts and macrophages, *Journal of Biological Chemistry* (2023). [DOI: 10.1016/j.jbc.2023.105191](#)

Kanako Tokuda et al, Rab32 and Rab38 maintain bone homeostasis by regulating intracellular traffic in osteoclasts, *Cell Structure and Function* (2023). [DOI: 10.1247/csf.23061](#)

Provided by Osaka University

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