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Cancer Stem Cells: What are they? Where do they come from? What can we do about them?

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What are they? Cancers arise from maturation arrest in the hierarchy of a cell lineage due to failure of cells to differentiate. Properties of cancer stem cells include: self renewal, ability to grow in vitro indefinitely (transformation), translatability (tumor initiation) and resistance to therapy.

Where do the come from? In each of the major causes of cancer arises from stem cells. 1. Field defect: Teratocarcinoma arises from germinal stem cells due to a field or niche effect. 2. Chemical Carcinogenesis. The cellular reactions of the liver exposed to chemical carcinogens shows that liver cancers arise from maturation arrest of liver stem and progenitor cells. 3. Virus infections: Viruses that cause cancer infect tissue stem cells (for example basal epithelial cells) with resultant continued proliferation of immature cells. 4. Mutations: Leukemias are caused by of specific gene rearrangements (mutations) that produce constitutive signaling lesions at various stages of differentiation (maturation arrest). Specific reversal of the molecular lesions is effective in restoring maturation. 5. Epigenetic changes: In gastric cancers associated with *H. Pylori* infection, hypermethylation of the gastric epithelial cells leads to field cancerization which is maintained by long-lived gastric stem cells.

What can we do about them? Conventional therapies are directed toward the proliferating transit amplifying cells. When these therapies are discontinued, the cancer will re-grow from the cancer stem cells, which are not proliferating at the time therapy is administered. In order to prevent re-growth new therapies must be developed that are directed to the cancer stem cells.

Biography

Dr. Sell received an MD from the University of Pittsburgh in 1960, residency in pathology at Massachusetts General Hospital, and fellowship training at NIH and U. Birmingham in England. He served on the faculty at Pitt; USCD; UT Houston; and Albany Medical College. He has published 265 research papers, 83 invited papers, 36 book chapters and 14 books. He has a paper listed as a "Citation Classic" by Current Contents and another as a "Scientific Landmark" by AACR. Awards include: Distinguished Scientist Award, IATMO; Virchow Award, LeadershipMedica; Legacy Laureate, Pitt (Highest Award for Alumni); and the Abbott Award of ISOBM.