



Methods and Models in Mammary Gland Biology and Breast Cancer Research

Johanna Englund¹ · Zuzana Sumbalova Kolodova²

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Abstract

The collection on Methods and Models in Mammary Gland Biology and Breast Cancer Research showcases recent advances in tools and models that enhance our understanding of mammary gland development and breast cancer. This collection includes sixteen articles, collectively addressing approaches to investigate key aspects of mammary gland biology and tumorigenesis, including hormonal signaling, tissue architecture, tumor microenvironment, and species-specific mammary development. The issue highlights innovations such as optimized progesterone receptor reporters, improved menopause models, and 3D-printed mammary epithelial structures. It also features advancements in organoid-based studies, in situ labeling of epithelial proliferation in large animals, preclinical models for breast cancer prevention, and high-resolution imaging techniques. Methodologies for studying macrophage-cancer cell interactions and lysosomal function are provided as step-by-step protocols. Additionally, review articles provide insights into diverse mammalian organoid systems, rat mammary tumor models, and strategies for modeling breast cancer metastasis. Together, these contributions advance mammary gland research by refining experimental approaches, expanding model diversity, and fostering translational applications in breast cancer.

Main Text

The articles in the Methods and models in mammary gland biology and breast cancer special issue collectively explore the diverse aspects of mammary gland biology, emphasizing the use of advanced tools and models to investigate e.g. hormonal signaling, tumor dynamics, and mammary tissue development across species. The collection comprises of nine original research articles, three reviews, two protocol articles, and two meeting reports.

In particular, this special issue highlights the advances in tools for studying normal mammary gland development and breast cancer. In their original research article, Aarts and colleagues describe luciferase and fluorescent reporters

based on optimized Progesterone Responsive Element (PRE) for studying progesterone receptor (PR) signaling in human breast epithelial cells [1]. PR signaling is essential for mammary physiology and breast cancer [3, 15], however tools for sensitive measuring and imaging of PR activity have been lacking. Hence, the authors have generated constructs enabling quantitative analysis of PR activity in cell populations or at the level of single cells and which further enhance the understanding of PR signaling and target gene induction.

Fluctuating hormone levels in perimenopause and near complete loss of circulating estrogen and progesterone in menopause lead to complex reorganization and regression of the mammary gland, while rendering it vulnerable to endocrine-disrupting chemicals. To study these critical windows of susceptibility for breast cancer, mouse ovariectomy model has been traditionally used though it comes short in recapitulating the gradual transition typical for human natural menopause. Therefore, Sacki and colleagues employed a chemically-induced menopause model using 4-vinylcyclohexene dioxide (VCD) [10] and characterized the VCD-induced morphological changes to mammary epithelium as well as sensitivity to hormones [19]. Upon demonstrating that VCD treatment provides mammary gland

✉ Johanna Englund
johanna.englund@helsinki.fi

✉ Zuzana Sumbalova Kolodova
zuzana.sumbalova-kolodova@img.cas.cz

¹ Institute of Biotechnology, University of Helsinki, Helsinki, Finland

² Institute of Molecular Genetics of the Czech Academy of Sciences, Prague, Czech Republic

Methods In Mammary Gland Biology And Breast Cancer Research

Nathan A. Berger



Methods In Mammary Gland Biology And Breast Cancer Research:

Methods in Mammary Gland Biology and Breast Cancer Research Margot M. Ip, Bonnie B. Asch, 2000-12-31 This book is a bench manual that provides in one volume all the important and unique technologies necessary to studies of mammary gland biology and breast cancer. The chapters are written by experts in each area with an emphasis on nitty gritty details that are key points for the successful use of a method. Sections include in vivo model systems special techniques for in vivo studies in vitro model systems and molecular analysis and gene transfer techniques. *Methods in Cell-Matrix Adhesion* Josephine Adams, 2002-06-12 Critically acclaimed for more than 25 years the Methods in Cell Biology series provides an indispensable tool for the researcher. Each volume is carefully edited by experts to contain state of the art reviews and step by step protocols. Techniques are described completely so that methods are made accessible to users. This volume Methods of Cell Matrix Adhesion contains integrated coverage on cell matrix adhesion methods. It brings the classical methodologies and the latest techniques together in one concise volume. This coverage includes experimental protocols and their conceptual background for all aspects of cell matrix adhesion research the extracellular matrix adhesion receptors and the growing number of functional applications of matrix adhesion in molecular cell biology. Also covered is the purification of the extracellular matrix to functional analyses of cellular responses. *A Guide to Breast Cancer Research* Therese Sørli, Robert B. Clarke, 2025-01-16 The book presents key topics at the forefront in breast development and cancer research in chapters authored by leading scientists in the field. The chapters provide a basis for understanding major concepts model systems cells of origin and heterogeneity in human breast development and cancer. The book builds on this understanding to guide readers through the cellular and molecular basis of breast cancer and the most important signaling pathways. Finally the book describes mechanisms of metastasis and cancer immunity and treatment options and resistance to therapy. It is targeted at young scientists and early career researchers and provides an overview of current topics in breast cancer research. Each chapter includes key learning points boxes and conclusions to highlight the most important information. This book will interest anyone who wants to learn about the main areas of breast cancer research and the most important recent advances.

Pathology of Genetically Engineered and Other Mutant Mice John P. Sundberg, Peter Vogel, Jerrold M. Ward, 2022-01-26 An updated and comprehensive reference to pathology in every organ system in genetically modified mice. The newly revised and thoroughly updated Second Edition of Pathology of Genetically Engineered and Other Mutant Mice delivers a comprehensive resource for pathologists and biomedical scientists tasked with identifying and understanding pathologic changes in genetically modified mice. The book is organized by body system includes descriptions and explanations of a wide range of findings as well as hundreds of color photographs illustrating both common and rare lesions that may be found in genetically engineered and wild type mice. The book is written by experienced veterinary and medical pathologists working in veterinary medical colleges medical colleges and research institutes. Covering the latest discoveries in mouse

pathology resulting from advancements in biotechnology research over the last 30 years this singular and accessible resource is a must read for veterinary and medical pathologists and researchers working with genetically engineered and other mice Readers will also benefit from A thorough introduction to mouse pathology and mouse genetic nomenclature as well as databases useful for analysis of mutant mice An exploration of concepts related to validating animal models including the Cinderella Effect Practical discussions of basic necropsy methods and grading lesions for computational analyses Concise diagnostic approaches to the respiratory tract the oral cavity and GI tract the cardiovascular system the liver and pancreas the skeletal system and other tissues As a one stop and up to date reference on mouse pathology Pathology of Genetically Engineered and Other Mutant Mice is an essential book for veterinary and medical pathologists as well as for scientists researchers and toxicologists whose work brings them into contact with genetically modified mice

A Practical Guide to the Histology of the Mouse Cheryl L. Scudamore, 2014-02-10 A Practical Guide to the Histology of the Mouse provides a full colour atlas of mouse histology Mouse models of disease are used extensively in biomedical research with many hundreds of new models being generated each year Complete phenotypic analysis of all of these models can benefit from histologic review of the tissues This book is aimed at veterinary and medical pathologists who are unfamiliar with mouse tissues and scientists who wish to evaluate their own mouse models It provides practical guidance on the collection sampling and analysis of mouse tissue samples in order to maximize the information that can be gained from these tissues As well as illustrating the normal microscopic anatomy of the mouse the book also describes and explains the common anatomic variations artefacts associated with tissue collection and background lesions to help the scientist to distinguish these changes from experimentally induced lesions This will be an essential bench side companion for researchers and practitioners looking for an accessible and well illustrated guide to mouse pathology Written by experienced pathologists and specifically tailored to the needs of scientists and histologists Full colour throughout Provides advice on sampling tissues necropsy and recording data Includes common anatomic variations background lesions and artefacts which will help non experts understand whether histologic variations seen are part of the normal background or related to their experimental manipulation

Tumor Models in Cancer Research Beverly A. Teicher, 2010-12-01 The past 6 years since the first edition of this book have seen great progress in the development of genetically engineered mouse GEM models of cancer These models are finding an important role in furthering our understanding of the biology of malignant disease A comfortable position for GEM models in the routine conduct of screening for potential new therapeutics is coming more slowly but is coming Increasing numbers of genetically engineered mice are available some with conditional activation of oncogenes some with multiple genetic changes providing mouse models that are moving closer to the human disease

Murine Models, Energy Balance, and Cancer Nathan A. Berger, 2015-06-19 This volume provides a transdisciplinary and translational review of many of the leading murine models used to study the mechanisms mediators and biomarkers linking energy balance to cancer It provides a

review of murine models that should be of interest to basic clinical and applied research investigators as well as nutrition scientists and students that work in cancer prevention cancer control and treatment The worldwide obesity pandemic has been extensively studied by epidemiologic and observational studies and even in some cases by randomized controlled trials However the development and control of obesity its comorbidities and its impact on cancer usually occurs over such long periods that it is difficult if not impossible to conduct randomized controlled trials in humans to investigate environmental contributions to obesity energy balance and their impact on cancer In contrast model organisms especially mice and rats provide valuable assets for performing these studies under rigorously controlled conditions and in sufficient numbers to provide statistically significant results In this volume many of the leading and new murine models used to study the mechanisms and mediators linking cancer with obesity sleep exercise their modification by environment and how they may continue to be used to further elucidate these relations as well as to explore preclinical aspects of prevention and or therapeutic intervention are considered This volume provides an important compilation and analysis of major experimental systems and principles for further preclinical research with translational impact on energy balance and cancer

Techniques and Methodological Approaches in Breast Cancer Research Jose Russo, Irma H. Russo, 2014-05-14 This volume explores the myriad of techniques and methodological approaches that are being used in breast cancer research The authors critically evaluate of the advantages and disadvantages of current methodologies starting with the tools available for understanding the architecture of the human breast including its tissue and cellular composition The volume discusses the importance of functional studies in breast cancer research especially with the help of laser capture microdissection which allows the separation of small amounts of tissue as well as specific cells for biochemical analysis In addition the authors address methodologies including stem cell separation which has helped in significantly understanding their role in normal breast development but also further the understanding of breast cancer and its therapeutic management The use of in vitro techniques and established cell lines for mechanistic studies in chemotherapeutic approaches have been invaluable will be discussed Imaging techniques for evaluating in vitro and in vivo behavior of normal and cancerous breast tissue will be explored as it provides a better understanding of the physiopathology of cancer The volume will also discuss the molecular analysis of gene function in breast cancer through the transcriptomic and epigenomic profile More importantly the advancement of more refined techniques in sequencing will be covered This monograph will be a comprehensive authoritative and timely as it addresses the emerging approaches used in breast cancer research

Carcinogen-Driven Mouse Models of Oncogenesis, 2021-03-28 Carcinogen Driven Mouse Models of Oncogenesis Volume 163 contains a series of protocols written by world leading experts in the field Each manuscript provides a detailed methodological description to drive carcinogen mediated oncogenesis in mice Chapters in this new release include Chemical carcinogenesis in mice as a model of human cancer Pros and cons MPA DMBA driven mammary carcinomas Dimethylbenz a anthracene

Induced Mammary Tumorigenesis in mice Urethane induced lung carcinogenesis Methylcholanthrene induced fibrosarcomas BBN driven bladder carcinomas Oral squamous cell carcinomas driven by 4NQO Analyzing skin tumor development in mice by the DMBA TPA model and much more Other sections cover DSS AOM driven colorectal carcinomas Diethylnitrosamine induced liver tumorigenesis in mice Two stage 3 methylcholanthrene and butylated hydroxytoluene induced lung carcinogenesis in mice Lung carcinomas induced by NNK and LPS Pristane induced mammary carcinomas The 4 NQO mouse model an update on a well established in vivo model of oral carcinogenesis and more Provides protocols provided by renowned experts in the field Presents detailed descriptions of protocols hence allowing appropriate reproduction of the models Includes author notes for each protocol covering useful tips and troubleshooting

Insulin-like Growth Factor Receptor Signalling Derek Leroith, Walter Zumkeller, Robert C. Baxter, 2003-07-31 Insulin like growth factors are ubiquitously expressed and are crucial for growth and function of almost all cells Together with their binding proteins and receptors they form a widely studied biological system involving many proteins and characterized by complex interactions In addition to its significance in growth and development the insulin like growth factor system also has important roles in a wide variety of pathological states This has led to interest in the therapeutic potential of insulin like growth factors and their binding proteins as candidate drug targets This comprehensive book contains current information on both basic science and clinical aspects of IGFs and their regulatory proteins with emphasis on their relevance to cancer

Knobil and Neill's Physiology of Reproduction, 2005-12-12 The 3rd edition the first new one in ten years includes coverage of molecular levels of detail arising from the last decade's explosion of information at this level of organismic organization There are 5 new Associate Editors and about 2/3 of the chapters have new authors Chapters prepared by return authors are extensively revised Several new chapters have been added on the topic of pregnancy reflecting the vigorous investigation of this topic during the last decade The information covered includes both human and experimental animals basic principles are sought and information at the organismic and molecular levels are presented The leading comprehensive work on the physiology of reproduction Edited and authored by the world's leading scientists in the field Is a synthesis of the molecular cellular and organismic levels of organization Bibliographies of chapters are extensive and cover all the relevant literature

Programmed Cell Death Part B Roya Khosravi-Far, Zahra Zakeri, Richard A. Lockshin, Mauro Piacentini, 2008-07-29 One of the major goals of researchers in the field of apoptosis is to identify targets for novel therapies in cancer AIDS and Alzheimer's disease Understanding the molecular mechanisms of the various components of the apoptotic pathways is the first step to reaching this goal The 2002 Nobel Prize in Physiology or Medicine was awarded to Sydney Brenner United Kingdom H Robert Horvitz US and John E Sulston UK for their discoveries concerning genetic regulation of organ development and programmed cell death Cell death is a fundamental aspect of embryonic development normal cellular turnover and maintenance of homeostasis maintaining a stable constant environment on the one hand and aging and disease on the other This volume

addresses the significant advances with the techniques that are being used to analyze cell death This volume provides the necessary trusted methods to carry out this research on these latest therapeutic techniques Once researchers understand the molecular mechanisms of the apoptotic pathways they can begin to develop new therapies Presents key methods on studying tumors and how these cancer cells evade cell death Eliminates searching through many different sources to avoid pitfalls so the same mistakes are not made over and over

Functional Foods for Chronic Diseases (Volume 3) Danik M. Martirosyan, 2008-02-10 The publication of this book serves two great purposes First it spreads the word about new functional food products for chronic diseases such as hypertension diabetes and obesity to the general public It not only introduces new functional foods but also shows the investigations and research that led to their creation Second the book preserves the numerous ideas and contributions made in the field This shows the progress and evolution of this thriving field with the power to change the lives of millions of people The forever growing field of functional foods brings together research scientists food manufacturers and consumers who are committed to this issue through modern achievements of surgical approaches and potential of drug therapy where particular emphasis is placed on the unresolved problems of pharmaceutical side effects

Issues in Cancer and Oncology: 2013 Edition, 2013-05-01 Issues in Cancer and Oncology 2013 Edition is a ScholarlyBrief that delivers timely authoritative comprehensive and specialized information about Neoplasia in a concise format The editors have built Issues in Cancer and Oncology 2013 Edition on the vast information databases of ScholarlyNews You can expect the information about Neoplasia in this book to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Cancer and Oncology 2013 Edition has been produced by the world's leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at <http://www.ScholarlyEditions.com>

Insulin-Like Growth Factors Douglas Yee, 2004 Over the past five years there has been an explosion of targeted therapies for cancer treatment In most cases these therapies have been based on pre clinical data showing that specific molecules play an important role in regulating the malignant phenotype In breast cancer there is compelling rationale that such targeted strategies should be successful Targeting of estrogen receptor ER has proven to be a successful way to reduce breast cancer risk decrease the risk of death and recurrence in an adjuvant setting and remains the first choice of treatment for advanced disease With this success it is hoped that other molecular pathways could also be successfully exploited This publication reviews the role of the insulin like growth factors IGFs in breast cancer Over 100 years ago George Beatson made an intuitive leap connecting breast cancer therapy with ovarian function He removed the ovaries from a premenopausal woman with breast cancer he reasoned that ovarian function regulated normal mammary gland function therefore the ovaries may influence the malignant phenotype

Other discussion included cover the function of IGF action in the normal mammary gland using mouse model systems where expression and function can be manipulated and the patterns of expression of the IGFs their binding proteins and their receptors in the normal gland

Recent Advances in Prolactin Research Maria Diakonova, PhD, 2014-12-03 Recent Advances in Prolactin Research summarizes the current knowledge of prolactin PRL PRL receptor PRL dependent signaling pathways the role of PRL in oncogenesis and PRL crosstalk with other oncogenic factors The chapters are written by experts in these fields and focus on identifying and reviewing timely experimental findings that provide new insights into the expanding role of PRL in the pathophysiology associated with a variety of human conditions Prolactin is a peptide hormone that is best known for its role in lactation Prolactin also has an influence on hematopoiesis and angiogenesis and is involved in the regulation of blood clotting through several pathways Although PRL was discovered more than 80 years ago the understanding of PRL signaling and its relationship to various pathologies is still very incomplete PRL is not only a pituitary hormone with an important role in reproduction but PRL also acts as a cytokine modulating a wide variety of physiological processes For example data gathered during the last decade have demonstrated that locally produced PRL acts as the autocrine paracrine factor and plays a contributory role during breast oncogenesis In fact the scientific and clinical communities have suggested that the manipulation of the PRL axis may lead to the successful treatment of breast cancer However recent work has demonstrated that the role of the PRL axis is much more complex than first envisaged

Stem Cells in Veterinary Science Ratan Kumar Choudhary, Shanti Choudhary, 2022-02-05 This book explores the potential applications of animal stem cells in veterinary medicine It begins with an overview of stem cells and their application in treating various animal diseases including mastitis In turn the book discusses the challenges of using stem cells in regenerative medicine and emphasizes the importance of understanding the action of stem cells and preclinical evidence for ensuring safety and therapeutic efficacy It also presents methods for the identification characterization and quantification of stem cells Further it discusses the therapeutic applications of different stem cells including milk derived testicular and mesenchymal stem cells in veterinary medicine Lastly it discusses strategies for and therapeutic applications of genome editing by CRISPER Cas9 in mammary stem cells As such the book offers a valuable resource for students and scientists working in the veterinary sciences and veterinarians

The Guide to Investigation of Mouse Pregnancy B. Anne Croy, Aureo T. Yamada, Francesco J. DeMayo, S. Lee Adamson, 2013-12-09 The Guide to Investigation of Mouse Pregnancy is the first publication to cover the mouse placenta or the angiogenic tree the mother develops to support the placenta This much needed resource covers monitoring of the cardiovascular system gestational programming of chronic adult disease epigenetic regulation gene imprinting and stem cells Offering detailed and integrated information on how drugs biologics stress and manipulations impact pregnancy in the mouse model this reference highlights techniques used to analyze mouse pregnancy Joining the ranks of much referenced mouse resources The Guide to Investigation of Mouse Pregnancy is the only manual

providing needed content on pregnancy in animal models for translational medicine and research Provides instruction on how to collect pre clinical data on pregnancy in mouse models for eventual use in human applications Describes the angiogenic tree the mother s uterus develops to support pregnancy and the monitoring of pregnancy induced cardiovascular changes Educates readers on placental cell lineages decidual development including immune cells epigenetic regulation gene imprinting stem cells birth and lactation Discusses how stress environmental toxicants and other manipulations impact upon placental function and pregnancy success Subject Index of Current Extramural Research Administered by the National Cancer Institute ,1978 **Subject Index of Extramural Research Administered by the National Cancer Institute** ,1979 Current information about research grants and contracts supported by the National Cancer Institute Subject listing gives contract or grant number and topic Investigator grant number and contract number indexes

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