

**出國報告**

**項目：開會(參加研討會)**

**第 59 屆美國獸醫實驗診斷協會年會  
(American Association of Veterinary  
Laboratory Diagnosticians, AAVLD,  
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## 摘要

為了發表細菌室有關動物細菌疾病診斷研究，增加本所國際能見度，與國外研究學者交流，吸收疾病診斷新知以改進細菌檢診服務，故參加 American Association of Veterinary Laboratory Diagnosticians (AAVLD) 第 59 屆年會張貼海報論文。AAVLD 成立之主要目的為推動獸醫診斷實驗室科學進步、促進全球動物健康及 One Health。年會時間全程為 2016 年 10 月 13 日至 19 日，舉辦地為美國北卡州 Greensboro Sheraton Hotel，發表之題目為 Genotyping of *Mycobacterium bovis* from ruminants in Taiwan during 2014-2016。大會演講提及兩個領域，一為動物的腸內菌微生物相之資料庫建立及運用，二為代謝體學對於獸醫診斷之未來的幫助等。細菌學研究報告與海報張貼方面，主要為常見病原菌的抗藥性分析、基因歧異分析或基因分型以及 MALDI-TOF 資料庫建立與運用。美國牛結核病發生率非常低，檢驗人員遇到最大問題是有病灶的肉牛常無法回溯或陽性牛場找不到感染來源，另外野生動物族群監測亦是美國牛結核病清除計畫的一環。

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## 目的

本所為發表細菌室有關動物細菌性疾病診斷研究成果，增加本所國際能見度與研究人員之視野，故參加 59th Annual conference American Association of Veterinary Laboratory Diagnosticians (AAVLD) 論文海報張貼。AAVLD 長遠目標為使全球認可獸醫診斷實驗室在公眾衛生中的作用、促進診斷實驗室技術的持續改進、人員資格認證與持續專業成長、傳播與監視動物健康和疾病之訊息以及提供獸醫診斷實驗室的正式認證程序，今年與 United States Animal Health Association (USAHA) 之第 119 屆年會合併舉辦，聚焦於動物疾病之實驗室診斷。年會全程為 2016 年 10 月 13 日至 19 日，舉辦地為美國 Greensboro, North Carolina 的 Sheraton Greensboro Hotel。此次與會在為期 7 日的議程中，有機會接觸各方新知及研究議題，舉凡疾病最新之診斷技術、抗藥性研究、疾病流行病學現況到最新分子生物學診斷方法等，增廣視野及與資訊更新，與國外研究學者交流，吸收疾病診斷新知，以改進細菌檢診服務。

## 會議行程與內容

AAVLD 是為給予各國各實驗室舞台之獸醫實驗室診斷研討會，論文海報張貼報名者有 55 位，個人講演者有 106 位，各國研究學者雲集於此發表研究成果，同時也是各大廠商展示最新產品、儀器，是跨足學術界及產業界的盛事。自 10 月 13 日起至 10 月 19 日在美國 Greensboro, North Carolina 的 Sheraton Greensboro Hotel 舉行(圖 1)。

筆者為第一作者及國立台灣大學獸醫專業學院蔡向榮教授共同研究之主題「Genotyping of *Mycobacterium bovis* from ruminants in Taiwan during 2014-2016」投稿論文海報，獲得主辦單位接受。為期七天的議程中，10 月 13 日為報到日，10 月 14 日為大會方之討論實際運作工作之 committee，這兩天皆無專題演講。

10 月 15 日早上為大會方舉辦之講演，每場時間 30 分鐘，大標題為「Precision Diagnostic Medicine: Game Changing Technology...Is Your Lab Ready?」。標題意涵與筆者聽講個人想法為：近年隨著分子生物技術的精進與成熟，出現了很多足以改變整個診斷醫學模式的創新技術，每位參與年會的研究人員應該思考各自實驗室該如何面對這些新知與技術，傳統的微生物學雖仍是根基不可放棄，但是新的技術常具有更佳的準確性與節省時間，相對的新技術的採用有時候代表著數百萬新儀器的採購，因此各實驗室需要仔細思考與拿捏引入新技術

與經費間的平衡。大會講演前半段的內容都是在講微生物相 (microbiome)，先由 The National Microbiome Initiative 研究人員來敘述微生物相是甚麼樣的概念及介紹人的微生物相資料庫，接著由其他講者說明目前透過次世代定序(NGS)逐步建立食用動物(food animal)及伴侶動物(companion animal)的微生物相以及未來可能之應用。微生物相的研究源於一種特殊療法，為將健康人體腸內容物稀釋後送入不明原因持續腹瀉的病患腸中，藉著健康人體腸內正常菌叢的介入而抑制病原的增殖與生長，治療有效的原因可能為此類病患腹瀉原因為缺乏保護腸道功能的某些腸內常在菌。人體與動物體腸內共生之微生物數量非常龐大，總數可能超過 10 兆個，是動物體細胞的 10 倍量以上，其種類又可達數千種以上，這些微生物對於人與動物的健康與疾病的感染有極高的關連性。微生物群功能包括分解與製造養分或維生素，也有調節免疫機能的作用。The National Microbiome Initiative 為美國政府所支持，人的微生物相資料庫建立從 2010 年的國家計畫 HMP (Human Microbiome Project)開始，目前已有 29 萬筆細菌全長基因以及 640 萬筆蛋白質序列，近年陸續有研究論文發表，並顯示出腸內微生物除影響腸道疾病外，尚可能影響其他系統疾病，如癌症、失智症及胎兒疾病等。相對來說，動物的腸道微生物相資料庫建立起步慢，目前尚處於建立階段，少有文獻發表，但研究人員強調這領域對於未

來複雜疾病的臨床運用上將有很大的助益。大會講演後半段提到另一個領域之研究「代謝體學(metabolomics)」，是只有 30 分鐘的演講。代謝體學指生命體對於外界刺激所反應產生代謝物之研究，是為生物化學及蛋白質學領域，跟微生物相比較起來是為發展較久的領域。代謝物通常是跨物種且變異性低的，而且是直接反應出生命體的代謝及生理狀態，而特定代謝物群的升高可能代表著特定疾病的生物標示(biomarker)，進而甚至可直接導引進行特定治療。資料庫的建立通常是以液相質譜儀來區分正常代謝調節與得病後異常代謝，人的代謝體學之研究目前很多直接運用到癌症相關研究，已有不少罹癌的病人代謝異常所產生的生物標示被辨識出來。但同樣的代謝體學於獸醫運用較少，目前已有部分文獻發表，如犬隻肝臟疾病時代謝異常的資料之研究、犬隻癌症代謝及動物服用特定藥物之後的代謝變化，講者對於未來獸醫界的應用仍具信心。

10 月 15 日下午起到大會議程結束，每天都有各種小型研討會、研究論文口頭及海報發表，研究論文口頭發表分成 Pathology、Bacteriology、Epidemiology、Virology、Serology、Toxicology 以及 Molecular Diagnostic and Bioinformatics 等 7 個子題同時間地分別於不同小演講廳舉辦。大部分講演為學生個人報告，每人 15 分鐘之報告內容相當多樣，筆者主要選擇細菌學及部分流行病學報告聽講。10

月 17 日至 18 日為 USAHA 舉辦之 committee，筆者選擇參與結核病討論會。10 月 19 日為會員餐會與會後討論。

### 專題報告與論文海報

由細菌學報告可歸納重點如下：

- 一、細菌抗藥性分子生物分析，目標細菌多為常見之致病菌，內容包括豬病灶來源的多重抗藥性 *Salmonella* 被分離鑑定出來的機率越來越高、生病豬隻分離到具抗藥性的 *Streptococcus suis* 案例報告、乳牛場所分離到的多重抗藥性 Enteropathogenic *E. coli* 分析報告以及自小動物膀胱穿刺取樣之細菌抗藥性分析。
- 二、細菌的基因分型，目標細菌同樣為常見之致病菌，內容包括反芻動物來源之 *Trueperella pyogenes* 表現型及毒力基因型分析、運用 HRM (high resolution melt) 分析牛隻來源之 *Moraxella* 基因歧異與乳牛來源 *Salmonella* Dublin 的表現型及基因型分析。
- 三、MALDI-TOF 之資料庫建立與運用，目標細菌則為少見之病原，像是 *Aeromonas salmonicida* 病原鑑定與 *Clostridium difficile* 的毒力鑑定。*Aeromonas salmonicida* 造成魚類癰瘡病 (furunculosis)，癰瘡病為非 OIE 表列疾病，1954 年便已發現命名，此病的致病原因可能是發展成敗血症而造成致死，於感染發生後的 24-96 小

時之間死亡率高，台灣未有病例。

四、其他項目包括新興人畜共通傳染病病原 *Streptococcus halichoeri* 及 *Salmonella* qPCR 運用於臨床與環境樣本監測。*Streptococcus halichoeri* 最早自 2004 年海豹(grey seal)分離而來，近年有發現兩例人類感染的案例，1 例為處理魚類時受傷後化膿，1 例為無魚接觸史病人的化膿灶，故此病原目前認為應為人畜共通傳染病病原。

而流行病學報告筆者未及關注甚多，主要為牛隻疾病流行病學分析及全世界高度關切之高病原性禽流感。論文海報張貼方面，細菌的研究項目也是五花八門，說明數則有注意之報告。如牛隻肺炎分離出來的 *Pasteurella multocida* 與 *Mannheimia haemolytica* 之抗藥性分析，本所細菌室也同樣有進行類似研究主題。另外如造成養殖魚類癩瘡病之 *Aeromonas salmonicida* 實驗室內特性分析。以上訊息可提供本所細菌室與魚病室參考。此外尚有引起馬腹膜炎與壞死性肝炎的 *Clostridium haemolyticum* 及野生羊隻感染的 *Corynebacterium pseudotuberculosis* 案例分析，本所細菌室也分離鑑定過這兩種細菌。還有一件值得提及的報告，為康乃爾大學動物健康診斷中心(Cornell University Animal Health Diagnostic Center)提出之報告，內容為實驗室臨床分離的細菌案例，萬一分離到類鼻疽桿菌時該怎麼辦。由於美國

也同樣將類鼻疽桿菌設定為最高等級之管制性病原(Select Agent)，但該菌為環境性病原，故一般檢驗實驗室有可能自病例或環境分離到該菌，報告結論為：一、由背景資料分析，若為本菌高風險的病例就應減少分離操作。二、若接獲此類病例就必須加強實驗室生物安全操作。三、應建立人員暴露時的應變程序。四、加強實驗室與現場人員的溝通。五、要相信美國有安全與有效的系統可以控制該病原。以上資訊相信可供未來本所細菌室或水產動物實驗室遇到疑似類鼻疽病例或誤分離得類鼻疽桿菌時之參考。

### Committee

USAHA Tuberculosis committee 討論在敘述美國目前牛結核病的現況與因應措施，美國從 2015-2016 年資料來看，有 91 萬場牛場，9 千 2 百萬頭牛隻，僅德州、密蘇里州及印第安納州仍有牛隻牛結核病案例。每年有擬訂計畫針對高風險區域性牛隻進行抽檢，密蘇里州的陽性案例就幾乎全為乳牛場年度皮內結核菌素試驗(Intradermal Tuberculin Test, ITT)檢出，德州與印第安納州則為肉牛於屠宰場發現病灶後回溯的案例。2015 及 2016 年的陽性場皆僅有 5 場，但以 2016 年資料分析，屠宰場發現的陽性案例卻有 10 例，但實際上成功回溯原牧場的也僅有 1 例，這起因於美國牛隻太多，牛籍無法全面管理。報告者提出的另個想法是，若是僅存這少數的陽性場，那每年又新發

生的無流行病學關係的陽性牛隻到底是何處感染病原(*Mycobacterium bovis*)的。故也有針對感染或保菌可能的野生草食動物進行調查，以數量最多的鹿科動物研究為主。數年前美國確實有解剖到有病變的白尾鹿，但是 2016 年由獵人收集的鹿隻血清學調查(以商品化快篩套組檢驗 10,750 頭)與解剖案例，完全沒有發現感染牛結核病的鹿隻。但美國地廣人稀大，野生動物族群龐大，鹿科動物與野牛都是 *M. bovis* 的天然宿主，故研究人員也擔心一旦病原進入野生動物族群後幾乎無法撲滅，將間接影響家畜產業及直接影響最近興起的狩獵經濟活動。

#### 論文發表

本所發表之題目為「Genotyping of *Mycobacterium bovis* from ruminants in Taiwan during 2014-2016」，為有關台灣 2014-2016 年間反芻動物分離之牛型分枝桿菌(*M. bovis*)的分子流行病學分布與分析之研究，是專題報告與論文海報中唯一有關牛結核病之報告，吸引與會研究人員拍照、詢問與關切。牛結核病是由 *M. bovis* 感染人或動物所引起之人畜共通傳染病。在台灣 ITT 是為例行性之牛結核病檢驗方法，每年檢驗乳牛、乳羊及自願檢驗之鹿隻(主要為水鹿)，政策仍為 ITT 陽性就撲殺，但每年依舊可以發現陽性動物病例。2014 到 2016 年間來自 13 場牛場及 1 場鹿場中 ITT 陽性動物共分離得 24 株

*M. bovis*。本研究中以常用於之分型方法 Spoligotyping 及 MIRU (8 個位點：ETRA, ETRB, ETRC, MIRU 4, MIRU 16, MIRU 20, MIRU 24, and MIRU 31)來分析，結果共有 2 種 Spoligotypes 及 5 種 MIRU 型被鑑定出來，分型指數 0.73。主要型別(Type 1: SB0265-53333223 占 41.7%，10/24)分布於台灣北、中、南部，而唯一 1 株鹿來源株亦是本型別。至於為何每年發生牛結核病案例之原因仍不明，需要持續進行流行病學分析。

## 心得與建議

AAVLD 是推動獸醫診斷實驗室科學進步、促進全球動物健康及 One Health 的世界領先者，主要工作為持續推展獸醫診斷科學來達到促進公眾對於獸醫診斷的認識以及診斷技術之進化。今年大會的演講面對新的診斷技術下，每位與會人員應思考實驗室該怎麼做。筆者主要提及兩個新領域之研究方向，一為動物的腸內菌微生物相之資料庫建立及運用，二為代謝體學對於獸醫診斷之未來的幫助等兩個方向。微生物相對筆者來說相當陌生，已經跳脫以往上課所教授的項目，以前學習的內容多為疾病症狀或病灶、病原及治療的單一線性思考。微生物相是建立在科技技術成熟下所產生之資料庫的運用，腸內某些微生物菌叢增減、整體比例變化或是某些基因表現增減可能代表著預防

特定疾病或高機率發生特定疾病，再延伸下去代表著某些措施(如直接補充微生物、食物、藥物及運動等)可增減或控制某些菌叢或基因表現將可預防或治療特定疾病，這的確是從新角度切入疾病的預防、診斷及治療。而代謝體學發展時間較久，主要是建立在正常與染病後代謝圖譜資料庫比較，某些代謝物的變化可能代表著可預防特定疾病或已發生特定疾病中的不同病程，因此只要出現某群代謝物特徵性變化可採用預防性措施或是在疾病初期採取投藥治療等，在人醫也已有許多癌症運用的例子，這代謝體學在未來獸醫疾病診斷上同樣也具有很大的發展空間。

依據細菌學研究報告與海報張貼，很多研究項目為常見病原菌的抗藥性分析，如 *Salmonella*、*Streptococcus suis*、*E. coli*、*Pasteurella multocida* 與 *Mannheimia haemolytica* 等顯示，很多常見病原菌已出現多重抗藥性，抗藥性的問題已然是全球性的威脅。另個研究項目為常見病原菌的基因歧異分析或基因分型，是為分子流行病學上的基礎研究。而針對細菌建立 MALDI-TOF 資料庫與運用則是近年蓬勃發展的另個研究方向，由於傳統細菌鑑定需要分離、增菌與鑑定等多個步驟，需花費不少時間，而 MALDI-TOF 鑑定方法只要有資料庫支應下，已有的純菌落可以在幾十分鐘內鑑定完成，甚至混合菌落如前述的腸內微生物群，可在軟體與資料庫配合下鑑定出有複數種類細菌。

MALDI-TOF 細菌鑑定方法確實為趨勢，本所細菌室應考慮逐步建立。

另外由最後 2 天牛結核病的討論會上可知，美國每年花費了不少經費與人力在監測牛結核病，美國牛隻牛結核病發生率非常低 (0.0005%，5/910000)，僅德州、密蘇里州及印第安納州仍有零星案例，檢驗人員遇到最大問題是有病灶的肉牛常無法回溯或陽性牛場找不到感染來源，前項原因為牛隻過多造成牛籍不清，後項原因不明，另外野生動物族群監測亦是美國牛結核病清除計畫的一環。

為增加本所研究人員視野與本所國際能見度，並與國外研究學者交流吸收新知，派員出國參訪或參與各項研討會對於個人和機關都是提升能力的良性刺激。

## 附圖

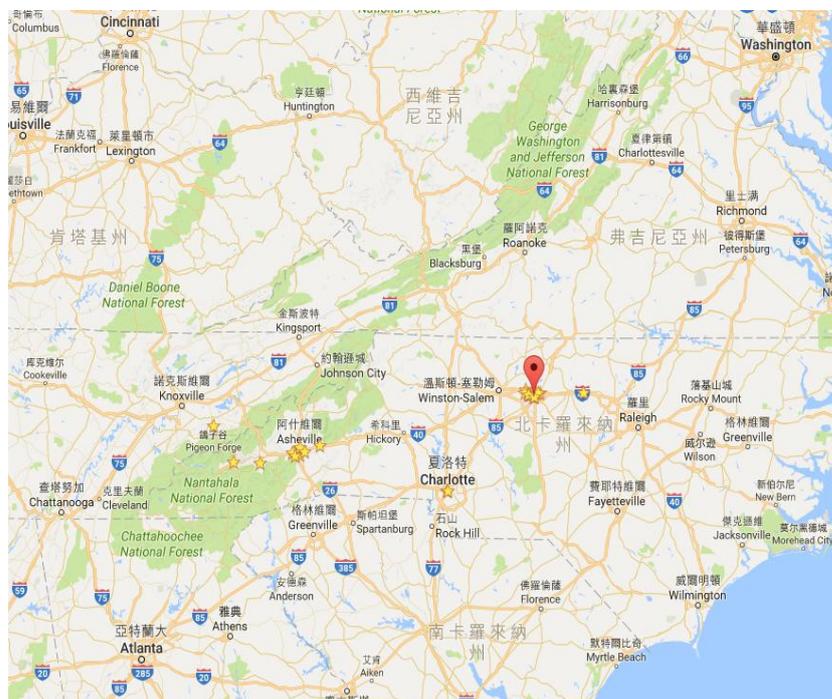


圖 1、本次會議舉辦地點，美國北卡州 Greensboro Sheraton Hotel。



圖 2、筆者與海報之合照。

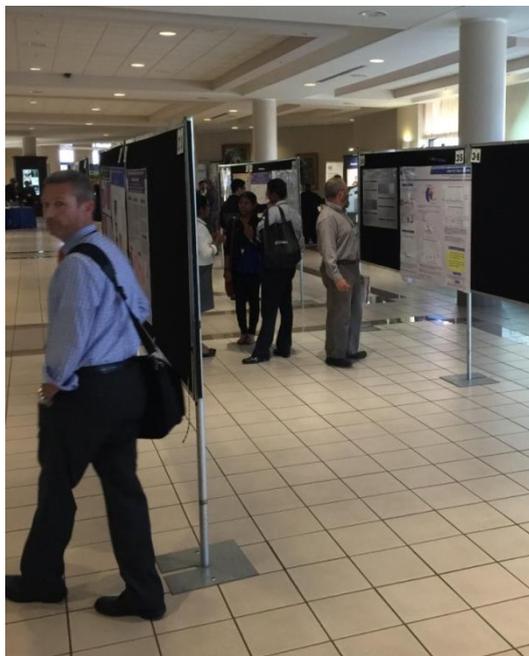


圖 3、海報張貼處。

Name	Room	Start	End
<b>Today's Events 4:22 PM</b>			
<b>NCFIA Fall Conference &amp; Chapter Meeting 2016</b>			
Check-in & professional identity	Workshop	03:30 PM	05:00 PM
Hope for Labor Economy	Ball Room	03:30 PM	05:00 PM
<b>Stetson 50th Birthday Celebration</b>			
Stetson Dinner	Ballroom 3	07:00 PM	11:00 PM
<b>The Great 100, Inc. 2016</b>			
Photo Booth Event	Workshop	03:00 PM	11:00 PM
CANCELLED	Gallery 4	03:00 PM	11:00 PM
CANCELLED	Gallery 5	03:00 PM	11:00 PM
Steady Progress	Ballroom 3	09:00 PM	11:00 PM
Dark Bar	Ballroom 3BCE	09:15 PM	11:00 PM
Registration	Ballroom #1 S	09:30 PM	09:30 PM
Sale Dinner/Dance	Ballroom 3BCE	09:00 PM	11:30 PM
<b>Thermo Fisher Science (USANA/AAVLD)</b>			
Meeting	Ball Room	09:00 AM	09:00 PM
<b>Traco First Limited</b>			
Meeting	Ball Room	09:00 AM	09:00 PM
<b>US Animal Health Association- October 2016</b>			
USANA AAH22 Office	Courtesy	09:00 AM	11:00 AM
Registration	Registration Desk 4	07:00 AM	09:00 PM
Registration	Registration Desk 5	07:00 AM	09:00 PM
National Assembly State Animal Health Officers	Ballroom 6	11:00 PM	09:00 PM
USANA AAH22 Committee on Programs Lab & Vet Work	Workshop C	02:00 PM	05:00 PM
Applied Animal Health Vet Symposium	Ballroom 3BCE	02:00 PM	05:00 PM

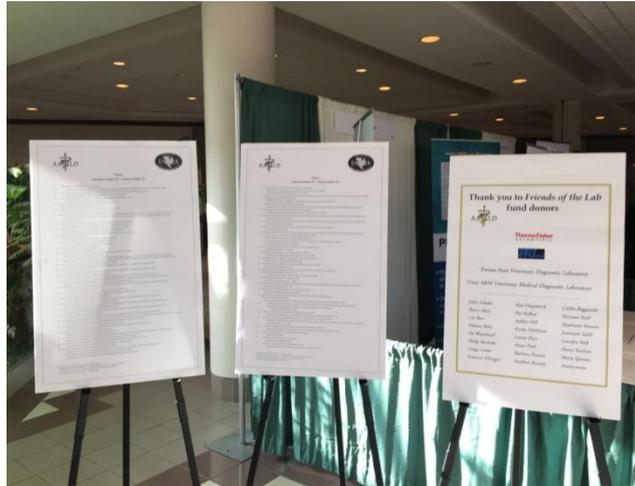


圖 4、即時議程及地點。

## 附錄

### 壁報論文摘要

# Genotyping of *Mycobacterium bovis* from ruminants in Taiwan during 2014-2016

Chen-Shen Huang<sup>1,2</sup>, Hsiang-Jung Tsai<sup>2</sup>

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2. School of Veterinary Medicine, National Taiwan University.

### Abstract

Bovine tuberculosis (bTB) is a chronic bacterial disease of animals and humans caused by *Mycobacterium bovis*. In Taiwan, the intradermal tuberculin test (ITT) is the routine method to test bTB every year in cattle, dairy goats, and domestic deers (Formosan Sambar, *Cervus unicolor swinhoei*, Sclater). The policy until now still is “ITT positive and slaughter”, but we found bTB cases every year. From 2014 to 2016, twenty-four *M. bovis* strains from 13 cattle herds and 1 deer herd were isolated from ITT-positive animals. In this study, we used Spoligotyping and MIRU (8 different loci, ETRA, ETRB, ETRC, MIRU 4, MIRU 16, MIRU 20, MIRU 24, and MIRU 31) as genotyping methods which were commonly used for genotyping of *Mycobacterium tuberculosis* complex. Two spoligotypes and 5 MIRU types were identified and the discriminatory power was 0.73. The main type, type 1 (SB0265-53333223), was the largest population (41.7%, 10/24) distributed across northern, middle and southern Taiwan, and the deer strain, the only one, was also belong to this type. Type 3 and 4 were the second and third most found respectively in southern and middle Taiwan. We need more epidemiologic researches to clarify the reasons why bTB persistent to occur in Taiwan.

Table 1. Numbers of each *M. bovis* type isolates in Taiwan.

Types	Spoligotypes	MIRU types	No. of isolates
1	SB0265	53333223	10
2	SB0265	23333223	1
3	SB0140	76532222	6
4	SB0140	77532222	6

5	SB0140	73532222	1
Total			24



Figure 1. Spoligotypes SB0265 and SB0140.

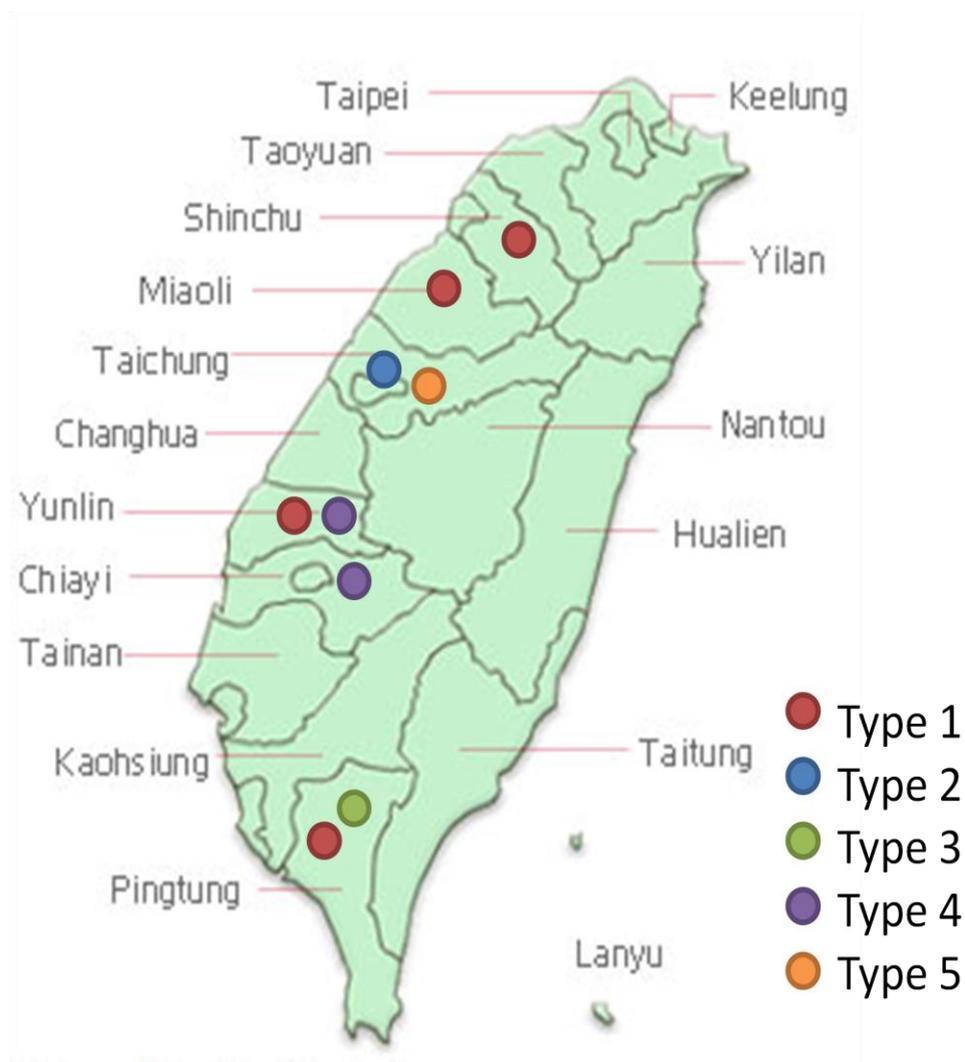


Figure 2. The distribution of each *M. bovis* type in Taiwan.

# 大會議程

## Daily Events (cont.) Saturday, October 15

Registration Hours: 7:00 am-5:00 pm

- 7:00-8:00 am **AAVLD Foundation Committee** Links
- 7:45-11:30 am **AAVLD Plenary Session - Precision Diagnostic Medicine: Game Changing Technology ... Is Your Lab Ready?** Imperial D  
Moderators: Patrick G. Halbur and Stephen B. Hooser
- 7:45 am Welcome
- 7:50 am The National Microbiome Initiative: Opportunities for diagnostic medicine and beyond - Jo Handelsman
- 8:30 am Progress on the food animal microbiome and relevance to veterinary diagnostic medicine... using next generation sequencing to unravel complex infectious diseases - Paul Plummer
- 9:00 am Progress on the companion animal microbiome and relevance to veterinary diagnostic medicine - Jan Suchodolski
- 9:30 am Break
- 10:00 am Precision Medicine: An opportunity for a paradigm shift in veterinary diagnostic medicine - K.C. Kent Lloyd
- 10:30 am Advances in the use of molecular techniques to detect and monitor antimicrobial resistance - Nicole Ricker
- 11:00 am Use of metabolomics in veterinary diagnostic medicine - Elizabeth Ryan
- 8:00 am-1:00 pm **JOINT Committee on Animal Emergency Management** Auditorium IV
- 9:00 am-6:00 pm **AAVLD Exhibits** Beverages 9:30-10:15 & 11:30-1:00; food & bev 3:00; wine/cheese 5:00 Third Floor
- 9:00 am-6:00 pm **AAVLD Poster Session** Third Floor
- 11:30 am-12:15 pm **AAVLD House of Delegates and General Membership** Imperial D
- 11:30 am-12:30 pm **LCEM User Group** Cedar A/B
- 12:00-1:30 pm **JOINT Student Luncheon** Augusta B
- 1:00-3:00 pm **AAVLD Scientific Session Pathology I** Imperial A  
Moderators: Jamie Henningson and Pablo E. Pineyro
- 1:00 pm Pathology findings in veterinary pharmacovigilance cases at the Oklahoma Animal Disease Diagnostic Laboratory: 2013-2015 Keith L. Bailey, Yoko Nagamori, Akhilesh Ramachandran, Grant Rezabek
- 1:15 pm A retrospective study of inflammatory conditions of the large intestine in race horses in California : 1990 - 2015 + Karina Cecilia Fresneda, Luis Hoyos, Ashley E. Hill, Francisco R. Carvallo, Santiago Diab, Francisco Uzal
- 1:30 pm Ribonucleic acid (RNA) decay and the estimation of the postmortem interval (PMI) in horses # + † † - Nanny Wenzlow
- 1:45 pm Detection of Bovine Viral Diarrhea virus (BVDV) in a Holstein heifer with mucosal disease - Melissa Behr, Kathy L. Toohey-Kurth, Sheila McGuirk, Sarah Jacob
- 2:00 pm Hyperplastic goiter in adult dairy cattle  
Scott D. Fitzgerald, Chee Bing Ong, Thomas H. Herdt
- 2:15 pm An influenza D virus vaccine protects cattle from respiratory disease caused by homologous challenge - Jamie Henningson, Ben House, Lucas Huntimer, Shollie Falkenberg, Jodi McGill, Tom Halbur

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## Daily Events (cont.) Saturday, October 15

- 2:30 pm Documentation for a suspect animal cruelty case in a miniature horse - Dons Marie Miller
- 2:45 pm Clinical and pathologic characterization of an outbreak of highly pathogenic avian influenza H7N8 in commercial turkeys in southern Indiana - Grant N. Burcham, Jose A. Ramos-Vara, Duane A. Murphy
- 1:00-3:00 pm **AAVLD Scientific Session Bacteriology I** Imperial B  
Moderators: John Dustin Loy and Claire Miller
- 1:00 pm Antimicrobial Susceptibility Testing in Veterinary Diagnostic Laboratories in the United States - Beth Harris, David Dargatz, Matthew M. Erdman, Sarah Tomlinson
- 1:15 pm Increased frequency of isolation of multi-drug resistant *Salmonella* 14,5,12:- from swine with histologic lesions consistent with salmonellosis - Adam Krull, Bailey Lauren Arruda, Kent L. Schwartz, Eric Burrough, Orhan Sahin, Amanda Kreuder
- 1:30 pm Culture and Sensitivity Results from Canine and Feline Cystocentesis Samples (2008-2014) - Emily Knebel, Stephen Cole, Shelley C. C. Rankin
- 1:45 pm Antimicrobial susceptibility of *Streptococcus suis* isolated from diseased pigs from a veterinary diagnostic laboratory in the Midwest United States: Association between isolation site, serotype and resistance - Orhan Sahin, Curt Thompson, Lei Dai, Adam Krull, Eric Burrough
- 2:00 pm Monitoring and source tracking of multiple antimicrobials resistant enteropathogenic *E. coli* and resistant genes in a dairy farm † - Asmaa Nady Mohamed
- 2:15 pm Creation of a MALDI-TOF Library to Identify *Aeromonas salmonicida* # \* † - Tessa LeCuyer, Timberly Maddox, Dubraska Vanessa Diaz-Campos, Kevin R. Snekvik
- 2:30 pm Validation and optimization of the NIH Mold Database for MALDI-TOF MS in veterinary diagnostic setting § - Niesa Kettler, Karen Parlor, Rinosh Joshua Mani
- 2:45 pm MALDI-TOF as a novel detection method for *Clostridium difficile* toxins - Kenitra Hammac, Dian Dian Lin, Kelly Ray, Christina Wilson
- 1:00-3:00 pm **AAVLD Scientific Session Epidemiology I** Imperial C  
Moderators: Michael Martin and Craig N. Carter
- 1:00 pm An evaluation of the performance of pre-movement active surveillance testing protocol options for moving pullets during an outbreak of highly pathogenic avian influenza - Sasidhar Malladi, Peter Bonney, Todd Weaver, Amos Ssematimba, David Halvorson, Carol Cardona
- 1:15 pm Small flock poultry diagnostics and veterinary training: a new approach to a capacity and emergency preparedness issue - Melanie K. Barham, Marina Louise Brash, Csaba Varga, Leonardo Susta, Lloyd Weber, Al Dam, Elizabeth Black, Michael Petrik, Michele Guenn

Symbols at the end of titles indicate the following designations:

- § AAVLD Laboratory Staff Travel Awardee \* Graduate Student Poster Presentation Award Applicant
- # AAVLD Trainee Travel Awardee † Graduate Student Oral Presentation Award Applicant
- + AAVLD/ACVP Pathology Award Applicant
- o USAHA Paper

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## Daily Events (cont.) Sunday, October 16

Registration Hours: 7:00 am-5:00 pm

- 6:30-8:00 am **Prayer Breakfast** Grandover East
- 7:00-8:30 am **USAHA District Breakfast (NE, S, W, NC, Allied), sponsored by Trace First** Blue Ashe
- 8:00-9:45 am **AAVLD Scientific Session Bacteriology 2** Imperial B  
Moderator: Kris A. Clothier
- 8:00 am ***Streptococcus halichoeri***, an emerging zoonotic pathogen. § - Eric W. Lee, Rebecca Franklin-Guild, Anil J. Thachil
- 8:15 am Factors and causal organisms associated with bacterial abscesses in goats from cases submitted to the California Animal Health and Food Safety Lab System from 2007-2014 - Kris A. Clothier, Michelle Schack, Ashley E. Hill
- 8:30 am Phenotypic characteristics and virulence genotypes of ***Trueperella pyogenes*** strains isolated from ruminants - Artem Rogovskyy, Sara Lawhon, Kay Dunkan, Chris Gillis, Helen Hurley, Kathryn Kuczmanski, Kranti Konganti, Jing Wu, Ching-Yuan Yang
- 8:45 am Assessing genetic diversity within ***Moraxella*** isolates from cattle; application of high resolution melt analysis for rapid sequence typing - John Dustin Loy, Joshua Payne, Aaron Dickey, Michael L. Clawson
- 9:00 am Validation of a 24-hour enrichment followed by quantitative PCR to decrease turnaround time and improve detection of ***Salmonella*** in clinical samples and environmental surveillance - Adam Krull, Carly Kanipe, Karen Harmon, Laura Bradner, amanda Kreuder
- 9:15 am Genotypic and phenotypic characterization of ***Salmonella enterica* serovar Dublin** in cattle - Milton Thomas, Anil J. Thachil, Sudeep Ghimire, Amy Glaser, Angela E. Pillatzki, Russ Daly, Eric A. Nelson, Jane Christopher-Hennings, Joy Scaria
- 9:30 am International impact of invalid ***Salmonella*** laboratory testing methods on public health - Megin Nichols
- 8:00-9:45 am **AAVLD Scientific Session Virology 2** Imperial F  
Moderator: Diego G. Diel
- 8:00 am Complete genome sequencing and phylogenetic analysis of cervid adenovirus from naturally occurring cases in Wyoming, Washington, and Colorado - Myrna M. Miller, Todd Cornish, Jennifer McKenna, Marce Vasquez
- 8:15 am Identification of a novel virus causing mass mortalities in an endangered species of freshwater turtle - Jing Zhang, Melinda Frost, Andrew J. Read, Mukesh Srivastava, Kate Parrish, Deborah S. Finlaison, Sarah Gestier, Xingnian Gu, Jane Hall, Karrie Rose, Peter Daniel Kirkland
- 8:30 am Observations on embryo mortality during avian influenza virus propagation from wild birds - Beate Crossley, Munashe Chigerwe, Kathy L. Toohey-Kurth, Hon Ip, Mia Kim Torchetti, John Baroch
- 8:45 am Evaluation of oral swabs as a sample for FMDV surveillance - Peter Daniel Kirkland, Rodney J. Davis, Bernd Haas, Kerstin Wernike, Martin Beer
- 9:00 am Detection of Foot and Mouth Disease virus serotypes and persistence of infection induced antibody against FMD in naturally infected cattle # † † - Laila Akhter
- 9:15 am *In vivo* bioluminescent imaging of J Paramyxovirus (JPV) infection # † - Mathew Abraham, Zhuo Li, Biao He
- 9:30 am Break

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## Daily Events (cont.) Sunday, October 16

- 10:15-11:30 am **AAVLD Molecular Diagnostics and Informatics 2** Imperial F  
Moderator: Karen Harmon
- 10:15 am Development and validation of the VetMAXTM-Gold MAP detection kit - Angela Burrell, Ivan Leyva Baca, Rohan Shah, Daniel Kephart
- 10:30 am Comparison of four DNA extraction methods for the detection of *Mycobacterium avium* subspecies *paratuberculosis* from the VersaTrek broth cultures by polymerase chain reaction - Nagaraja Thirumalapura, Willard Fera, Deepanker Tewari
- 10:45 am Improved performance and turnaround time of PRRSV PCR using optimized TaqMan® Fast Virus 1-Step Master Mix - Kelly Smith, Sarah Bade, Phillip Gauger, Karen Harmon
- 11:00 am Prevalence of Porcine Parainfluenza Virus Type 1 (PPV-1) in diagnostic specimens § - Kevin Lin, Sarah Bade, Karen Harmon, Pablo E. Pineyro, Jianqiang Zhang, Phillip Gauger
- 11:15 am Survey of inhibitor resistance in qPCR/qRT-PCR master mixes † - Derek Grillo, Sarah Read, Sharon Matherly, Richard Conrad
- 8:00-11:30 am **AAVLD Scientific Session Epidemiology 2** Imperial C  
Moderators: Albert Rovira and Ashley E. Hill
- 8:00 am Agricultural animal population database and case study for the DTRA BSVE † - Jamie L. Barnabei, Anna M. Dixon, Danielle S. Fields, Catharine Weber, Shawn S. Jackson, Erin T. Lauer, Eric Hess, Margaret A. Rush
- 8:15 am Achieving efficiency: Systems for receiving case submissions in a high throughput veterinary diagnostic laboratory - Katie Woodard, Michelle Grabosch, Kelly Boesenberg, Wendy R. Stensland, Dave Baum, Rodger Main
- 8:30 am Attaining document control compliance using the I.D.E.A.S. framework - Susan L. Martin, Thomas James Reilly, Timothy Evans, Shuping Zhang
- 8:45 am Podcasts as a tool to enhance communications, lab sample quality, continuing education, and emergency preparedness with practicing veterinarians - Melanie K. Barham, Andrew Vince, Michael Deane
- 9:00 am U.S. survey of AAVLD veterinary diagnostic laboratory Leptospirosis diagnostic capabilities - Gloria Gellin, Craig N. Carter, Jackie Smith, Erdal Erol
- 9:15 am Break
- 10:00 am Holstein single nucleotide polymorphisms analyzed by genome wide association study for associations with mastitis resistance and susceptibility - David J. Wilson
- 10:15 am Frequency of detection and serotype distribution of *Salmonella* in backyard poultry flocks in California - Kris A. Clothier, Asli Mete, Ashley E. Hill
- 10:30 am Vesicular stomatitis virus in Colorado horses: seroprevalence and associated risk factors \* † - Anna Claire Fagre, Kristy Pabilonia, Gabriele Landolt, Christie Mayo

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- # AAVLD Trainee Travel Awardee † Graduate Student Oral Presentation Award Applicant
- + AAVLD/ACVP Pathology Award Applicant
- ◊ USAHA Paper

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## Daily Events (cont.) Monday, October 17

Registration Hours: 7:30 am-5:00 pm

- 7:00-8:00 am **AAVLD Past Presidents Breakfast** Olympia  
 7:00-8:00 am **Continental Breakfast** Imperial Foyer
- 8:00 am-12:00 pm **JOINT Plenary Scientific Session: Challenges, High Tech Solutions and Success Strategies in Animal Agriculture** Imperial DEFGHI  
 Moderator: Max Armstrong
- 8:00 am Opening Remarks - Boyd Parr, Pat Halbur  
 8:10 am Initial Remarks from Moderator - Max Armstrong  
 8:25 am Economic challenges and opportunities facing U.S. animal agriculture - David Kohl  
 9:10 am Challenges and Opportunities for US Animal Agriculture: Meeting the demands of global and domestic markets while fighting burdensome regulation - Dale Moore  
 9:55 am Panel Discussion  
 10:05 am Break  
 10:20 am Experiences with Precision Livestock Farming in Europe - Daniel Berckmans  
 11:05 am Precision breeding to advance animal health and welfare - Randall Prather  
 11:50 am Panel Discussion
- 8:00 am-5:00 pm **USAHA Display Tables** Third Floor  
 9:30 am-10:00 am **Break** Third Floor  
 11:00 am-8:00 pm **Directors of State Meat Inspection** Colony A  
 12:00-12:30 pm **USAHA Membership Luncheon & Meeting, sponsored by Merial** Imperial DEFGHI  
 12:00-12:45 pm **AAVLD House of Delegates** Colony B  
 1:00-5:00 pm **USDA-ARS National Animal Health Research Review** Imperial A  
 1:00-5:00 pm **USAHA Subcommittee on Farmed Cervidae** Augusta  
 1:00-6:00 pm **USAHA Committee on Infectious Diseases of Horses** Auditorium II  
 1:00-6:00 pm **USAHA Committee on Transmissible Diseases of Poultry and Other Avian Species (Monday & Tuesday)** Auditorium III  
 1:00-6:00 pm **USAHA Committee on Brucellosis** Auditorium IV  
 1:00-6:00 pm **USAHA Committee on Transmissible Diseases of Swine** Grandover West  
 1:00-6:00 pm **USAHA Committee on Tuberculosis Scientific Advisory Subcommittee** Grandover East  
 1:30-3:30 pm **AAVLD Committee Chairs and Program Committee** Pebble Beach  
 2:30-3:30 pm **Break** Third Floor  
 3:30-5:00 pm **USAHA and AAVLD Executive Committees** Pebble Beach  
 5:30-8:00 pm **National Association of Federal Veterinarians** Imperial B  
 6:00-7:00 pm **USAHA Board of Directors Meeting** Imperial D  
 7:00-10:00 pm **Monday Night Reception, hosted by GlobalVetLINK** Club Fifth

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## Daily Events (cont.) Tuesday, October 18

Registration Hours: 7:30 am-5:00 pm

- 7:30-9:30 am **USAHA Past President Breakfast** Turnberry  
 8:00-9:00 am **National Scrapie Oversight Board** Imperial B  
 8:00 am-12:00 pm **USAHA Committee on Captive Wildlife and Alternative Livestock** Colony B  
 8:00 am-12:00 pm **USAHA Committee on Livestock Identification** Guilford F  
 8:00 am-12:00 pm **USAHA Committee on Pharmaceutical Issues** Imperial F  
 8:00 am-12:00 pm **USAHA Committee on Salmonella** Imperial C  
 8:00 am-5:00 pm **USAHA Display Tables** Third Floor  
 8:00 am-5:30 pm **USAHA Committee on Foreign and Emerging Diseases** Guilford E

**Time Specific Paper**  
**Committee on Foreign and Emerging Diseases**  
**Tuesday, October 18 • 1:30-2:15pm**  
 Global Efforts towards Peste des petits ruminants Eradication  
*Bouna Diop*

- 8:00 am-5:30 pm **Directors of State Meat Inspection** Colony A  
 9:00 am-12:00 pm **USAHA Committee on Scrapie** Imperial B  
 9:30-10:30 am **Break** Third Floor  
 10:00 am-12:00 pm **American Association of Avian Pathologist Liaison with AVMA** Imperial E  
 1:00-5:30 pm **USAHA Committee on Public Health and Rabies** Imperial GH

**Time Specific Paper**  
**Committee on Public Health and Rabies**  
**Tuesday, October 18 • 3:40pm**  
 Insights into Rabies Virus Spread as Revealed by Whole Genome Sequencing  
*Susan A. Nadin-Davis, PhD, Canadian Food Inspection Agency*

- 1:00-5:30 pm **USAHA Committee on Sheep and Goats** Imperial B  
 1:00-5:30 pm **USAHA Committee on Transmissible Diseases of Poultry and Other Avian Species (Monday & Tuesday)** Auditorium III  
 1:00-5:30 pm **USAHA Committee on Tuberculosis** Guilford D  
 1:00-5:30 pm **USAHA Committee on Biologics and Biotechnology** Imperial F  
 2:30-3:30 pm **Break** Third Floor  
 6:00-7:00 pm **USAHA Board of Directors Meeting** Imperial D

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圖 5、大會議程、細菌學報告、流行病學報告及 USAHA 之 committee

議程。