**Forming New Bone to Treat Old Diseases**
**By Cutter Chaboya**

We've all had our fair share of falls and tumbles growing up. We've all fallen and banged our knees on the blacktop during recess or simply tripped on the curb stepping onto the sidewalk. When we're young these falls are minor and cause nothing more than a scrape or bruise allowing us to continue on our day. As we get older, there is a chance that these "minor" falls can hospitalize us or even permanently disable us. But why does this happen?

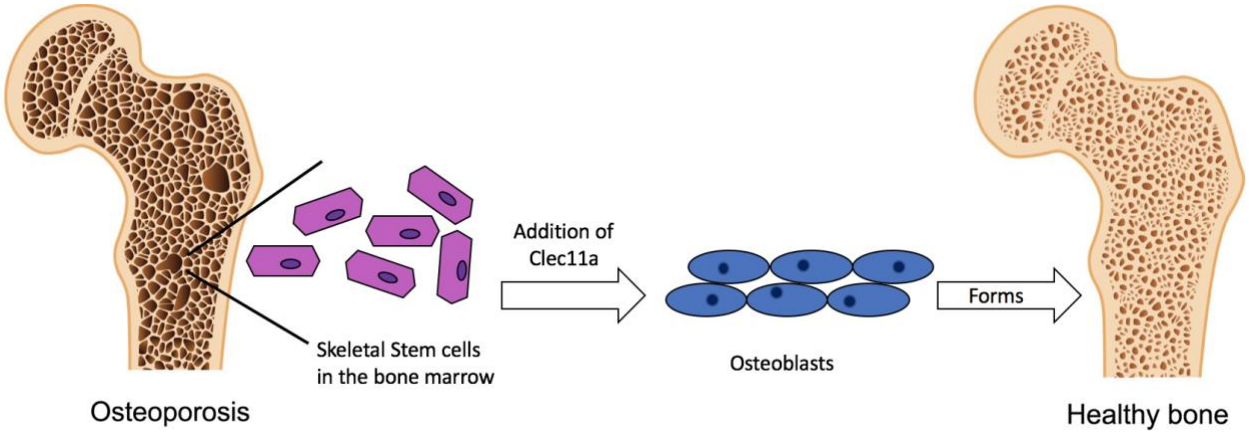
Throughout our life, our bones are constantly in a state of renewal. Normal maintenance of bones requires the reabsorption of calcium and minerals coupled with the formation of new bone to maintain the overall strength and integrity of our skeleton. As we age though, this process shifts and begins to favor resorption, thereby decreasing the overall thickness and mass of our bones. For many people, too much bone is reabsorbed making the bones incredibly brittle and prone to breaks…even from small falls or bumps. This is the degenerative bone disease osteoporosis and millions of Americans over the age of 50 either have or are at major risk of developing this life changing disease [1].

Osteoporosis has been found, in part, to be hereditary meaning that this disease extends to your genetic level and can be passed on to your children. Osteoporosis is often characterized as a "silent disease" because many people don't realize they may have it until they're hospitalized. The only current treatments for osteoporosis are medications that prevent the further resorption of bones. There are currently no known treatments that cause new bone to form, leaving many people permanently at a high-risk for bone fractures.

Thankfully, a new discovery in the world of stem cell research may lead to a new osteoporosis treatment that actually aids in the formation of bone.

As adults, we have multiple populations of stem cells that help replenish the many cells that we lose each day. We have stem cells located at the base of our skin that help replace tissue when we get cuts and scrapes. We have hematopoietic stem cells in our bone marrow that form new red and white blood cells. We also have skeletal stem cells that help form new bone and cartilage. Now, you're probably wondering —if we have stem cells that form new bone and repair damaged bone— why does osteoporosis ever occur? This has to do with how cells talk and communicate amongst each other.

Cells communicate by creating molecules and releasing them to their surrounding environment. Neighboring cells have receptors surrounding their surfaces. Each of these receptors recognizes specific molecules, an interaction that causes the cell to respond in some way, shape, or form. As we age, the signals these cells receive can change. In the case of osteoporosis, there is either (1) a reduction in the signals that tell cells to form new bone or (2) an increase in the signals that tell cells to breakdown bone. Recently, a team of researchers found a molecule, more specifically a protein, that stimulates the formation of bone in both mouse and human skeletal stem cells.




This protein is called Clec11a and preliminary investigations revealed it had a close association with the blood, so its association with bone was initially overlooked. Its role relating to bone was found almost by pure accident. When researchers looked at mice lacking Clec11a, they expected a change in our red and white blood cells. What they found instead was a decrease in bone volume resembling mice with osteoporosis. When they administered Clec11a back into the mice, new bone formed thereby reversing the original bone loss. They also modeled osteoporosis in mice and administration of Clec11a reversed the symptoms. The receptor and method for how Clec11a stimulates bone development is currently not known but its identification could lead to the development of a novel osteoporosis therapy!

As researchers keep learning and making new discoveries we may soon see the eradication of osteoporosis thanks to our bodies own skeletal stem cells.

1. Prentice, A., *Diet, nutrition and the prevention of osteoporosis.* Public Health Nutrition, 2004. **7**(1a): p. 227-243.