

Artificial Bone Marrow

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One of the newest developments in the area of tissue engineering is the creation of artificial bone marrow. Recently Nicholas Kotov, a professor at the University of Michigan for the Chemical, Materials and Science, and Biomedical Engineering departments, and his team of researchers have developed artificial bone marrow that can produce red and white blood cells. (1)

The formation of the artificial marrow starts with the construction of a scaffold comprised of a transparent polymer that allows nutrients to pass through, like human marrow does. (1) The polymer is also molded into a network of tiny spheres and pores that allow the different cells types to prosper, as they would in human bone marrow. (2) The scaffold is then covered with stem cells and osteoblasts, the cells from which bone is produced. The resulting matter exhibits characteristics nearly identical to human bone marrow. (2)

Bone marrow is a form of spongy tissue found in the interior of bones. (3) It contains stem cells that produce erythrocytes and leukocytes. Erythrocytes are red blood cells that carry oxygen and remove wastes within the body, while leukocytes are white blood cells whose primary function is to fight infection and disease. (3)

Within the leukocytes of the bone marrow are B-cells. B-cells are essential in battling infections as well as some types of cancers. When B-cells detect a threat in the body they produce antibodies to fight the infection. (4) After the infection is gone, the antibodies produced are replicated, allowing for a faster response time if the pathogen is introduced into the system on another occasion. (4)

When a person is diagnosed with cancer, a common form of treatment that they undergo is chemotherapy. The drugs given to the patient during the chemotherapy treatment suppress the function of the bone marrow and B-cells cannot be produced at an efficient and effective rate, which is

why cancer-patients are very susceptible to viruses and infections. (4)

It is estimated that last year in 2008, 1,437,180 people were diagnosed with some form of cancer. (5) The marrow, which is designed to function in a test tube outside of the body and is not intended to be implanted, could allow for the researching of the effectiveness and toxicity of new drugs without any chance of harming the patient. (4) It also provides for the studying of the responses that the immune system will have and producing an essentially unlimited supply of blood needed for transfusions that is undoubtedly uncontaminated. (4) This newly created form of bone marrow could be of tremendous use to these cancer patients, as well as individuals previously diagnosed and ones that will be diagnosed in the future.

References:

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