

## Introduction

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Mammary gland biology has continued to excite and entice researchers due to its relative ease for manipulation as a developmental model system as well as its relevance to lactation biology and to understanding breast tumor biology. As a developmental system, the mammary gland has provided insights into epithelial and secretory differentiation as well as stem/progenitor cell biology. The relevance to breast cancer continues to be the basis for much of the rapidly-expanding mammary tumor literature. Whether one is a neophyte starting breast cancer research or a well-established PI, the questions posed by these researchers include which models will help unmask features of human breast cancer? Which ones faithfully recapitulate aspects of this disease? And, last but not least, which protocol should be used and how will the data be interpreted? Regardless of whether your primary focus is breast cancer, development or lactation, it is clear that advances in methodologies continue to be integral to progress in these fields.

Numerous reviews have previously appeared in this journal detailing methods to approach critical questions in mam-

mary gland development, lactational biology and breast cancer. Notably, an entire issue of the Journal of Mammary Gland Biology and Neoplasia was devoted to this topic in 2009 (Volume 14, Issue 4) to update researchers on *in vitro* and *in vivo* methods. That issue was a stunning success. Given the rapid methodological advances in these fields there clearly is a need for an update of the update! This Methods issue addresses new and refined approaches as well as some current controversies in the field. In the developmental arena we have included an article comparing leading methods for isolating and separating populations of mammary epithelial cells [1] as well as articles describing protocols for 3D *in vitro* models [2] and non-adherent sphere assays [3, 4] to study morphogenesis/differentiation and stem/progenitor populations, respectively, *in vitro*. We also include a review by Lewis and Medina in which they continue a critical discussion of the controversies surrounding the use of Matrigel for transplantation methodologies [5]. Finally, in a novel addition for this journal we now make available a digital link to the popular mouse mammary methods video first produced in VHS format by Charles Daniel and Gary Silberstein [6].

Regarding tumor biology, we have included articles describing methods that should help address the following outstanding problems: what are the molecular and cellular mechanisms that govern progression from confined breast cancer into invasive carcinoma and to metastases [4, 7, 8]? What drives organ tropism of breast cancer cells during metastasis [9]? What is the influence of estrogen receptor (ER)-ligands and ER-cooperating factors on gene expression in ER-positive breast cancers [10]? And, what are the clinically-valuable protein biomarkers [11]?

We would like to thank all the authors and reviewers for their contributions and hope that the readers will find the described methods useful for their research.

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