

Laboratory Pig Breed A, O and U

實驗豬種A, O及U品種

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畜產試驗所 台東種畜繁殖場

Introduction 4 ♂, 16 ♀ TAPS LRI 1980

Introduction policy making

Developing experimental minipigs

Germplasm Introduction
4 ♂ 16 ♀, TAPS, 1980

Introduction Policy, 1979

Made by Dr. Jong and Dr. Hwang

Suggested by experts from NIH USA



Dr. Jong



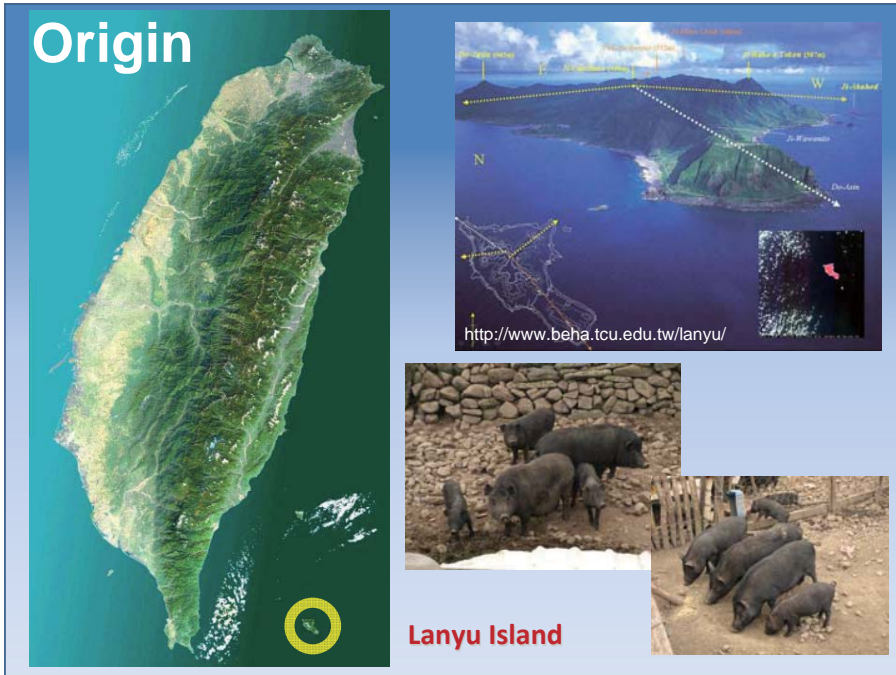
Dr. Hwang



Dep. Animal Industry
Council for Agricultural Planning and Development (CAPD, 1979)

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Origin

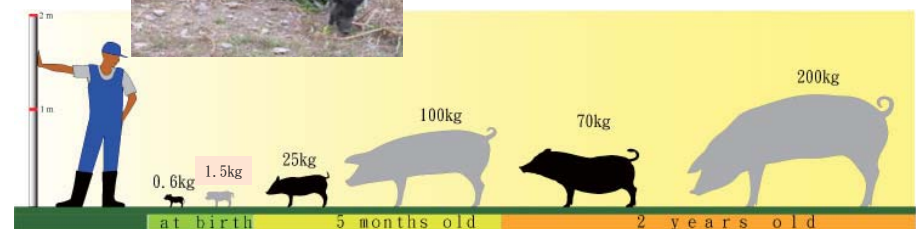


Lanyu Island



Adapting characteristics:

- heat tolerance
- disease-resistance
- roughage tolerance
- early maturity
- similar to human physiologically and anatomically



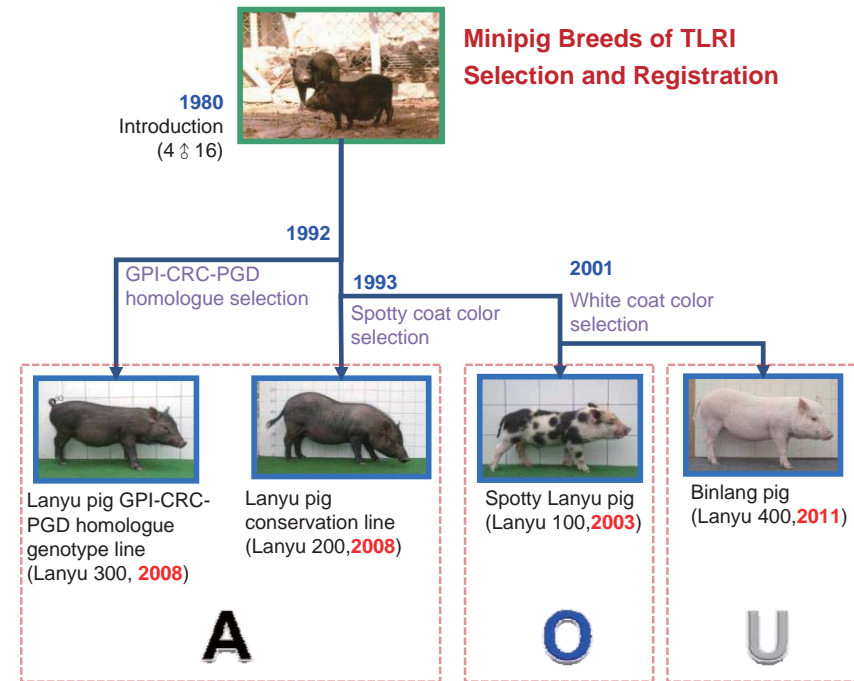
■ Missions of minipig in TAPS, LRI

Germplasm Conservation

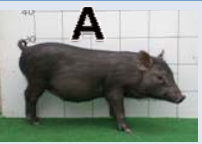


- Preserve agricultural biodiversity
- Maintain genetic diversity

Developing Niche Usage

- Selection
 - Extension
- For biomedical research**



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Breed	Basic information
 <p>Lanyu pig GPI-CRC-PGD homologue genotype line</p>	
 <p>Spotty Lanyu pig</p>	weight at birth : 0.6~0.8 kg weight at sexual maturity : 20~25 kg Sexual maturity : 4~5 months
 <p>Binlang pig</p>	

Reproduction parameters of swine, and miniature swine with the adult weights of Micropig and Minipig.

Parameter	Swine	Miniature swine	
		Micropig	Minipig
Weight at birth (Kg)	1.30	0.45~0.60	0.60~1.00
Weight at sexual maturity (Kg)	90~120	15~18	25~30
Weight at body maturity (Kg)	200~300	35~55	70~90
Sexual maturity (month)	6	4~5	6
Estrus cycle (day)	14	14	14
Length of estrus (day)	3	3	3
Length of pregnancy (day)	114	114	114
Litter size	10~14	5~8	5~8
Age at weaning (day)	28~35	28~35	28~35

^aYucatan micropig, Gottingen and Sinclair minipig

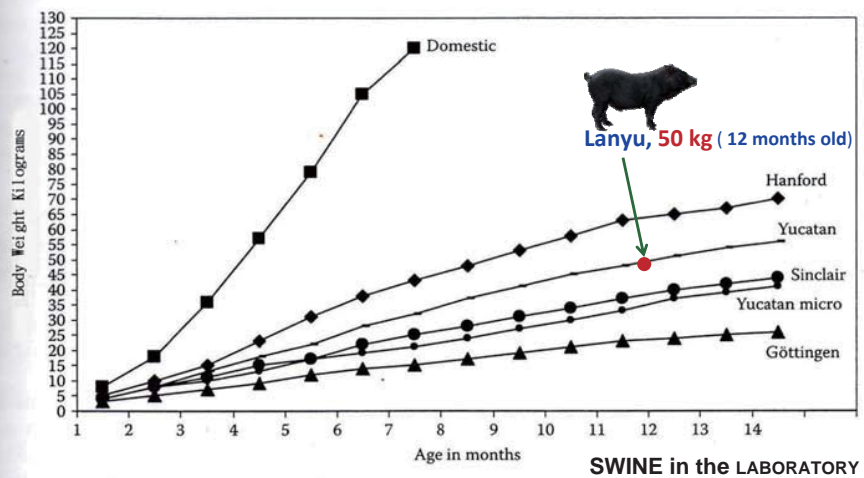
^bYucatan and Hanford minipig

Lanyu minipig breeds

The Laboratory Swine.

2000 by Peter Bollen PJA; AK Hansen & HJ Rasmussen. CRC Press.

TABLE 1.1
Relative Body Weights and Growth of Domestic and Miniature Pigs



A Lanyu pig GPI-CRC-PGD homologues genotype line (Lanyu 300)



GPI - BB
CRC - CC
PGD - AA

G0	1992	Gene Screening
G1~G2	1993~1998	Half-sib selection
G 3~G5	1999~2004	Full-sib selection
Registered as a new line in 2008		

A Lanyu pig GPI-CRC-PGD homologues genotype line (Lanyu 300)

Gene	Chromosome	Genotype	Function
GPI	6th	BB	Glucose phosphate isomerase
CRC	6th	CC	Calcium Release Channel
PGD	6th	AA	6-Phosphogluconate dehydrogenase



CRC-CC Type (Normal type)
free of stress-shock syndrome

registered as a new line in 2008.

O Spotty Lanyu pig (Lanyu 100)



G0	1993	Separating spotty offspring
G1~G5	1994~1998	Half-sib selection
G 6~G8	2000~2002	Full-sib selection
Registered as a new breed in 2003		

Spotty Lanyu pig Breeding Process



Spotty offspring were observed from black herd from 1993.

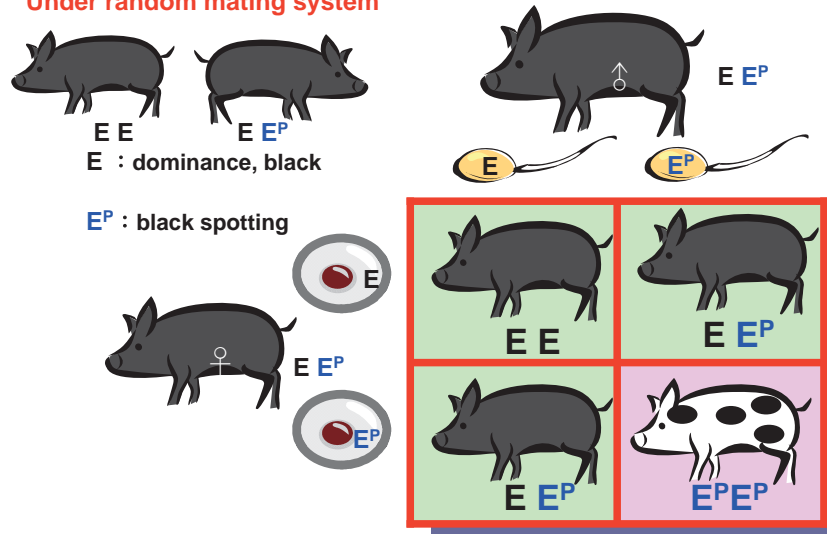
Spotty Lanyu pig Breeding Process



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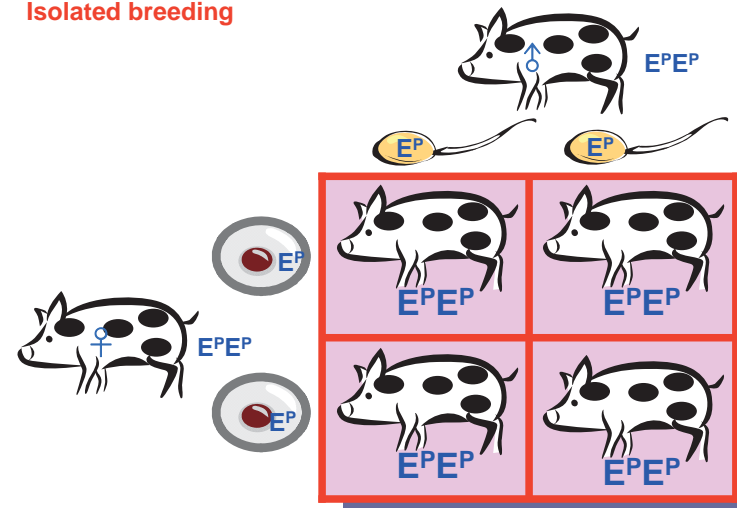
Spotty Lanyu pig Color Genetics

Under random mating system



Spotty Lanyu pig Color Genetics

Isolated breeding



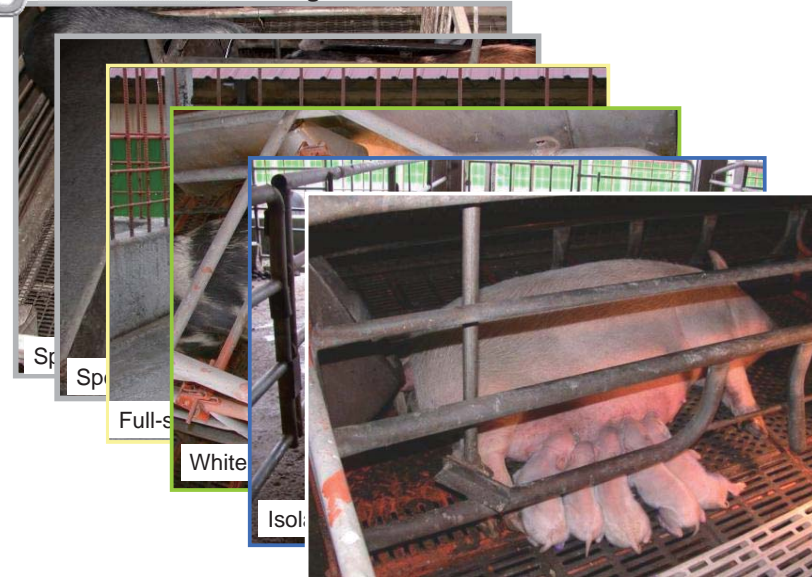
U Binlang pig (Lanyu 400)

TAPS locate at **Binlang** Village



G0	1999	Full-sib mating of Spotty Lanyu
G1	2001	1 male white offspring appeared
G2~G3	2003~2004	Collect more white piglets (the white boar x Spotty sows)
G4~G5	2005~2008	Full-sib selection
Registered as a new breed in 2011		

U Binlang pig Breeding Process



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U KIT exon and intron 17 of Binlang pig

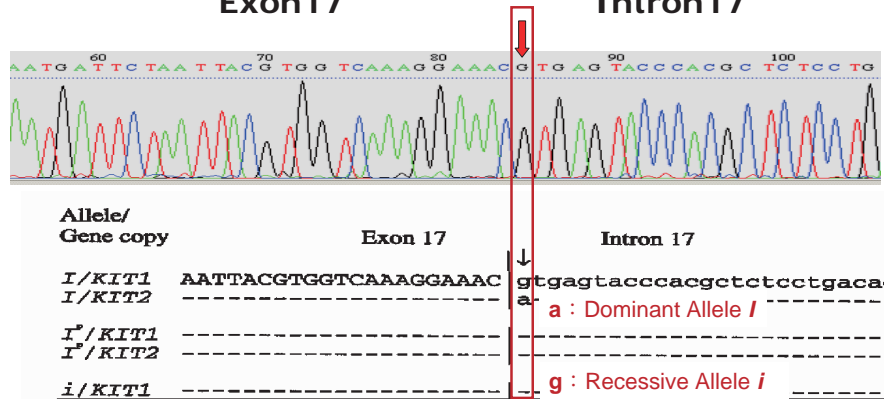
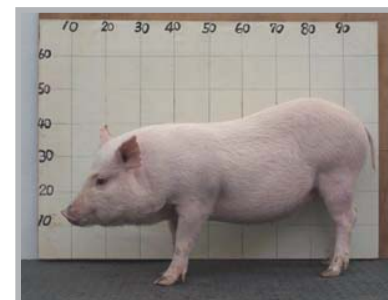


Figure 1. DNA sequence comprizing 48 bp of the exon17/intron 17 border in *KIT1* and *KIT2* associated with the *I*, *I*^o, and *i* alleles. The position of the exon/intron border is marked with a vertical line, the splice mutation (nt1^G → ^A) with a vertical arrow, and sequence identity to the master sequence with a dash. (Marklund *et al.*, 1998)

U Binlang pig



Oncoming Project : **Micropig** Selection

For all fields of biomedical research, especially *pharmacology* and *toxicology* studies.

Animal resource : **Binlang pig**

Reproduction parameters of swine, and miniature swine with the adult weights of Micropig and Minipig.

Parameter	Swine	Miniature swine	
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Size	10-14	5-8	5-8
	35	28-35	28-35



Oncoming Project : **Micropig** Selection

Sire & Dam determination

Sire : The **smallest body-size** Binlang boar



Dam : The daughters of the Binlang boar who **has the most offspring**

Also consider the lighter skin selection

Small body size selection

Boar	BW(kg)	BL(cm)	BH(cm)	RW(cm)	CG(cm)	Age(month)	offspring
722-3	112	112	74	37	132	36	28
731-2	86	104	49	34	121	36	18
639-1	132	103	67	42	138	42	31
549-3	132	123	69	38	135	50	23
530-1	149	122	72	42	142	51	32
729-2	135	113	72	45	135	36	4
717-4	107	118	68	36	125	37	52
389-1	121	127	72	37	126	62	36
717-2	101	117	69	34	122	37	54
791-1	112	118	72	38	129	31	19
730-2	123	116	70	39	134	36	45
626-1	132	125	68	40	135	43	39

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■ Utilization of minipigs for biomedical research from 2011 to 2012

Category	No.	Item	User*
Surgery	653	Medical device Urological technology Laparoscope Stem cell technology New Drug Development Allotransplantation Regeneration Teaching test Cardiology research Operation technology	NCKUH, MMH, NTUCM, TVGM, FEMH, CGMH, KMUH, TSGH, MMH, CSMUH, NDMC
Dentistry	56	Regeneration	NTUVM, TMUH, TVGM
Emergency	78	Training Operation test	FAST, NTUVM, NTUCM
Internal Medicine	251	Cardiac vascular check diabetes therapy Cancer therapy Cardio cell regeneration New Drug Development	CGMH, NTUCM, NCKUH, CGMH, NTUVM
Anesthesiology	96	Teaching test	MMH, CMMC, NDM
Orthopedics	82	Allotransplantation Regeneration	CGMH, CMUH, NTUVM
Radiology	35	Medical image	NHRI
Pharmacology	10	Teaching test	YCHM
Total	1261	82 projects	24 users



Association for Assessment and Accreditation of Laboratory Animal Care

■ Application — 2012/7/24

■ Site visit — 2012/11/6

■ Full Accreditation — 2013/2/25



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Swine hemi-facial composite tissue allotransplantation: A model to study immune rejection.

Kaohsiung Chang-Gung Memorial Hospital

Team : Yur-Ren Kuo, M.D. Ph.D. *et al.*



Journal of Surgical Research 153: 268-237, 2009 (SCI; IF.=1.875, Surgery 49/148)

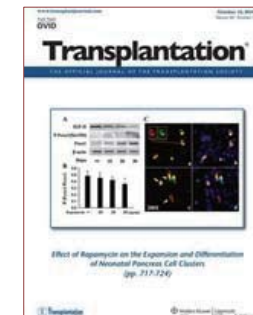


Mesenchymal stem cells prolong composite tissue allotransplant survival in a swine model.

Kaohsiung Chang-Gung Memorial Hospital

Team : Yur-Ren Kuo, M.D. Ph.D. *et al.*

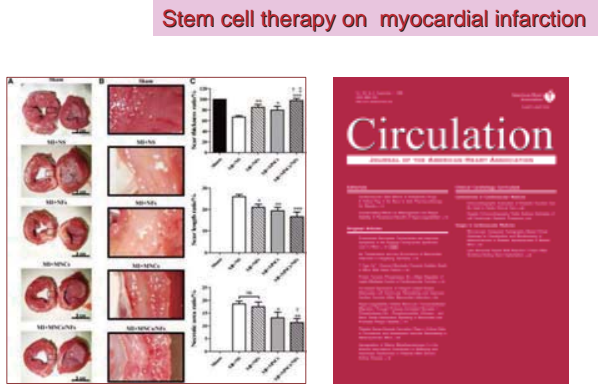
Transplantation 87: 1769-1777, 2009. (SCI; IF=3.816, Surgery 10/148)



Intramyocardial Peptide Nanofiber Injection Improves Postinfarction Ventricular Remodeling and Efficacy of Bone Marrow Cell Therapy in Pigs

National Cheng Kung University hospital,
Team : Patrick C.H. Hsieh, MD, PhD et al.

Circulation 2010;122;S132-S141



Stem Cells Tissue Regeneration --Tooth Regeneration

2010-11-25

Tooth Regeneration on Mini Pigs from Dental Stem Cells

Eight mini pigs (about one and half month old in age) were used for study, six for experimental group and two for control group. In experimental group, **dental stem cells** were **isolated** from tooth buds by explant **outgrowth technique** and **transplanted** into alveolar bone of the original mini pig (autograft) for establishing tooth regeneration. After one year, **Well differentiated tooth crowns** were found to grow in mini pigs in the experimental group.



Fig. The tooth formed by dental stem cells transplanted



Thanks for your attention