

Farm Animals in Biomedical Research—Part One

Swine in Biomedical Research: Management and Models

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INTRODUCTION

For the last 2 decades, swine have been used with increasing frequency in biomedical research as replacements for dogs and primates, as well as models of human disease based upon their own unique anatomy and physiology (Stanton and Mersmann, 1986; Swindle, 1992; Tumbleson, 1986).

All of the domestic farm breeds and miniature breeds available in the United States are *Sus scrofa domestica*. Farm breeds have the disadvantage of a rapid growth rate, increasing from an average weight of 1 kg at birth to 100 kg at 4 months of age. Mature breeding stock typically reach weights of greater than 200 kg. Consequently, these animals are best used for non-survival or short-term projects of less than 3 weeks in duration.

Miniature pigs are more commonly used for long-term projects because of their smaller size and growth rate. Depending on the breed, miniature pigs grow from a birth weight of 0.5 kg to 12–45 kg, at 4 months of age. Breeding stock reach weights of 45–100 kg. Commercially available miniature pigs also tend to be more tractable than domestic breeds raised in an agricultural setting. The most commonly used laboratory breeds of miniature pigs are Yucatan miniature, Yucatan Micropig®, Hanford, Sinclair (Hornell), Pitman-Moore, and Goettingen (Panepinto, 1986).

The purpose of this article is to review the use of swine in biomedical research and to provide general information on the husbandry and management of the various breeds in a laboratory setting. If an institution seeks to raise swine in large numbers, it would be well advised to consult an agricultural scientist involved in swine production programs for advice on facility design and management.

BIOMEDICAL MODELS

Swine are commonly used in cardiovascular research because swine and humans share important anatomic and physiologic characteristics. Their hearts are approximately

the same size, and coronary blood flow, hemodynamic and myocardial contractility, development of atherosclerosis are analogous (Stanton and Mersmann, 1986). Consequently, swine are used to study congenital heart disease (Gillette et al., 1991; Mitchell et al., 1994; Swindle et al., 1992), myocardial infarction (Bloor et al., 1992), hemodynamics and shock (Hannon, 1992; Hoban et al., 1992), development of interventional radiology devices including balloon catheters and intravascular stents (Gal and Isner, 1992; White et al., 1992), hypertension (Zambraski et al., 1992), cardiopulmonary bypass and anesthesia (Cameron et al., 1992; Weiskopf et al., 1992), heart failure (Hendrick et al., 1990), and atherosclerosis (Lee et al., 1986).

Swine are also used extensively for nutritional studies because their digestive physiology is similar to humans. Because they are omnivores, swine will readily consume a variety of nutritional supplements and test substances (Swindle et al., 1988). They have also been used for many other studies related to nutrition, including total parenteral nutrition, lipid metabolism, diabetes, alcoholism, gastric ulceration, and splanchnic blood flow (Cohen et al., 1992; Laber-Laird et al., 1992; Tumbleson, 1986).

Organ transplantation studies have been performed using the swine heart (Hall et al., 1986), liver (Flye, 1992), kidney (Pennington, 1992), pancreas (Koyama et al., 1986), and intestine (Pritchard et al., 1986). Many of these organ transplantation studies have been related to immunologic aspects of transplants, including the development of transgenic animals that would be immunologically accepted by humans (Sachs, 1992).

Other studies have involved wound healing and plastic and reconstructive surgery (Kerrigan et al., 1986), fetal surgery (Randall, 1986), and pharmacology and toxicology (Kurihara-Bergstrom et al., 1986; Feletou and Teisseire, 1992). Reproductive physiology and endocrine functions have also been studied (Tumbleson, 1986).

Swine are used extensively in surgical training classes for health care practitioners. Initially they were used to train medical students and residents in surgical skills (Swindle and Bobbie, 1983) but are now used extensively to train graduate physicians, nurses, and technical staff in endoscopic and stapling surgical techniques, laser surgery, and microsurgery.

When comparing studies using swine, the differences in physiology, genotype, and phenotype and in maturity at a

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Swine As Models In Biomedical Research

H Kauffman



Swine As Models In Biomedical Research:

Animal Models in Biomedical Research Cynthia Petrie Smith, 1991 *Sourcebook of Models for Biomedical Research* P. Michael Conn, 2008 The collection of systems represented in Sourcebook of genomic programs although this work is certainly well Models for Biomedical Research is an effort to reflect the represented and indexed diversity and utility of models that are used in biomedicine Some models have been omitted due to page limitations That utility is based on the consideration that observations and we have encouraged the authors to use tables and made in particular organisms will provide insight into the guinea pigs to make comparisons of models so that observations workings of other more complex systems Even the cell not available in primary publications can become useful to cycle in the simple yeast cell has similarities to that in the reader humans and regulation with similar proteins occurs We thank Richard Lansing and the staff at Humana for Some models have the advantage that the reproductive guidance through the publication process mitotic development or aging cycles are rapid compared As this book was entering production we learned of the with those in humans others are utilized because individual loss of Tom Lanigan Sr Tom was a leader and innovator proteins may be studied in an advantageous way and that in scientific publishing and a good friend and colleague to have human homologs Other organisms are facile to grow all in the exploratory enterprise We dedicate this book to in laboratory settings or lend themselves to convenient analysis his memory We will miss him greatly *Animal Models in Biomedical Research* Cynthia Petrie Smith, 1991

Swine as Models in Biomedical Research M. Michael Swindle, Donald C. Moody, Lucy D. Phillips, 1992 Swine as Models in Biomedical Research is based on the proceedings of the Seventh Charles River International Symposium which called upon recognised experts in the use of swine as animal models in various biomedical fields to present overview talks in their areas of interest They provide thorough coverage of the use of swine as animal models including immunology organ transplantation neonatology renal failure hypertension anaesthesiology cardiopulmonary bypass cardiovascular pharmacology atherosclerosis interventional radiology myocardial infarction congenital heart disease shock and wound healing Their writing also reflects the increased interest by biomedical researchers in the use of miniature pigs and micropigs instead of commercial farm breeds in the laboratory Of value both to established investigators familiar with swine as well as to junior investigators who are starting their careers of who are unfamiliar with the species this book will be useful to laboratory researchers as well as to veterinarians and technical personnel involved with service functions related to research projects using swine **Animal Models in Biomedical Research** Cynthia P. Smith, 1994-07-01 Swine have been utilized as a biomedical research model in a wide variety of disciplines the most notable being cardiovascular research The pig has been used as a model for diabetes alcoholism peptic ulcers and even transplant studies This bibliography is a sampling of the current literature and contains 556 bibliographic citations of articles and books obtained from a variety of scientific and agricultural sources dating from January 1980 to September 1990 Arranged by subject Author index

Animal Models in Biomedical Research ,1993-07 The Minipig in Biomedical Research Andrew Makin,Anthony D. Dayan,Kenneth L. Hastings,Niels-Christian Ganderup,2025-12-11 The second edition of *The Minipig in Biomedical Research* is a comprehensive resource for research scientists on the use of the minipig in basic and applied biomedical research. Written by experts in the field coverage extends from the minipig's origins anatomy genetics immunology pathology and physiology to its welfare health and husbandry practical dosing and examination procedures surgical techniques and all areas of toxicity testing and the uses of the minipig as a disease model. The book represents the state of the art recognising the growing influence of Artificial Intelligence and where appropriate relevant databases are referenced. The future of minipigs with respect to genome editing and possible use in transplantation research makes this a very interesting model. Since the first edition was published there has been a considerable increase in scientific industrial and regulatory interest in the minipig in some jurisdictions for instance the UK it is mandated that the minipig should be considered as a first line non rodent model. The expert authors in this new edition have given practical details and extensive examples of its successful application in many fields including surgery drug development and safety testing. Greater emphasis is given to the origins and uses of several different strains of minipig the greater understanding of genomics genetic manipulation immunology their value in the development of novel exploratory and therapeutic implantable devices and genetic and surgical procedures. The second edition includes full color throughout with high quality illustrations making it the go to guide and resource for present and potential new users of minipigs.

Animal Models in Biomedical Research ,19?? **Animal models for biomedical research III** ,1970 **Advances in Swine in Biomedical Research** L.B. Schook,M.E. Tumbleson,1997-01-31 Contains papers from the October 1995 symposium in sections on general aspects transgenics and immunology and infectious diseases. Topics include ultrastructure of the liver in piglets fed dietary oils artificial surfactant as a vehicle for endotracheal epinephrine in pediatric porcine cardiopulmonary arrest transplantation and genetic manipulation in porcine systems assessment of public health aspects of porcine xenotransplantation cellular immune responses controlling infectious diseases and associations between stress susceptibility and immune status in pigs. Annotation copyrighted by Book News Inc Portland OR

Swine in the Laboratory M. Michael Swindle,2007-03-22 To diminish the learning curve associated with using swine as models *Swine in the Laboratory Surgery Anesthesia Imaging and Experimental Techniques* Second Edition provides practical technical information for the use of swine in biomedical research. The book focuses on models produced by surgical and other invasive procedures supplying the ba

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in Biomedical Research ,1992
in Biomedical Research ,1988

Journal of the American Veterinary Medical Association ,1992

Animal Models

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