

出國報告

出國類別：開會

**國際生殖生物學會 (WCRB) 之第四屆會員
國大會暨國家級細胞庫發展會議**

服務機關：行政院農業委員會畜產試驗所

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派赴國家：日本

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摘要

國際生殖生物學會 (World Congress of Reproductive Biology, WCRB) 之第四屆會員國大會暨國家級細胞庫發展會議由日本生殖與發育學會 (SRD) 主辦，於 2017 年 9 月 27 日至 30 日在日本沖繩召開。此次會議匯集生殖生物學領域之傑出科學家、研究人員與學者專家分享研究經驗與研究趨勢，共有來自 33 個國家之 770 位人員參與，發表超過 600 篇研究論文題目，總括為六大領域：(1)卵巢與濾泡、(2)睪丸與精細胞、(3)受精與早期胚、(4)子宮、著床與胎盤、(5)生殖內分泌、(6)生殖科技與幹細胞。各領域研究之最新研究成果及技術發展，包含經濟畜禽、實驗動物、陸生動物與水生動物之精、卵、胚、體細胞之組織發育複製科技研究，乃至於幹細胞之凍存管理系統及活用醫療模式等。本次與會不僅收集各國研究議題趨勢，也比對相關領域之研究設施及研發團隊之國際合作交流機會。亦先分別與日本生殖學教授及泰國生殖學教授研議，討論由臺灣籌辦第 13 屆「亞太地區生殖科技國際論壇 (ARBC)」之中心議題。ARBC 的前 12 屆已在越南(第 1、3、10、12 屆)、泰國(第 2、11 屆)、新加坡(第 4 屆)、中國(第 5、8 屆)、柬埔寨(第 6 屆)、馬來西亞(第 7)、菲律賓(第 9 屆)舉辦。我國由畜產試驗所遺傳育種組吳明哲組長規劃徵詢，受到日、韓、越、泰、澳等五國的教授專家支持，同意由臺灣舉辦第 13 屆「亞太地區生殖科技國際論壇(ARBC)」及舉辦日期訂於 2018 年 5 月 3 日至 6 日，舉辦地點在臺北市立動物園國際廳。我國負責初步規劃舉辦方式及推薦那些國家專家教授為論壇顧問群。第 13 屆 ARBC 的中心議題，包含多項有關人體、經濟動物、實驗動物之生殖科技議題及其適用物種，因在臺北市立動物園國際廳舉行，首度包含動物園動物、水生動物、爬蟲類與昆蟲類之生殖科技議題。基於過去臺琉畜產科技之合作交流，利用 WCRB 會議前，由沖繩縣畜產研究所前任所長庄子一成博士安排拜會沖繩縣政府畜產科，研究種原繁殖育種及精液應用等議題之合作交流機制。會員國大會閉幕典禮宣布第五屆 WCRB(2020)由中國生殖生物學學會(CSRB)主辦，及新增泰國生殖醫學學會(TSRM)成為 WCRB 學會聯盟之第七國籌辦委員。利用 WCRB 會議後也出席日本第 48 屆精子學研究學會年度會議，藉此研商臺灣種原庫精子凍存活用與日本可能合作交流之議題。

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壹、目的

國際生殖生物學委員會(World Congress of Reproductive Biology, WCRB)學會聯盟籌辦委員會由六個國際學會所共同組成，包括美國生殖研究學會 (SSR)、澳洲生殖生物學會 (SRB)、英國繁殖學會(SRF)、中國生殖生物學學會(CSRB)、韓國動物繁殖學會 (KSAR) 和日本生殖與發育學會 (SRD)。第四屆 WCRB 會員國大會暨國家級細胞庫發展會議由日本生殖與發育學會(SRD)主辦，共同研討生殖生物學領域的最新發展趨勢以及共同關切的議題。其他國家之生殖學研究聯絡窗口或研究團隊則為會員代表，負責聯繫該國與世界級研究人員交流合作，汲取生殖學研究之寶貴經驗、對該領域最新科技發展之瞭解及動物細胞凍存活用科技提升。第四屆 WCRB 會員國大會暨國家級細胞庫發展會議由日本生殖與發育學會 (SRD)主辦，於 2017 年 9 月 27 日至 30 日在日本沖繩召開。我國會員代表與各國專家共同研商於我國舉辦國家級細胞庫發展會議之規劃，並提出畜產種原利用及生殖科技發展合作之議題。徵詢由臺灣舉辦第 13 屆「亞太地區生殖科技國際論壇(ARBC)」及舉辦日期訂於 2018 年 5 月 3 日至 6 日，舉辦地點在臺北市立動物園國際廳，中心議題包含多項有關人體、經濟動物、實驗動物之生殖科技議題及其適用物種，因在臺北市立動物園國際廳舉行，首度包含動物園動物、水生動物、爬蟲類與昆蟲類之生殖科技議題。利用 WCRB 會議後也出席日本第 48 屆精子學研究學會年度會議，藉此研商臺灣種原庫精子凍存活用與日本可能合作交流之議題。

貳、過程

時間		活動紀要
9月26日	上午	桃園機場至日本沖繩那霸機場。
	下午	會見沖繩縣畜產研究所前任所長庄子一成博士(於2011年促成臺琉畜產種原庫議題交流合作)，介紹那霸市相關文化。
9月27日	上午	前往沖繩縣政府畜產科拜會，研議畜產種原利用之未來合作可能議題。
	下午	出席第四屆全球生殖生物學國際會議(WCRB)，會見日本地主國主辦單位會長與秘書長，並分場次了解科技議題之分工及其國際趨勢。
9月28日	上午	持續參加WCRB分場次科技會議及研究論文海報區之種原庫相關研究。
	下午	先分別與日本生殖學教授及泰國生殖學教授研議在臺灣籌辦"亞太地區生殖科技國際論壇(ARBC)"之中心議題，並會同日韓越泰澳等五國專家，初步商訂2018年5月3日至6日在台北市動物園國際廳舉辦之多項生殖科技議題及其適用物種。
9月29日	上午	持續參加WCRB分場次科技會議，並配合泰國生殖學教授研商該國生殖學學會成為WCRB學會聯盟(該聯盟之學會國順序為美國、澳大利亞、英國、日本、韓國、中國)之第七國之提案。
	下午	持續參加WCRB分場次科技會議及閉幕典禮。也針對臺灣舉辦"亞太地區生殖科技國際論壇"進行確認舉辦方式及邀請那些國家專家教授為論壇顧問群。
9月30日		應邀出席日本第48屆精子學研究學會年度會議，該會議在日本分北中南三區輪流主辦年會，這次由南區辦理。藉此也研商臺灣種原庫精子凍存活用與日本可能合作交流之議題。
10月1日		日本沖繩那霸機場搭機，下午返抵桃園國際機場，再轉搭高鐵返回台南。

參、會議內容

第一屆 WCRB (2008) 由美國生殖研究學會(SSR)主辦、第二屆 WCRB (2011) 由澳洲生殖生物學會 (SRB) 主辦、第三屆 WCRB (2014) 由英國繁殖學會 (SRF) 主辦。會議主辦國必須有學術界組成的學會團體，並由其餘會員國的學會理事長擔任國家代表而組成國際生殖生物學委員會。第三屆 WCRB (2014) 舉行時，再加入韓國動物生殖學會(KSAR) 和中國生殖生物學會 (CSRБ)，形成由六個學會所共同組成的 WCRB 委員會。



Society Representative (President)

CSRБ

Dr. Qíng-Yuan Sun
(Secretary general: Haibin Wang)

KSAR

Dr. Bohsuk Yang
(Secretary general: Chang-Kyu Lee)

SRB

Dr. Chris O'Neill
(Secretary general: Mark Green)

SRD

Dr. Keiichiro Maeda

SRF

Dr. Tony Michael

SSR

Dr. Bruce Murphy

圖 1. 國際生殖生物學會 (World Congress of Reproductive Biology) 之各國際學會及其代表。

表 1. 第四屆 WCRB 會議議程

	Sep 27 (Wed)			Sep 28 (Thu)			Sep 29 (Fri)		
Site	1	2	3	1	2	3	1	2	3
8:00	WCRB Registration (Site 1)								
9:00				<u>Concurr. session 4</u> Ovary and follicles 2	<u>Concurr. session 5</u> Testis and spermatozoa 2	<u>Concurr. session 6</u> Uterus, implantation and placentas 2	<u>Concurr. session 10</u> Reproductive technology and stem cells 2	<u>Concurr. session 11</u> Fertilization and early embryos 2	<u>Concurr. session 12</u> Reproductive endocrinology 2
10:00	WCRB Registration (Site 1)			Coffee/Poster Viewing (Exhibition Hall)			Coffee/Poster Viewing (Exhibition Hall)		
11:00				Plenary lecture 3 Prof. Moira K. O'Bryan [SRB](Site 1)			Plenary lecture 5 Prof. Jae Yong Han [KSAR](Site 1)		
12:00	Opening Ceremony (Site 1)				<u>Lunchon seminar</u> Supported by Zoetis Japan	Young Scientists Session 1 (*)		Young Scientists Session 2 (*)	Young Scientists Session 3 (*)
13:00	Plenary lecture 1 Prof. Takashi Miyano [SRD](Site 1)			Posters-1 (Odd numbers) (Exhibition Hall) Coffee will be provided			Posters-2 (Even numbers) (Exhibition Hall) Coffee will be provided		
	Coffee (Exhibition Hall)								
14:00									
15:00	<u>Concurr. session 1</u> Ovary and follicles 1	<u>Concurr. session 2</u> Testis and spermatozoa 1	<u>Concurr. session 3</u> Uterus, implantation and placentas 1	<u>Concurr. session 7</u> Reproductive technology and stem cells 1	<u>Concurr. session 8</u> Fertilization and early embryos 1	<u>Concurr. session 9</u> Reproductive endocrinology 1	<u>WCRB-JSRE Special Joint Session</u> "Control of HPG axis to improve the fertility in animals and humans"	<u>Sponsored Symposium</u> "Genome Editing in mammals"	
16:00	Coffee (Exhibition Hall)						Coffee (Site 1)		
17:00	Plenary lecture 2 Prof. Tom P. Fleming [SRF](Site 1)			Plenary lecture 4 Prof. Heng-yu Fan [CSRB](Site 1)			Plenary lecture 6 Prof. Michael Soares [SSR](Site 1)		
18:00							Closing Ceremony (Site 1)		
19:00	Welcome Reception (Exhibition Hall)			Meet the Professors (*) (Exhibition Hall)			Conference Dinner (Laguna Garden Hotel)		
20:00									
21:00									

表 2. 第四屆 WCRB 相關會議議程

Meetings of Related Societies

	Sep 26 (Tue)	Sep 27-29	Sep 30 (Sat)
Site			
8:00		WCRB 2017	
9:00	<u>SRD (JAPAN)</u> administrative meetings 9:30 AM - 16:00 PM		<u>Japan Society of Reproductive Endocrinology Meeting</u> (Site 2 & 3) 9:00 AM - 17:00 PM
10:00			
11:00			
12:00			
13:00			
14:00			
15:00			
16:00			
17:00			
18:00			
19:00			
20:00			
21:00			

一、大會邀請專題講座

此次會議，主辦單位共邀請六位生殖生物學領域之傑出科學家進行專題演講，摘要其演講內容如下：

SRD

Prof. Takashi Miyano

Kobe University, Japan

In vitro growth of oocytes: from mice to domestic animals



在哺乳動物卵巢中，始基生殖細胞 (primordial germ cells) 可分化為 oogonia，並進行減數分裂成為卵母細胞。生殖生物學家長期致力於建立體外卵母細胞成熟系統，除了想進一步了解卵子發生機制，並期許將來可利用生殖細胞直接生產受精卵。在體外受精 (IVF) 初步成功後，一些哺乳動物體外成熟 (IVM) 卵母細胞已成功在體外受精生產後代。目前 IVF 和 IVM 已被廣泛應用於農業及醫學領域，作為動物生產和不孕症治療之新策略。John Eppig 博士研究團隊在 1996 年首度公開發表，已成功利用 IVG (*in vitro* growth) 技術將小鼠始基生殖細胞分化培育成卵母細胞，並轉化為受精卵。在 2016 年，Hayashi 博士研究團隊成功利用小鼠胚幹細胞 (ES) 和誘導性多功能幹細胞 (iPS) 以人工分化誘導的方式產生精子和卵子，並形成受精卵。IVG-IVM-IVF 以及改進的 IVG 系統在全面建立之前，仍有重大的障礙尚待克服，本專題演講包括回顧卵子 IVG 技術研發的歷史，並根據已知結果系統性地檢視、討論 IVG 成功與否可能涉及的各项因素，希望不久的將來，可成功建立家畜 IVG 系統。

SRF

Prof. Tom Fleming

University of Southampton, UK

Environmental programming of the early embryo: how mother's nutrition can influence health and disease risk throughout life



胚著床前會歷經一系列的基因啟動、表現程序和形態發生的改變過程以形成囊胚。但此階段的胚對外環境條件敏感，任何微環境的改變，都將造成胚

遺傳組成「編程」的修飾，並影響後續整個生命期的健康和疾病風險。胚遺傳組成的「編程」修飾可能會發生在孕婦營養不足、營養過剩，疾病、衰老及輔助生殖治療操作等。在包括人類在內的哺乳動物中已經得到證實，胚著床前環境造成的長期影響可能包括生長、心血管、代謝和神經功能等障礙。Tom Fleming 教授研究團隊發現，導致胚胎代謝異常可能與 mTORC1 信息傳遞途徑相關。營養素感應途徑導致補償反應，以保護胎兒生長和競爭優勢，這些機制是通過表觀遺傳、細胞溝通和生理過程等的相互作用來調節的。

SRB

Prof. Moira O'Bryan

Monash Biomedicine Discovery Institute, Monash University, Australia
Microtubules as the masters of sperm function



Katanin microtubule-severing 蛋白是微管 (microtubule) 動力學的重要調節因子，在哺乳動物睪丸中富含 katanin 亞基。最新研究發現，katanin 調節蛋白之一 KATNB1 和另一種新定義的調節蛋白 KATNAL1 是生殖細胞發育所不可缺少的。此外，在我們最近的研究中更發現，katanin 調節蛋白 KATNAL2 在睪丸生精作用扮演重要角色，包括精子尾部生長，精子頭部形狀及頭帽構造形成…等。更有證據顯示，KATNAL2 是除了 α - β -tubulin microtubule polymers 以外的微管蛋白調節因子。由此可知，katanin 調節蛋白家族功能的多樣性遠比我們以前認識到的要多更多。

CSRB

Prof. Heng-yu Fan

Life Sciences Institute, Zhejiang University, China
Role of newly discovered oocyte factors in regulating maternal-zygotic transition in mammals



儲存在卵母細胞中的 mRNA，在受精卵基因表現由母源轉胚源時期 (maternal-zygotic transition, MZT) 將逐漸衰變，其穩定性與減數分裂細胞週期進

程是緊密相互關聯的。然而，引發母源 mRNA 衰變的機制與卵母細胞減數分裂之間的關聯性仍是未明的。目前已知，B 細胞易位基因-4 (B-cell translocation gene-4, BTG4) 為小鼠 MZT 許可因子；而與 BTG4 橋接的 CNOT7，則為 CCR4-NOT 腺苷化酶之次單元，在母源 mRNA 衰變中扮演轉譯作用起始因子的角色，並在母系 mRNA 衰變中發揮了許可作用。在早期胚階段，基因組的轉錄作用呈現靜止狀態，一直到受精後 2-3 天後，受精卵基因組才開始啟動，接手調節胚胎發育。那麼，究竟是哪些母源轉錄因子調節這些現象呢？為了驗證揭發這個機制，Dr. Fan 研究團隊產製了 Yap1 基因剔除小鼠，證實了母鼠積累 YAP 在卵母細胞對受精卵基因組活化扮演極重要的角色。Yap1 基因剔除母鼠之胚胎 2 細胞階段延長，與對照組相較發育成 4 細胞速度要慢得多。同時並發現 YAP 標的基因，特別是 Rpl13 和 Rrm2 調控了著床前胚胎的發育。前述這些發現，證實了 YAP 在受精卵基因組激活機制及胚胎發育上的重要性，期許將來可以應用於人類生殖醫學和動物人工生殖生物技術。

KSAR

Prof. Jae Yong Han

Seoul National University, Korea

Primordial germ cell as a key modulator for avian genome modification



始基生殖細胞 (PGCs) 是功能性配子的前驅細胞，可應用在禽類生產基因轉殖雞和生殖腺嵌合體上。對於區分 PGCs 本身具有的幹細胞特質(stemness)和分化成為生殖細胞的特性(germness)的遺傳機制調節機制的研發，將有助於研究禽類生殖細胞生物學以及改善以 PGC 作為對象的基因組編輯系統。本演講重點在介紹此領域最新進展，同時闡明家禽 PGC 及其未來在家禽基因組修改以生產特用蛋白質的基因轉殖家禽的應用。

SSR

Prof. Michael Soares

Kansas University Medical Center, USA

Plasticity, invasive trophoblast, and placental health



血絨膜胎盤的形成必須藉由母體細胞和胚胎細胞在時間和空間高度協同機制，以對滋養層幹細胞 (trophoblast stem cell) 及前驅細胞 (progenitor cells) 進行調控作用。滋養層細胞侵入子宮形成螺旋型動脈構造之階段，是一個對環境敏感且極不穩定的過程。侵入性滋養層細胞為藉由間質和血管內途徑，以離開胎盤並移行進入子宮基質。相關研究已經證實，大鼠和人類胎盤擁有共同的血絨膜胎盤形成機制。本研究的重要性在於證實胎盤對環境挑戰所發展出的可塑性及適應性，是維持健康懷孕的關鍵條件之一。

二、論文口頭發表

論文口頭發表共區分為六大領域：卵巢與濾泡 (Ovary and Follicles)、睪丸與精細胞 (Testis and Spermatozoa)、受精與早期胚 (Fertilization and Early Embryos)、子宮、著床與胎盤 (Uterus, Implantation and Placentas)、生殖內分泌 (Reproductive Endocrinology) 及生殖科技與幹細胞 (Reproductive Technology and Stem Cells)。被指定做為口頭發表之 78 篇論文 (表 3)，係大會學術組從總數超過 600 篇的研究論文中所挑選出來的，篇篇研究創新精彩。本所此次參與發表的論文之中，由生理組劉振發博士、廖御靜助理研究員及陳立人組長所共同發表之「Establishment of induced pluripotent stem cell lines from Taiwan black silkie chicken」獲大會邀請進行口頭發表，由陳立人組長代表於 9 月 28 日在「生殖科技與幹細胞領域」進行論文口頭報告 (圖 2)。

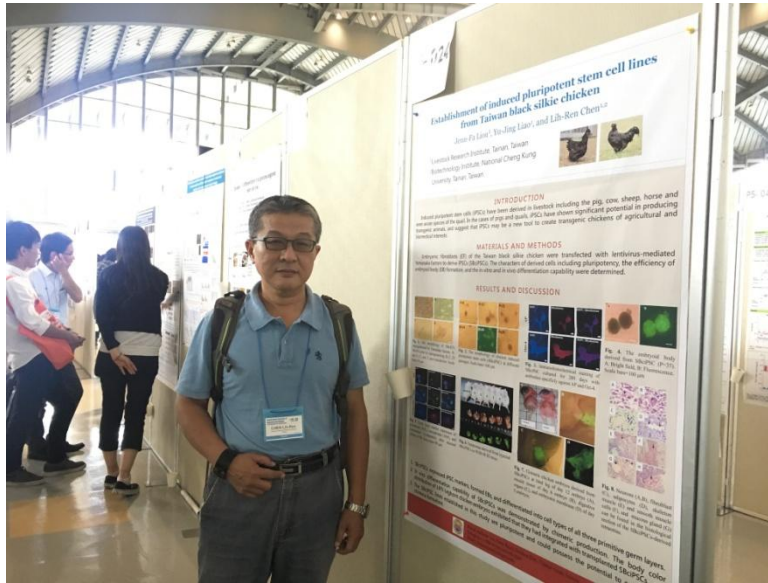


圖 2. 生理組陳立人組長口頭發表論文題目「Establishment of induced pluripotent stem cell lines from Taiwan black silkie chicken」。

三、海報論文發表

海報論文發表亦區分為六大領域：包括卵巢與濾泡 (Ovary and Follicles)、睪丸與精細胞 (Testis and Spermatozoa)、受精與早期胚 (Fertilization and Early Embryos)、子宮、著床與胎盤 (Uterus, Implantation and Placentas)、生殖內分泌 (Reproductive Endocrinology) 及生殖科技與幹細胞 (Reproductive Technology and Stem Cells)。內容涵括各領域研究之最新研究成果及技術發展，包含經濟畜禽、實驗動物、陸生動物與水生動物之精、卵、胚、體細胞之組織發育複製科技研究，乃至於幹細胞之凍存管理系統及活用醫療模式等。此次共有來自 33 個國家之 770 位人員參與 (圖 3)，發表超過 600 篇研究論文題目 (附錄二)。本所此次共有四篇進行海報論文發表，包括遺傳育種組林秀蓮助理研究員發表「Effects of single-layer Percoll centrifugation on rooster spermatozoa selection」(圖 4)，該研究為應用 Percoll 梯度離心法篩選分離品質優、劣之雞精子。試驗結果顯示，Percoll 70%、80%和 90%梯度離心，可有效分離品質優良雞精子，精子活力顯著提升 13.98%、17.99%和 19.02% (P <0.001)；精子快速直線前進顯著增加 26.84%，34.17%，37.24% (P <0.001)。此外，DAP，DCL，LIN，STR，VAP，VCL，VSL 等精子活力參數也高於對照組 (P <0.001)；捲尾精子 (P <0.001) 和遠端原生質滴精

子明顯降低 ($P < 0.001$)，由此可知單層 Percoll 70%，80%和 90%可應用於公雞精子篩選；生理組陳裕信助理研究員發表「Effects of Different Dose of sperm on Fertility of Sows」(圖 5)、康定傑助理研究員發表「Low dose laparoscopic artificial insemination established for Alpine goats」(圖 6)及郭曉芸助理研究員發表「Pluripotency chicken embryonic stem cells have potential ability to form chimeras」。



圖 3. WCEB 海報論文發表展示區。

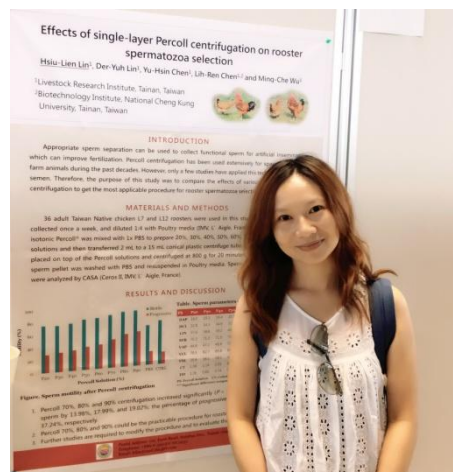


圖 4. 遺傳育種組林秀蓮助理研究員發表「Effects of single-layer Percoll centrifugation on rooster spermatozoa selection」。







Booth No.	Company Name
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⑨	 Reproduction and Development The Society for Reproduction and Development / Journal of Reproduction and Development
⑩	 MISAWA Misawa Medical Industry Co., Ltd.
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圖 7. WCRB 協辦單位展示區。



圖 8. 林秀蓮助理研究員與「The Journal of Reproduction and Development」總編輯 Atsuo Ogura 博士合影。



圖 9. TOKAI HIT 亞洲區業務代表遠藤慎一郎先生。

肆、心得與建議

- 一、第四屆 WCRB 聚集了世界各地生殖生物學領域之傑出科學家、研究人員與學者專家分享研究經驗與研究趨勢，共有來自 33 個國家之 770 位人員參與，發表超過 600 篇研究論文題目，總括為六大領域：(1) 卵巢與濾泡(Ovary and Follicles)、(2) 睪丸與精細胞(Testis and Spermatozoa)、(3) 受精與早期胚(Fertilization and Early Embryos)、(4) 子宮、著床與胎盤 (Uterus, Implantation and Placentas)、(5) 生殖內分泌(Reproductive Endocrinology)、(6) 生殖科技與幹細胞(Reproductive Technology and Stem Cells)。內容含括生殖生物學相關之最新研究成果及技術發展，包含經濟畜禽、實驗動物、陸生動物與水生動物之精、卵、胚、體細胞之組織發育複製科技研究，乃至於幹細胞之凍存管理系統及活用醫療模式等。會議期間有幸與世界頂尖科學家期聚一堂，不僅收集各國研究議題趨勢，同時也比對相關領域之研究設施，並積極認識各國研發團隊，期能促進本所將來國際合作交流的機曾。

- 二、此次出席會議，先分別與日本生殖學教授及泰國生殖學教授研議，討論由臺灣籌辦第 13 屆「亞太地區生殖科技國際論壇(ARBC)」之中心議題，包含多項生殖科技議題及其適用物種，首度包含動物園動物、爬蟲類與昆蟲類。此提議受到日、韓、越、泰、澳等五國教授專家支持，同意由臺灣舉辦第 13 屆 ARBC，初步已完成規劃舉辦方式及邀請那些國家專家教授為論壇顧問群。第 13 屆「亞太地區生殖科技國際論壇(ARBC)」舉辦日期訂於 2018 年 5 月 3 日至 6 日，將在臺北市立動物園國際廳舉辦。

附錄一：第四屆 WCRB 口頭論文發表題目

Concurrent sessions 1-3

Concurrent session 1 (Site 1)	Concurrent session 2 (Site 2)	Concurrent session 3 (Site 3)
Ovary and follicles 1	Testis and spermatozoa 1	Uterus, implantation and placentas 1
Chairs : Aleksandar Rajkovic (University of Pittsburgh, USA) Koji Sugiura (The University of Tokyo, Japan)	Chairs : Jibak Lee (Kobe University, Japan) Kate A.L. Loveland (Monash University, Australia)	Chairs : Shuangbo Kong (Medical College of Xiamen University, China) Hakhyun Ka (Yonsei University, Korea)
Mark A. Fenwick (University of Sheffield, UK) TGFβ as a master regulator of early follicle development (C-1)	Hyuk Song (Konkuk University, Korea) Spermatogonia Stem cells in Domestic animal (C-4)	Kelle H. Moley (Washington University in St. Louis, USA) Maternal metabolic disorders, oocyte quality and longterm offspring health (C-7)
Michael W. Pankhurst (University of Otago, New Zealand) Normal ovulation, but reduced developing follicle pool in an infertile strain of AMH-overexpressing mouse (P1-8)	Manabu Ozawa (The University of Tokyo, Japan) The histone demethylase KDM2A regulates differentiation of spermatogonia in mice (P2-4)	Yuki Yamamoto (Okayama University, Japan) Calcium and chloride ion current responsible for spontaneous contractions of bovine oviduct (P4-48)
Dulama Richani (University of New South Wales Australia, Australia) Cyclic AMP modulated-IVM differentially impacts oocyte and cumulus cell metabolism (P1-72)	Hiroki Inoue (Bioresource Center, RIKEN, Japan) Mouse D1Pas1, a DEAD-box RNA helicase, is required for the completion of first meiotic prophase in male germ cells (P2-14)	Li Nie (Sichuan University, China) The Role of miR-152 in Early Embryonic Development and Implantation by Down-regulating GLUT3 in Mouse Endometrial Epithelial Cells (P4-26)
Chairs : You-Qiang Su (Nanjing Medical University, China) Keith T. Jones (University of Southampton, UK)	Chairs : Monika A. Ward (University of Hawaii, USA) Masahito Ikawa (Osaka University, Japan)	Chairs : Yan-Ling Wang (Institute of Zoology, CAS, China) David Simmons (The University of Queensland, Australia)
Hisataka Iwata (Tokyo University of Agriculture, Japan) Granulosa cell number and oocyte growth (C-2)	Jibak Lee (Kobe University, Japan) Meiotic cohesins during spermatogenesis (C-5)	Shuangbo Kong (Medical College of Xiamen University, China) Bmi-1 determines uterine progesterone responsiveness via modulating PR ubiquitination in a Polycomb complex independent manner essential for normal embryo implantation (C-8)
Yuta Matsuno (The University of Tokyo, Japan) Mouse granulosa cells secrete functional extracellular vesicles in vitro (P1-62)	Elizabeth G. Bromfield (The University of Newcastle, Australia) The Targeted Disruption of Lipoygenase Enzymes Prevents Oxidative Stress in the Male Germline (P2-102)	Samson N. Dowland (The University of Sydney, Australia) Prominin-1 and -2 are uniquely found in flattened membranes in uterine epithelial cells during early pregnancy (P4-1)
Shyamal K. Roy (University of Nebraska Medical Center, USA) Estrogen Stimulation of Primordial Follicle Assembly Requires BMP2 Action (P1-7)	Diqi Yang (Northwest A&F University, China) Inhibition of ER stress alleviates ZEA-induced apoptosis in Leydig cells through modulation of UPR pathway (P2-90)	Lois A. Salamonsen (Hudson Institute of Medical Research, Australia) New Insights into human endometrial-embryo interaction: secretome and exosomes during implantation (P4-33)
Aleksandar Rajkovic (University of Pittsburgh, USA) Oocyte differentiation during embryogenesis is independent of meiosis and driven by interplay of multiple transcriptional regulators (C-3)	Kate A.L. Loveland (Monash University, Australia) A nucleocytoplasmic transport protein essential for gametogenesis (C-6)	Hakhyun Ka (Yonsei University, Korea) The role of cytokines during the implantation period at the maternal-conceptus interface in pigs (C-9)

Concurrent sessions 4-6

Concurrent session 4 (Site 1)	Concurrent session 5 (Site 2)	Concurrent session 6 (Site 3)
Ovary and follicles 2	Testis and spermatozoa 2	Uterus, implantation and placentas 2
Chairs : Bruce D. Murphy (Université de Montréal, Canada) Mark A. Fenwick (University of Sheffield, UK)	Chairs : Martin M. Matzuk (Baylor College of Medicine, USA) Hyuk Song (Konkuk University, Korea)	Chairs : Kelle H. Moley (Washington University in St. Louis, USA) Satoshi Tanaka (The University of Tokyo, Japan)
Keith T. Jones (University of Southampton, UK) Arresting oocytes in meiosis I: mechanisms to stop the creation of a bad egg (C-10)	Monika A. Ward (University of Hawaii, USA) The role of Y chromosome in directing spermatogenesis (C-12)	David Simmons (The University of Queensland, Australia) Impaired placental development causes embryonic heart defects and midgestational lethality in Ly6e mutant mice (C-14)
Sugako Ogushi (University of Oxford, UK) Loss of sister kinetochore co-orientation and peri-centromeric cohesin protection after meiosis I depends on cleavage of REC8 at centromeres (P1-49)	Ying Shen (Sichuan University, China) Immotile short-tail sperm defect related gene QRICH2 regulates AKAP4 expression during the development of sperm flagellum (P2-31)	Li Tang (Sichuan University, China) Dicer controls the proliferation and invasion of HTR8 cells and may modulate the intracellular communication between HTR8 cells and HUVECs (P4-27)
Guangyi Cao (Nanjing Medical University, China) MARF1 controls oocyte meiotic progression in mice (P1-48)	Hidenobu Okuda (Monash University, Australia) LRGUK1 is required for manchette function, forming multiprotein complex with intracellular transportation proteins (P2-28)	Koji Hayakawa (The University of Tokyo, Japan) Nucleosomes of polyploid trophoblast giant cells mostly consist of histone variants and form an unstable chromatin structure (P4-45)
You-Qiang Su (Nanjing Medical University, China) Identification of new players in the control of oocyte maturation(C-11)	Masahito Ikawa (Osaka University, Japan) CRISPR/Cas9 mediated genome editing and its application for the study of reproduction (C-13)	Yan-Ling Wang (Institute of Zoology, CAS, China) The relevance of placental endocrine dysfunction to preeclampsia (C-15)
Suzannah A Williams (University of Oxford, UK) Dissociated adult ovarian somatic cells can reorganise to form follicles (P1-11)	Adam J. Watkins (Aston University, UK) Paternal diet impacts on adult offspring health through sperm- and seminal fluid-specific mechanisms (P2-109)	Isao Tamura (Yamaguchi University Graduate School of Medicine, Japan) Importance of WT1 in the regulation of IGFBP1 and PRL in human endometrial stromal cells undergoing decidualization (P4-2)
Sanghoon Lee (Seoul National University, Korea) Comparison among resveratrol, melatonin and their combination in improving in vitro maturation of porcine oocytes (P1-31)	Katerina Dvorakova-Hortova (Charles University and IBT, Czech Republic) Protein-protein interactions in the sperm membrane prior to fusion with the egg (P2-33)	Victor H. Parraguez (University of Chile, Chile) Hypoxia associated with twin and/or undernourished pregnancies contributes to fetal growth restriction in sheep (P4-46)

Concurrent sessions 7-9

Concurrent session 7 (Site 1)	Concurrent session 8 (Site 2)	Concurrent session 9 (Site 3)
Reproductive technology and stem cells 1	Fertilization and early embryos 1	Reproductive endocrinology 1
Chairs : Mark P. Green (University of Melbourne, Australia) Katsuhiko Hayashi (Kyushu University, Japan)	Chairs : Jennifer R. Wood (University of Nebraska - Lincoln, USA) Lei Li (Institute of Zoology, CAS, China)	Chairs : Daniel J. Bernard (McGill University, Canada) Yoshihisa Uenoyama (Nagoya University, Japan)
Francesca D. Houghton (University of Southamp, UK) Hypoxic regulation of human embryonic stem cells: a metabolic perspective (C-16)	Rebecca Robker (University of Adelaide, Australia) Obesity, oocyte quality and the legacy of the egg (C-19)	Richard A. Anderson (University of Edinburgh, UK) The new neuroendocrinology: novel pathways, and their clinical applications (C-22)
Arata Honda (University of Miyazaki, Japan) Germ Cells from Induced Pluripotent Stem	Qinghua Zhang (Monash University, Australia) Cyclin A2 prevents merotelic attachments	Rukmali Wijayarathna (Monash University, Australia) Interactions between activins,

Cells of an Endangered Species, <i>Tokudaia osimensis</i> (P6-56)	and lagging chromosomes specifically in meiosis II (P3-2)	follistatin, and inhibin in the male reproductive tract (P5-10)
Lih-Ren Chen (Livestock Research Institute, Taiwan) Establishment of induced pluripotent stem cell lines from Taiwan black silkie chicken (P6-24)	Jia-Qiao Zhu (Yangzhou University, China) Lack of coordination between sister chromatid segregation and cytokinesis in the oocytes of B6.YTIR (XY) sex-reversal female mice (P3-4)	Lei Gao (Northwest A&F University, China) Regulation of Testosterone Production by Circadian Clockwork in Mouse Leydig Cells (P5-8)
Chairs : Goo Jang (Seoul National University, Korea) Franchesca D. Houghton (University of Southamp, UK)	Chairs : Inchul Choi (Chungnam National University, Korea) Karl Swann (Cardiff University, UK)	Chairs : Kirsty A. Walters (University of New South Wales, Australia) Toshiya Matsuzaki (Tokushima University, Japan)
Wei Li (Institute of Zoology, CAS, China) Generation and application of mammalian haploid and interspecies allodiploid stem cells (C-17)	Lei Li (Institute of Zoology, CAS, China) Molecular mechanism of the subcortical maternal complex (C-20)	Yoshihisa Uenoyama (Nagoya University, Japan) Brain mechanism regulating puberty onset in mammals (C-23)
Yoshiaki Nakamura (National Institute for Basic Biology, Japan) Understanding the post-transplantation behavior of mouse spermatogenic stem cells (P6-64)	Bo Xiong (Nanjing Agricultural University, China) A Unique Egg Cortical Granule Localization Motif Is Required for Ovastacin Sequestration to Prevent Premature ZP2 Cleavage and Ensure Female Fertility in Mice (P3-94)	Shiori Minabe (The University of Tokyo, Japan) Kisspeptin neurons in the arcuate nucleus is a target of estrogen in the developing brain to lead reproductive toxicity in male rats (P5-34)
Bo Ram Lee (Seoul National University, Korea) A Unique Epigenetic and Transcriptional Program of Chicken Primordial Germ Cells (P6-58)	Keiji Mochida (Bioresource Center, RIKEN, Japan) Rapid production of next generations by in vitro fertilization using spermatozoa from prepubertal male mice (P3-88)	Yiliyasi Mayila (Tokushima University, Japan) Infectious stress in neonatal period delayed the onset of puberty in male and female rats (P5-32)
Katsuhiko Hayashi (Kyushu University, Japan) Understanding of PGC-oocyte differentiation using in vitro reconstitution system (C-18)	Jennifer R. Wood (University of Nebraska – Lincoln, USA) Maternal Obesity, the Gut Microbiota, and Oocyte mRNAs: Potential Impact on the Developing Embryo and Fetus (C-21)	W. W.P.N. Weerakoon (Osaka Prefecture University, Japan) Comparison of plasma insulin-like growth factor-I, insulin-like peptide 3, testosterone and inhibin concentrations around puberty in Japanese Black beef bulls between normal and abnormal semen (P5-72)

Concurrent sessions 10-12

Concurrent session 10 (Site 1)	Concurrent session 11 (Site 2)	Concurrent session 12 (Site 3)
Reproductive technology and stem cells 2	Fertilization and early embryos 2	Reproductive endocrinology 2
Chairs : Wei Li (Institute of Zoology, CAS, China) David N. Wells (AgResearch, New Zealand)	Chairs : Teruko Taketo (McGill University, Canada) Rebecca Robker (University of Adelaide, Australia)	Chairs : Joy Pate (The Pennsylvania State University, USA) Richard A. Anderson (University of Edinburgh, UK)
Mark P. Green (University of Melbourne, Australia) Sorting sperm by microfluidics: A practical solution (C-24)	Karl Swann (Cardiff University, UK) The mechanism of sperm induced Ca ²⁺ oscillations that activate mammalian eggs (C-26)	Daniel J. Bernard (McGill University, Canada) Beware of dogma: Revisiting the role of activin B in FSH synthesis (C-28)
Tawny N.A. Scanlan (UC Davis, USA) Cryopreservation of rainbow trout whole gonads by vitrification to maintain reproductive stem cell potential (P6-106)	John Parrington (University of Oxford, UK) PLCzeta is the physiological trigger of embryogenesis in mammals, but offspring can be conceived naturally in its absence (P3-82)	Tomasz Schwarz (Agricultural University of Krakow, Poland) The influence of azaperone treatment at weaning on reproductive function in sows: Ovarian activity and endocrine profiles during the weaning-to-ovulation interval (P5-42)
Takayuki Hirota (The Francis Crick Institute,	Masatoshi Ooga (University of Yamanashi,	Leila Arbabi (Monash University, Australia) The

UK) Chromosome elimination as a therapy for infertility (<i>P6-138</i>)	Japan) Disrupted parental asymmetry of chromatin structure in ROSI-derived zygotes (<i>P3-6</i>)	effects of gut peptides on reproductive function at the level of the median eminence of hypothalamus (<i>P5-54</i>)
Goo Jang (Seoul National University, Korea) Genome engineering technologies in cattle (<i>C-25</i>)	Inchul Choi (Chungnam National University, Korea) Intercellular Junctions formation during preimplantation development (<i>C-27</i>)	Kirsty A. Walters (University of New South Wales, Australia) Unravelling the role of androgens in polycystic ovary syndrome (PCOS) (<i>C-29</i>)
Effrosyni Fatira (University of South Bohemia in CB, Czech Republic) Somatic cell nuclear transfer in a real endangered species, Sturgeon (<i>P6-86</i>)	Chika Higuchi (Kindai University, Japan) Proper degradation of a maternal protein during maternal-to-zygotic transition is important for normal development (<i>P3-12</i>)	Aneta Andronowska (Institute of Animal Reproduction and Food Research Polish Academy of Sciences, Poland) Do exogenous gonadotropins affect factors regulating oviductal functions expressed in the porcine oviductal epithelial cells (POEC)? (<i>P5-44</i>)
Marta Czernik (University of Teramo, Italy) Ultrastructural analysis reveals abnormal mitochondria in cloned blastocysts (<i>P6-84</i>)	Young Sun Hwang (Seoul National University, Korea) The molecular characteristics of avian blastoderm dormancy (<i>P3-80</i>)	Alexander Goikoetxea (University of Otago, New Zealand) Sex and stress: Is cortisol a mediator of sex change in fish? (<i>P5-2</i>)

附錄二：第四屆 WCRB 海報論文發表題目

P1-1	Single-cell RNA-seq analysis of human germline cells and their niche cells Fuchou Tang
P1-2	Exploring the DNA repair mechanisms responsible for safeguarding oocyte quality Jessica Miriam Stringer and Karla Hutt
P1-3	Does DAZL regulate germ cell apoptosis via CASP7 in the fetal ovary? Roseanne Rosario, Alma K M Torokoff and Richard A Anderson
P1-4	Uncovering the gene-networks regulating oogenesis Nobuhiko Hamazaki, So Shimamoto, Orié Hikabe, Norio Hamada and Katsuhiko Hayashi
P1-5	Unique method for producing oocyte that decreased spindle formation factors Shunsuke Konno, Shunsuke Konno, Masatoshi Ooga, Satoshi Kamimura, Sayaka Wakayama and Teruhiko Wakayama
P1-6	A novel culture system to recapitulate mouse oogenesis from fetal gonads of 12.5 day post-coitum:toward a large scale production of mature oocytes Taiki Aritomi, Yayoi Obata and Yuji Hirao
*P1-7	Estrogen Stimulation of Primordial Follicle Assembly Requires BMP2 Action Shyamal K Roy and Prabuddha Chakraborty
*P1-8	Normal ovulation, but reduced developing follicle pool in an infertile strain of AMH-overexpressing mouse. Michael W Pankhurst and Nicola J Batchelor
P1-9	Analysis of follicle development in cultured and transplanted reagggregated ovaries Belinda K.M. Lo, Sairah Sheikh and Suzannah A. Williams
P1-10	The regulation of high insulin levels on ovary apoptosis in early pregnant mice Fei Ru Gao, Chen Zhang, Juan Wu, Lin Jun He, Qing Xue Liu, Mei Xue Chen, Chao Tong, Bin Yu Ding, Qing Yan Geng, Qi Wen Chen and Xiong Ying Wang
*P1-11	Dissociated adult ovarian somatic cells can reorganise to form follicles Sairah Sheikh, Heidi Kaune, Belinda KM Lo, Anna Deleva and Suzannah A Williams
P1-12	The role of Janus kinase 1 (JAK1) in primordial follicle activation Jessie Maree Sutherland, Emily R Frost, Emmalee Ford, Kate A Redgrove and Eileen A McLaughlin
P1-13	Difference in antral follicle count of daughters and testosterone concentration during pregnancy between heifers and lactating cows Keisuke Koyama, Yojiro Yanagawa, Takeshi Koyama, Yoshitaka Matsui, Naohito Kusakari and Masahito Sugimoto
P1-14	Poly-ADP-ribosylation dependent autophagy signaling is involved during the process follicular development and atresia in pig ovarie Quanwei Wei, Wei Ding, Jun Xing, Siyu Sun, Yueqiao Zhang, Dagan Mao and Fangxiong Shi
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