

**BIOLOGI MOLEKULER SEL**  
**MOLECULAR ANIMAL GENETICS**  
**in Animal Production**

**Dr. Gatot Ciptadi**

Email: [ciptadi@ub.ac.id](mailto:ciptadi@ub.ac.id) , [ciptadi@yahoo.com](mailto:ciptadi@yahoo.com)

Blog : [gatotciptadi.lecture.ub.ac.id](http://gatotciptadi.lecture.ub.ac.id)



**[www.bankselgamet.com](http://www.bankselgamet.com)**



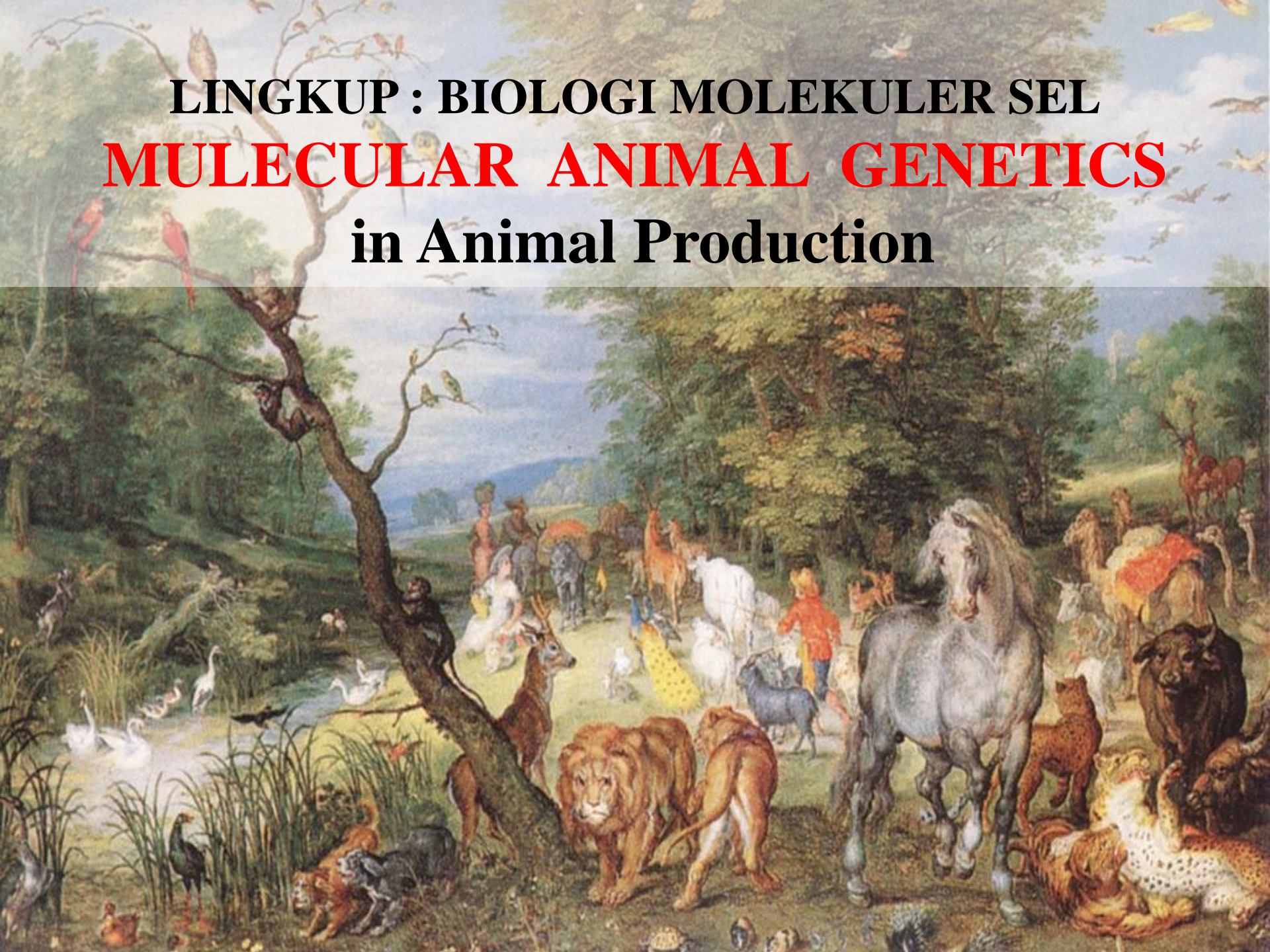
Mata Kuliah: Genetika , Pemuliaan ternak, Manajemen Pemuliaan Ternak Kultur sel , biomonsel, Statistik dan Rancob, Met. Penelitian dan Pen. Karya Ilmiah, Biokimia.

Fakultas : Fapet, Kedokteran Hewan, FMIPA-Biologi

Laboratory: An Genetik-PT Fapet, LSIH-Inst Biosains UB.



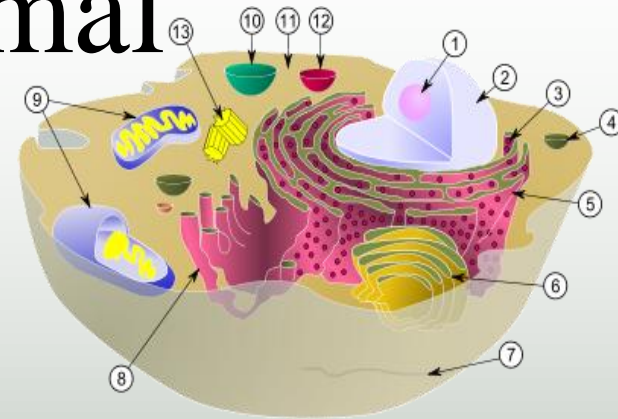
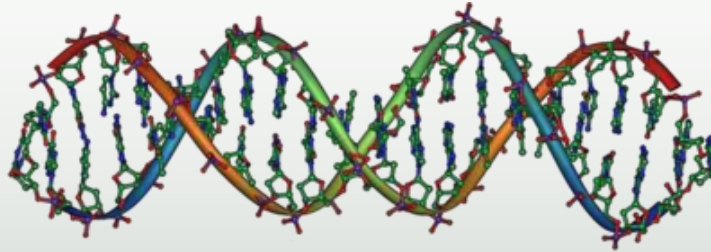
**LINGKUP : BIOLOGI MOLEKULER SEL**  
**MOLECULAR ANIMAL GENETICS**  
**in Animal Production**



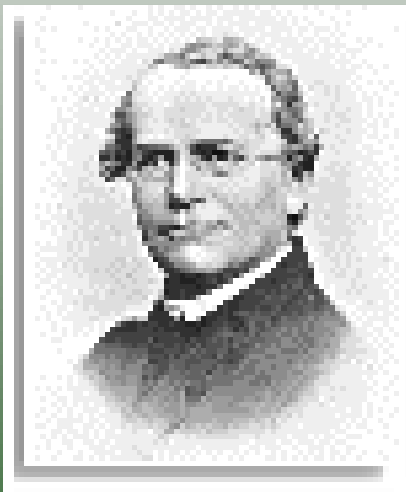




# Genetics of Animal



**Explain how genetics relates to improvement in livestock production**



Describe how cell division occurs  
how animal characteristics are transmitted

explain sex determination, linkage, crossover and mutation

No	Subject : Cellular	Lecturer	Note
1.	Introduction-Recent dev of . Anim Biotech:Mol-Cell	GC	Class Discussion
2	Basic Mol-Cell Laboratory Practice, In vitro.	GC	Class Discussion
3	Chromosome Bio-Cell Analysis		
3.	In vitro- Cell culture (IVM, IVF, IVG)	GC	Class Discussion
4.	Nuclear Cell – Gene (Transgenic Animal-Cloning: Cell communication and Cell Reprogramming) Basic Theory : Part 1	GC	Class Discussion
5.	Nuclear Cell – Gene (Transgenic Animal-Cloning) Technical Aspect: Part 2.	GC	Class Discussion
6.	Software analysis of Chromosome Cells	GC+ Lab. Tech.	Lab works/Visit/LSIH/ Institut Biosains
7.	Nuclear Cells Transfer /Gen Transfer	GC + Lab. Tech	Lab work/Visit/LSIH (Jika Lab-tidak sedang digunakan)/Biosains

No	Subject: Molecular	Lecturer	Note
1.	DNA : Molecular Basic Sci. and technology	GC	Text book reading
2.	DNA Preparation and Analysis: Electroforesis. Part 1	GC	Class Discussion
3.	DNA Preparation and Analysis: Electroforesis. Part 2	GC	Class Discussion/ Teks Book and Journal Reading.
4.	Introduction to Bioinformatic: DNA Squence analysis by BLAST	GC	Class Dicsussion
5.	Discussion/Presentation Research Topic cell-Moll.	GC+	Lab works/Visit
6.	Discussin/Presentation Research Topic cell-Moll.	GC	Class Discussion
7.	Molecellar Result Analysis	GC+ Lab.Technician	Lab work/Visit
8.	Final test/Tugas/ Review/ <b>UAS</b>	GC	TEXTBOOK READING

# Genetic manipulation :

makes important contributions to domesticated animals in relation to immunology, vaccines, aging, and cancer.: Biofarmacy, **Organ Transplantation**, Gene conservation

The implications for introducing superior production, conformation, and **disease-resistant** traits into domestic animals through gene transfer hold considerable promise in the genetic improvement of animals.

*"Annie the cow: bioengineered to have a gene for mastitis resistance" (USDA-Acells, RS).*



Photo by Scott Bauer courtesy of USDA Agricultural Research Service.

# Biology-Molecular Genetetics :

## Biotechnology

- Technology based on biology (molecular)
- Biotechnology is the integration of natural sciences and engineering sciences in order to achieve the application of organisms, cells, parts thereof and molecular analogues for products and services

### What is **Biotechnology**?

Microbiology  
Biochemistry  
Enzymology  
etc.

Molecular Biology  
Physiology  
(Bio)Chemistry

Bioanalytics  
Cell Culture Technology  
Bioprocess Engineering  
Bioreactor Design

#### BIOTECHNOLOGY

Pharma / Medicine

Agriculture

Food and Feed

Chemical Industry

Environment

Energy / Fuels

Electronics

Usually refers to recombinant DNA or tissue culture based processes

emphasizes modern technology

generate genetically modified organisms

# Traditional vs. Modern Biotechnology

## Traditional

- Based on microorganisms
- Cells are not manipulated
- Production of antibiotics by fermentation

## Modern

- Based on microorganisms and **cell culture**
- Cells are **manipulated**
- Production of protein products based on **recombinant DNA** and **cell culture**
- Modern biotech refers to **Molecular Biology, Molecular Genetics and Genetic Engineering**



## Sejarah perkembangan ilmu Genetika dan pemuliaan ternak .

	Awal sejarah peternakan	Beberapa ribu tahun SM	
	Karya Robert Bacwell: Bpk. Pemuliaan ternak	1800 - 1865	<b>MENDEL, hukum pewarisan sifat, Bapak Genetika</b>
	Buku silsilah pertama di Inggris: kuda, sapi.	1800 + 1890	WEISMAN, perbedaan sel gamet sel tubuh
	Pengembangan buku silsilah dan kreasi bangsa/ras ternak	1800 + 1900	DE VRIES, CORRENS, TSCHEMARK, Melengkapi hukum pewarisan sifat
	Asosiasi kontrol produksi susu di Denmark	1890 + 1910 +	CUENOT, BATESON, aplikasi hukum pewarisan sifat pada hewan
	Kontrol performans babi di Denmark	1900+ 1920	MORGAN et al. Elaborasi teori kromosom
	Hukum HARDY WEINBERG dan dimulainya genetika populasi	1900-1910 1930- 1940	LUSH awal perkembangan genetika kuantitatif dan program seleksi
	Inseminasi Buatan dalam skala luas sapi dan domba di Sovyet (USSR)	1930 1940	BEADLE and TATUM, Teori satu gen satu enzim AVERY et al. DNA sebagai material genetik
	Pembekuan semen sapi di Inggris	1950 + 1950	WATSON and CRICK, Teori Double helix DNA
	FALCONER, dan analisa genetika kuantitatif	1960 + 1960	NIREMBERG et all. Kode genetik.
		1970	Awal sejarah rekayasa Genetika
	Kelahiran pertama hewan manipulasi genetik	1981	

# Current Applications of Biotech

It is important to gain a brief understanding of the many applications of biotechnological advancements.

## Biotechnology Color Code

- Microbial
- Agricultural
- **Animal**
- Forensic
- Environmental
- Aquatic
- Medical

### **RED BIOTECHNOLOGY: Medicine / Pharmaceuticals**

- Gene therapy
- Production of proteins, antibodies, and vaccines
- Tissue engineering

### **WHITE BIOTECHNOLOGY: Chemical industry**

- Basic chemicals
- Biopolymers
- Biorefinery

### **GREEN BIOTECHNOLOGY: Agriculture**

- Crops improvement
- Natural pesticides
- Pest and disease resistance

## Perkembangan terakhir : Bioteknologi-Genetika-Biomolekuler

1	1997	Birth of dolly (1 <sup>st</sup> animal cloning using somatic cells)
2	1998	Birth of cows: Charlie/George: ( serum albumin) Specific protein for human blood agglutination
3	2000	Pig cloning (transgenic) for organ transplantation (human),
4.	2001	Inter species nuclear transfer (Yak to Bos Taurus)

### **advantages: non conventional product of livestock:**

- Genetic quality improvement
- Biopharmacies
- Organ Transplantation (Biomedic industry)
- Genetic concervation of endangered animals