Groundbreaking research shows platelets can reproduce in circulation

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University of Utah researchers led an international team of scientists that is the first to report on the previously undescribed ability of platelets to reproduce themselves in the circulation. Their revolutionary findings were published online Jan. 19, 2010, in the journal *Blood*.

Platelets develop from precursor cells found in the bone marrow, a process that is called thrombopoiesis. During the final stages of thrombopoiesis, platelets are shed from the cytoplasm of their precursors and then enter the bloodstream. Because they lack nuclei, circulating platelets are often referred to as "cytoplasts."

Because DNA resides in the nucleus, platelets were previously considered incapable of reproducing themselves. However, according to this new study led by Hansjörg Schwertz, M.D., and Andrew S. Weyrich, Ph.D., both of the U of U School of Medicine, platelets are actually capable of giving rise to new platelets.

"Cells with nuclei typically split into two uniform daughter cells that share identical genetic information," says Schwertz, research assistant professor of surgery and lead author of the study. "In our experiments, we found that platelets increase in number by generating beaded extensions that resemble a pearl necklace. Development of these extensions, which contain two or more new platelets, does not require a nucleus."

Schwertz and his colleagues found that the newly formed platelets are

structurally and functionally indistinguishable from normal platelets and are similar in size, shape, and metabolic activity. Importantly, the group also demonstrated that platelets produce progeny in human whole blood cultures. This suggests that new treatments may be devised to increase circulating platelet numbers in patients whose platelet counts are abnormally low because of a medical condition.

Platelets are one of the most abundant cells in the bloodstream and their primary function is to halt bleeding. Decreased platelet counts can increase a person's risk for bleeding complications. Conversely, if platelet counts are too high or platelets inappropriately stick to one another, individuals may be at increased risk for vascular disorders such as heart attacks.

In additional studies conducted in cooperation with Robert C. Blaylock, M.D., medical director of transfusion services at the University of Utah and professor of pathology, the group found that platelets used for transfusion are also capable of generating new platelets, even after they are stored in bags for five days. This suggests that platelet numbers may be expanded after they are removed from the body, a finding that could have a significant impact on transfusion medicine.

"More research is needed to understand how platelets reproduce themselves and whether newly formed platelets are identical to, or distinct from, the platelets that are formed directly from their bone marrow precursors," says Weyrich, professor of internal and molecular medicine at the University of Utah's Eccles Institute of Human Genetics and corresponding author of the study. "Nevertheless, our findings identify a new function of platelets that has important bench-to-bedside implications."

Provided by University of Utah