Cell-free extracts in Development and Cancer Research

Guest Editor

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THE INTERNATIONAL JOURNAL OF DEVELOPMENTAL BIOLOGY

Volume 60 Nos. 7/8/9 Special Issue 2016

Preface

Cell-free extracts in Development and Cancer Research for over 40 years

The main reason for this Special Issue of *The International Journal of Developmental Biology (Int. J. Dev. Biol.)* is to commemorate two milestone anniversaries in the history of cell-free extract application in research.

The first is the 100th anniversary (next year) of the publication of the first paper ever to describe a cell-free extract use in the field of cancer research (Shattock and Dudgeon, 1917). The second is the 40th anniversary (last year and this year) of the two first papers describing the autonomous function of the cell-free extract of *Xenopus* oocytes after isolation of cytoplasm from the cell membrane, which helped to improve our understanding of DNA replication (Benbow and Ford, 1975; Gandini Attardi *et al*., 1976). During these early studies, *Xenopus* oocytes were homogenized with a whirling blade homogenizer, followed by centrifugation at 2,500 g (Benbow and Ford, 1975), or the cytoplasm was manually isolated by removal of germinal vesicles (cell nuclei), homogenized in a glass douncer, and centrifuged at 8,000 g (Gandini Attardi *et al*., 1976). Today, oocytes, eggs or embryos are crushed directly during centrifugation at 8,000-10,000 g to obtain the so-called low speed extract and at 150,000 g to obtain the high speed extract. Such a way to produce the cell-free extract preserves many activities to the extent that it allows undergoing several cell cycles.

Cell-free extracts recapitulate in a test tube certain biological or biochemical activities. The discovery that isolated cytoplasm behaves very much like an intact cell and recapitulates life processes had enormous consequences for studying diverse biochemical aspects of cell physiology and pathology, and allowed the discovery of many biochemical processes. Certainly, from the very beginning, investigators have been aware that they can be confronted with situations when artefacts appear in the test tube. However, well aware and prudent scientists do not base final conclusions solely on results obtained *in vitro*, but arrive at these only after confirming that the studied processes occur similarly *in cellulo*. Earlier observations, that lysates of bacteria and reticulocytes may autonomously synthesize proteins on a large scale, suggested that other life processes could be recapitulated by lysates from other cells as well. This was proven by the two papers cited above and was confirmed by thousands of papers which followed.

Analysis of cell-free extracts has allowed us to understand many of the fundamental processes of cell physiology and pathology, including those involved in embryo development and cancer. This methodology is being continuously modified and improved. Papers selected for this Special Issue will show readers the plethora of systems and applications of this methodology. Let this selection of papers speak for itself!

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Further Related Reading, published previously in the *Int. J. Dev. Biol.*

Control of timing of embryonic M-phase entry and exit is differentially sensitive to CDK1 and PP2A balance
Mohammed El Dika, Damian Dudka, Claude Prigent, Jean-Pierre Tassan, Malgorzata Kloc and Jacek Z. Kubiak
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Identification of the sperm motility-initiating substance in the newt, Cynops pyrrhogaster, and its possible relationship with the acrosome reaction during internal fertilization
Toshihiko Watanabe, Hideo Kubo, Shinya Takeshima, Mami Nakagawa, Manami Ohta, Saori Kamimura, Eriko Takayama-Watanabe, Akihiko Watanabe, and Kazuo Onitake
Int. J. Dev. Biol. (2010) 54: 591-597

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Benchun Liu, Dongxiao Feng, Guiting Lin, Mei Cao, Yuet Wai Kan, Gerald R. Cunha and Laurence S. Baskin
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Chanchao Lorthongpanich, Davor Solter and Chin Yan Lim
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Faithful reprogramming to pluripotency in mammals - what does nuclear transfer teach us?
Julien Maruotti, Alice Jouneau and Jean-Paul Renard
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Gonad-stimulating substance-like molecule from the radial nerve of the sea cucumber
Hideki Katow, Tomoko Katow and Akihiko Moriyama
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