

DR. NELSON: You're looking at a few hundred cells here that are working together--

VIVIEN WILLIAMS: The heart muscle cells that Dr. Tim Nelson views highlight recent advances into regenerative medicine.

DR. NELSON: The simplest way to explain that is, it's the opposite of degeneration.

VIVIEN WILLIAMS: Tissues in your heart, joints, and other areas can degenerate or break down with time or disease. Regeneration is the renewal of those tissues, which is something the body does naturally.

DR. NELSON: So one strategy is to try to find ways to improve the healing of your body, and another strategy is to actually supplement or augment the stem cells in your body so that we can improve the healing by transplanting stem cells into it.

VIVIEN WILLIAMS: Dr. Nelson and his colleague, Dr. Andre Terzic, used stem cells in their research because stem cells are responsible for growing new tissue.

DR. NELSON: So stem cells just means that they're seeds that can grow into many, many tissues.

VIVIEN WILLIAMS: Stem cells can come from a variety of places. Embryos-- which are not generally used anymore-- umbilical cord blood, adult blood, or adult bone marrow.

DR. NELSON: So the type of stem cell will dictate how many different types of tissues can emerge out of it.

VIVIEN WILLIAMS: Scientists can engineer stem cells into the type of cells they want. Here's how it works. Cells called fibroblasts are removed from a patient's skin. They are reprogrammed into what are called pluripotent stem cells. Those cells can be taught to become any type of healthy cells, such as these heart muscle cells. The idea is that the newly engineered healthy cells-- when introduced to, say, those of failing heart-- will help restore or regenerate the function of the unhealthy cell.

DR. NELSON: This is one cell, that's contracting, is working with many cells, and that gives the whole tissue the contraction pattern like a normal heart. It becomes much more real when you have a personal connection to a disease or an illness where we don't currently have good options, and this is where people are asking more and more the questions, what about stem cells?

VIVIEN WILLIAMS: The answer is, researchers, such as these at Mayo Clinic, push forward to make regenerative medicine a reality for patients searching for successful treatment and perhaps cures. For Mayo Clinic News Network, I'm Vivien Williams.