

Animal Biotechnology - Technologies, Markets and Companies

Description: This report describes and evaluates animal biotechnology and its application in veterinary medicine and pharmaceuticals as well as improvement in food production. Knowledge of animal genetics is important in the application of biotechnology to manage genetic disorders and improve animal breeding. Genomics, proteomics and bioinformatics are also being applied to animal biotechnology.

Transgenic technologies are used for improving milk production and the meat in farm animals as well as for creating models of human diseases. Transgenic animals are used for the production of proteins for human medical use. Biotechnology is applied to facilitate xenotransplantation from animals to humans. Genetic engineering is done in farm animals and nuclear transfer technology has become an important and preferred method for cloning animals. There is discussion of in vitro meat production by culture

Biotechnology has potential applications in the management of several animal diseases such as foot-and-mouth disease, classical swine fever, avian flu and bovine spongiform encephalopathy. The most important biotechnology-based products consist of vaccines, particularly genetically engineered or DNA vaccines. Gene therapy for diseases of pet animals is a fast developing area because many of the technologies used in clinical trials humans were developed in animals and many of the diseases of cats and dogs are similar to those in humans. RNA interference technology is now being applied for research in veterinary medicine

Molecular diagnosis is assuming an important place in veterinary practice. Polymerase chain reaction and its modifications are considered to be important. Fluorescent in situ hybridization and enzyme-linked immunosorbent assays are also widely used. Newer biochip-based technologies and biosensors are also finding their way in veterinary diagnostics.

Biotechnology products are approved by the Center for Veterinary Medicine of the FDA. Regulatory issues relevant to animal biotechnology are described.

Approximately 111 companies have been identified to be involved in animal biotechnology and are profiled in the report. These are a mix of animal healthcare companies and biotechnology companies. Top companies in this area are identified and ranked. Information is given about the research activities of 11 veterinary and livestock research institutes. Important 108 collaborations in this area are shown.

Share of biotechnology-based products and services in 2012 is analyzed and the market is projected to 2022.

The text is supplemented with 34 tables and 5 figures. Selected 250 references from the literature are appended.

Contents: Executive Summary

1. Introduction to Animal Biotechnology

Introduction

Historical evolution of animal biotechnology

Basics of biotechnology

DNA

RNA

Genes

Single nucleotide polymorphisms

Copy number variations in the genome

DNA sequences

Gene expression

Gene regulation

Proteins

Functions of proteins

Recombinant proteins

- Monoclonal antibodies
- Animal genetics
- Molecular genetics
- Twinning in cattle
- Pig genetics
- Genetic studies in dogs
- Animal genomics
- The mouse genome
- The dog genome
- Sequencing of the dog genome
- Comparison of genomes of healthy and diseased dogs
- Analysis of DNA copy number variation
- The cat genome
- Marsupial genomes
- Genomes of non-human primates
- Chimpanzee genome
- Genome of the rhesus macaque
- Genome of gorilla
- Livestock genomics
- Bovine genome
- Bovine SNP map
- Bovine stomach microbiome genes
- Camel genome
- Goat genome
- Horse genome
- Pig genome
- Sheep genome
- Chicken genome
- Turkey genome
- Salmon genome
- Priority genome list of the National Human Genome Research Institute
- Animal proteomics
- Applications of proteomics in animals
- Caseins in goat milk
- Lactic acid bacteria
- Applications of proteomics in animal healthcare
- Antigenomics
- Bioinformatics
- Nanobiotechnology and animal health
- Biomarkers and animal health
- Recombinant protein manufacture
- Animal biotechnology in relation to other technologies

2. Application of Biotechnology in Animals

- Introduction
- Applications of animal genomics
- Bovine ankyrin 1 gene and beef tenderness
- Chicken breeding based on genomics
- Genomics of disease resistance
- Genome wide associations and milk production in cows
- Low cost genotyping for genetic improvement in dairy cattle
- SNPs and longevity in dairy cattle
- Share genomic data to improve cattle breeding programs
- Statistical genomics to improve breeding
- Genetic engineering
- Livestock improvement by genetic engineering
- Disease control by genetic engineering
- Limitations and precautions for genetic engineering
- Transgenic animal technology
- Cloning animals
- Nuclear transfer technology
- Nuclear bisection for cloning

- Zona-free cloning method
- Abnormalities in cloned animals
- Cloning from embryonic cells
- Cloning of rabbits
- Cloning the rat
- Cloning the horse
- Cloning the cow
- Cloning the dog
- Cloning in primates
- Retrovector-mediated production of transgenic animals
- Episomal vector-mediated gene delivery
- Sperm-mediated gene transfer
- Lentiviral transduction of male germ-line stem cells
- Lentiviral transgenesis
- Transgenic pharmaceuticals
- Proteins from the milk of transgenic animals
- Advantages of milk as source of transgenic proteins
- Therapeutic proteins from rabbit milk
- Recombinant human antibodies from cows
- Therapeutic proteins from goat milk
- Chicken transgenesis for the production of biopharmaceuticals
- Concluding remarks about production of recombinant proteins in animals
- Companies involved in production of transgenic pharmaceuticals
- Transgenic food products
- Milking genetically modified cows
- Transgenic fish
- Cloned animals as sources of milk and meat
- Animal feeds from transgenic plants
- Transgenic modification of plants to increase nutritional value of animal feeds
- Transgenic disease models
- Technologies to create transgenic disease models
- Gene manipulation techniques
- Embryonic stem cells for gene targeting
- Homologous recombination
- Animal models of human diseases
- Transgenic models for studying human drug metabolism and toxicity
- The Human Genome Project and the role of transgenics
- Genomic and proteomic analyses of transgenic animal models
- Concern about health and welfare of transgenic animals
- Safety of transgenic technology
- Concluding remarks about use of transgenic animals
- RNA interference technology
- RNAi versus antisense
- Applications of RNAi in animal biotechnology
- Xenotransplantation
- Pigs for xenotransplantation
- Genetically engineered pigs for transplants
- Risks of xenotransplantation
- World Health Organization and xenotransplantation
- Ethical aspects of animal biotechnology

3. A Biotechnology Perspective of Animals Diseases

- Introduction
- Infections in animals
- Viral infections
- Avian influenza
- Animal surveillance of influenza
- Animal biotechnology implications of H1N1 influenza
- Animal corona viruses and human SARS
- Avian coronavirus
- Bluetongue virus
- Canine parvovirus

Classical swine fever
Developing new treatments against FMD
Equine infectious anemia
Foot-and-mouth disease
Porcine reproductive and respiratory syndrome virus
Rabies
Rinderpest
Schmallenberg virus
Bacterial infections
Bovine tuberculosis
Mycoplasmal pneumonia
Fungal infections
Protozoal infections
Coccidiosis
Neosporosis
Toxoplasmosis
Trypanosomiasis
Nematodes
Infections that cross the species barrier
Complications of bacterial infections and antibiotic use in animals
Transmissible spongiform encephalopathies (TSEs)
Inter-species transfer of prions
Scrapie
Bovine spongiform encephalopathy
Epidemiology of BSE
Biomarkers in the urine of BSE infected cattle
Human health implications of BSE
Breeding animals protected against BSE
TSE research
Prion gene haplotyping
Pharmacological approaches to TSE research.
Molecular diagnostic approach to TSE research
RNAi for knockdown of the bovine prion gene
Chronic wasting disease
Chronic wasting disease in wildlife
Chronic wasting disease of the cattle in Sudan
Chronic wasting in dairy cows in the Netherlands
Genetic disorders in farm animals
Genetic predisposition to acquired diseases in animals
Diseases of pet animals
Canine anemia
Canine epilepsy
Cardiovascular disease
Heart failure
Cardiac complications of canine babesiosis
Diabetes
Role of biotechnology in management of diabetes
Arthritis
Cancer in cats and dogs
Cancer clinical trials in dogs
Canine Comparative Oncology Genomics Consortium
Preventive veterinary medicine
Prevention of introduction of foreign animal diseases
Producing transgenic cattle resistant to BSE
Zoonotic diseases
Global impact of zoonotic diseases
Viruses that emerge in animals and spread to humans
Collaborative management of animal and human health
Vaccines for zoonotic viral diseases

4. Molecular Diagnostics in Animals

Introduction

Nucleic acid technologies
The polymerase chain reaction
Basic Principles of PCR
Target selection
Detection of amplified DNA
Real-time PCR systems
LightCycler PCR system
Molecular beacons
Applications of PCR in veterinary medicine
Fluorescent in situ hybridization
Immunodiagnosics
Enzyme-linked immunoassays
Bovine Gamma Interferon Test
Antigen diagnosis of trichinosis
Parachek™ for the diagnosis of Johne's disease
Antibodies for differentiation between vaccinated and infected animals
Biochip/microarray technology
Applications of microarrays in animal biotechnology
Cattlearray3800 for functional genomics
eSensor™ electrochemical biochip
FR 48 microfluidic biochip
Biosensors
Immunosensors
Biosensor for ovulation prediction in dairy cows
Flow cytometry for animal diagnostics
Molecular imaging in animals
Veterinary cytogenetics
Applications of sequencing for veterinary diagnostics
Role of sequencing in detection of cancer biomarkers
DNA sequencing for study of bacterial epidemics
Role of sequencing in epidemic of Shiga toxin-producing E. coli
Role of sequencing in the study of genetic disorders in animals
Applications of molecular diagnostics in animals
Canine DNA testing
Cat pedigree determined by gene tests
Diagnostic aids to selective breeding
Selection of desirable traits
Gene variations and fat content of beef
Using genetic markers for improved milk production in dairy cattle
Application of bovine genomics for improving milk yield
Recognition of hereditary syndromes
Genetic markers in animals
SNP genotyping in animals
SNP genotyping for selective breeding of chicken
Animal identity and parentage analysis
Animal species identification in food
Diagnosis of infections
Bacterial infections
Diagnosis of fungal infections in animals
Diagnosis of viral infections
Molecular diagnosis of avian influenza
Molecular diagnosis of swine influenza
Diagnosis of parasitic infections
Detection of natural or bioterror threats to livestock
Molecular diagnosis of prion diseases
Bovine spongiform encephalopathy
Testing for BSE in living animals
Prions in urine
Diagnosis of chronic wasting disease in wildlife
Developing new tests for prion diseases
Differentiation among various types of TSEs
Protein cyclic amplification
Antibody tests for prion diseases

- Scrapie genotyping
- A real-time ultrasonic method for prion protein detection
- Companies involved in developing molecular diagnostics for TSEs
- Diagnosis of genetic disorders
- Genetic screening of companion animals
- Genes associated with exercise-induced collapse
- Preimplantation genetic diagnosis
- Diagnosis of cancer in animals
- Diagnosis of skin cancer
- Diagnosis of food-borne pathogens
- Introduction
- Molecular diagnostic methods used in food-borne infections
- Detection of Listeria-contaminated foods
- Optical biosensor for detection of Listeria
- Real-time PCR for detection of Listeria
- Detection of Salmonella
- MicroSEQ® Salmonella Detection Kit
- E. Coli detection
- DuPont Bax system
- MLG method for detection of multiple STEC strains
- MicroSEQ® E. Coli Detection Kit
- RapidFinder™ STEC
- Limitations of use of molecular probes in food analysis
- Companies with technologies for food pathogen detection
- Biotechnology-based novel diagnostics for aquatic animals
- Detection of chemicals in foods of animal origin
- Companies developing molecular diagnostics for animals

5. Biotechnology-based Veterinary Medicine

- Introduction
- Biotechnology versus pharmaceutical products
- Role of biotechnology in drug discovery and development
- Cost of veterinary vs. human drug discovery and development
- Advantages and disadvantages of testing biotech products in animal models
- Biotechnology-based antiparasitic drugs
- Non-antibiotic strategies for control of infections in animals
- Probiotics
- Potential role for probiotics in the human gut
- Potential role for probiotics in animals
- Probiotic bacteria for control of pathogens in cattle
- Nonantibiotic drugs for infections in animals
- Immunomodulation as an alternative to antibiotics in infections
- Cathelicidins: effector molecules of mammalian innate immunity
- Bacteriophage therapy for antibiotic resistance
- Biotechnology for treating tendon injuries
- Use of growth factors to facilitate tendon injuries
- Productivity enhancers
- Bovine somatotropin for increasing milk production in dairy cows
- Increasing milk production in cows by feeding propionibacteria
- Use of growth factors
- Transgenic plant products for use in animals
- Biotechnology-based vaccines
- Modern vaccines without viral non-structural proteins
- Plant-derived vaccines for use in animals
- Nano-bead vaccine adjuvant
- Genetically engineered vaccines
- Application of nucleic acid vaccines in veterinary medicine
- DNA vaccines
- DNA vaccine for tuberculosis
- DNA vaccines for West Nile encephalitis
- DNA vaccines for cancer
- Gene-based vaccine for Marek's disease

- Genetic engineering of live rabies vaccines
- Genetically engineered vaccines for equine encephalitis
- Genetically engineered vaccines for Johne's disease
- Vaccines against avian influenza
- Vaccines against parasitic infections
- Recombinant marker vaccines
- Marker vaccines for foot-and-mouth disease
- Marker vaccine for Newcastle disease
- Vaccines for classical swine fever
- Vaccines for tick control
- Vaccination to protect swine from H1N1 influenza virus infection
- Vaccination of cattle to prevent E. coli transmission to consumers in meat
- Vaccines for bacterial equine respiratory infections
- Using RNAi to develop vaccines for viral infections in prawns
- Companies developing biotechnology-based vaccines
- Biotechnology in treatment of parasitic infections
- Biotechnology in the treatment of CNS injuries in pet animals
- Paraplegia due to acute spinal cord injury in dogs
- RNAi for suppression of prions in livestock
- Cell Therapy
- Umbilical cord blood stem cells
- Application of stem cells in veterinary medicine
- Use of stem cells to repair tendon injuries in horses
- Stem cells for spinal cord injury in dogs
- Gene therapy
- Gene therapy vectors
- Gene therapy by mitochondrial transfer
- In utero gene therapy
- Applications of gene therapy in veterinary medicine
- Gene therapy for arthritis
- Gene therapy for blindness in dogs due to Leber congenital amaurosis
- Gene therapy for cardiomyopathy in dogs
- Gene therapy for diabetes in dogs
- Gene therapy for endocrine disorders
- Gene therapy for hematological disorders
- Gene therapy for inherited disorders of metabolism in dogs
- Gene therapy to increase disease resistance
- Gene therapy for infections
- Gene therapy for renal failure
- Cancer gene therapy
- Antiangiogenic cancer gene therapy in dogs
- Brain tumors in cats and dogs
- Breast cancer in dogs
- Canine hemangiosarcoma
- Canine melanoma
- Canine soft tissue sarcoma
- Melanoma in horses
- Oncolytic virotherapy for cancer in dogs

6. Research in Animal Biotechnology

Introduction

Research institutes

- Animal and Natural Resources Institute (USDA)
- Center for Animal Biotechnology at University of Melbourne (Australia)
- CSIRO Livestock Industries
- Easter Bush Research Consortium
- Danish Veterinary Institute
- Friedrich-Loeffler-Institute
- Indian Veterinary Research Institute
- Institute for Animal Health of UK
- Kimron Veterinary Institute
- Korean National Livestock Research Institute

National Agricultural & Veterinary Biotechnology Center of Ireland
Swiss Federal Institute of Technology
Veterinary Laboratories Agency of UK
Veterinary Medical University of Vienna
Ethical issues of research in animal biotechnology
Future prospects
Strategies for control of twining in cattle
Future developments of molecular diagnostics
Future of vaccine application in veterinary medicine
Promotion of innate immunity in animals
Identification of key parasite antigens for eliciting immune response
Virus-like particle vaccines for lasting immune response
Control of respiratory virus infections
Control and prevention of bioterrorism diseases in animals
Genetic control of disease resistance
Production of cattle lacking prion protein
Application of genetics and biotechnology to wildlife management
Future of animal genomics
Future prospects of in vitro meat production

7. Animal Biotechnology Markets

Introduction
Markets for biotechnology-based products for animal healthcare
Markets for biopharmaceuticals for animals
Markets for recombinant proteins for animal healthcare
Markets for vaccines for animals
Markets for animal diagnostics
Test for bovine spongiform encephalopathy
Animal biotechnology markets according to therapeutic areas
Markets for biotechnology-based animal products for humans
Transgenic proteins
Market for xenotransplantation
Strategies for promoting use of animal biotechnology
Financial losses from death and disease in animals
Losses in farm animals
Losses in poultry
Losses in equine industry
The emerging role of pet owners
Improvement in cattle through application of biotechnology
Economic aspects of genomic evaluation of dairy cattle
Pig market
Cattle Market
Poultry market
Milk from genetically modified cows
Transgenic fish
Role of biotechnology in livestock performance enhancer market
Gene transfer technologies
In vitro meat production and animal biotechnology markets
Cost-benefit aspects of transgenic proteins
Lower costs of transgenic production
Lower costs of treatment
Unmet needs in animal biotechnology
Future prospects of animal biotechnology
Farm animals
Global trends in epidemiology of livestock diseases
Genetic engineering of animals
Companion animals
Animal molecular diagnostic markets

8. Regulatory issues

Introduction

Regulatory agencies for veterinary biotechnology in the US
FDA regulatory issues in agricultural biotechnology
FDA guidelines on use of antibiotics in food-producing animals
Food safety evaluation of transgenic animals
Food from cloned animals
FDA investigation of drug transfer into eggs
Animal feed safety
Medicated feeds
Regulatory issues for production of transgenic proteins
Risks of animal biotechnology
FDA regulation of bovine products
Worldwide biotechnology regulatory and trade issues

9. Companies Involved in Animal Biotechnology

Introduction
Biotechnology at top veterinary pharmaceutical companies
Profiles of selected companies
Collaborations

10. References

Tables

Table 1-1: Landmarks in the evolution of animal biotechnology in the 20th century
Table 1-2: Expression systems for production of recombinant proteins
Table 1-3: Applications of proteomics in livestock industry and veterinary medicine
Table 1-4: Selected animal genomics and proteomics databases (DB)
Table 2-1: Applications of genomics in livestock industry and veterinary medicine
Table 2-2: Recombinant proteins obtained from milk of transgenic animals
Table 2-3: Companies involved in the production of transgenic pharmaceuticals
Table 2-4: A comparison of gene knockout and transgenic techniques
Table 2-5: Examples of transgenic mouse models of non-neoplastic human diseases
Table 3-1: Diseases of dairy cattle
Table 3-2: Causes of chronic wasting disease in animals
Table 4-1: Applications of microarrays in animal biotechnology
Table 4-2: Biosensor technologies with potential applications in molecular diagnostics
Table 4-3: Applications of molecular diagnostics in animals
Table 4-4: Viruses that can be detected by molecular diagnostics
Table 4-5: Testing for harmful prions in brain tissue from dead cattle
Table 4-6: Companies involved in developing molecular diagnostics for TSEs
Table 4-7: Pathogenic bacteria in food and targets for molecular diagnostic probes
Table 4-8: Companies involved in molecular diagnostics for food-borne infections
Table 4-9: Companies developing molecular diagnostics for veterinary medicine
Table 5-1: Veterinary biotechnology products
Table 5-2: Pharmaceutical versus biotechnology products
Table 5-3: Nonantibiotic strategies for control of infections
Table 5-4: Experimental DNA vaccines tested in animals
Table 5-5: Companies developing biotechnology-based vaccines for animals
Table 6-1: Areas for future research applications of animal biotechnologies
Table 7-1: Worldwide markets for biotechnology-based products for farm animals: 2012-2022
Table 7-2: Worldwide markets for biotechnology-based products for pet animals: 2012-2022
Table 7-3: Biotechnology-based markets for animal healthcare according to regions: 2012-2022.
Table 7-4: Biotechnology markets for farm animals according to therapeutic areas: 2012-2022
Table 7-5: Biotechnology markets for pet animals in therapeutic areas: 2012-2022
Table 7-6: Worldwide markets for biotechnology-based animal products for humans: 2012-2022
Table 9-1: Ranking of top 7 veterinary companies with biotechnology products
Table 9-2: Selected collaborations of companies in animal biotechnology

Figures

Figure 1-1: Relation of animal biotechnology to other technologies and human health
Figure 2-1: Nuclear transfer technology

Figure 2-2: Generation of transgenic animals by linker based sperm-mediated gene transfer

Figure 2-3: Production of therapeutic proteins in the milk of transgenic animals.

Figure 7-1: Unmet needs in animal biotechnology

Ordering:

Order Online - <http://www.researchandmarkets.com/reports/39075/>

Order by Fax - using the form below

Order by Post - print the order form below and send to

Research and Markets,
Guinness Centre,
Taylors Lane,
Dublin 8,
Ireland.

Fax Order Form

To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit

<http://www.researchandmarkets.com/contact/>

Order Information

Please verify that the product information is correct and select the format(s) you require.

Product Name: Animal Biotechnology - Technologies, Markets and Companies
Web Address: <http://www.researchandmarkets.com/reports/39075/>
Office Code: OC8DIRPMTMVOST

Product Formats

Please select the product formats and quantity you require:

	Quantity	
Electronic - Single User:	<input type="checkbox"/>	€2,330
Hard Copy:	<input type="checkbox"/>	€2,563 + Euro €50 Shipping/Handling
Electronic and Hard Copy (PDF) - Single User:	<input type="checkbox"/>	€2,951 + Euro €50 Shipping/Handling
Electronic - Enterprisewide:	<input type="checkbox"/>	€6,990

* Shipping/Handling is only charged once per order.

Contact Information

Please enter all the information below in **BLOCK CAPITALS**

Title: Mr Mrs Dr Miss Ms Prof

First Name: _____ Last Name: _____

Email Address: * _____

Job Title: _____

Organisation: _____

Address: _____

City: _____

Postal / Zip Code: _____

Country: _____

Phone Number: _____

Fax Number: _____

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)



Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

- Pay by credit card:
 - American Express
 - Diners Club
 - Master Card
 - Visa

Cardholder's Name _____

Cardholder's Signature _____

Expiry Date _____ | _____

Card Number _____

CVV Number _____

Issue Date _____ | _____

(for Diners Club only)

- Pay by check:

Please post the check, accompanied by this form, to:

Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

- Pay by wire transfer:

Please transfer funds to:

Account number	833 130 83
Sort code	98-53-30
Swift code	ULSBIE2D
IBAN number	IE78ULSB98533083313083
Bank Address	Ulster Bank, 27-35 Main Street, Blackrock, Co. Dublin, Ireland.

If you have a Marketing Code please enter it below:

Marketing Code: _____

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at <http://www.researchandmarkets.com/info/terms.asp>

Please fax this form to:
(646) 607-1907 or (646) 964-6609 - From USA
+353-1-481-1716 or +353-1-653-1571 - From Rest of World