ILLINOIS
Laboratory of Comparative Genomics

http://www.ansci.uiuc.edu/labs/schook

THE PIG model

PIG GENOME MAPPING WEBSITES

Laboratory of Comparative Genomics, University of Illinois:
http://www.ansci.uiuc.edu/labs/schook
Roslin Institute, Edinburgh: www.projects.roslin.ac.uk/pigmap/pigmap.html
USDA Meat Animal Research Center: www.marc.usda.gov/genome/genome.html
US Pig Gene Mapping Coordination Program, Iowa State: www.genome.iastate.edu/pig

THE PIG

(*Sus scrofa domesticus*)
Given their anatomical and physiological similarities to humans, pigs have long been valuable biomedical models for human disease. Because pig and human genomes are structured with high similarity, the use of comparative mapping further solidifies its utility as an animal model. By effectively uniting enabling technologies and sequence data with classical techniques and experimental design, the pig may be used to create ideal biomedical models in the future.

STATISTICS

(Domesticated commercial breeds)[1]
Breeds: >180 breeds exist worldwide.
Location: found on every continent except Antarctica.
Human consumption: pork is the world's most widely eaten meat.
Population: ~ 60 million pigs in US and > 900 million worldwide.
Natural life span: 10 to 5 years of age.
Breeding age: 6 to 8 months of age.
Estrous cycle: 21 days.
Gestation period: 114 days.
Average litter size: 9 to 10 pigs/litter.
Weaning age: 3 to 4 weeks.
Mature weight: up to 350 kg.

Mini-pigs are similar to commercial breeds, but are smaller in size 40 to 100 kg), reach breeding age earlier (as early as 3 months of age), and have smaller litters (4 to 6 pigs per litter).

GENOME

Diverged from humans: ~70 to 80 MYA.
Genome size: ~3 billion base pairs.
Chromosomes: 18 autosomes, plus X and Y.
Number of genes: 30,000 to 40,000 estimated.
Origins: although conflicting reports exist, Southwest Asia (Thailand) is thought to be the birthplace of settled farming practices and the earliest domestication of the pig (~9,000 yr ago).
Classification: the domestic pig (*Sus scrofa*) is a member of the Order Artiodactyla that includes all even-toed ungulates (hoofed mammals); the Family Suidae (pigs) composed of 5 Genera; the Genus *Sus* includes *Sus scrofa*, which includes domestic pigs and the wild boar from which the domestic breeds originated.

TIMELINE

7000 BC: Thought to be first domesticated by humans in Southeast Asia.
3000 BC: Domestic pigs appear in Europe.
1493: Columbus introduces domestic pigs (the famous 8) to the West Indies.
1539: Hernando DeSoto brings 13 domestic pigs to the United States.
1937: Inauguration of the Regional Swine Breeding Laboratory in Ames, IA.
1949: First mini-pig strain produced (Hormel miniature) at University of MN for research purposes.
1994: First linkage map of the pig.[2]
1999: First-generation porcine whole-genome RH map.[3]
2000: First cloned pigs produced.[4,5,6]
2001: First transgenic pig produced by nuclear transfer.[7]
2002: First knockout (alpha-1,3-galactosyltransferase) pigs produced.[8,9]
2002: Pig upgraded to "High Priority" for genome sequencing by NIH.
2003: Swine Genome Sequencing Consortium established.

PIG AS HUMAN DISEASE MODELS

Strengths:
Similar anatomy and physiology to humans.
Similar feeding patterns and dietary habits to humans (omnivore).
Genetically amenable to both forward and reverse genetic approaches.

Common disease models and areas of study:
Cancers
Obesity and type 2 diabetes
Atherosclerosis and hypertension
Neonatal nutrition
Host-pathogen interactions
Organ transplantation (allo and xeno)
Wound healing
Microsurgery techniques

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