Scientists Discover: Haemoglobin isn't used only in blood

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Context:

Textbooks have said for decades that haemoglobin is found in the red blood cells (RBCs), that it makes blood red, carries oxygen, and is essential for our survival.

'Haemoglobin bodies':

1. A new and serendipitous discovery has revealed that haemoglobin isn't used by RBCs alone. In a study published in Nature, scientists from China have reported that chondrocytes – cells that make cartilage, the connecting tissue between bones – also make haemoglobin and seem to depend on it for their survival. Feng Zhang, a pathologist in China, had been working on bone development since 2010.
2. In 2017, when he was studying growth plates –cartilaginous tissue at the end of certain long bones that allow the bones to become longer –he stumbled upon a few spherical blob-like structures. They seemed to bear an uncanny resemblance to RBCs, and they contained haemoglobin.
3. Picture what happens when oil is mixed into water: the oil separates out into little globules in a process called phase separation. That's what seemed to be happening in the chondrocytes in the cartilage as well.
4. Dr. Zhang ascertained that the chondrocytes within the growth plates of newborn mice were not only producing large amounts of haemoglobin, but also that it was coalescing and forming large blobs without a membrane. The scientists called these blobs haemoglobin bodies, or Hedy.

The haemoglobin does something:

1. Now that they knew chondrocytes were making haemoglobin bodies, the question was: were the Hedy functional or not. To test this, the scientists used genetically modified mice, in this case mice in which the gene making haemoglobin had been removed. These mice produced almost no haemoglobin molecules and they died as embryos. But it turned out that if one looked closely at the growth plate cartilage tissue from these mice, most of the chondrocytes were dying.
2. Removing the gene that made haemoglobin specifically in the cartilage tissue also resulted in the same outcome: cell death among the chondrocytes. It was clear that Hedy was essential for the chondrocytes to live.

An oxygen store:

1. Now they knew that the absence of haemoglobin caused the chondrocytes to go through some sort of low-oxygen stress. They then wanted to see how normal and haemoglobin-free

chondrocytes behaved when there is little oxygen in the cells' environment. The researchers proceeded to test the cells in a low-oxygen, or hypoxic, environment.

2. In the presence of haemoglobin, the cells seemed to release more oxygen. But in the absence of haemoglobin, the chondrocytes started dying. This further confirmed their hunch that the haemoglobin in the chondrocytes was most likely storing oxygen and supplying it to the cells when required.

Conclusion:

What is important in this paper is that it breaks down barriers between haematology and skeletal biology, and shows that, in fact, these fields are more connected than it seems. The discovery of functional haemoglobin in cartilage also leads to the possibility that it plays a role in certain joint diseases. There are many bone deformities that develop from defects in chondrocytes. Scientists hopes this discovery can reinterpret the mechanisms underlying some joint diseases.