Male Germ Cells in Development & Tumors

Guest Editors

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THE INTERNATIONAL JOURNAL OF DEVELOPMENTAL BIOLOGY

Volume 57 Nos. 2/3/4 Special Issue 2013

Preface

Male germ cells and cancer: a connection among pluripotency, differentiation and stem cell biology

The development of male germ cells begins with the formation of the primordial germ cells (PGCs) and ends with that of sperm. During this process, spanning from the embryo to the adult age, there are points in which abnormalities in the corresponding processes can produce defective germ cells prone to tumour transformation. From the pioneering studies of Leroy Stevens, we know that male primordial germ cells and/or their progeny the gonocytes, can stray from their normal differentiation pathway and, within the context of a certain genetic background, give rise to testicular or more rarely extra-testicular germ cell tumors (GCTs). Barry Pierce working on mouse teratomas and teratocarcinomas, the most frequent type of testicular germ cell cancer, hypothesized that most cancers contain self renewing undifferentiated stem cells (called embryonal carcinoma cells, ECCs) that can be malignant or can differentiate into benign, non-cancerous cells.

Cancer stem cells have recently been identified in several types of tumors, but their origin is still an area of ongoing research. Perhaps without the need to think that all tumors originate from ectopic PGCs (J. Beard, 1902. Embryological aspects and etiology of carcinoma, *Lancet*, pp. 1758-1761), the formation of GCTs from PGCs/gonocytes may represent a paradigm of this process. Although GCTs display various histologies, those inside testes at least arise from a common premalignant lesion arising within the seminipherous tubules termed carcinoma *in situ* (CIS) in which a series of genomic, genetic and epigenetic alterations (today suspected to be at least partly due to environmental pollutants), leads to progression towards cancer. It is now clearly emerging that germ cells and cancer cells share several characteristics; a number of genes and molecular mechanisms (i.e. epigenetic changes, microRNA) typically involved in the early programming of germline cells are also involved in the formation of various cancers. The concept that a close relationship exists between germ cells and stem cells is also a pillar of contemporary developmental biology. Indeed the relationship between ECCs and the early embryo demonstrated in several studies during the 1970s led to the derivation of mouse embryonal stem cells (ESCs) and inaugurated the stem cell era.

In the present Special Issue we, with the help of eminent scientists and leading researchers in the field who contributed to the Issue and to which we give our sincere thanks, have tried to look back to the origin of the concepts summarized here, and ahead to the future fascinating development of this field of research. A special thanks to Professor Juan Aréchaga, Editor in Chief of the Journal, who asked us to be guest editors and his Editorial Team whose members made possible the realization of this Special Issue.

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Rome, January 2013

Int. J. Dev. Biol. 57: 101-103 (2013)
doi: 10.1387/ijdb.130167md

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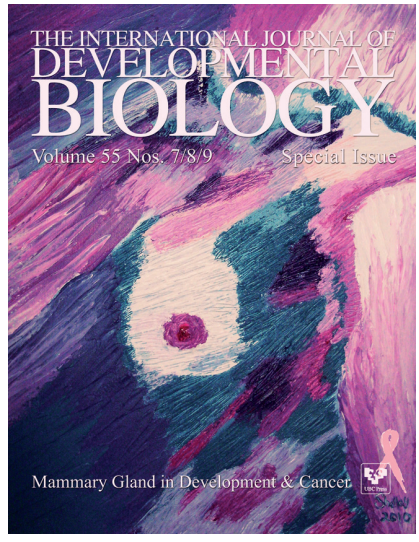

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