Stem Cells and Cancer

Cancer Education Project
University of Rochester
Stem Cells: The Good and The Bad
Stem Cells: What are they?

Can you divide and renew yourself?

Yeah...
Stem Cells: What are they?

See, I’m still here!
You seem rather unspecialized. Can you give rise to specialized cells?

Yes, I’m unspecialized but my brother can become specialized. Watch him.
Stem Cells: What are they?

My brother can become a skin cell. He specialized to form tight attachments to his neighbors…
Stem Cells: What are they?

You’re hired. You can start as one of our stem cells tomorrow.

So do I get the job?

Stem Cell Recruitment Center
Stem Cells: Not like other cells...

Self Renewal

Stem Cell

Undifferentiated

Stem Cell

Progenitor Cell

Cell division and differentiation

Red Blood Cell
Platelet
White Blood Cell
Adult stem cells: Many different types…

Adult stem cells contribute to homeostasis

They divide only when needed

Their progeny differentiate into cells that perform essential body functions.
Cancer Stem Cells

Uncontrolled, rapid cell division gives rise to improperly differentiated tumor cells.

DNA mutations

Cancer Stem Cell

Cancer Stem Cell

Cancer Progenitor Cell
Identifying Cancer Stem Cells

Scientists can break up the cells of a tumor, then transplant each tumor cell into a new location.…

Most of the tumor cells end up dying…

But a rare few go on to grow a new tumor…

Cancer Stem Cells
Where might cancer stem cells come from?

DNA mutations in normal stem cells may give rise to cancer stem cells.
Chemotherapy: Targets Rapidly Dividing Cells

Stem cells do not divide rapidly, so are not targeted by chemotherapy.

Conventional chemotherapy targets rapidly dividing cells.
Chemotherapy: Targets Rapidly Dividing Cells

The stem cell survives conventional chemotherapy and divides to form a new tumor.
What’s coming in cancer therapy?

New targeted drugs that specifically kill cancer stem cells **without harming normal stem cells** should remove the “root” of the cancer.

The rest of the cancer cells should die on their own, or conventional chemotherapy drugs can be used to kill these cells.
Scientists are searching for answers to these questions about cancer stem cells...

- What makes these cells different?
- What kinds of drugs can target these cells?
- What cellular pathways are affected by drugs that target these cells?
- Are there other possible drugs that target those pathways?
Cancer Stem Cell Cartoon

Work with your team to draw a stem cell cartoon strip that illustrates the answers to questions:

- 3, 4 and 5, or
- 6 and 7, or
- 8 and 9