



Generation of useful cell culture data

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Abstract. As the need for viable and interpretable cell culture systems increases, it is not sufficient to simply be successful at growing cells *in vitro*. Rather, vigilance is required to obtain repeatable data from these systems, especially if mechanistic or developmental experimental designs are attempted. We suggest that all aspects of basic cell culture are as important as growing cells. We offer the papers of

this issue to help the cell scientist scrutinize and identify problems in many of these important areas, including obtaining tissue, eliminating microbial contamination, formulating a defined medium, isolating specific cell types from tissue and then using them for *in vitro* studies, cloning cells, selecting and developing methods for cell culture analyses, and recognizing abnormal cell culture activity.

Key words: Analysis of cell activity, Basic cell culture methods, Microbial contamination, Satellite cell

Overview

This issue represents a review and reinvestment in basic cell culture methods. Cell culture has proven to be both a boon and a bust to scientists. If the cell culture system is well developed, and time is not required to establish the limits of the *in vitro* system, then relatively large amounts of research data may be generated in relatively short timeframes and researchers may make steady research gains and publish above average numbers of papers with minimal delays. Also, depending on the type of cell culture system employed and whether the research question is timely (i.e. descriptive, mechanistic, and in vogue by granting agencies), researchers may secure grant funding for continued studies.

However, cell culture systems and conditions differ between laboratories. In many cases data generated under similar conditions but in different laboratories are not consistent. An example of this potential problem is the circumstance when cells are obtained from another's laboratory. In this case, we suggest that any deviation from the way in which the cell culture was originally maintained in the parent laboratory should be stated whenever the culture is referred to in a publication. We also suggest that if a laboratory changes the formulation of a particular medium in any way, it is no longer correct to call that medium by its original name. It should be called a modification of the original medium, and any publication should describe the modifications in detail. As cell cultures may vary in their responses depending upon the way they are maintained, it is quite unfair to the developer of a culture system for

one to describe the absence of a biological parameter that the cultures were supposed to possess when that lack may be due to differences in cultural procedures in subsequent laboratories. Further, as a major aspect of research is the communication (via publication) of data, in order for the findings derived from cell culture to be verified and the methodology used, every effort must be made to describe phenomena and methods so that others can repeat and reproduce experiments. As such, we are enthusiastic that the subjects covered in this issue may help new researchers in the field, provide information that might be useful in teaching cell culture techniques at the university level, and form the foundation for standardization of cell culture systems across discipline boundaries.

In the first paper of this issue, methods to isolate mature adipocytes from fat tissue depots within necropsy horses are described and discussed. Although a perspective, this paper provides a new idea about the timing of tissue removal from animals. Successful isolation of adipocytes from necropsy animals may prove interesting to those for whom (for whatever reason) the use of live animals is not an option. In addition, for those researchers who are focused on defining the lineage origin of mesodermal-derived cells, this paper may provide a new system for isolation of specific subpopulations of adipocytes. Paper two sets forth guidelines for the prevention of contamination *in vitro*. Specifically, this paper covers procedures beginning with the removal of tissue from animals and all subsequent steps, from isolating cells from the tissue to placing these cells into primary cell culture. While contam-

ination is not a new subject, new scientists need to be exposed to the problem and more experienced researchers need to be reminded of what they may have forgotten. The third paper of this issue describes how one might formulate a defined medium for cultured cells and what might happen to the cells if one alters only a few components of the defined medium. Paper four of this issue covers a comparison of methods used to isolate myogenic satellite cells from animals. In addition, this paper offers another animal procedure for those who might be interested in initiating satellite cell cultures derived from wild animals. The fifth paper describes how one might clone cells and therefore obtain pure cultures of cells for specific research purposes. The subsequent paper by Stewart et al. discusses many of the methods used to analyze cell cultures, including some relatively new techniques that are just appearing in the scientific literature. Finally, the last paper of this issue characterizes some common phenomena observed in cell cultures and offers restrictions on the

use of culture data where such phenomena are contained.

If used correctly, cell cultures yield valuable data. However, generation of viable cell culture data is not easy, requires patience and many times is costly. The numerous steps involved in basic cell culture must be performed with a critical eye to detail, especially if one is using cells isolated from tissues. Even with appropriate technical help, customized cell culture laboratories and unlimited budgets, situations may occur which restrict the use of such data. Discarding an experiment, even if costly, is better than trying to interpret data from marginal cultures. As the papers of this issue suggest, basic cell culture methods should not be taken for granted.

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