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### 35. 種豬厭氧腸道菌培養體學分析之初探

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#### 35. 種豬厭氧腸道菌培養體學分析之初探

陳佳萱(1) 劉忠憲(2) 楊杰(3) 吳明哲(1) 黃建勳(2)

(1)行政院農業委員會畜產試驗所 (2)財團法人食品工業發展研究所 (3)福昌種豬場

影響宿主腸道健康之關鍵微生物存在於厭氧環境中，不易自腸道分離，故腸道菌培養體學技術對於發展新世代益生菌相當重要。本試驗採集杜洛克種公豬新鮮糞便樣本，使用3種不同的厭氧培養條件進行厭氧腸道菌之分離培養，再以基質輔助雷射脫附游離飛行時間式質譜儀 (MALDI-TOF MS) 或16S rRNA基因定序，快速鑑別所得分離株。結果顯示，總計挑選近500個分離菌落，經過繼代培養、菌株純化和學名鑑別，最後得到20株不同菌種別之分離株，這些菌株主要分別為厚壁菌門、擬桿菌門、放線菌門、變形菌門與Synergistetes門，其中有四株無法定義出菌種學名，推測可能是從未被發現的新穎菌種，未來將利用全基因體序列進行更進一步的比對分析，並結合傳統多相分類技術，藉以完成新種的描述與發表。

關鍵語：豬腸道菌相、培養體學分析、微生物新種

Preliminary study of gut microbiota in breeding pig using microbial culturomics analyses

C. H. Chen(1), J. S. Liou(2), C. Yang(3), M. C. Wu(1) and C. H. Huang(2)

(1)Livestock Research Institute, Council of Agriculture, Executive Yuan (2)Bioresource Collection and Research Center, Food Industry Research and Development Institute

(3)Formosa Breeding Pig Farm

The host intestinal health may be affected by some crucial microorganisms, which are existed in the anaerobic environment and are difficult to isolate. Therefore, microbial culturomics technique for anaerobic intestinal microbiota is of great importance to the development of next-generation probiotics. The gut isolates include facultative and strict anaerobes that were isolated from pig feces samples under three different culture conditions. Nearly 500 isolated colonies were identified using MALDI-TOF MS (matrix-assisted laser desorption ionization time-of-flight mass spectrometry) combined with 16S rRNA sequencing, and successfully cultured 20 different bacterial species, which were belonged to the members of Firmicutes, Bacteroidetes, Actinobacteria, Proteobacteria and Synergistetes respectively. Among them, 4 new species have been discovered. These new taxa will be characterized and described by taxonogenomics approaches for proposing the novel species in the future.

Key Words: Swine gut microbiota, Culturomics, Microbial novel species

#### 44. 即時聚合&#37238;鏈鎖反應檢測努比亞山羊黏多醣症之基因型分析

#### 44. 即時聚合&#37238;鏈鎖反應檢測努比亞山羊黏多醣症之基因型分析

朱家德(1) 林德育(1) 賴永裕(1) 陳若菁(1) 吳明哲(1) 張秀鑾(2)

(1)行政院農業委員會畜產試驗所 (2)國立屏東科技大學

山羊黏多醣症 (Mucopolysaccharidosis, MPS) IIID型, 是一種遺傳缺陷所導致的代謝性疾病。黏多醣學名為醣胺多醣glycosaminoglycans (GAGs), 是體內含量最豐富的多醣體; 因GAGs的溶液態具有高黏度, 故稱為黏多醣mucopolysaccharide。目前僅有單一品種努比亞 (Nubian) 山羊的GNS (N-acetylglucosamine-6-sulphatase, 又稱 G6S) 基因在cDNA第322個核&#33527;酸有一突變點 (C T)。本試驗山羊以5場民間種羊場業者提供90頭努比亞種羊血液為樣本, 運用螢光引子 (FAM/HEX-labelled Primer) 標記之即時聚合&#37238;鏈鎖反應進行G6S基因型鑑別, 分析顯示G6S正常型、雜合型及有病型分別為72.2% (65/90)、27.8% (25/90) 及0% (0/90), 並進行突變點拆離式聚合&#37238;鏈鎖反應 (MS-PCR) 檢測與基因片段定序 (DNA Sequencing) 比對作業, 發現3者判定之G6S基因型結果相符合。綜合上述, 以即時聚合&#37238;鏈鎖反應檢測技術做為判斷努比亞山羊黏多醣症之正常型及有病型個體, 可為另一種迅速判定山羊GNS黏多醣症基因型之檢測模式。

關鍵語: 山羊、黏多醣症、即時聚合&#37238;鏈鎖反應

Genotypic Analysis of Caprine Mucopolysaccharidosis Type IIID by Real-time PCR Platform

C. T. Chu(1), D. Y. Lin(1), Y. Y. Lai(1), J. C. Chen(1), M. C. Wu(1) and H. L. Chang(2)

(1)Taiwan Livestock Research Institute (2)National Pingtung University of Science and Technology

The mucopolysaccharidoses (MPSs) are a group of lysosomal storage disorders caused by deficiency of enzymes catalyzing the stepwise degradation of glycosaminoglycans (GAGs). A model of a Nubian goat with biochemical abnormalities and an enzyme deficiency resembling was found in the Sanfilippo syndrome type D, mucopolysaccharidosis IIID (MPS IIID). In Nubian goat MPS IIID, the G6S deficiency is associated with a single mutation, changing a C to T in the 322 nucleotide of the G6S cDNA sequence. Blood and DNA were obtained from five different farms (n=90) and were tested the G6S deficiency by Real-time PCR platform. The results showed the frequencies of AA, AB, and BB genotypes were 72.2% (65/90), 27.8% (25/90), and 0% (0/90), respectively. The polymorphism (C to T) detected by Mutagenically Separated PCR and DNA sequencing had the same genotypes by Real-time PCR. The genotype of caprine mucopolysaccharidosis type IIID by Real-time PCR could be one of the genotyping methods to effectively detect the G6S deficiency in Nubian goat.

Key Words: Nubian goat, G6S, Real-time PCR

#### 45. 即時聚合&#37238;鏈鎖反應檢測土雞A-FABP基因Exon1點突變多態性之基因型分析

#### 45. 即時聚合 $\beta$ 37238; 鏈鎖反應檢測土雞A-FABP基因Exon1點突變多態性之基因型分析

朱家德(1) 林德育(1) 賴永裕(1) 陳若菁(1) 吳明哲(1) 張秀鑾(2)

(1)行政院農業委員會畜產試驗所 (2)國立屏東科技大學

肌間脂肪含量 (Intramuscular Fat, IMF%) 為影響肌肉柔嫩度 (Tenderness)、多汁性 (Juiciness)、氣味 (Odor) 及風味 (Flavor) 的關鍵影響因子之一。研究文獻指出, 脂肪 $\beta$ 32454; 胞脂肪酸 $\beta$ 32467; 合蛋白 (Adipocyte fatty acid binding protein, A-FABP) 點突變能顯著 ( $P < 0.05$ ) 影響北京油雞公雞腿肉與雞胸肌間脂肪含量。本試驗以凱馨桂丁土雞 ( $n=30$ )、黑羽土雞 ( $n=30$ ) 及烏骨雞 ( $n=30$ ) 為樣本, 運用螢光引子 (FAM/HEX-labelled Primer) 標記之即時聚合 $\beta$ 37238; 連鎖反應 (Real-time PCR) 基因型檢測技術, 檢測三個品種土雞A-FABP基因Exon1點突變多態性之基因型, 初步結果發現凱馨桂丁土雞、黑羽土雞及烏骨雞的C交替基因頻率分別為0.85、0.38及0.85。後續將A-FABP基因Exon1點突變之基因型與土雞雞胸肉與腿肉肌間脂肪含量進行統計分析, 以確定此點突變是否為影響土雞胸肉與腿肉肌間脂肪含量之有利基因。

關鍵語: 土雞、脂肪 $\beta$ 32454; 胞脂肪酸 $\beta$ 32467; 合蛋白、即時聚合 $\beta$ 37238; 連鎖反應

Genotypic Analysis of Single Nucleotide Polymorphism on Exon1 of A-FABP Gene in Indigenous Chicken by Real-time PCR platform

C. T. Chu(1), D. Y. Lin(1), Y. Y. Lai(1), J. C. Chen(1), M. C. Wu(1) and H. L. Chang(2)

(1)Taiwan Livestock Research Institute (2)National Pingtung University of Science and Technology

The intramuscular fat (IMF) content in muscles is one of the most important underlying factors for tenderness, juiciness, odor, and flavor of the meat. A-FABP, which affects the transport, uptake, esterification, and mitochondria of fatty acids, is a member of the fatty acid binding protein (FABP) multigene family and plays an essential part in the transfer of intracellular fatty acids through binding lipids and metabolism. Beijing-You chickens inheriting the homozygous BB genotype at A-FABP had a significantly higher content of IMF in thigh muscles and breast muscles than did those inheriting the AA and AB genotypes. DNA obtained from Kaisheng Guiding Native Chicken ( $n=30$ ), Black Feather Native Chicken ( $n=30$ ), and Silkie Bantam ( $n=30$ ) were tested single nucleotide polymorphism on exon1 of A-FABP gene by Real-time PCR platform. The results showed that allele C frequencies were 0.85, 0.38, and 0.85, respectively, in indigenous chicken (Kaisheng Guiding, Black Feather, and Silkie Bantam). Further, We will proceed with the statistical analyses to identify the polymorphism of A-FABP associated with the intramuscular fat content in muscles.

Key Words: Indigenous chicken, A-FABP, Real-time PCR

#### 46. 即時聚合 $\beta$ 37238; 鏈鎖反應檢測土雞H-FABP 基因Intron2 點突變多態性之基因型分析

#### 46. 即時聚合 $\beta$ -actin; 鏈鎖反應檢測土雞H-FABP 基因Intron2 點突變多態性之基因型分析

朱家德(1) 林德育(1) 賴永裕(1) 陳若菁(1) 吳明哲(1) 張秀鑾(2)

(1)行政院農業委員會畜產試驗所 (2)國立屏東科技大學

肌間脂肪含量 (Intramuscular Fat, IMF%) 為影響肌肉柔嫩度 (Tenderness)、多汁性 (Juiciness)、氣味 (Odor) 及風味 (Flavor) 的關鍵影響因子之一。研究文獻指出, 心臟型脂肪酸 $\beta$ -actin; 合蛋白 (Heart-type fatty acid binding protein, H-FABP) 點突變能顯著影響封開杏花雞、惠陽鬍鬚雞、廣西霞 雞、嶺南黃雞、清遠麻雞及侏儒雞等中國本土雞隻與愛拔益加商用肉雞品種雞胸肌間脂肪含量。本試驗以凱馨桂丁土雞 (n=26)、黑羽土雞 (n=30) 及烏骨雞 (n=30) 為樣本, 運用螢光引子 (FAM/HEX-labelled Primer) 標記之即時聚合 $\beta$ -actin; 連鎖反應 (Real-time PCR) 基因型檢測技術, 檢測三個品種土雞H-FABP基因Intron2點突變多態性之基因型, 初步結果發現凱馨桂丁土雞、黑羽土雞及烏骨雞的C交替基因頻率分別為0.54、0.33及0.23。後續將H-FABP基因Intron2點突變之基因型與土雞雞胸肉與腿肉肌間脂肪含量進行統計分析, 以確定此點突變是否為影響土雞胸肉與腿肉肌間脂肪含量之有利基因。

關鍵語: 土雞、心臟型脂肪酸 $\beta$ -actin; 合蛋白、即時聚合 $\beta$ -actin; 連鎖反應

Genotypic Analysis of Single Nucleotide Polymorphism on Intron2 of H-FABP Gene in Indigenous Chicken by Real-time PCR platform

C. T. Chu(1), D. Y. Lin(1), Y. Y. Lai(1), J. C. Chen(1), M. C. Wu(1) and H. L. Chang(2)

(1)Taiwan Livestock Research Institute (2)National Pingtung University of Science and Technology

The intramuscular fat (IMF) content plays a very important role in flavour, tenderness and juiciness for chicken meat, and a higher content of IMF means higher quality chickens. H-FABP is a cytosolic protein found in heart, muscle, and lactating mammary gland. This protein is the only FABP expressed in various muscle tissues. A single nucleotide polymorphisms (SNP) of chicken H-FABP gene were significantly associated with IMF content in Chinese domestic chicken breeds (Fengkai Xinghua, Huiyang Huxu, Qingyuan Ma, Guangxi Xiayan, Lingnan Huang, dwarf chicken) and broiler (Abor Acre). DNA obtained from Kaishhing Guiding Native Chicken (n=26), Black Feather Native Chicken (n=30), and Silkie Bantam (n=30) were tested single nucleotide polymorphism on Intron2 of H-FABP gene by Real-time PCR platform. The results showed that allele C frequencies were 0.54, 0.33, and 0.23, respectively, in indigenous chicken (Kaishhing Guiding, Black Feather, and Silkie Bantam). Further, We will proceed with the statistical analyses to identify the polymorphism of H-FABP associated with the intramuscular fat content in muscles.

Key Words: Indigenous chicken, H-FABP, Real-time PCR

#### 84. 畜試所藍殼烏骨雞之微衛星遺傳標記多態性分析

#### 84. 畜試所藍殼烏骨雞之微衛星遺傳標記多態性分析

林德育(1) 曾淑貞(2) 劉曉龍(1) 賴永裕(1) 蔡銘洋(1) 洪哲明(1) 吳明哲(1)

(1)行政院農業委員會畜產試驗所 (2)中華醫事科技大學

為評估行政院農業委員會畜產試驗所藍殼蛋烏骨雞選育族群的遺傳變異，本試驗利用FAO(2010)建議使用的24組雞微衛星標記組分析117隻藍殼蛋烏骨雞第G4世代種雞個體DNA。其中除MCW0103、MCW0216及MCW0248微衛星標記所檢測的基因型在所有檢測個體皆為單型外，其它21組微衛星標記皆有多態型的基因型。共檢測到87個對偶基因，平均每個基因座具有3.5個對偶基因(1~13)；其期望異質度介於0到0.774，平均為0.422，觀測異質度介於0到0.778，平均為0.372，而多態性訊息含量介於0到0.735，平均為0.377(表26)。在選用的24組微衛星標記組中有10組呈現高度多態性資訊(PIC &#8805; 0.50)，有5組呈現中度多態性資訊(0.50 > PIC &#8805; 0.25)，9組呈現低度多態性資訊(PIC

關鍵語：烏骨雞、微&#34910;星遺傳標記、多態性

#### Polymorphism analysis of LRI blue egg silkie chicken by microsatellite markers

D. Y. Lin(1), S. J. Tzeng(2), H. L. Liu(1), Y. Y. Lai(1), M. Y. Tsai(1), C. M. Hung(1) and M. C. Wu(1)

(1)Livestock Research Institute(LRI), Council of Agriculture (2)Chung Hwa University of Medical Technology

In order to evaluate genetic variation of LRI blue egg silkie chicken flock. we use a set of 24 microsatellite markers recommended by FAO to analyze 117 candidate bred chickens from this flock. Except MCW0103, MCW0216 and MCW0248, all the microsatellites were polymorphic. The average allelic number 3.5, ranged from 1 to 13 per locus. The expected heterozygosity ranged from 0 to 0.774, and the average expected heterozygosity was 0.422. The observed heterozygosity of the population ranged from 0 to 0.778, and the average observed heterozygosity was 0.372. The polymorphic information content (PIC) ranged from 0 to 0.774, and the average PIC was 0.491. In 24 markers, 10 markers were highly informative with polymorphism information content (PIC &#8805; 0.50), five markers were reasonably informative(0.5 > PIC &#8805; 0.25) and the other nine markers were slightly informative (PIC

Key Words: Silkie chicken, Microsatellite marker, Polymorphism

#### 85. 畜試所藍殼烏骨雞選育族群之家禽白血病 J 病毒監測

#### 85. 畜試所藍殼烏骨雞選育族群之家禽白血病 J 病毒監測

林德育(1) 曾淑貞(2) 劉曉龍(1) 蔡銘洋(1) 賴永裕(1) 朱家德(1) 吳明哲(1)

(1)行政院農業委員會畜產試驗所 (2)中華醫事科技大學

家禽白血病 (avian leucosis, AL) 是由家禽白血病毒 (avian leucosis virus, ALV) 引起，其中的 J 亞群 (subgroup J ALV; ALV-J) 於 1989 年出現，造成養雞業者的嚴重損失。為了解行

政院農業委員會畜產試驗所監製烏骨雞選育族群種雞群是否感染家禽白血病 J 病毒，於本（2020）年進行全場選育族群315隻候選種雞之家禽白血病 J 病毒篩檢。以含抗凝劑 EDTA-K3之採血器採集雞隻翼靜脈 2 毫升全血，以核酸萃取試劑進行核酸萃取後，進行 PCR（primer H5/H7）檢測家禽白血病 J 病毒。檢測結果在所有送檢樣品皆呈陰性反應，顯示該選育族群為一家禽白血病 J 病毒清淨族群。

關鍵語：烏骨雞、家禽白血病、家禽白血病J病毒、監測

Avian leucosis J-virus monitoring in the selection population of LRI blue egg silkie chicken

D. Y. Lin(1), S. J. Tzeng(2), H. L. Liu(1), M. Y. Tsai(1), Y. Y. Lai(1), C. T. Chu(1) and M. C. Wu(1)

(1)Livestock Research Institute (LRI), Council of Agriculture (2)Chung Hwa University of Medical Technology

Avian leucosis is caused by avian leucosis viruses (ALVs) are prevalent in the poultry industry worldwide and cause severe economic losses. The subgroup J of ALV (ALV-J) has emerged as an important pathogen of meat-type chickens since 1989 and causes serious economic losses in poultry industry. In order to monitor ALV-J disease in the selection population of LRI blue egg silkie chicken, we collected blood samples of candidate breeder chicken by the blood collection device with anticoagulant EDTA-K3 in 2020. The DNAs of 315 silkie chicken blood samples were extracted with nucleic acid extraction reagent and the primer kits (H5/H7) was used for ALV-J PCR detection. All of the detected samples were ALV-J negative. It shows that the selection population of LRI blue egg silkie chicken is an avian leukemia J virus free population.

Key Words: Silkie chicken, Avian leucosis, Avian leucosis J-virus(ALV-J), Monitoring

## 90. 乳牛場IoT物聯網建置之研究

### 90. 乳牛場IoT物聯網建置之研究

曹全偉(1) 吳明哲(1) 陳怡璇(2) 葉亦馨(2) 陳國禎(3) 杜家瑞(4)

(1)行政院農業委員會畜產試驗所 (2)行政院農業委員會畜產試驗所新竹分所 (3)和荃種牛場 (4)物聯智慧股份有限公司

乳牛場每日擠乳、餵養及清潔工作皆需使用大量的水與電，對於設備的用電量資訊與畜舍的用水量資訊若無法掌握，將沒有牧場管理的意義。本研究導入IoT物聯網至乳牛場中，裝設具備Wi-Fi傳輸功能與IP65防水防塵等級以上的數位水錶與數位電錶，定時收集牛舍的廢水排放量（單位：公升）及擠乳設備的用電量（單位：度），以無線網路傳輸到現場的資料收集軟體（Modbus），再透過Http協定呼叫API應用程式介面將所收集的水電資料，轉換成JSON資料交換格式，回寫至畜產試驗所生乳資料平台。該平台提供牧場管理人透過行動裝置或電腦存取場域用水與用電資訊，資料數位化之後，牧場管理

人能掌握每日的用電資訊，對於異於用電情況便能迅速查覺；另外牧場人員每日需抄寫廢水排放量的工作改由系統自動記錄，能避免忘記抄錶或抄錯資料的情況發生。

關鍵語：乳牛場、物聯網、感測器

Research on the establishment of Internet of Things in dairy farms

C. W. Tsao(1), M. C. Wu(1), Y. H. Chen(2), Y. H. Yeh(2), G. J. Chen(3) and C. J. Tu(4)

(1)Livestock Research Institute, COA, Executive Yuan. (2)Hsinchu Branch, Livestock Research Institute, COA, Executive Yuan. (3)HeQuag Dairy Breeding Farm (4)ThroughTek Co., Ltd.

Daily milking, feeding and cleaning jobs in dairy farms require large amounts of water and electricity. If it is impossible to get the power consumption of the equipment and the water consumption of the livestock house, the farm management is not actually a fact. This research applies the Internet of Things architecture to a dairy farm, and installs digital water sensors and digital electric sensors with Wi-Fi function and over IP65 waterproof and dustproof level. These sensors regularly collect the waste water discharge with liter unit and the electricity consumption of the milking equipment with degree unit, and the gained data is transported via Wi-Fi network to a collection software, called Modbus. Modbus could convert the collected water and electricity consumption data into JSON exchange format, and then calls the application program interface through Http protocol, and writes data back to the data platform for dairy farms. This platform provides farm managers with access to water and electricity information through mobile devices or computers. After the data is digitized, the farm managers can grasp the daily electricity consumption information and quickly find the abnormal situation in electricity usage. In addition, the daily work of the employee to transcribe the waste water discharge amount is automatically recorded by the system, which can avoid the situation of forgetting or transcribing the wrong information.

Key Words: Dairy farm, Internet of Things, Sensors

#### 100. 種豬體型、腳蹄評鑑與承購價關連性探討

#### 100. 種豬體型、腳蹄評鑑與承購價關連性探討

朱巧倩(1) 顏念慈(1) 陳佳萱(1) 吳明哲(1) 林正祥(2) 劉桂柱(3)

(1)行政院農業委員會畜產試驗所 (2)財團法人中央畜產會 (3)臺灣區種豬產業協會

本試驗目的為探討種豬體型與腳蹄評鑑結果是否影響種豬拍賣標購者出價意願。完檢且指數合格種豬依據品種性別分組進行體型評鑑，體型評鑑入選2頭（含）以上之組別才進行腳蹄評分。試驗豬隻為自2011年3月23日至2020年9月23日，中央檢定站完檢之腳蹄評分第一名種豬共245頭，包含杜洛克公豬76頭與母豬19頭、藍瑞斯公豬75頭與母豬32頭及約克夏公豬42頭與母豬1頭，比較腳蹄評分第一名、

體型評鑑入選及未入選體型評鑑種豬三者之間承購價及成交百分比之關連性。本研究結果顯示體型評鑑入選及腳蹄評分第一名種豬的承購價及成交百分比顯著高於未入選體型評鑑種豬，顯示體型評鑑及腳蹄評分結果是影響標購者承購意願的因素之一。

關鍵語：種豬、體型評鑑、腳蹄評分

The investigation of relationships among the hoof evaluation, body-type evaluation, and bidding price of breeding pigs

C. C. Chu(1), N. T. Yen(1), C. H. Chen(1), M. C. Wu(1), C. H. Lin(2) and K. C. Liu(3)

(1)Livestock Research Institute, Council of Agriculture, Executive Yuan (2)National Animal Industry Foundation (3)Formosan Farmers Association for Swine Improvement

This research is conducted to investigate whether the hoof evaluation results of breeding pigs will affect the bidding willingness of bidders. After the performance examination, the index-qualified breeding pigs were grouped by breeds and gender for the body-type evaluation. Once, more than two pigs were selected, the hoof evaluation will be implemented. The performance test period was from March 23, 2011, to September 23, 2020. Totally, there were 245 pigs in top rank after the hoof evaluation in Central Performance Test Station, and 76 Duroc boars, 19 Duroc gilts, 75 Landrace boars, 32 Landrace gilts as well as 42 Yorkshire boars, 1 Yorkshire gilts included. Therefore, we would like to find out the relations of the bidding price and sales rate among pigs from the top rank of hoof evaluation, qualified for body-type evaluation, and unqualified for body-type evaluation. The result indicated that both the bidding price and sales rate were higher in the pigs from the groups of the top rank of hoof evaluation and qualified for body-type evaluation than the group of unqualified for body-type evaluation. It demonstrated that the bidding willingness of bidders was affected by the results of hoof evaluation and body-type evaluation of breeding pigs.

Key Words: Breeding pig, Body-type evaluation, Hoof evaluation

## 107. 畜產種原維護保存的現在與未來

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謝佳容(1) 賴永裕(1) 吳明哲(1)

(1)行政院農業委員會畜產試驗所遺傳育種組

氣候變遷與疫病橫行是對全球畜牧產業的嚴峻考驗，而各國面對此挑戰除了加速對於耐 逆境品系的選育及飼養管理的調整外，更是以完備的種原庫作為種原維護與保存的最後 一道防線。聯合國農糧組織 (Food and Agriculture Organization of the United Nations) 也 有提供一系列的指引，供各國作為其在地畜產種原維護之參考。台灣畜產種原中心於 2004 年啟用，由凍存中心與DNA 庫所組成，其中收納了畜產試驗所在過去數十年間培 育的優質畜禽品種，包含黃牛、水牛、豬、山羊與雞等物種



。除了以種原庫保存畜產種原，積極活化應用種畜禽資源與種原庫是畜產種原維護的下一步。惟有讓大眾了解畜產種原的得之不易，在地種原在畜牧產業及生物多樣性上扮演重要的角色，並促使業者一同投入種畜禽的應用，方能使畜產種原的維護與保存能永續經營。

關鍵語：畜產動物、種畜、種原維護、種原庫、生物多樣性

The present and future of the maintenance and preservation of breeding stocks

C. J. Hsieh(1), Y. Y. Lai(1) and M. C. Wu(1)

(1)Division of Breeding and Genetics, Livestock Research Institute, COA

Climate change and epidemic disease are critical challenges for the worldwide animal industries. In order to cope with these challenges, it is necessary to accelerate the breeding of anti-adversity lines and to adjustment the husbandry management. Also, the complete animal germplasm bank is the last line of defense for breeding stock maintenance and preservation. Furthermore, FAO provides a serial of guidelines to guide the countries for their local breeding stock germplasm preservation. Taiwan Animal Germplasm Center (TAGC) was established in 2004, and it was constituted by the cryopreservation center and DNA bank. The collections of farm animal germplasm in TAGC were from the elite breeding stocks which Taiwan Livestock Research Institute (TLRI) bred for decades, including yellow cattle, buffalo, pig, goat, chicken, etc. Besides preserving the germplasm of farm animals in the animal germplasm bank, applying the genetic resource of breeding stock and animal germplasm bank actively is the next step. Ultimately, it is important to let people know that precious local animal germplasms play significant roles in the animal industry and biodiversity, as well as to invite the farm owns to involve in the applications of breeding stocks, to make the breeding stock germplasm sustainably maintain and preserve.

Key Words: Farm animal, Breeding stock, Germplasm preservation, Germplasm bank, Biodiversity