

FEATURES

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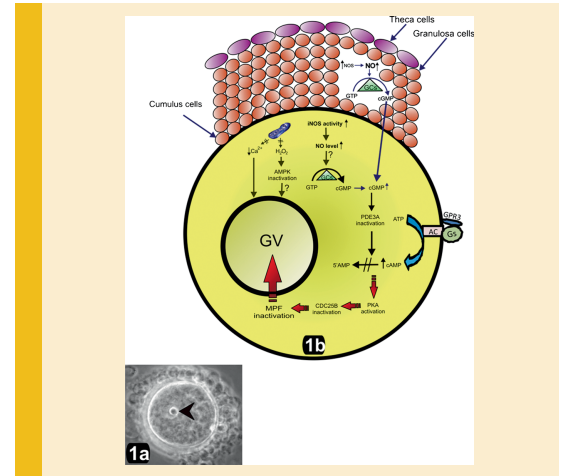
ROS and RNS in the Cell Cycle

Ashutosh N. Pandey, Anima Tripathi, Karuppanan V. PremKumar, Tulasidas G. Shrivastav, and Shail K. Chaube

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In this review article, the authors discuss the beneficial roles of ROS and RNS during meiotic resumption from diplotene-arrest in mammalian oocytes. Takami et al., (1999) reported that antioxidants reversibly inhibit meiotic resumption from diplotene arrest that led Pandey et al to hypothesize that the generation of a tonic level of ROS could be beneficial for meiotic resumption. Subsequent studies were conducted to test this hypothesis. The authors compiled the studies and updated information on follicular production of ROS and RNS and their roles on meiotic resumption from diplotene-arrest. In this review article, sources of ROS and RNS production inside the follicular microenvironment and their beneficial effect on meiotic resumption from diplotene-arrest are described. The authors propose possible mechanisms of ROS and RNS action during meiotic resumption from diplotene-arrest in mammalian oocytes. Although Pandey et al have updated the possible mechanism of meiotic resumption from diplotene arrest, further studies in this area may yield important new insights about the beneficial roles of ROS and RNS and their mechanisms regulating meiotic cell cycle in mammalian oocytes.



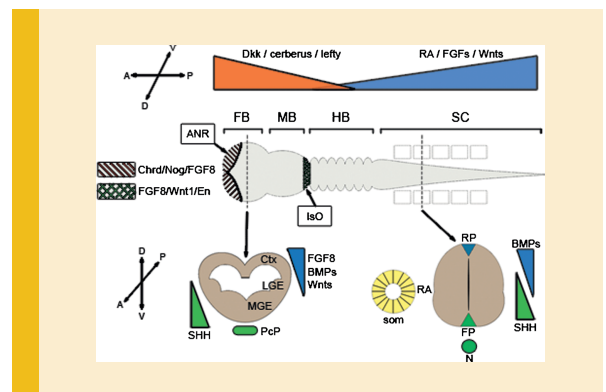
Embryonic Stem Cell Neurogenesis

No lle Germain, Erin Banda, and Laura Grabel

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When designing protocols to promote neural differentiation of embryonic stem cells (ESCs), the mantra has been “look to the embryo”. By mimicking the cell interactions and using the signaling molecules that direct neurogenesis and pattern formation in the neural tube during development, one can obtain the desired ESC-derived neural progenitors or neurons. Interestingly, differentiating ESC cultures form two- and three-dimensional structures that are reminiscent of the embryo, exhibiting similar cell interactions and undergoing patterning events and morphogenesis as in vivo. Germain et al. review these data and suggest that we can study ESC neurogenesis as a means to understanding neural specification during development, flipping around the conventional paradigm.



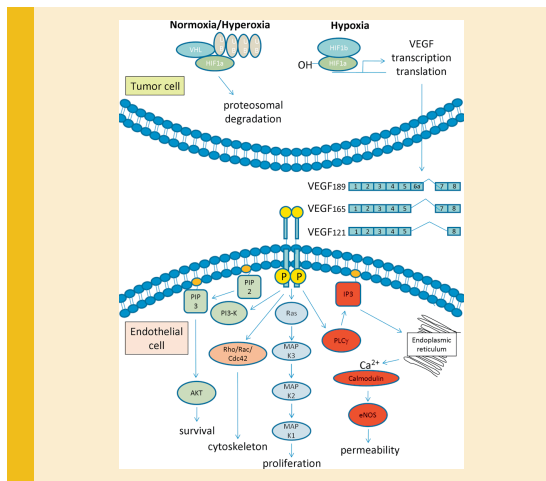
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Anti-Angiogenic Therapeutic Strategies

Dianne C. Mitchell and Brad A. Bryan

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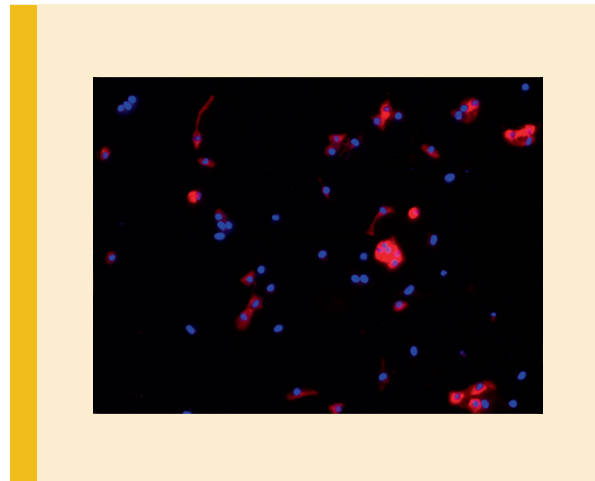
From benign to malignant, tumors absolutely rely on the host's blood supply to bring in oxygen and nutrients and carry away waste products. While conventional cancer treatments such as chemotherapy and radiation directly target aggressively dividing tumor cells, it is unfortunate that many of the patients who undergo these therapies experience tumor resurgence post-treatment. Anti-angiogenic therapy, which specifically targets the tumor vasculature with the aim of starving the tumor, comprises a new generation of anti-cancer therapeutics that has demonstrated exceptional efficacy against a number of tumors. For instance, targeting tumor blood vessels has proven to be as good, or better, than any other drug combination for colorectal cancer patients. This review by Mitchell and Bryan summarizes the benefits and side effects that are associated with anti-angiogenic therapy. Moreover, the authors discuss the unfortunate mechanisms of acquired resistance to these novel therapeutics which often result in transitory improvements that inevitably lead to tumor recurrence and disease progression. Furthermore, promising next generation anti-angiogenics are highlighted which may more effectively inhibit cancer progression.

Hyaluronan and Versican Control hESC Differentiation

Christina K. Chan, Marsha W. Rolle, Susan Potter-Perigo, Kathleen R. Braun, Benjamin P. Van Biber, Michael A. Laflamme, Charles E. Murry, and Thomas N. Wight

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Cells live in a complex mixture of extracellular macromolecules that is constantly changing throughout the life of the cell. This extracellular micro-environment creates mechanical forces which impact the cells' capacity to grow and differentiate. In addition, specific components of the extracellular microenvironment interact with cell receptors on the surface of the cells to stimulate particular signaling pathways which, to some extent, govern the ability of a cell to differentiate as well as proliferate, migrate, and survive. In this study, Chan et al. investigated the involvement of two specific extracellular macromolecules, hyaluronan and versican, in the differentiation of human embryonic stem cells to cardiomyocytes. Previous studies had indicated a role for these two molecules in heart development. Their results indicate that human undifferentiated embryonic stem cells synthesize and secrete hyaluronan and versican, but their synthesis and accumulation changes as they differentiate into cardiomyocytes. Chan et al. go on to show the specific nature of the changes and suggest that these specific extracellular matrix molecules are critical to cardiomyocyte differentiation.