CRISPR and Genetic Editing for Animal Breeding Training Course

Professional Development Training Course Outline

Category	Veterinary and Animal Science	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

CRISPR and Genetic Editing for Animal Breeding Training course is designed to equip professionals, researchers, and students with cutting-edge knowledge in gene-editing technologies for livestock and aquaculture. Participants will gain a thorough understanding of CRISPR-Cas9, TALENs, and advanced genome editing tools, emphasizing their application in enhancing productivity, disease resistance, and sustainability in animal breeding programs. This course integrates hands-on lab demonstrations, case studies, and bioinformatics analysis, providing learners with actionable skills to implement genetic strategies in real-world settings.

By exploring ethical, regulatory, and environmental considerations alongside advanced techniques in genome engineering and precision breeding, learners will develop a holistic understanding of modern animal genetics. The curriculum leverages emerging trends in biotechnology, epigenetics, and genomic selection, enabling participants to drive innovation in livestock improvement, aquaculture efficiency, and conservation breeding. Whether aiming for enhanced growth traits, disease resistance, or climate-resilient livestock, this training positions learners at the forefront of next-generation animal breeding strategies.

Programme Curriculum

CRISPR and Genetic Editing for Animal Breeding Training Course

Introduction

CRISPR and Genetic Editing for Animal Breeding Training course is designed to equip professionals, researchers, and students with cutting-edge knowledge in gene-editing technologies for livestock and

aquaculture. Participants will gain a thorough understanding of CRISPR-Cas9, TALENs, and advanced genome editing tools, emphasizing their application in enhancing productivity, disease resistance, and sustainability in animal breeding programs. This course integrates hands-on lab demonstrations, case studies, and bioinformatics analysis, providing learners with actionable skills to implement genetic strategies in real-world settings.

By exploring ethical, regulatory, and environmental considerations alongside advanced techniques in genome engineering and precision breeding, learners will develop a holistic understanding of modern animal genetics. The curriculum leverages emerging trends in biotechnology, epigenetics, and genomic selection, enabling participants to drive innovation in livestock improvement, aquaculture efficiency, and conservation breeding. Whether aiming for enhanced growth traits, disease resistance, or climate-resilient livestock, this training positions learners at the forefront of next-generation animal breeding strategies.

Course Duration

10 days

Course Objectives

1. Master CRISPR-Cas9 and TALEN genome editing techniques for livestock and aquaculture.
2. Apply precision breeding strategies to enhance production traits.
3. Analyze genomic data for trait selection using bioinformatics tools.
4. Understand epigenetic modifications and gene regulation in animals.
5. Develop skills in functional genomics and phenotype-genotype correlation.
6. Implement disease resistance breeding programs using gene editing.
7. Evaluate ethical, legal, and biosafety considerations in genome editing.
8. Design sustainable breeding strategies for livestock and aquaculture.
9. Explore transgenic animal models and their applications.
10. Integrate omics technologies (genomics, transcriptomics, proteomics) in breeding programs.
11. Investigate climate-resilient animal breeding solutions.
12. Conduct case studies and experimental designs in genetic engineering.
13. Gain hands-on expertise in CRISPR lab techniques, gene delivery, and validation methods.

Target Audience

1. Animal geneticists and breeders
2. Livestock and aquaculture researchers
3. Biotechnology and molecular biology professionals
4. Veterinary scientists
5. Agritech entrepreneurs
6. Students in animal sciences, biotechnology, and genomics
7. Policy makers and regulators in livestock genetics
8. Conservation biologists and environmental scientists

Course Modules

Module 1: Introduction to Genetic Editing in Animal Breeding

- Overview of animal breeding and genetic improvement
- Evolution of genome editing technologies
- Introduction to **CRISPR-Cas9, TALENs, and ZFNs**

- Key applications in livestock and aquaculture
- Case Study: **Gene-edited pigs resistant to PRRS virus**

Module 2: Molecular Biology Foundations

- DNA, RNA, and protein basics
- Gene expression and regulation
- Molecular cloning techniques
- Genomic sequencing technologies
- Case Study: **Functional genomics in dairy cattle**

Module 3: CRISPR Technology Essentials

- CRISPR-Cas9 mechanism
- Guide RNA design and optimization
- Off-target effects and mitigation
- Delivery systems for animal cells
- Case Study: **CRISPR-edited chickens with improved disease resistance**

Module 4: TALENs and Alternative Genome Editing Tools

- TALEN design and function
- Comparing TALENs, ZFNs, and CRISPR
- Applications in livestock breeding
- Efficiency and specificity assessment
- Case Study: **TALEN-based cattle hornless gene editing**

Module 5: Gene Delivery and Editing Validation

- Viral and non-viral delivery methods
- Microinjection and electroporation
- Screening edited embryos and animals
- Molecular validation techniques (PCR, sequencing)
- Case Study: **Gene knockout validation in pigs**

Module 6: Functional Genomics and Trait Analysis

- Linking genotype to phenotype
- QTL mapping and GWAS
- Transcriptomics and proteomics in breeding
- Bioinformatics tools for analysis
- Case Study: **Genomic selection for milk yield in cows**

Module 7: Disease Resistance Breeding

- Identifying genetic markers for resistance
- CRISPR-mediated gene knockouts
- Enhancing immunity through genome editing
- Evaluating edited animals for health
- Case Study: **Salmon resistant to viral diseases**

Module 8: Ethical, Regulatory, and Biosafety Considerations

- Global regulatory frameworks
- Ethical implications of gene editing
- Risk assessment and containment
- Public perception and stakeholder engagement
- Case Study: **Regulatory approval of gene-edited livestock in the US**

Module 9: Aquaculture Genetic Improvement

- Genomic editing in fish and shellfish
- Traits for growth, feed efficiency, and disease resistance
- CRISPR applications in aquaculture
- Environmental impact assessment
- Case Study: **CRISPR-edited tilapia with improved growth**

Module 10: Climate-Resilient Livestock Breeding

- Genetic strategies for heat tolerance
- Drought-resistant livestock genes
- Integrating climate data with breeding programs
- Gene editing for adaptation
- Case Study: **Heat-tolerant CRISPR-edited cattle**

Module 11: Omics Integration for Precision Breeding

- Genomics, transcriptomics, proteomics
- Data integration and multi-omics analysis
- Precision selection of superior traits
- Computational tools for breeding
- Case Study: **Omics-guided CRISPR selection in pigs**

Module 12: Transgenic Animal Models

- Design and creation of transgenic animals
- Applications in research and agriculture
- Ethical considerations and welfare
- Validation and performance testing
- Case Study: **Transgenic cows producing therapeutic proteins**

Module 13: Lab Techniques and Hands-On Practices

- DNA/RNA extraction and PCR
- CRISPR plasmid design
- Microinjection and embryo manipulation
- Screening and sequencing edited animals
- Case Study: **Hands-on CRISPR experiment in poultry**

Module 14: Data Analysis and Bioinformatics Tools

- Genome editing data pipelines
- CRISPR off-target analysis
- GWAS and QTL mapping software
- Data visualization and reporting

- Case Study: **Bioinformatics analysis of edited livestock genomes**

Module 15: Future Trends and Innovations

- Synthetic biology in animal breeding
- Next-gen CRISPR tools
- AI and machine learning in genomics
- Global impact on food security
- Case Study: **Predictive breeding using AI and CRISPR**

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com