Cell Biology 2002

The American Society for Cell Biology ❋ Press Book
42nd Annual Meeting ❋ San Francisco ❋ December 14-18, 2002

BUILDING ON CELLS

Unmasking Sleeping Sickness

Surviving Cancer, Saving Fertility

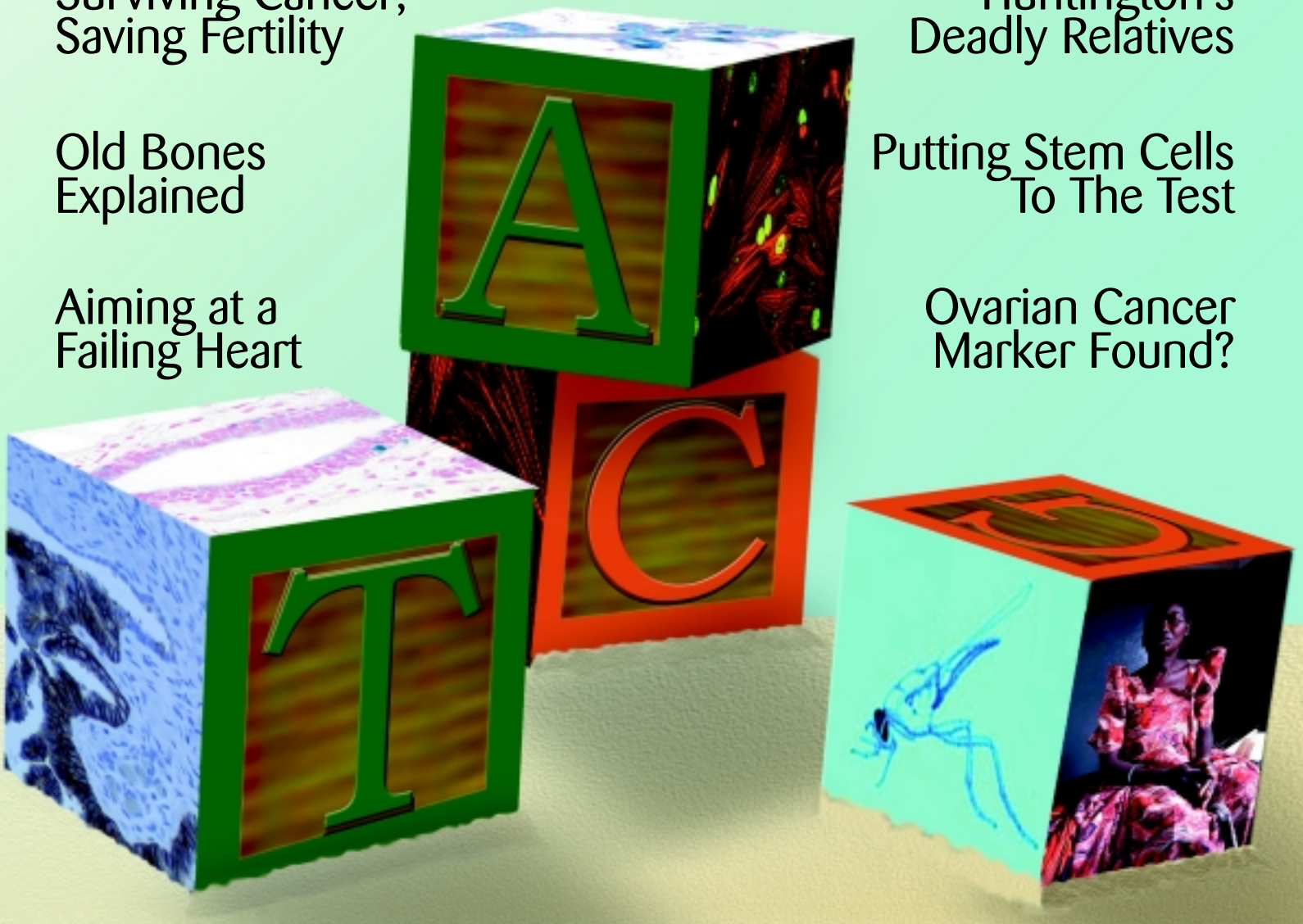
Huntington's Deadly Relatives

Old Bones Explained

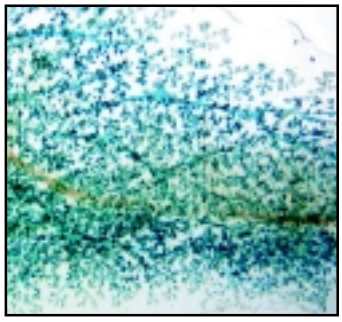
Putting Stem Cells To The Test

Aiming at a Failing Heart

Ovarian Cancer Marker Found?



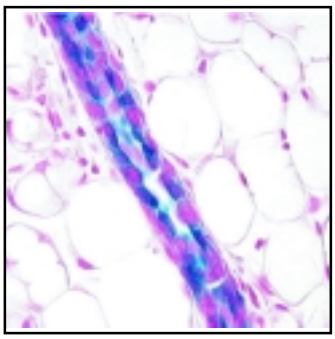
A Pregnancy-Induced Stem Cell: Is It the Clue to Pregnancy's Anti-Cancer Effects?



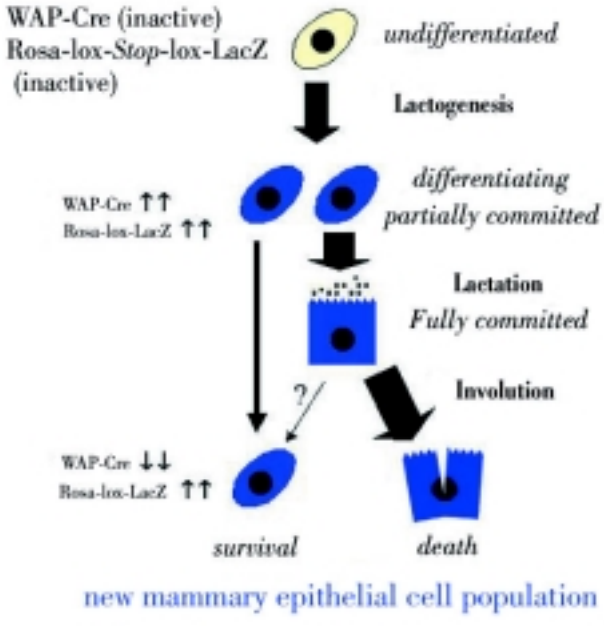
The baby may seem the prime beneficiary but a mother's milk has an unexpected benefit for the mother. Studies have shown that early pregnancy confers a lifelong, two-fold reduction in breast cancer risk in women regardless of race, creed, or nationality. Mice and rats also enjoy this increased protection against mammary cancer even when challenged with cancer-inducing chemicals.

The biological problem is how. It was commonly held that all milk-producing breast cells were lost when nursing stops and that the gland reverts to its virginal state. But if these parous (i.e. breeding) females no longer have their distinctive milk-producing cells, where does their anti-cancer protection come from? The common theory, it turns out, is wrong. Gil Smith and his colleagues at the National Cancer Institute in Bethesda, Maryland, in collaboration with Dr. Kay-Uwe Wagner at the Eppley Cancer Center in Omaha, Nebraska, have discovered a new pregnancy-induced epithelial cell population present in the mammary glands of parous mice. This discovery could help unlock their anti-cancer protective mechanism, possibly for all women.

Instead of dying out completely, a proportion of milk-producing cells survive cell death after lactation and the reversion to pre-pregnancy conditions, say the researchers. With subsequent pregnancies, the proportion of surviving cells increases within the glands. Similar cells were not found in females that were never pregnant (nulliparous). Therefore, says Smith and colleagues, the mammary cell population in breeding animals is fundamentally different than those in virgin females.



This new pregnancy–dependent epithelial population was found in the mammary glands of mice by using a reporter gene that could be triggered only by the expression of a milk protein gene. The cells thus identified were isolated and grown in culture so they could be transplanted into epithelium-free mammary fat. There, the pregnancy-induced mammary cells acted like stem cells, multiplying and differentiating into most, if not all, of the epithelial subtypes recognized in the gland. Now the question becomes, how do these pregnancy-induced stem cells protect women when they are no longer pregnant? This raises the possibility of a common mechanism to protect all women against breast cancer. ❐



To follow undifferentiated epithelial cells through lactogenesis (see diagram), Smith and colleagues used female mice with two transgenes, WAP-Cre to report cell differentiation and Rosa-lox-LacZ to monitor cell survival. After lactation ends, fully differentiated, milk-producing aveolar cells undergo apoptosis as the mammary gland involutes to its virgin state. It was thought that all aveolar precursors perished as well. Instead, the reporter genes showed the survival of a new type of pregnancy-induced epithelial stem cell. Early in pregnancy (top left), the reporter genes show under blue stain in mammary tissue section. Yet even after involution, blue stain in small ducts shows the survival (left) of aveolar precursor cells.

Contact: Gilbert H. Smith, National Cancer Institute, NIH, MBTL, CCR, Bldg10, Room 5B56, 9000 Rockville Pike, Bethesda, MD 20892, (301) 496-2385, gs4d@nih.gov

Identifying Multilineage Mammary Epithelial Progenitors, In Vivo. G. H. Smith,[1] K. Wagner,[2] and C. Boulanger[3] ; [1]NCI, NIH, Bethesda, MD, [2] Eppley Institute, University of Nebraska, Omaha, NE, [3] NCI, NIH, Bethesda, MD

At the ASCB meeting: Presentation 2352, Minisymposium 26: Stem Cells. **Author presents**: Wednesday, December 18, 2002, 3:45 —4:05 PM.