Tendons shape bones during embryonic development

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In all vertebrates, including humans, bones, muscles and tendons work together to give the skeleton its characteristic balance of stability and movement. Now, new research uncovers a previously unrecognized interaction between tendons, which connect muscles to bones, and the developing embryonic skeleton. This study, published by Cell Press in the December 15th issue of the journal *Developmental Cell,* demonstrates that tendons drive the development of specific bone features that are needed for a strong skeletal system.

"Our skeleton with its bones, joints, and muscle attachments serves us so well in our daily lives that we hardly pay attention to this extraordinary system," says senior study author, Dr. Elazar Zelzer from the Weizmann Institute of Science in Rehovot, Israel. "Although previous research has uncovered mechanisms that contribute to the development and growth of each issue composing this complex and wonderfully adaptable organ system, specific interactions between bones, muscles and tendons that drive the ordered assembly of the musculoskeletal system are not fully understood."

Dr. Zelzer and colleagues were interested in uncovering how "bone ridges" form. Bone ridges are knobby, thickened areas of bone that can be found wherever tendons are attached. These reinforced sections of bone are important anchoring points for connecting bones to muscles, and strong attachment at these sites enables the skeleton to cope with mechanical stresses exerted by the muscles.

While studying mouse embryos, the researchers discovered that tendons control the formation their own bone ridges through a two-stage process. First, tendons initiate outgrowth of the bone ridge by secreting a protein (BMP4) that promotes bone formation. Then, during the second stage, muscle activity helps to promote further bone growth and set the final size of the bone ridge.

Taken together, the results demonstrate that tendons are needed for bone ridge patterning. "These findings provide a new perspective on the regulation of skeletogenesis in the context of the musculoskeletal system and shed light on a specific mechanism that underlies the assembly of this system," concludes Dr. Zelzer.

Source: Cell Press (news : web)