

CUTTING CANCER LOOSE

This animation was created by Dr Kate Patterson to explain some of the research being carried out by CSIRO researchers Associate Professor Susie Nilsson and Dr Ben Cao.

It explains how a novel therapy called BOP is now being used to mobilise dormant cancer cells from bone marrow, so that they are susceptible to chemotherapy and decreasing the chance that patients will relapse following treatment.

The animation was created using scientific data derived from the Protein Data Bank and information from the scientific literature. The animation was created using Autodesk Maya with plugin Molecular Maya (mMaya) by Clarafi and compositing with Adobe After Effects.

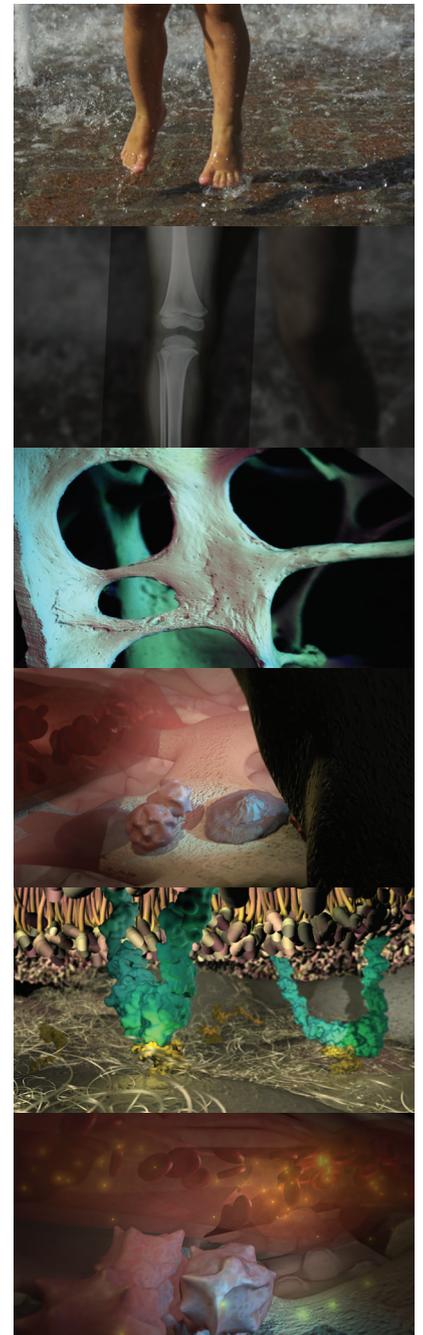
Bones are made up of a calcified matrix, as well as many different types of cells. The middle of our bones, the bone marrow is home to a special type of cell called a haematopoietic stem cell. These stem cells divide and mature when needed, and then enter the blood stream, destined to become new circulating blood cells.

In patients with some blood cancers, these stem cells start to divide out of control, forming a growing mass inside the bone marrow and causing more and more abnormal cells to enter the blood stream.

Chemotherapy is used to kill most of these cells, shown here as bright particles, spreading into the bone marrow and killing the dividing cells.

But some cancer cells remain dormant or asleep and wait for the chemotherapy to pass. These cells interact with the bone matrix via a tiny molecular bridge. The molecular bridge forms between integrin molecules on the surface of the cell and osteopontin molecules which is a component of the bone matrix. Long after the chemotherapy has passed, some of these drug resistant cells start to divide again, causing the cancer to relapse.

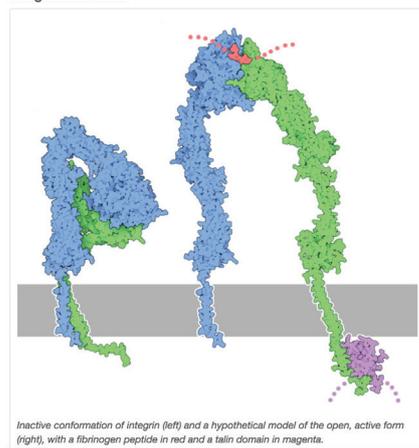
An exciting new therapy is now being used to seek out these dormant cells. BOP is a tiny chemical that can break the molecular bridge so once the cancer cells are woken from their inactive state, chemotherapy can now target more of these cancer cells and greatly reduce the chance that patients will relapse following treatment.



Integrin Molecule in PDB

<https://pdb101.rcsb.org/motm/134>

Integrin Activation



News Release from CSIRO:

<https://www.csiro.au/en/News/News-releases/2016/New-way-to-harvest-stem-cells-better-for-donors>



A hematopoietic stem cell (HSC) being mobilised from the bone marrow microenvironment into a blood vessel. ©Garvan Institute of Medical Research, Dr Kate Patterson

Cleaved OPN predicted model

