

The use of animal models in rheumatoid arthritis research

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The pathological hallmark of rheumatoid arthritis (RA) is a synovial pannus that comprises proliferating and invasive fibroblast-like synoviocytes, infiltrating inflammatory cells, and an associated neoangiogenic response. Animal models have been established to study these pathological features of human RA. Spontaneous and induced animal models of RA primarily reflect inflammatory aspects of the disease. Among various induced animal models, collagen-induced arthritis (CIA) and collagen antibody-induced arthritis (CAIA) models are widely used to study the pathogenesis of RA. Improved transplantation techniques for severe combined immunodeficiency (SCID) mouse models of RA can be used to evaluate the effectiveness of potential therapeutics in human tissues and cells. This review provides basic information on various animal models of RA, including CIA and CAIA. In addition, we describe a SCID mouse coimplantation model that can measure the long-distance migration of human RA synoviocytes and cartilage destruction induced by these cells.

Keywords: Animal models; Cell movement; Rheumatoid arthritis; Severe combined immunodeficient mice; Synoviocytes

Introduction

Rheumatoid arthritis (RA) is a common autoimmune disorder that affects approximately 1% of the global population. It is characterized by tumor-like expansion of the synovium, angiogenesis, and destruction of the articular cartilage and bone [1]. Despite the advent of anticytokine therapies that ameliorate the inflammatory manifestations of RA, there is no curative treatment and the pathogenesis of the disease is not fully understood. In RA joints, various cell populations, including innate immune cells, adaptive immune cells, endothelial cells, and fibroblast-like synoviocytes (FLSs), are activated [1]. Resident synoviocytes participate in the chronic inflammatory response and joint destruction in RA, and in fact,

these cells represent the major cell population in the invasive pannus [2]. RA-FLSs have the potential to secrete matrix-degrading enzymes (matrix metalloproteinase 3 [MMP3] and MMP9), pro-inflammatory cytokines (interleukin 1 [IL-1] and IL-6), chemokines (IL-8 and C-C motif chemokine ligand 2), and angiogenic factors (vascular endothelial growth factor and placental growth factor) [2]. Moreover, although RA synoviocytes are primary cells, they proliferate abnormally and display resistance to Fas-mediated apoptosis, similar to cancer cells [2,3]. During RA development, the phenotype of RA-FLSs is altered to an invasive and aggressive behavior, with increased migratory ability and reduced attachment-dependent growth, leading to articular cartilage destruction [2,4]. RA-FLSs can spread by migrating from the af-

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Genetic Studies Of Rheumatoid Arthritis Using Animal Models

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Genetic Studies of Rheumatoid Arthritis Using Animal Models Niklas Nordquist,2001 *Animal Models in Orthopaedic Research* Yuehuei H. An,Richard J. Freidman,2020-04-30 *Animal Models in Orthopaedic Research* is a reference book of the major animal models used in the study of orthopaedic conditions and in the in vivo study of biomaterials Use of animal models provides important knowledge about pathological conditions that can eventually lead to the development of more effective clinical treatment of diseases in bot

Genes and Genetics of Autoimmunity A. N. Theofilopoulos,1999-07 Autoimmunity is one of the most highly investigated areas of immunologic research The principle of immune system discrimination between self and foreign molecules is fundamental to the survival of the species and the failure to establish or maintain this discrimination can lead to a wide spectrum of diseases As a consequence of intensive studies much has been learned with regard to the normal functioning of the immune system and the editing processes by which self tolerance is established Moreover many theories and experimental models have been developed to explore the mechanisms of autoimmune disease pathogenesis This book is the first volume of the new series *Current Directions in Autoimmunity* which aims to consolidate current knowledge of autoimmunity focusing on both basic and clinical aspects Given that these diseases have a strong genetic basis it seems appropriate that the first volume addresses this topic It reviews the most recent findings on genes affecting autoimmunity and genome wide studies defining the multiple loci predisposing to prominent autoimmune diseases such as lupus arthritis diabetes and multiple sclerosis For each of these entities studies in experimental models as well as humans are covered The authoritative and timely material will be of interest to investigators in the fields of immunology and genetics to clinicians with interest in rheumatology endocrinology and neurology and to those working to devise gene specific therapies for a variety of inflammatory conditions

Current Topics In Human Genetics: Studies In Complex Diseases Hong-wen Deng,Hui Shen,Yongjun Liu,Hai Hu,2007-11-12 The sequencing of the human genome has brought human genetics into a new era of study resulting in the generation of an explosive amount of information Application of genomic proteomic and bioinformatics technologies to the study of human genetics has made it possible for human genetic diseases to be studied on an unprecedented scale both in silico and in the wet lab This volume provides up to date coverage of the broad range of research topics in this fascinating area In the first part of the book a whole spectrum of approaches to human genetics research is reviewed for both background and the latest progress In the second important topics related to genetic research of various complex human diseases are discussed The robust content and diverse array of subjects allow the book to serve as both a concise encyclopedia that introduces basic and essential concepts of human genetics and an in depth review of the current understanding of genetic research in human diseases

Rheumatoid Arthritis: New Insights for the Healthcare Professional: 2013 Edition ,2013-07-22 *Rheumatoid Arthritis New Insights for the Healthcare Professional 2013 Edition* is a ScholarlyEditions book that delivers timely authoritative and comprehensive information about Diagnosis and

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The Mouse In Animal Genetics And Breeding Research Eugene J Eisen, 2005-06-27 The sequencing of the mouse genome has placed the mouse front and center as the most important mammalian genetics model However no recent volume has detailed the genetic contributions the mouse has made across the spectrum of the life sciences this book aims to fill that vacuum Mouse genetics research has made enormous contributions to the understanding of basic genetics human genetics and livestock genetics and breeding The wide ranging topics in the book include the mouse genome sequencing effort molecular dissection of quantitative traits embryo biotechnology ENU mutagenesis and genetics of disease resistance and have been written by experts in their respective fields

Handbook of Laboratory Animal Science, Volume III Jann Hau, Steven J. Schapiro, 2013-12-26 While replacing and reducing the use of laboratory animals are integral parts of the 3Rs replace reduce refine which form the cornerstones of laboratory animal science biomedical research involving animals remains absolutely essential for the advancement of the medical veterinary agricultural and biological sciences Building upon the bestsel

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Genomic and Personalized Medicine, 2012-10-30 Genomic and Personalized Medicine Second Edition winner of a 2013 Highly Commended BMA Medical Book Award for Medicine is a major discussion of the structure history and applications of the field as it emerges from the campus and lab into clinical action As with the first edition leading

experts review the development of the new science the current opportunities for genome based analysis in healthcare and the potential of genomic medicine in future healthcare The inclusion of the latest information on diagnostic testing population screening disease susceptibility and pharmacogenomics makes this work an ideal companion for the many stakeholders of genomic and personalized medicine With advancing knowledge of the genome across and outside protein coding regions of DNA new comprehension of genomic variation and frequencies across populations the elucidation of advanced strategic approaches to genomic study and above all in the elaboration of next generation sequencing genomic medicine has begun to achieve the much vaunted transformative health outcomes of the Human Genome Project almost a decade after its official completion in April 2003 Highly Commended 2013 BMA Medical Book Award for Medicine More than 100 chapters from leading researchers review the many impacts of genomic discoveries in clinical action including 63 chapters new to this edition Discusses state of the art genome technologies including population screening novel diagnostics and gene based therapeutics Wide and inclusive discussion encompasses the formidable ethical legal regulatory and social challenges related to the evolving practice of genomic medicine Clearly and beautifully illustrated with 280 color figures and many thousands of references for further reading and deeper analysis *Immunogenomics and Human Disease* Andras Falus, 2006-03-30 This book provides an overview of key conceptual and molecular technologies being deployed in immunogenomics followed by detailed evaluations of the impact of genomics and systems biology on important areas such as cancer immunology autoimmunity allergy and the response to infection *Preclinical Rheumatic Disease, An Issue of Rheumatic Disease Clinics* Vivian P. Bykerk, 2014-11-20 The ability to intervene at the earliest phases in the pathogenesis of a chronic rheumatic disease caused by auto inflammatory autoimmune or tissue injury mechanisms has the potential to prevent disease manifestations and consequences limited loss of quality of life comorbidity and costs to society This issue is dedicated to exploring the stages of rheumatic disease biologic mechanisms contributing to the pathogenesis along with possible ways to study and screen for persons at risk with the ultimate goal of finding ways to prevent these devastating diseases

Biomedical Index to PHS-supported Research , 1989 [Oxford Textbook of Rheumatoid Arthritis](#) David L. Scott, James Galloway, Andrew Cope, Arthur Pratt, Vibeke Strand, 2020-09-18 This brand new textbook of rheumatoid arthritis RA is an important addition to the Oxford Textbooks in Rheumatology series and provides a comprehensive overview of both the scientific and clinical aspects of the disease Divided into eight sections from the history diagnosis and epidemiology of the disease through the pathogenesis clinical presentation and assessment to treatments and management strategies both drug and non drug based each chapter is written by leading clinicians and scientists in the field to deliver a contemporary view of RA During the past two decades there have been revolutionary changes in the understanding and management of rheumatoid arthritis in particular the development of biological treatments This has had wide ranging effects on almost all aspects of treatment from effectiveness and intensity to the nature and the cost Providing a comprehensive account of the

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