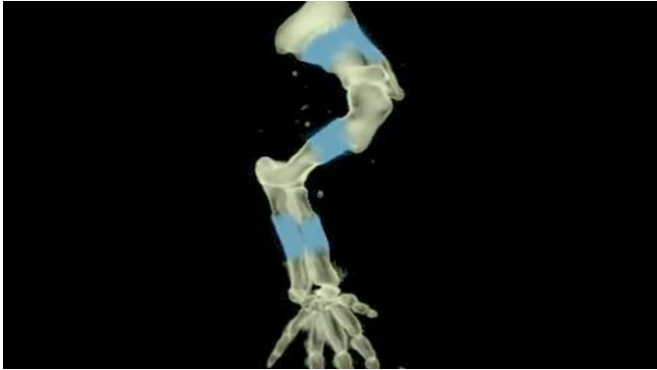


New research shows why babies need to move in the womb

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Scientists have just discovered why babies need to move in the womb to develop strong bones and joints. It turns out there are some key molecular interactions that are stimulated by movement and which guide the cells and tissues of the embryo to build a functionally robust yet malleable skeleton. If an embryo doesn't move, a vital signal may be lost or an inappropriate one delivered in error, which can lead to the development of brittle bones or abnormal joints.

Cells in the early embryo receive biological signals that direct them to contribute to different types of tissue, and in different places. For example, our bones need to be made of strong and resilient material to protect and support our bodies, whereas our articulating [joints](#) (e.g. our knees and elbows) need to be able to move smoothly. As a result, at joints, bones need to be covered in smooth, lubricated cartilage. Cells in the early embryo are thus directed to make a decision to either form bone or cartilage, depending on where they are.

Scientists understand many of the signals that direct the [cells](#) to build bone, but, know a lot less

about how the cartilage at the joint is directed. At the moment clinical treatment for joint degeneration is joint replacement, which improves the quality of life for many people but involves invasive surgery and is not a permanent solution. If we understood better how the embryo forms [articular cartilage](#) at the joint, we would be in a better position to come up with ways of regenerating cartilage from stem cells to provide improved treatments for joint injuries and diseases.

Professor in Zoology at Trinity College Dublin, Paula Murphy, co-led the research that has just been published in leading international journal *Development*. She said: "The relative lack of understanding around how cartilage was directed presented an unfortunate knowledge gap because there are many painful, debilitating diseases that affect joints—like osteoarthritis—and because we also often injure our joints, which leads to them losing this protective cartilage cover."

"Our new findings show that in the absence of embryonic movement the cells that should form articular cartilage receive incorrect molecular signals, where one type of signal is lost while another inappropriate signal is activated in its place. In short, the cells receive the signal that says 'make [bone](#)' when they should receive the signal that says 'make cartilage'."

Prior to this discovery, using chick and mouse [embryos](#) where movement could be altered, the scientists had previously shown that when movement is reduced the articular cells at the joint do not form properly, and that in extreme cases the bones can fuse at the joint, but they didn't know why. Now, they have isolated the mechanism underlying healthy development, which has provided new insights into what type of embryo [movement](#) is important and the specific signals that are needed to make a healthy joint.

The next steps will see the scientists take what they

have learned thus far and attempt to activate the correct signals to make stable [cartilage](#) that is capable of contributing to a healthy joint. This will involve exposing cells to different combinations of the all-important biological and biophysical signals to find the perfect recipe. Their continued work will also build knowledge around what exact movements are needed, which may help diagnose problems earlier and suggest how clinicians may compensate for natural movements if required. It could, for example, inform physiotherapeutic regimes that would alleviate resulting problems.

Provided by Trinity College Dublin

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