

# Use of Animals in Biomedical Research

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## *Importance of Experimental Animals*

- *With the use of laboratory animals in scientific research, it was ensured that research data could be repeated without any prejudice and could be reproduced in the desired conditions.*
- *As a result of many other studies conducted during the 19th century, it was seen that the results of experiments in animals could be successfully translated to humans to achieve therapies*

# Nobel Prize

- Nobel Prize  
Physiology or Medicine  
(1901-..)



## When asked to the Nobel Prize winners

- ✓ *Animal experiments are a prerequisite for progress and development; 97%*
- ✓ *Use of animals in the studies; 74%*
- ✓ *Animal experiments are still required; 74%*
- ✓ *Since there is not yet a complete alternative, restricting animal experimentation will restrict the development in medicine; 97%*

# *Laboratory Animal Science*

## *Subjects:*

- *Biology of animals, husbandry, environmental requirements*
- *Genetic and microbiological aspects of standardization processes*
- *Disease prevention and treatment*
- *Improvement of experimental techniques*
- *Analgesia, anesthesia and euthanasia*

## *Standardization in Lab Animals*

- *In studies conducted with humans, it is not possible to achieve standardization in animals.*
- *There are problems of individual deviations in the experiments and a large number of people should be enrolled in studies.*
- *The standard test animal is a must for obtaining reliable data*

## *Standardization in Lab Animals*

- ***Aim:** Providing the same or near results when the data obtained from an experiment is repeated*
- *Increased closeness between data from the same or similar studies and increased confidence in research results*
- *Keeping the environmental and experimental conditions constant or controlled*

Then different races were formed from these rats.

## *First Rat Standardization*

- *Rats have been cultivated in laboratories since 1877*
- *The first albino rat was found in 1906 when colony standardization was attempted.*
- *Daha sonra bu ratlardan farklı ırklar oluşturulmuştur*



## *Standard Rat Colonies*

- *Wistar Institute has continuously increased its production and sold to many laboratories and institutes within the USA between 1911-1928.*
- *The Sprague-Dawley colony was produced by Robert Dawley by using the rats obtained from the Wistar Institute.*
- *Long-Evans Colony; was developed by Long and Evans from UC Berkeley between 1915-1920 during estrogen cycle research*



## *Genetic Standardization Inbred Production*

- *Aim: to obtain genetically identical animals, to avoid variation*
- *Obtained by mating of siblings*
- *50% purity is obtained in the first cross.*
- *In every next generation, it is purified half as much as the previous one.*
- *$F_{20}$  is considered pure.*

# *Microbiological Special Production Techniques*

## **Conventional Animals**

*Animal groups that are not subjected to any other application other than the normal maintenance and nutrition conditions required for their production and survival*

## **Specific Patogen Free Animals**

- *Animal groups without some special pathogens in their structures*

## **Gnotobiotic Animals**

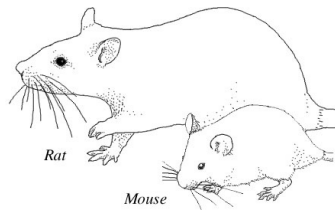
- *Animals with microflora and fauna known per se and are therefore microbiologically standardized*

## **Germ-Free Animals**

- *Animal groups free from all microorganisms that can be detected by cultivation in a closed technique (for antibody production)*

## *Lab Animals Used the Most*

- *Rat*
- *Mice*
- *Rabbit*
- *Fish*



## *Other lab animals including but not limited to,*

- *Pig*
- *Guinea pig*
- *Hamster*
- *Sheep*
- *Monkey*



*Usage rates of experimental animals according to their study area*

<i>Rate (%)</i>	<i>Study Area</i>
22	<i>Drug research and tests</i>
22	<i>Vaccine tests</i>
10	<i>Toxicity tests</i>
10	<i>Cancer research</i>
5	<i>Cardiovascular diseases studies</i>
30	<i>Basic medical research and experimental surgery</i>

System	Experimental System	Animal Model								
		G. Pig	Rat	Mouse	Rabbit	HAMSTER	Dog	Cat	Sheep	Pig
<b>Skin</b>	Epidermal Migration	+								+
Epidermal Reg.	Epidermal Proliferation	+								+
	Epidermal Differentiation	+		+						
	Skin Closure	+	+	+	+					
Dermal Reg.	Tensile strength	+	+							+
	Biochemical Analysis	+	+							
	Primary Irritation	+		+	+		+			+
	Cumulative Irritation				+					
Wound Healing	Photochemical Irritation	+		+	+					+
	Allergic Contact Derm.	+								
	Histology	+								
	Biochemistry		+							

System	Experimental System	Animal Model									
		KOBAY	RAT	FARE	TAVŞAN	HAMSTER/ MAYMUN	KÖPEK	KEDİ	KOYUN/ KEÇİ	KUZU	DOMUZ
URO-GENITAL SYSTEM	Renal Hipertansiyon		+		+		+		+/+		+
	Akut ve Kronik Renal Yetersizlik		+	+	+		+				+
	İntrarenal Cerrahi						+				+
	Hidrouretero-nefrosis		+				+			+	+
	Vesicouretral Reflux						+				+
	Ureteral Colic				+		+				
	Uriner Diversion		+		+		+				+
	Nörojenik Mesane Bozukluğu		+				-/+		+		+
	Mesane-Uretanın Greftlenmesi Rekonstrüksiyonu				+		+	+			+
	Colovesical Fistul						+				
	Vasectomi-Vasovasostomy	+	+	+	+	+/+	+				
	Spermatik Cord Torisyonu	+	+				+				
	Varicocele		+				-/+	+			
	Cryptorchism	+	+	+	+						+
	Penis, Scrotum, Testis Anatomisi	+	+	+			-/+	+	+	+/+	+
	Hydrosalpinx				+						
	Gebelik toxemisi	+	+		+		-/+	+			

System	Experimental System	Animal Model								
		KOBAY	RAT	FARE	TAVŞAN/ KANATLI	HAMSTER/ MAYMUN	TAVUK	KÖPEK	KEDİ	DOMUZ
<b>PANCREAS</b>	Anatomi	+	+		+/-	-/+		+	+	+
	Pankreatik Ekzokrin Sekresyon		+	+				+	+	
	Pankreatik Transplantas.							+	+	
	Pankreatik Endokrin Sekresyon		+							+
Diabetes Mellitus	Cerrahi İndükleme		+				-/+	+		
	Farmakolojik İndükleme		+	+/-	+/-	+/+		+	+	
	Viral İndükleme	+								
Acute Pancreatitis	İlaç-Diyet ile İndüklene		+	+/-		+/+		+	+	
	İschemia ile İndüklene		+					+	+	
	İnfeksiyöz			+/-						
	Pankreatik Ductal Obstruksiyon		+		+					
	İntraparanchimal Extravasation/ Akut pankreatik İnflamasyon	+								
	Duodenal Reflux ve Akut Pankreatitis		+							
	Farklı Ajanların Direk İntraductal Enjeksiyonu		+		+/-			+	+	+
	İsole Perfused Pancreas Model							+		