出國報告（出國類別：其他）

赴美參訪美國疾病管制局與參加新浮現人畜共通傳染病國際研討會議

服務機關：行政院農業委員會家畜衛生試驗所
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派赴國家：美國
出國期間：95 年 3 月 19 日至 3 月 26 日
報告日期：95 年 6 月 12 日

壹、摘　要

近年來由於貿易全球化趨勢與氣候變遷等因素，各國間動物及其畜產品貿易往來頻繁，促使新浮現人畜共通傳染病遽增且傳播範圍擴大，成爲全球關注之議題。爲積極參與國際性學術活動以開拓視野並汲取各國經驗與知識，於 95 年 3 月 22 日至 24 日赴美國亞特蘭大參加首屆由美國疾病管制局（CDC）、世界動物衛生組織（OIE）、聯合國糧農組織（FAO）及世界衛生組織（WHO）等共同舉辦之「新浮現人畜共通傳染病國際研討會」，該會之目的係經由人類醫學、公共衛生、動物衛生領域與國際組織間的經驗交流，藉以強化公共衛生與傳染病防疫體系，進而有效地因應新浮現及再浮現人畜共通傳染病所帶來的威脅。該研討會由來自多國相關領域學者專家，針對新浮現及再浮現人畜共通傳染病，進行經驗分享與研究成果之發表，主要議題包括人類與動物健康之關聯、目前威脅與挑戰、過去經驗、未來發展、風險管理與溝通等，會終與會學者皆認爲成果斐然，有助於跨越國別，結合獸醫及人醫領域學者專家，共同防堵新浮現及再浮現人畜共通傳染病對全球人類之衝擊。本次研討會會議地點位於美國喬治亞州的亞特蘭大，爰就近參訪美國疾病管制局位於亞特蘭大總部之人畜共通傳染病診斷實驗室，藉由實地觀摩拓展視野並加強國際間之學術交流。

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人畜共通傳染病之發生不但會造成公共衛生問題與經濟損失，且極易引起社會恐慌。我國因鄰近中國大陸，疫情不明且走私行為時有所聞；加上貿易自由化開放動物及其產品市場的新情勢及兩岸三通的外在環境壓力，使防疫工作益加艱鉅。隨著全球化與貿易市場自由化之開放，人畜共通傳染病的傳播也有全球化的趨勢，新浮現或再浮現人畜共通傳染病逐漸增多，例如多達 20 餘國發生之牛海綿狀腦病（狂牛病）、馬來西亞之立百病、歐美之西尼羅熱等或近年來亞洲多國發生之 H5N1 家禽流行性感冒。以 H5N1 家禽流行性感冒為例，甚至已擴展至歐洲與非洲，對人類健康的威脅，所造成的社會恐慌，皆受到全世界的普遍重視，甚至會嚴重影響到國家整體經濟發展與國際聲望，故其影響層面可謂既深且遠。

鑑於人畜共通傳染病之全球重要性日益增加，美國疾病管制局（Centers for Disease Control and Prevention, CDC）與世界動物衛生組織（World Organisation for Animal Health, OIE）遂於 2006 年 3 月舉辦「2006 International Symposium on Emerging Zoonoses 新浮現人畜共通傳染病國際研討會」，邀集相關領域專家與國際組織進行為期 3 日之經驗與知識分享。此研討會除報告相關案例經驗與研究成果外，重點為號召全球應跨越國別與獸醫及人醫間的界限共同合作，並建立公私部門間的合作夥伴關係，方足以因應這些新浮現人畜共通傳染病；主要議題包括人類與動物健康之關聯、目前威脅與挑戰、過去經驗、未來發展、風險管理與溝通等。我國為 OIE 會員國，為積極參與國際性學術活動以開拓臺灣參與國際性事務之空間與視野，並提昇人畜共通傳染病專業知能，爰由行政院農業委員會家畜衛生試驗所李淑慧研究員兼組長率領該所張國慧副研究員暨行政院農業委員會動植物防疫檢疫局吳佩宜技士參與此國際性研討會。

本次研討會會址位於美國喬治亞州的亞特蘭大，爰請 CDC 病理專科醫師謝文儒博士 Dr. Wun-Ju Shieh，協助安排就近參訪 CDC 位於亞特蘭大總部之人畜共通傳染病診斷實驗室。CDC 隸屬於美國聯邦政府健康和人類服務部（Department of Health & Human Services；HHS）十三個機構之一，前身為第二次世界大戰期

間控制瘧疾的機構，正式成立於 1946 年。其任務主要是透過預防和控制慢性與傳染性疾病、受傷、殘障，來促進公眾健康和生活品質，目標是藉由「預防」使健康的人類生活在健康的世界。近年來 CDC 之實驗室爲符合生物安全相關規範，不斷地興建新式高生物安全等級實驗室，本次參訪這些實驗室，旨在汲取經驗並拓展視野，俾利強化我國人畜共通傳染病診斷與防治能力。

參、行　程

日　　期	地　　點	活　動　內　容
95 年 3 月 19 日	台北至美國喬治亞州亞特蘭大市	啓程
95 年 3 月 20 日至 21 日	美國疾病管制局亞特蘭大總部	參訪 CDC 人畜共通傳染病診斷實驗室
95 年 3 月 22 日至 24 日	美國喬治亞州亞特蘭大 Marriott Marquis 飯店	參加新浮現人畜共通傳染病國際研討會
95 年 3 月 25 日	美國喬治亞州亞特蘭大市至台北	返程

肆、參訪美國疾病管制局內容報告

美國自從 2001 年 9 月 11 日紐約遭受恐怖攻擊事件之後，全國各地之安全檢查措施皆大爲提升。由於本次參訪地點隸屬於美國聯邦政府機構，所以特別重視進出人員之安全管制措施。外國訪客在進入 CDC 的三個工作天前需事先提出申請，經確認後方得以訪客身份進入，且訪客須有 CDC 人員陪同。特別感謝傳染病病理部主任 Dr. Sherif R. Zaki 擔任保證人及病理專科醫師謝文儒博士 Dr. Wun-Ju Shieh 代爲辦理相關申請手續，使本次參訪得以順利成行並收穫豐碩。亦感謝特殊病原部門主任 Dr. T. G. Ksiazek 於百忙之中仍抽空熱心接待、帶領我們參觀實驗室、進行詳盡的解說並耐心回答相關問題。

本次係以訪客身分參訪，全程由謝文儒博士陪同，CDC 各建築物之進出口皆設有安全檢查站並備有保全人員，隨身物品皆需通過 X 光機掃描，人員每次進出皆須出示護照、簽名並通過金屬偵測通道，其安全檢查之謹慎與重視程度令人印象深刻。

本次參訪對象爲 CDC 位於亞特蘭大總部之國家傳染病中心（National Center for Infectious Diseases, NCID）病毒和立克次體部門（Division of Viral and Rickettsial, DVRD）之傳染病病理部（Infectious Disease Pathology Activity, IDPA）與特殊病原部門（Special Pathogens Branch）。CDC 國家傳染病中心職司傳染病之防治，不但對於近年來頗受重視之人畜共通傳染病相當重視，更在全球無數次人類或人畜共通傳染病大規模爆發或發生不明原因傳染病時皆曾扮演著相當重要的角色，例如：病毒性出血熱、立百病毒感染症、炭疽、西尼羅病毒腦炎、嚴重急性呼吸道症候群等皆能迅速確實地診斷出病因，有效地遏阻傳染病之擴大傳染趨勢，具有豐富之疫情處理經驗與快速又正確的診斷技術，故其診斷技術可謂當今之翹楚，我國歷年來亦曾多次派遣專家前往研習。

CDC 共分爲十四個研究中心，約有 8,600 名員工，亞特蘭大總部約有 6,000 員工在此地工作，傳染病病理部共有四位病理專科醫師與二十多位研究人員。傳染病病理部之新建大樓已於 2005 年底落成啓用，人員已進駐至新大樓，舊大樓

業交由其他單位使用但尚未進駐，故本次不但參觀傳染病病理部門新建實驗室與設備（含生物安全第二等級實驗室）、特殊病原部門（含生物安全第二、第三與第四等級實驗室）亦參觀舊有實驗室。特殊病原部門主任 Dr. T. G. Ksiazek 並向我們解釋各實驗室之設計與配置理念，經過參觀比較之後，深刻體認到其實驗室設計之用心與值得學習之處。

謝文儒博士亦向我們介紹該部門內之病理研究診斷相關儀器設備，皆爲現代化之自動儀器，例如：全自動組織脫水機、新型組織包埋機、新型切片機、全自動切片染色機、全自動封切片、全自動免疫組織化學染色機、包埋盒打印機、玻片打印機、各式標籤機與全自動切片影像掃瞄器等，且大多數的儀器皆至少有兩套以上，不僅可充分節省人力與時間，並容易控制切片與染色之品質。以免疫組織化學染色爲例，該部門內共有四台全自動免疫組織化學染色機，由於該技術步驟相當繁瑣，故充分利用機器來取代人力。此外，該實驗室之所有切片的顯微影像皆以全自動切片影像掃瞄器建檔，十分具有效率。

伍、新浮現人畜共通傳染病國際研討會內容報告

一、　人類、動物與疾病

（一）人類與動物健康之關聯

約有六成的人類傳染病病原爲人畜共通，而人類與動物健康之間的關聯促使動物衛生與公共衛生部門有著前所未有的機會，應聯合力量共同對抗與日俱增的新浮現人畜共通傳染病。當前需要有新的整合性策略與預防措施來應變，方得以對抗新浮現傳染病。受到全球動物貿易快速增加等因素影響，使「人類–家畜–野生動物」之間的活動關係受到影響，流行病學理論中的三角平衡關係改變，因此出現了新浮現與再浮現傳染病的新局勢。爲了能成功地對抗這些新的挑戰與衝擊，需要建立與實行新的方法、技術與工作方式。

（二）候鳥是帶原者或是犧牲者？

爲了解釋快速傳播的新浮現傳染病或人畜共通傳染病時，候鳥容易成爲被懷疑的對象，此時健康專家、天然資源保護者與政治人物之間的意見通常分歧。但是以活禽市場或去年台灣中正機場查到藏於軟管中的走私鳥爲例，候鳥顯然並非唯一的感染途徑。衛生專家在研究疾病如何擴散時，必需提出流行病學上的證據，客觀地分析原因然後謹慎地提出疾病管理策略，如此才能防止無知或恐慌的民眾採取一些毫無根據的行爲。畢竟候鳥是世界自然資產的一部份，是無法失去的自然資源之一。

（三）蝙蝠與 SARS：病毒來源與預防策略

至目前爲止 SARS 病毒的來源仍然未被釐清，研究顯示果子狸可能是一種自然保毒宿主，然而有趣的是，雖然部分市場動物帶原率高，但回溯其來源場卻通常查無病源。最近不同研究團隊同時證實蹄鼻蝙蝠（horseshoe bats，爲菊頭蝠屬 *Rhinolophus*）爲一種類似 SARS 病毒的保毒者。經由核酸序列分析證實不同的菊頭蝠帶有一群與 SARS 冠狀病毒相近的病毒。

澳州動物健康實驗室目前的實驗重點包括：非蝙蝠類之哺乳類對這些類

似 SARS 病毒之感受性、引起 2002 與 2003 年人類 SARS 疫情之冠狀病毒究竟存在於那一種蝙蝠身上。這些研究將有助於了解保毒宿主，進而有助於擬定預防策略。

（四）家畜介入人類健康與社會利益

一般認爲人類布氏桿菌病等人畜共通傳染病唯有在被控制於只存在於動物宿主時，才可能被撲滅。然而大規模地使用動物疫苗或淘汰等其他控制方法並不符合經濟效益，例如最近在蒙古進行一項「使用動物疫苗以降低人類布氏桿菌病」計畫的經濟效益分析即證實了此理論；但是若把畜牧業相關領域的效益納入考量，並將成本按比例分配到農業與公共衛生領域，這項控制措施其實對雙方都是有利的。對發展中的國家而言，這種橫跨人類健康與農業的經濟效應分析，同時評估兩個領域的社會經濟層面，將有助於發展新的人畜共通傳染病控制方法。

（五）尼泊爾豬、馬、鴨之日本腦炎血清學研究

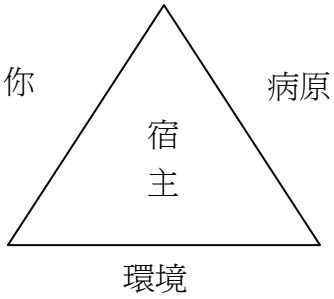
日本腦炎是一種新浮現的病毒性疾病，會引起人與馬的腦炎以及豬的流產。豬和鴨被認爲是日本腦炎病毒最重要的增幅宿主。2002 至 2005 年間以競爭型酵素連結免疫吸附法調查尼泊爾 534 頭豬、25 匹馬、74 隻鴨之血清抗體陽性率，陽性率分爲 57.67%、68.0%與 21.62%。

二、 野生動物、寵物貿易在人畜共通傳染病所扮演的角色：研究與控制

（一）野生動物之重要性

環境、健康、地球都只有一個而且息息相關(One World – One Health – One Environment)，我們無法置身於這個大環境之外，因此對野生動物疾病愈多了解愈有利。欲調查野生動物疾病，行前收集資料與相關資源，並接受適當的訓練是非常重要的。行前應注意之事項簡敘如下：

1. 了解流行病學要件：



2. 了解宿主爲何
3. 了解病原
4. 個人部份：注意自我保護，取得許可
5. 後勤：例如於偏僻地區調查時要注意配備如有損壞，補修材料是否容易取得、應有可靠且便於攜帶的能源、有後勤團隊如動物保定者、技術人員等。
6. 各地法令不同，應避免違反當地法令。
7. 事先確實作好規劃，包括：團隊之組成、人員工作項目分配、整個調查行動的流程以及溝通等。

（二）以分類及生態學的觀點來研究猴痘病毒（Monkeypox）的潛在性野生保毒動物

猴痘病毒於不同種別嚙齒類之感染力不同，症狀差異亦大。全球人類病例分布是以非洲爲主，然而美國 2003 年經由輸入嚙齒類，引爆了一連串的案例，因此美國亦正在改變動物輸入相關規定。曾有許多研究試圖找出猴痘病毒的野生保毒動物，嘗試著在短時間之內調查大量物種，方法與美國爆發後的調查相似，將疑似帶有病原的物種範圍逐漸縮小。然而，因爲對這些物種分類學上的了解相當有限，所以如果能對這些可能的保毒動物進行廣泛的分類及生態學研究，應有助於了解猴痘病毒是如何傳染給人類。

（三）野生動物成爲寵物引起的新浮現及再浮現人畜共通傳染病

有 75%新浮現傳染病爲人畜共通傳染病。野生動物是一個龐大且通常未知的宿主，也可成爲原本已絕跡的人畜共通傳染病再浮現的來源。雖然這些人畜共通傳染病的浮現與日益精進的診斷工具有關，但是其實人類行爲及自然棲地的改變才是主因。這些因素包括人口族群的增加、入侵野生動物的棲

地、農業型態的改變、貿易的全球化、野生動物的移動與貿易、野生動物肉品與活動物的市場、進口食品、生態旅遊的發展、動物園的互動親近區及飼養外來寵物等。例如，拉薩熱的發生是因爲雨林開發（例如成爲農田），1998 年至 1999 年馬來西亞與新加坡的立百病毒與當地養豬型態有密切關聯，人類因條紋鼬而感染結核病，英國牛結核的再浮現是來自野生動物，泰國旅客非法走私鳥類被發現帶有 H5N1 病毒至歐洲，非洲盛行的野生動物肉品市場，日本食用生豬肝感染 E 型肝炎的案例，獸醫與其他與豬有關的工作者感染 E 型肝炎的風險偏高，因國際性旅遊（例如到南非）而感染壁虱傳播性立克次體病，因到印尼峇里島生態旅遊而感染獼猴疱疹 B 病毒，大象與結核病的關聯，因爲接觸寵物而感染沙門氏菌、猴痘、兔熱病，或被刺蝟感染沙門氏菌與錢癬等。

目前全球年平均國際野生動物貿易值高達 60 億美元，包含觀光、野生動物牧場、狩獵、動物競賽、肉品等。然而以衛生安全的觀點而言，結論是飼養狗貓等一般寵物其實比較好，不應該鼓勵飼養那些新奇的野生動物。

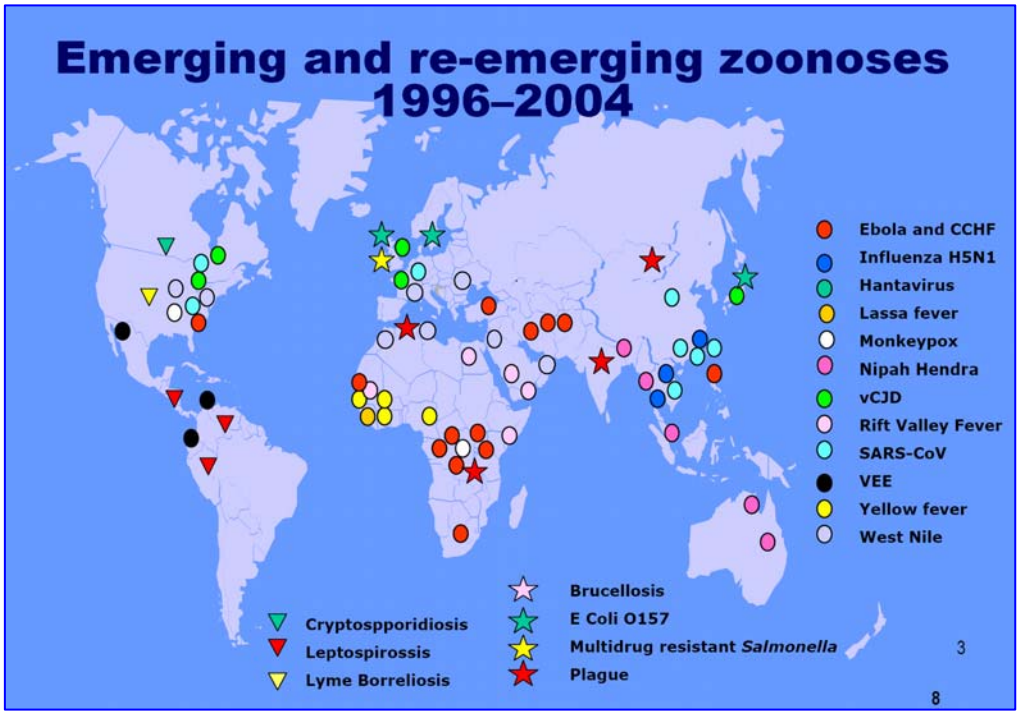


圖 1. 1996 年至 2006 年全世界新浮現及再浮現人畜共通傳染病分布圖

（四）新浮現 Lyssaviruses 病毒的演化

Lyssaviruses 病毒爲負股 RNA 病毒，可引起人的急性致死性腦炎，也會引起眾所皆知的狂犬病。根據前人的研究顯示，該病毒原本只存在於翼手目野生動物，並不會出現臨床症狀，約有 2~60%的血清學調查呈陽性反應。後來 Lyssaviruses 病毒傳染給臭鼬類的食肉目野生動物，造成該等野生動物間相互感染，再進一步造成犬隻的感染。

根據最近的估計顯示，狂犬病仍是全球人類最重要的病毒性人畜共通傳染病，死亡率遠高於其他傳染病。其潛伏期約 2 週至 7 年，通常爲 2 個月，發病期約 1 週。通常是犬隻被野生動物傳染，才再傳染給人類，偶爾也有野生動物直接感染人的案例。在 2005 年約有 5 萬 5 千人死於狂犬病，其中約 95%是遭到犬隻咬傷引起的（亞洲約 3 萬 1 千人、非洲約 2 萬 4 千人、南美洲約 500 人、北美洲約 50 人）。歐洲目前以口服疫苗來控制野生動物的狂犬病，效果不錯，雖無法完全根絕，但可有效地控制本病。

目前至少有 11 種 Lyssaviruses 病毒被確認出，主要是存在食肉目與翼手目野生動物。然而由於生物學上的研究模式大多是以傳統的狂犬病病毒爲基礎，而疏忽了類似的 Lyssaviruses 病毒也可能造成交叉反應。依據目前全球的人類活動趨勢推估，狂犬病的野生動物感染源由於口服疫苗的發展將可望被有效控制，而 Lyssaviruses 病毒可能會逐漸浮現及擴展，可能成爲 21 世紀公共衛生及獸醫的一大挑戰。

三、 農業型態與人類健康

（一）大規模的撲殺措施

撲殺在動物疾病撲滅過程中扮演很重要的角色，因爲可以防止疾病傳播到其他具感受性的族群，所以愈快速地進行大規模撲殺，則可以愈快速地控制病原傳播。然而大量撲殺卻是需要社會、政治、經濟及環境等各方面付出代價的。社會面的影響例如撲殺的過程會造成工作人員及畜主的負擔；政治

面的影響包括對國際貿易的影響，及撲殺行爲所引起的公眾議論。潛在性的經濟影響包括撲殺的直接及間接花費。最後，動物屍體的處理方式也會對環境造成不同程度的影響。

撲殺動物對公眾的影響層面很廣，例如動物被撲殺的畜主、畜主擔心其他動物也會被感染、動物保護團體、環保團體、相關業者等，此外看到動物被撲殺、運輸、掩埋或焚化場景的大眾及工作人員等都會受到影響。對獸醫師而言，犧牲動物的生命也會對心理造成相當大的障礙與壓力。間接影響的層面包括相關貿易、總體經濟損失、成爲公眾議題、觀光、政治、輸出市場、相關產品的價格變動、需重新購買昂貴的種原動物等。而未被包括在補償費內的損失，包括畜主的精神、動物及器具的銷毀、恢復生產前的空窗期所造成的損失等，這些間接花費同樣會銷耗掉許多社會成本。

然而如擬以免疫計畫替代撲殺，仍有許多因素必須考量，例如：是否有適合的疫苗存在、免疫效果不可能達到 100%、動物免疫過仍可能染病、對貿易可能造成的負面衝擊、免疫所需經費等。

（二）地方文化對新浮現立百病毒的影響

在新加坡與馬來西亞發生在人類致死性立百病毒性腦炎，是一種跳躍式的感染，果蝠是自然界的保毒宿主，而當地養豬業是屬於開放式豬場且四週遍植果樹，這種飼養文化使病毒由果蝠這種野生保毒動物直接建立了豬隻感染的途徑。這種跳躍式的感染因爲集約式的養豬模式，使病毒有機會被大量增殖，加上感染豬隻在農場間的互相流通，更促使大量豬群受到感染，而且有許多人群與病豬接觸，最終導致疾情爆發。可見在每個關鍵點人類活動都扮演著很重要的角色。地方文化影響當地農業活動的模式，也創造了病毒自果蝠感染到豬隻，然後在豬場內大量繁殖，進而感染人類及其他伴侶動物的契機。馬來西亞的豬場完全沒有所謂的生物安全防護措施，因此人們要保護自己，最基本的要求就是要有生物安全防護與自我防護等措施。

（三）發展中國家的地方文化與農業型態對新浮現禽流感的影響

禽流感在亞洲成爲地方性疾病的原因很多，包括完全沒有生物安全防護的放養及豬禽混養農業模式、病毒流行病學上的特性與人類活動的影響等，例如獸醫體系薄弱、喜好溫體肉、鬥雞文化及節慶習俗等。在歐洲與非洲，野鳥可能爲感染源，但在亞洲野鳥並非感染的主要來源。

瞭解發展中國家的地方文化與農業模式對禽流感的新浮現及傳播的影響，特別是對亞洲而言，有助於發展一套更有效的風險降低法，也就是把禽鳥飼養規模劃分爲 1 到 4 區來管理。爲降低禽流感發生風險，進而避免感染人類，發展中國家應從疾病控制及文化的角度，將重心放在第 3（後院式飼養的雞、鴨、池塘的鴨）或第 4（放養而隨處覓食的雞、鴨）區塊的飼養規模。當無法改善農場或農村的生物安全防護時，野鳥、家鴨或鄰國都可能成爲高病原性禽流感的來源，此時獸醫當局應考慮就此區塊施行侷限性的免疫計畫，以保護易感性動物，並降低對人類的健康風險。舉例而言，越南每年節慶前後禽流感案例都會大幅增加，但進行免疫計畫後，2005 年節慶前後案例雖有增加，但案件數卻明顯比往年降低，2006 年已可有效地控制禽流感。

其他的措施也必需確實施行方能降低風險，包括強化獸醫體系、知識教育、改變活動與行爲的教育、強化監測體系等，其中教育需包括撲殺的危險性以及防護措施等。

（四）對偏遠地區及遊牧民族的人與動物合作實行免疫計畫

對偏遠地區及遊牧民族的人與動物實行免疫計畫，常因經費及人力不足的原因而失敗。然而在查德，藉由獸醫與公衛體系的結合，讓兩個領域的資源與後勤得以共享，使總支出減少，進而創造了一個成功的經驗。這種結合涵蓋了許多事前的規劃，包括改善健康部門與遊牧民族間的通路、討論公衛與獸醫部門參與的可能性、資源與訊息例如交通工具與人員的共享、確認免疫計畫的範圍與經費、確認免疫計畫可持續地實施、共同面對財政負擔、尋求國際支援等。政府部門經由這種策略，已可有效地控制人的小兒麻痺與動物的炭疽病。公衛與獸醫兩個領域的結合可降低成本支出並增加農畜收益，

不論是對人還是動物免疫計畫皆必需持續進行方能發揮效用。

四、 國際貿易及交通：從嘗試與錯誤的經驗中學習

（一）國際衛生條例（International Health Regulations, IHR）

1993 年至 2005 年間全球重要傳染病包括：漢他、鼠疫、伊波拉、SARS 與禽流感等，這些爆發流行事件突顯在全球爆發流行之預警與應對能力不足，對全球性監測及通報機制帶來了新的挑戰。國際衛生條例的價值在於建立一套防止疫病及災害散播的策略與方法，強化國際間對於突發事件之緊急處理與處理過程的透明化。處理的原則包括注重持續性及突發事件的風險、重視全球性合作例如監測計畫與回應、各通關口、參與國際活動等。

以 2005 年的 IHR 而言，範圍擴大到通報國際關注之公共衛生突發事件、加強流行預警與應變。通報部份包括：意見交換以決定必要的措施、避免反射性的通報或回應、決策工具，也就是依據條例評估哪些公衛相關事件應予通報。每個國家應有最基本的監測和應變能力，以共同確保全球衛生安全。2005 年的 IHR 另一重點爲強調有關國際之間應以有效率的溝通最爲重要。

（二）如何控制家禽的禽流感

亞洲持續發生 A 型 H5N1 亞型的高病原性家禽流行性感冒，而成爲全球動物及人類健康的重大威脅。要預防與控制本病，一個「通用」的解決方法並不存在，可使用的策略包括教育、生物安全防護、疫苗或撲殺等。雖然最近免疫計畫已被推薦使用，爲避免禽流感成爲一個地區的常在性疾病，仍需要藉由業者確實施行衛生管理措施才能控制本病。在此特別強調，免疫計畫若未能與其他衛生管理控制措施並行，將無法清除撲滅本病，對公眾健康的威脅將一直持續存在。

以教育而言，包括知識上的投資及應變能力的強化等。生物安全防護則要先了解，本病並非空氣傳播而是經由接觸動物或其分泌物與排泄物，如此方能選擇適當的防護措施。此外，最近發現有野生鳥類感染爆發疫情的案例，

故對其感染對象與潛伏期等資訊均尚待建立。正確地鑑定病原與劃分防治對象有助於採取正確且有效的防護措施。撲殺是一個很實際也很有效的方法，但要考慮損失可能會很大。使用疫苗的部分，因爲以前並不被推薦所以相對經驗較少，而且可能會造成貿易障礙，如果必需要使用疫苗，則儘量要選擇能鑑別爲自然感染或施打疫苗所致者。

以經驗而言，許多已開發國家已制定因應對策且亦有實際經驗，例如1999年至2004年的義大利（H7N1, H7N3, H5N2）、2003年的荷蘭（H7N7）、1994的美國（H7N2）等。而對開發中國家應特別注意：畜禽業應提升生物安全防護等級、活禽市場也要增加生物安全防護、至於農村則可以考慮施打疫苗。不論如何，制定控制與預防禽流感的策略是必要的。

（三）由高病原性禽流感的經驗來探討監測計畫

近三年來對於 H5N1 禽流感病毒的監測計畫已急劇地展開。由於來自於媒體與公共衛生的壓力希望能明確知道病毒分布範圍與對人類健康的風險，促使有關本病的報導與分析已被擴大對象除了家禽，還包括其他家畜甚至野鳥。由於事關人類健康，且歐洲、東亞與非洲已因候鳥而發現病毒，迫使疫情不得不透明化報導。此外，國際貿易與交通往來頻繁也成爲傳播 H5N1 禽流感病毒的途徑。當下的需求爲：資訊透明化，並了解 A 型流感基因的不穩定性、H5N1 病毒的環境特性（生態學）、分享資訊與病毒、疫苗的發展、抗病毒藥物的效用、情勢是否被擴大渲染或未獲得足夠的重視等。未來的目標則包括：實際面的風險評估、增加資源不足地區的監測計畫、評估快速與準確診斷的必要性、全面性的透明化等。

（四）從美國新浮現西尼羅熱學習到的應變經驗

西尼羅熱病毒原爲東半球的一種親神經性蚊媒黃熱病毒，西半球首例則發生於 1999 年的紐約。蚊蟲與鳥類爲自然宿主，病毒會在兩者間傳播增殖，而人、馬與烏鴉則爲終末宿主。自 1999 年起，西尼羅熱病毒成爲北美的常在性傳染病，迅速擴散至美國 48 州、加拿大與墨西哥，感染數百種蚊及脊椎動

物，成爲一種地區性的人、禽與動物的傳染病。面對此突然、快速且毫無預警的蚊媒性人畜共通傳染病，促使美國公衛及動物衛生機構迫切地需要建立一個全國性的因應對策。自 2000 年起，CDC 與各州本病監測專家及其他聯邦機關密切合作，成功地建立一套全國性監測指標及網路平台，一個全新的、有效的、以網路爲基準的監測平台－ArboNET，持續地收集並向公眾及專家們通報監測資料。這個全國性的監測通報體系，是由 CDC、農業部、內政部、國防部以及環保等部門共同組成，該專屬網站會每週會公布最新疫情。

除了通報體系，美國也試圖進行病媒蚊的控制，然而蚊蟲控制部份受到地理學的影響很大，雖有區域性的協調，但受限於經費昂貴與財源短缺，所以政策常無法達到預期效應。經驗顯示，一個快速的新浮現人畜共通傳染病，很容易就成爲一個地方常在性疾病，因應這類人畜共通傳染病需要建立全國性的政策，而全國性的政策需要各部門間非常良好的合作關係，美國在此方面成功地建立了一個網路監測追蹤系統。

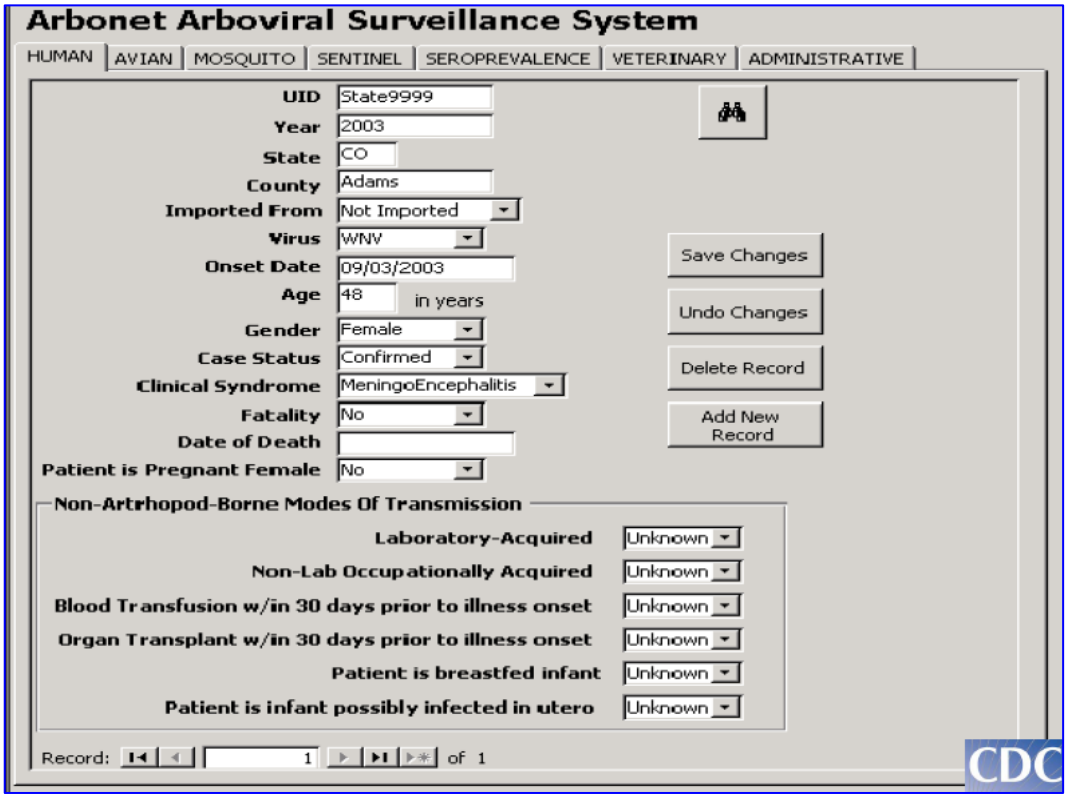


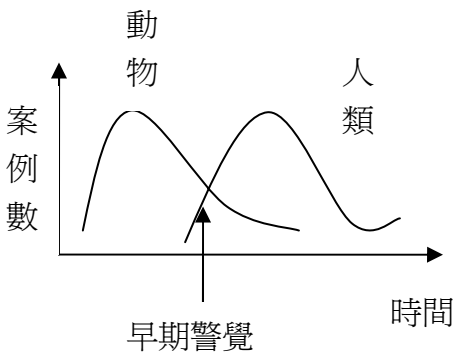
圖 2. 美國蚊媒傳染病之網路通報系統－ArboNET

五、 以國際合作方式進行早期偵測、應變、監測（包含實驗室）、預防與控制

（一）由最近的案例學習對新浮現人畜共通傳染病的監測與控制

世界衛生組織爲了解微生物的分布情形、偵測新浮現傳染病、了解其對公共衛生的潛在性威脅以及建立有效的控制措施，發展了一個結合數個疾病監測網的全球疫病預警與應變系統（Global Outbreak Alert and Response Network, GOARN）。GOARN 是 WHO 的疫情通報與反應中心，而這個監測體系主要監測的傳染性疾病包括流感、登革熱、黃熱病或腦膜炎等，另外也包括了 SARS 之類的新浮現傳染病，這些傳染病可能是自然發生、意外發生、也可能肇因於人爲因素的生物武器或恐怖攻擊等。世界在改變（SARS 造成的經濟損失最多，比狂牛病、口蹄疫與禽流感還多），國際衛生條例對控制疫情的基本策略也應更新，所以最近 WHO 特別致力於將過時的國際衛生條例更新爲 2005 年版，並致力於協助各國強化疫情發生時的警覺性與應變能力。

從過去的經驗得知合作的重要性，也顯示動物案例的發生總是早於人類的案例，所以應在動物案例發生時即有所警覺。另外，對於新浮現人畜共通傳染病要注意的層面應包括公共衛生教育與社會動員、流行病學（阻斷傳播途徑，公共衛生與動物監測體系的互動等）、實驗室診斷能力（沒有診斷力，也就無法知道有案例發生，亦即所謂 No Laboratory, No Case）、生態學的研究、儲備與後勤支援、生物安全防護等。



（二）FAO/OIE/WHO 全球早期預警應變系統（Global Early Warning System Response, GLEWS）

GLEWS 由 OIE、WHO 與 FAO 共同組成，對象包括了人畜共通及動物傳染病，例如豬瘟、非洲豬瘟、牛接觸傳染性胸膜肺炎等，這些疾病牽涉到的不只是動物疾病還有食品衛生安全。影響這些疾病的因素包括了氣候變化、農業活動的擴張、市場與貿易、觀光與旅遊、經濟條件狀況、食物及生活環境的改變等。所謂早期應變係指即時介入與協調。對於這些公衛與動物健康相關事件的處理，必需考慮到許多層面，包括食物、食品安全、安全防護、食物品質、人民生計等。GLEWS 的另一個重點爲一系列國際性及區域性訓練計畫，包括了外部品質認證系統（External Quality Assurance System, EQAS）、針對國家或區域的訓練計畫、成立網路討論團隊（Electronic Discussion Group, EDG）、國家資料庫等。目前的成果包括有來自 142 國的 900 個成員、91 國包含 16 種語言超過 300 個成員參與的 34 項計畫、有 70 個成員已設立 EDG、成立區域性中心、有 91 國的 178 家實驗室參與 EQAS、建立國家資料庫等等。

（三）OIE/FAO 動物流感系統（OIE/FAO Animal Influenza Network, OFFLU）

OIE 與 FAO 都有指定國際參考實驗室，而 OFFLU 主要由 OIE 科學委員會統籌，將實驗室診斷層級依次分爲：國內實驗室、國家級實驗室、區域性實驗室、OIE/FAO 參考實驗室（目前 OIE 有 6 個，而 FAO 有 4 個禽流感參考實驗室）。經由專家的研究與診斷，提供會員國國際級的實驗室來協助控制疾病。此外，此系統亦協助訊息、物資與人才的交流。OFFLU 的禽流感參考實驗室專家們與全球其他系統的專家共同合作，組成了一個範圍廣闊的研究團隊。OFFLU 亦與 WHO 的禽流感系統保持密切聯繫，同時使成員間的訊息與資源更容易流通（例如核酸序列、分離病毒株、參考材料等），提供全球共同對抗流感的一個科學專家群。

（四）WHO 沙門氏菌全球監測系統（WHO Global Salmonella Surveillance, WHO GSS）

WHO GSS 是由 WHO 贊助，透過許多協會與工作小組的合作。目標是藉由提升實驗室診斷及疫情控制爲基礎的監測體系，期望能降低食物媒介性疾病。食物媒介性疾病通常是可以預防的，選擇沙門氏菌爲主角是因爲其爲全球性的疾病，涉及許多領域而且可成爲其他病原的參考模式。WHO GSS 的目標在於能力強化、建立集合各項專長的中心、更快速的合作、改善反應機制、促進流行病學家與微生物學家在食品安全、獸醫與公衛上的溝通等。此系統現有來自 142 個國家的 900 個成員，已建立了 5 個區域中心及 7 個訓練小組來協助區域內的基礎建設與能力培養。其活動包括了國際性訓練計畫、全球性的熟練度測試（藉助於 EQAS）、國家資料庫、重點計畫與 EDG 等。

（五）OIE 標準與國際性生物安全防護之衝擊

OIE 之基本宗旨在於防止疾病經由國際間的貿易傳播，所以建立一套國際標準與指導方針來促使貿易時的疾病傳播風險降到最低。這套 OIE 標準包括了水生、陸生動物法典及實驗與疫苗診斷手冊。WTO 的動植物檢疫協定（SPS）自 1995 年起開始將這套標準納爲準則。

OIE 已建立並不斷更新其標準，以降低動物疫病及人畜共通傳染病經國際貿易傳播的風險。這些標準皆列在水生與陸生動物法典中，包括監測程序與疫病發生時的通報、獸醫當局的需求、要宣稱一個國家無特定疫病的條件、安全輸入動物其及產品應注意的疾病、監測的特別準則、消除病原的程序、各國應如何降低疫病經由貿易入侵的風險等基本原則。水生、陸生實驗與疫苗診斷手冊主要描述鑑定動物傳染病的各項實驗與相關疫苗，所規範的一系列實驗方法被引用於法典中，被視爲國際間動物輸出入移動時確定動物健康狀況的方法。手冊內也有特別章節規範採樣方式、樣品包裝運送、獸醫實驗室的品管、無菌試驗、獸醫微生物實驗室的人員安全、動物疫苗製造、消毒與不活化程序、細菌抗生素感受性試驗等。

要達到有效的全球性生物安全防護，OIE 會員國必需確實地遵循標準與指導方針、有效地對相關團體進行宣導教育、適當地增加其獸醫體系的人力與物力等資源。英國 1990 年到 2001 年間因狂牛病引起的損失爲 70 億美元，台灣 1997 年因口蹄疫引起的損失高達 150 億美元，荷蘭 1997 年因豬瘟引起的損失爲 2 億美元，這些因疫病發生而引起經濟損失的案例經驗，促使大多數國家有了相同的共識：對於自然發生的或人爲刻意散播的病原性微生物會嚴重影響到動物產品、食品及公眾安全。在各國與國際間現存的疾病防治方法、政策及規則、國際標準與準則等皆持續被重視與擴張，對於自然發生、意外發生或甚至被人爲刻意引入的動物疫病，各國皆須強化其預防與控制疫情的能力。整體而言，建立良好的溝通與監測方能控制疫病，而全球性的合作更是重要。

六、 未來的方向：疾病預測模式與新技術

（一）控制人畜共通傳染病的新方法

新浮現人畜共通傳染病例如 BSE、 SARS、 H5N1、WNV 等總是不斷地發生。目前面臨的是 H5N1，那麼下一波大流行又會是那種疾病呢？由於病原不斷進化，各種客觀因素不斷地改變，所以沒有人可以正確地預知，目前能做的是不斷地強化全球（地方性、區域性、國際性）早期正確診斷的能力還有及早正確因應。

新浮現及已被忽視的人畜共通傳染病其重要性正日益增加，越來越多國家，特別是發展中國家，經歷了這些疾病對公共衛生及社會經濟面的衝擊。人畜共通傳染病正逐漸加重公衛體系的負擔，日漸威脅畜牧產業，影響動物來源食物的安全性，也影響輸出與國際需求。經由獸醫與公衛各層面的了解，對這些疾病的控制方法與政策應該改進，共同合作促使人類及動物均能受益。要控制人畜共通傳染病需注重下列層面：

1. 強化全球國際性組織的合作，要有國際性的架構。

2. 發展新的技術使控制策略更迅捷，包括訊息的流通、培養各國及區域性的應對能力、建立人畜共通傳染病研究中心以及可依據不同狀況制定不同策略所需的工具等。

3. 有效地推廣新觀念，包括打破領域界限（One health, One medicine）、改變對自然界的態度、醒思人與動物間的關係（例如立百病毒、SARS、禽流感等）、傳統動物產業的改革、動物的運輸、交易與屠宰等。

4. 對人的案例，控制策略應包括治療、切斷可能的感染途徑、經由社區教育降低風險、高風險性活動的改善、發展新疫苗、抗菌劑、抗病毒劑等。

5. 對動物的案例，控制策略應包括治療、淘汰、防護措施，以哨兵動物進行主動性監測、調整生產模式、將家畜與野生動物都納入考量、發展新疫苗等。

6. 應以現行的公衛體系爲基準，來強化對人畜共通傳染病的控制。

7. 公衛界與動物界應共同合作，發展單一的衛生防疫體系。

（二）以風險評估爲工具來預防與控制里夫谷熱

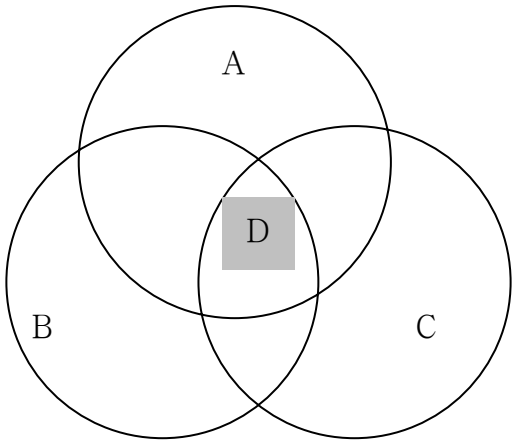
由於氣候變化、人類造成的環境變化及貿易的增加，里夫谷熱在某些地區對人類健康的威脅正逐漸增加。本病在非洲很多地區是呈常在性的地方性感染，通常在聖嬰現象引起的長期豪雨季後，案例會增加。因爲有這種流行病學上的模式可預測疾病的發生，人們可以實施以風險爲基礎的疾病管理措施。風險評估提供了一個清晰而科學的應對架構，歐盟及塞內加爾均曾運用這種模式協助制定相關應對政策。

風險分析包括了危機確認、風險評估與風險管理，不論哪一步驟都必需進行風險溝通。進行風分析時需以科學爲基礎，並以透明化的態度來施行風險管理。評估分析時要對有害的部份及緩和風險的方法進行充分的研究評估與討論，必須涵蓋不同領域的意見，不只要考量本質上的風險，也要考慮量的問題，而且一定要不斷進行風險溝通。

以 RVF 的風險分析而言，乾雨季、蚊蟲的分布與生活史、動物的遷徙與人的移動都必需納入考慮。本病亦有可能傳入歐洲，而歐盟在經過分析後，認爲確有風險，遂建議應對本病建立流行病學的監測系統，以及聯合診斷模式。以本病而言，這是屬於一種預警式的風險管理。

（三）經由研究生物多樣性的資料與生態位置模式來協助分析疾病傳播的生態學與地理學

疾病傳播受到許多生物學因素的影響，病原、傳媒、宿主都有其生物學上不同的需求與考量。生態位置模式是一種預測特定物種地理學分布的工具，配合地理資訊系統與特定物種案例資料的運算來進行預測。當面對樣本不全、特定物種可能入侵新地區並擴散時、物種分布可能產生變動時（例如氣候變遷），這項工具提供了地理學上可能的分佈預測。近來例如研究伊波拉、馬得堡病毒（Marburg virus）與禽流感時皆嘗試利用此工具。



生態位置模式的基礎：
A-（無生命的）地理狀況
B-入侵管道
C-生物間的活動
D-實際上的地理學分佈

（四）食品安全的風險評估

制定公衛政策時必需同時分析食物媒介性疾病追蹤資料與食物監測體系資料。微生學風險評估（Microbiological Risk Assessment, MRA）提供了一套系統，經由有害因素確認、有害因素特性描述（劑量與反應的關聯）、暴露評

估與風險特性描述四個步驟，對可能發生的疾病進行客觀的因果關係評估，進而完成風險評估。經由 MRA 架構的資料分析，亦可反推回這些食物媒介性疾病的來源，進而採取特定的預防與控制措施。同樣地，這個架構也提供了國際合作與資料工具共享的平台。

MRA 有助於建立一套從牧場到餐桌完整的體系，特別是對於開發中國家。依據 WHO 於 2005 年公佈的資料，開發中國家每年有約一百九十萬人死於食物媒介性疾病引起的下痢，而 MRA 是一套以科學爲基礎的評估程序，可協助尋找病原與食物間的關聯性，各國政府、食品安全團體及相關國際性組織（例如 Joint FAO/WHO Export Meeting on MRA, JEMRA）都應該使用這套程序。

（五）CDC 的全球疾病警訊系統（Global Disease Detection, GDD）

AIDS 與拉薩熱都是因爲未能早期察覺，而付出極大代價的案例；再以 H5N1 爲例，如果人傳人需要 1 天的時間可傳染 1 個人，第 21 天就有 243 人被傳染，第 30 天就有 2187 人被傳染，可見及早準備的重要性。各國應培養對抗這種全球性大流行的能力，例如使人們可迅速進入備戰狀態、儲備物質如何分配等等。所以美國 CDC 在 2004 年成立了 GDD，GDD 的理念是建立一個反應中心，可迅速強化對 H5 全球大流行時的反應，是對抗未來威脅的戰略中心，主要功能包括了疫情發生時的應對、訓練、監測、實驗室診斷及其他功能。同時也和 WHO 等國際組織共同合作。各國都需要早期警覺並及時控制疫病的體系，美國 CDC 的 GDD 就是其中之一。

七、 解決之道

（一）除了狂熱，我們是否準備好了共同對抗這些疾病

新浮現人畜共通傳染病的來源與病原演化程度決定其威脅性。雖然挑戰確實存在，且對抗策略也已經建立，包括一個共同負責的文化、動物與公衛部門間的溝通，特別是在緊急管理與災害反應部份。對於警覺、通報、反應

公衛需求與動物保護間的溝通，還有維持公眾的信心等，大部分的國家都已經投入心力，致力於創造這樣一個適當的環境。

1. 了解當前局勢：禽流感、BSE、SARS 等案例都不是單一事件，是各種因素的綜合結果，也打破了不同領域的界限。

2. 建造一個具有警覺性的環境：不論是對人或動物，家畜或野生動物，監測計畫應予統合，監測應該是有目標的、主動的、有哨兵制的，而公眾的了解與支持才能使監測落實且有足夠的經費維持下去。監測前要先分析病源感染途徑、模式與對象，也要對這些商業動物移動狀況進行統計，並確認那些族群是不在控制內的。另外，也需培養相關能力，例如獸醫教育體系應加強警覺性及社會（安全）責任之重要性、設立參考實驗室，相關人員的培訓等。

3. 建造一個通報的環境：依據國際標準，要依據區域性及產品風險性來劃分通報內容，通報必需及時，對於通報者給予補償有助於民眾爲避免經濟損失而延遲或不予通報。

4. 建造一個有效率反應的環境：遇到國際性的新興疾病，獸醫與國家獸醫系統應跨越陣線動員起來，實務演習應該要跨越各領域，動物與公衛部門都該參與練習，疫苗銀行與決策單位要密切保持合作，要增進生產階層的生物安全防護，撲殺的方法要先與大眾溝通後決定，對於這些受到影響的對象要先擬定輔助程序。

5. 建造一個溝通順暢的環境：若要建立公眾信賴，溝通必需即時且透明，發布的訊息應與實際情況相同，訊息來源不統一將導致認知錯誤，應提供大量的資訊與分析來建立民眾的基本知識，動物健康與公衛兩部門間，溝通要充足而對民眾提供的資訊必需兩者並重且互補。

6. 合作才能存活，單打獨鬥只會導致滅亡：提早溝通才能有效預防，對抗新浮現人畜共通傳染病的投資（包括基礎建設、能力培養、資源儲備等）十

分龐大，動物健康與公衛部門要不斷的溝通、合作與分享資源，才能使對抗這些威脅的措施可以持續下去。

7. 結論：科學可以決定什麼是安全的，但社會將決定什麼是可以接受的。

（二）在不確定的狀況下制定決策

當決策牽涉到動物健康時，往往無法排除所有的不確定因子。藉由決策制定原則可以降低這些不確定性。這些原則包括以科學爲基礎的風險降低、過去案例的分析、政府與相關團體的合作。以 BSE 爲例，美國採用的對策包括確認高風險性物質、採用能有效降低風險的進口策略、對新發生的案例有效率地反應、對可能發生的案例作好準備，同時致力於開啓各聯邦與機關間的溝通，以及聯邦、各州與地方團體間的合作。

造成不確定的因素很多，例如反應時間上的限制、非法走私、生物恐怖主義、資源的再分配等，降低不確定性的原則有：

1. 預先計畫與準備：要先準備好反應計畫、國家級的監測、了解國際資源、全球野生動物的監測、診斷鑑定的能力與足夠的獸醫資源等。

2. 以科學爲基礎的風險降低：依據國際規範（例如 OIE）來劃分各種產品的安全性，也要依據不同區域劃分輸入產品的風險，進而採取不同降低風險的措施，例如美國對加拿大因爲有 BSE，所以對於邊境防護及隔離設施的要求就比較嚴格。

3. 分析過往案例的經驗：例如德州發生的禽流感，經由指揮系統的迅速反應，有效將之侷限於美國西南，然後成功快速地撲滅。

4. 各部門間的合作：以美國 BSE 案例而言，與降低風險有關的部門包括了農業部、食品安全檢查局（Food Safety Inspection Service, FSIS）與藥物食品部（Food and Drug Administration, FDA）；國家動物疾病鑑定系統則包括了聯邦政府、州政府與其他機關。

結論：應降低不確定性，並找出最適當的解決方案。

（三）公私部門對於對抗新浮現人畜共通傳染病時的合作關係

由於動物與公衛部門歷經全球性的人力與經費削減，使得對新浮現人畜共通傳染病預防、反應與控制的能力降低，相對於需求的增加，公私部門的伙伴關係提供了共同合作的機會，以應付這些新浮現傳染病，加強基礎建設並致力於應對能力的建置。食品衛生相關業者、學界、其他非政府組織與OIE、聯邦政府間的主動合作，產生了許多利基，例如催化了以科學爲基礎的標準，強化了動物健康與公衛部門的基礎建設，促進了工作小組與領導階層的能力建置。公私部門的合作使得長期性的規劃得以施行並持續下去。

作任何決策與研究前都要先有經濟觀，這樣的決策或研究才不會不切實際，例如資源減少而需求增加時就必需創造合作關係，而經濟上的變化也決定了接下來可能浮現的疾病。一般而言，社會運用動物的程度越高，公眾的不安全感就越深，學界、私人部門與公務部門的伙伴關係，使相關單位有能力降低運用這些動物所造成的風險，也相對降低了社會的緊張度。

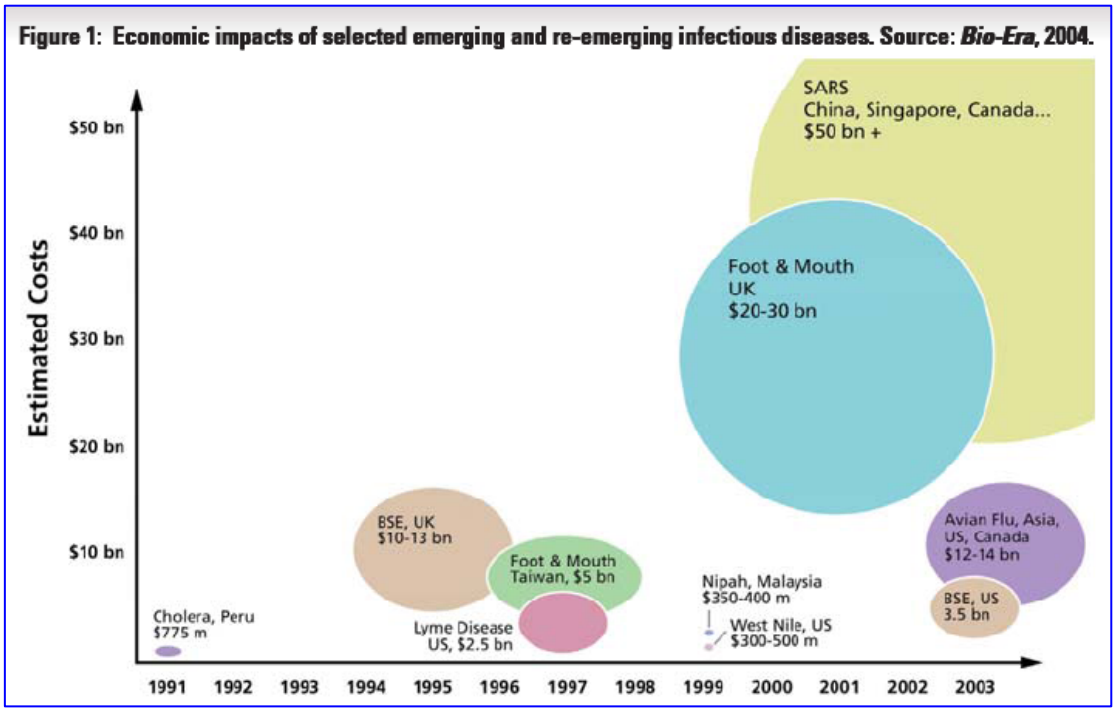


圖 3. 近年來重大人畜共通傳染病造成的經濟損失

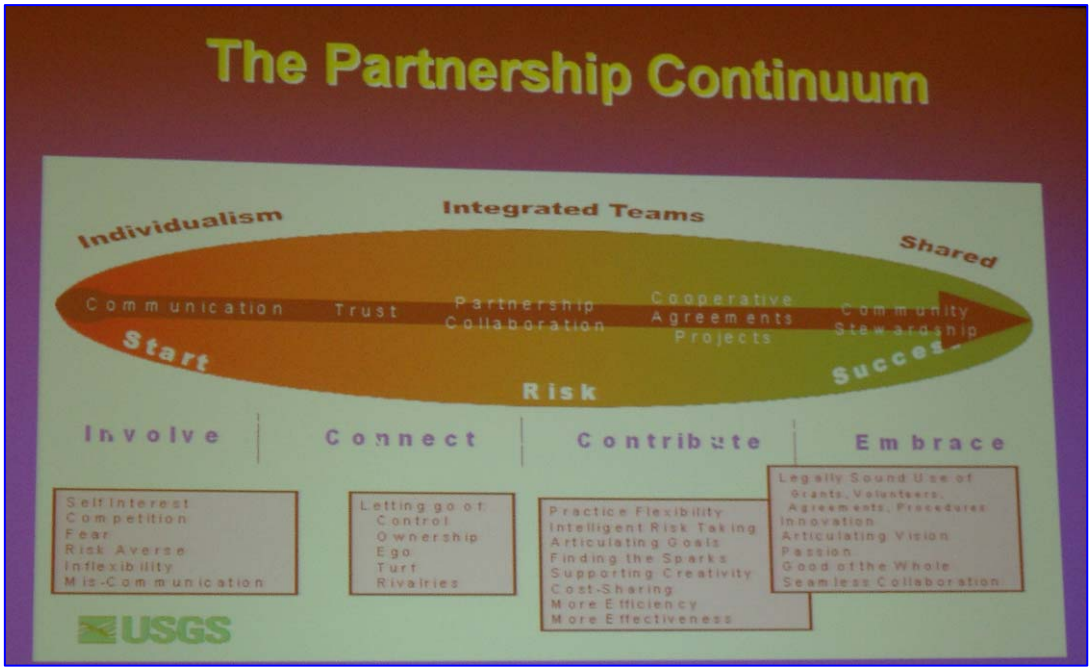


圖 4. 如何建立持久的合作關係

（四）FAO/OIE GF-TADs

目前遭遇到的禽流感顯示我們需要更有效的監測與早期警覺，而 GF-TADs 的目的就是發展客觀的觀察力。觀察顯示，社會對於禽流感的應對仍有許多有待改進之處，例如國家能力、流行病學的分析、工具（疫苗）、政治導向、大眾意識初萌芽、私部門的投資不足等。相對而言，可從這些部份開始強化，例如流行病學分析、早期警覺系統、獸醫體系、國際與區域的診斷與監測能力、實驗室的能力、監測團隊間的合作等。整體而言，建立全球性的合作關係將是未來的世界趨勢。

（五）經由風險溝通獲取信任

疫情相關的資訊科技或疫情發生時的風險溝通，可以創造一個透明、公正且及時的管道，民眾可以藉此取得可信任的資訊。提供資訊的管道要統一以凝聚效果。如果民眾已有疑慮，提供的訊息要確實而統一，要讓民眾知道有哪些不確定因子、風險如何評估及評估後的結果，避免浮誇也不可以顧左右而言他；持續地告知大眾哪些是已知的、哪些是未知的、這些訊息是如何產生的，將有助於建立信任感，使相關的建議或措施比較容易被採納。發布

訊息時，必需信任公眾是有能力應付這些不確定性的，要相信民眾有接受壞消息與控制恐懼的能力，是能明辨是非的，千萬不可以高傲或權威的態度來掩飾潛在的危險性，更切忌說謊或只提供一半的真象，例如提供過度的保証、拖延、試圖保護、嘲弄或低估人們的恐懼等。有效的風險溝通才可以在過度的警告與無警覺性間找到平衡。此外，有效的風險溝通一定要有回饋互動機制，以獲取來自大眾的訊息、意見與信任。最重要的是，要讓民眾知道「政府不可能是萬能的」。

陸、研 習 心 得

綜合此次赴美參訪美國疾病管制局與參加新浮現人畜共通傳染病國際研討會議之心得，概分述如下列五點：

一、人畜共通傳染病高生物安全等級實驗室之設計原理及管理概念

高生物安全等級實驗室之設立應先遵尋正確之實驗室操作流程及動線規劃，美國 CDC 國家傳染病中心職司傳染病之防治，對於人畜共通傳染病相當重視，而以診斷實驗室的觀點而言，對於人類或人畜共通傳染病之防治，最重要的是需具備快速與正確的診斷技術，因此該傳染病中心除延攬相關專業人才亦致力於擴充實驗室之自動化系統，實驗室硬體設備之自動化不僅可節省大量人力與時間，亦可使實驗室品質管制更容易掌控，故可有效提升實驗室之試驗品質與診斷效率。近年來人畜共通傳染病頗受重視，美國 CDC 具豐富之疫情處理經驗與確診技術，故其診斷技術及相關經驗相當值得學習。此次參訪美國 CDC 國家傳染病中心，發現其實驗室設計理念除了相當重視對實驗室操作人員的保護外，各項儀器的設置主要是以使用者爲考量，尤其著重於實驗室間的動線規劃。如果實驗人員可輕鬆而不被影響地進行實驗，效率自然事半功倍，所以國人設計實驗室時，不應只侷限於最小空間的最大利用，亦應考慮動線、實驗人員與儀器（例如散熱或維修）的活動空間，留下適當的空間才能得到更大的收益。

二、政府應建立人畜共通傳染病公部門與私部門間的溝通聯繫平台

近年來人畜共通傳染病有全球擴大傳播的趨勢，對動物與人類的健康皆造成威脅，其發生不僅會引起社會恐慌，甚至會嚴重影響到國家整體經濟發展與國際聲望。此次研討會的精神主軸在於強調合作與溝通的重要性以及技巧。各項案例經由不同領域的分析均顯示，各國甚至各部門的單打獨鬥，並無法應付這些新興的人畜共通傳染病。人畜共通傳染病的發生會影響深遠，其實是人類的活動導致，隨著自然資源的過度開發與交通貿易上的全球化，這些疾病已經超越了自然地理及生態環境上的限制，如果不能放棄本位主義，進行政府各部門間、國與國間、公私部門間甚至各國際組織間的協調與合作，縱使能暫時獨立對抗這些疾

病，也要付出相當大的代價，況且如果只是將危險拒於門外就不再採取近一步的因應措施，威脅將一直存在且茁壯，當資源耗盡後又將如何？

三、禽流感防治策略思考與新主張

本次研討會除了提出溝通與合作等國際趨勢上的資訊，亦針對當前最被重視的人畜共通傳染病「禽流感」，分享經驗與醒思。本病的傳統對策是整場撲殺，以前本病屬個別國家零星發生，因爲是發生於已開發國家，其撲殺損失固然龐大但仍可以負擔，所以長遠來看仍是有利的，但是此波全球大流行主要發生於開發中國家，許多國家發現若採用撲殺政策，這些國家根本無法負擔撲殺所帶來的社會與經濟損失，而且也容易導致農民爲減少撲殺所造成之損失，而隱匿疫情，反而導致更嚴重的後果，因此之故，有部份專家及國家極力推薦，使用疫苗來控制禽流感，但是與會專家，仍慎重提醒施打疫苗必須輔以撲殺及嚴格監測等相關配套措施，此策略方得以收到良效，否則只會招致反效果。

四、將新浮現人畜共通傳染病納入一系列獸醫教育體系內，並培育專業講師群

有關於獸醫教育體系，本次演講的專家普遍認爲各國均有待加強，特別是獸醫的社會責任感與警覺性。檢視國內獸醫教育體系，正如專家所言，甚少著墨於此，就連公共衛生教育或獸醫自身的安全防護，亦甚少被視爲教學重點，面對一波波跨越國際的人畜共通傳染病疫情，我國這些部分的獸醫教育不但應該積極改進，更應該多培養具有公共衛生與流行病學背景的獸醫人才。

五、持續查緝走私，加強寵物動物之防檢疫業務

有關於新浮現人畜共通傳染病的傳播，許多專家不約而同將不法走私與飼養外來寵物列爲最重要的因素之一，此點與國內情況不謀而合。

柒、建 議 事 項

綜合此次赴美參訪美國疾病管制局與參加新浮現人畜共通傳染病國際研討會議之建議，概分述如下列五點：

一、人畜共通傳染病高生物安全等級實驗室之設計原理及管理概念

建議我國相關獸醫診斷中心，應學習美國 CDC 使用自動化設備，以節省人力與時間。但選購前述實驗室利器時，不能只考量功能與價錢，後續的維護也很重要，例如在國內是否有足夠水準與數量的維修人員（從有問題到修好這段時間對實驗進度可能的影響，應納入其經濟效益考量）、相關零件是否容易取得且價格是否合理、廠商經營的永續性是否有納入評估、如果廠商倒閉則是否有可能爲這些昂貴的儀器找到替代的維修商等等。資源有限所以要選購高性能的昂貴儀器前，多詢問其他國內外使用者的經驗是非常重要的。據瞭解目前國內建設高生物安全等級實驗室之程序常是與美方相反，先完成硬體設施再設計實驗室標準操作流程及規劃實驗室動線，此爲嚴重的錯誤應與改正。

二、政府應建立人畜共通傳染病公部門與私部門間的溝通聯繫平台

對抗這些傳染病所帶來的威脅，合作不僅是共享人力、物力、技術、資訊等資源，更藉由不同領域間的激盪，尋求更有效的應對政策，不僅是共同抵禦，更應藉由彼此的磨合來醒思自身的盲點，進而共同成長並學習尊重，當人們懂的尊重彼此、尊重生命甚至懂得尊重自然，或許威脅將可以不再是威脅。要合作就要溝通，溝通才能使彼此的立場漸趨一致，才能使意見不同或誤會所帶來的人力、物力與精神上的浪費降到最低。溝通需要技巧且需要學習。風險容忍度常因個人、文化、教育程度、年齡、性別或地域等而有差異，甚至受災害經驗、社會價值觀影響，因此風險溝通技巧之訓練愈顯其重要。不可否認，我國的溝通文化並不發達，不論是公部門間、公私部門間、或公私部門與社會大眾間，常只是單向的政策宣導、意見表達，缺乏回饋機制，也缺乏主動理解不同甚至反向意見的能力與雅量，所以很多很好的政策推動起來卻事倍功半，很多有意義的意見無法影響到政策的制定。目前政府已經注意到這項問題，開始在公部門推廣溝通的觀念

與技巧。像動植物防疫檢疫局這類常需面對媒體及消費大眾的機關，爲減輕動物疫病對產業或社會大眾之衝擊，更應該加強風險溝通技巧之訓練。然而，溝通是雙向的，民眾也需要學習如何溝通，這一部分也是政府應該努力的，不僅是學校教育，社會教育與傳播媒體都應該是我們努力的對象。

三、禽流感防治策略思考與新主張

現今我國雖屬高病原性禽流感非疫區，但仍應積極考量若疫情發生，一旦採用疫苗策略時，應具有詳細配套措施及標準作業流程以因應所需。

四、將新浮現人畜共通傳染病納入一系列獸醫教育體系內，並培育專業講師群

建議國家應有足夠經費與計畫來培植相關人才，鼓勵專業人員積極參與相關國際會議與訓練，與國際先進國家之專家保持良好之互動，進而得以相互合作。

五、持續查緝走私，加強寵物動物之防檢疫業務

加強防檢疫措施、查緝不法走私與提高警覺予以防範固然重要，如何與民眾溝通使其了解這些行爲所造成的嚴重性，與對其自身健康或經濟上的傷害，將有助於降低民眾對飼養外來寵物的興趣並從根本杜絕走私。

捌、誌　謝

一、感謝外交部經費支持動植物防疫檢疫局動物檢疫組之出國旅費，使得以順利派員出席會議。

二、感謝臺美農業合作計畫經費支持家畜衛生試驗所之出國旅費，使得以順利派員出席會議。

三、承蒙美國疾病管制局謝文儒博士之熱心安排與協助，使我國與會人員可就近參訪美國疾病管制局位於亞特蘭大總部之人畜共通傳染病診斷實驗室，特此誌謝。

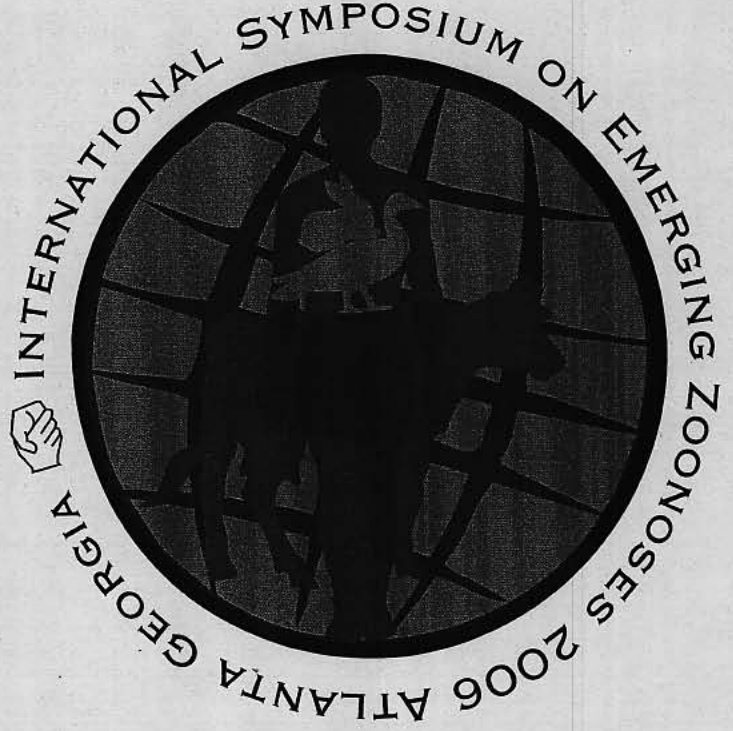
圖 5. 我國與會人員合影於美國疾病管制局

圖 6. 我國與會人員合影於研討會會場

玖、附　錄

（研討會之議程與講者簡介）

PROGRAM AND ABSTRACTS



2006 International Symposium on Emerging Zoonoses

Medical and Veterinary Partnerships to Address Global Public Health Challenges

Marriott Marquis
Atlanta, Georgia
March 22–24, 2006

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

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WELCOME

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control and Prevention

March 22, 2006

Dear Colleagues:

Welcome to the International Symposium on Emerging Zoonoses (ISEZ). As you know, the confluence of people, animals, and animal products in today's world is unprecedented, and episodes of emerging zoonoses are being increasingly recognized on a global level. As human and animal health organizations attempt to respond to this new era of emerging and re-emerging zoonotic diseases, strengthening existing and building new strategic partnerships is of paramount importance.

ISEZ was developed to promote these partnerships, and was organized and sponsored by many organizations on the front lines for detecting and responding to animal and human health threats. We are grateful to the World Organisation for Animal Health, the Food and Agriculture Organization of the United Nations, the World Health Organization, the Animal and Plant Health Inspection Service of the U.S. Department of Agriculture, the U.S. Geological Survey, the American Society for Microbiology, the American Veterinary Medical Association, the National Foundation for Infectious Diseases, and the Immunization Action Coalition for their commitment in bringing this meeting to fruition.

We hope that your participation in ISEZ over the next three days along with the wide range of presentations from internationally recognized experts will further the development of effective and cooperative partnerships to combat emerging microbial threats. On behalf of the Centers for Disease Control and Prevention and the program committee, organizers, and co-sponsors of ISEZ, I thank you for your enthusiasm and commitment of time and effort in attending our conference.

Sincerely,

Nina Marano

Nina Marano, DVM, MPH, Dipl. ACVPM
Co-Chair, Scientific Program Committee, ISEZ
Centers for Disease Control and Prevention

COMMITTEES AND SPONSORS

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SPECIAL REQUESTS

The Marriott Marquis Hotel is equipped to provide a comfortable setting for all those attending the conference. If you have special requests (e.g., accessible accommodations, room preferences, etc.), please visit the hotel registration desk.

GUEST SERVICES

Concierge desk
Full-service Business Center
Safe deposit boxes at the front desk

RESTAURANTS AND LOUNGES (WITHIN THE HOTEL)

Allie's American Bar and Grille – American; open for breakfast and lunch; traditional American fare, featuring hearty, reasonably priced breakfast buffet served daily

Atrium Express – Deli; open for breakfast, lunch, and dinner; features Starbucks coffee

GrandStand Lounge – Located in the 50-story atrium, this attractive lounge lends itself perfectly to quiet conversation and relaxation over light fare and cocktails

Marquis Steakhouse – Steakhouse; open for dinner; luscious steaks, remarkably fresh seafood and grilled specialties with a Southern flair

Hotel Information

Rising 50 stories above Atlanta's Peachtree Center near downtown's celebrated dining, shopping, and entertainment, the award-winning Atlanta Marriott Marquis takes sophistication and service to breathtaking heights. From the dramatic atrium that ushers guests into this premiere convention hotel, to an extraordinary 120,000 square feet of technologically enhanced event space, the Marquis clearly distinguishes itself from other hotels in Atlanta on all levels. Focused on the art of conducting business, hotel staff will coordinate details and anticipate needs for events ranging from small meetings to expansive conventions. This standard of excellence extends to a choice of restaurants, like the Marquis Steakhouse, serving innovative fare with a masterful Southern twist. For workouts and relaxation, try the connecting indoor/outdoor pools and full health club. Our smartly appointed guest rooms and suites offer amenities to keep you productive in restful, welcoming surroundings.

Symposium Registration

The ISEZ Registration Desk is located at the entrance to the hotel. Registration will be open on Wednesday, 22 March 2006, from 12:00pm-3:00pm and Thursday, 23 March 2006, from 8:00am – 12:00pm.

PROGRAM

Wednesday, 22 March 2006

Welcome and Opening Remarks

Wednesday, 22 March 2006
3:00pm – 3:20pm
Dr. Nina Marano, CDC, USA
Dr Lonnie King, CDC, USA
Dr. Bernard Vallat, OIE, France

Session 1: Animals, Humans, and Disease

Wednesday, 22 March 2006
3:20pm – 5:30pm
Moderators:
Prof. Hassan Aidaros, Egypt, and
Dr. Jim Hughes, USA

The Convergence of Human and Animal Health: the Dilemma of Connectivity
Dr. Lonnie King
CDC, USA

Migratory Birds: Victim or Vector?
Dr. Leslie Dierauf
National Wildlife Health Center, USA

Bats and SARS: Virus Origin and Prevention Strategies
Dr. Linfa Wang
Australian Animal Health Laboratory
Australia

Human Health and Societal Benefits of Interventions in Livestock
Dr. Jakob Zinsstag
Swiss Tropical Institute, Switzerland

Serological Study of Japanese Encephalitis Virus in Pigs, Horses, and Ducks in Nepal
Dr. Ganesh Pant
Central Veterinary Laboratory, Nepal

ISEZ Welcome Reception

Wednesday, 22 March 2006
5:30pm – 7:00pm
Marquis Foyer Area
Beverages and appetizers will be served.

Thursday, 23 March 2006

Session 2: Role of Wildlife, Pet Trade in Zoonoses; Implications for Research and Control

Thursday, 23 March 2006
9:00am – 10:45am
Moderators: Dr. Ben Beard, USA, and
Dr. Paul Arguin, USA

Why Wildlife Matters
Dr. Thomas DeLiberto
USDA, USA

A Taxonomic and Ecological Overview of Potential Sylvatic Reservoirs of Human Monkeypox
Dr. Darin Carroll, CDC, USA

Emerging and Remerging Zoonoses from Wildlife Reservoirs to Exotic Pets
Dr. Bruno Chomel
University of California Davis, USA

Evolution and Emergence of Lyssaviruses
Dr. Noel Tordo, Inst Pasteur, France
Dr. Charles Rupprecht, CDC, USA

Break

Thursday, 23 March 2006
10:45am – 11:15am

Session 3: Agricultural Practices and Human Health

Thursday, 23 March 2006
11:15am – 12:45pm
Moderators:
Dr. Joseph Domenech, Italy, and
Dr. Peter Fernandez, USA

The Consequences of Mass Depopulation Campaigns
Dr. Larry Granger, USDA, USA

Cultural Practices that Influence the Emergence of Nipah
Dr. Peter Daniels
Australian Animal Health Laboratory
Australia

Farming and Cultural Practices in Developing Countries that Influence the Emergence of Avian Influenza
Dr. Vincent Martin, FAO, Italy

Integrated Vaccination Delivery to Remote and Mobile Pastoral Families and their Animals
Dr. Esther Schelling
Swiss Tropical Institute, Switzerland

Lunch

Thursday, 23 March 2006
12:45pm – 1:45pm

Session 4: The Challenge of International Trade and Traffic: Trial and Error – What We Know from Previous Experiences

Thursday, 23 March 2006
1:45pm – 3:15pm
Moderators:
Dr. Alejandro Schudel, France, and
Dr. Patty Wilkins, USA

Global Awareness and International Health Regulations
Dr. Ray Arthur, CDC, USA

Avian Influenza: How to Control AI in Poultry?
Dr. Ilaria Capua
Veterinary Public Health Institute, Italy

Global Challenges to Accurate Surveillance for Zoonotic Viruses – the Highly Pathogenic Avian Influenza Experiences
Dr. Mike Perdue, WHO, Geneva

Lessons Learned From Response to Emergence of West Nile Virus in the United States
Dr. Dan O'Leary, CDC, USA

Break

Thursday, 23 March 2006
3:15pm – 3:45pm

PROGRAM

Session 5: Collaborative Achievements in Early Detection, Response, Surveillance (including Laboratories), Prevention, and Control

Thursday, 23 March 2006
3:45pm – 5:30pm
Moderators:
Prof. Vincenzo Caporale, Italy
Dr. Jennifer McQuiston, USA

Surveillance and Control of Emerging Zoonotic Diseases Worldwide: Lessons Learned During Recent Outbreak Responses
Dr. Pierre Formenty, WHO, Geneva

FAO/OIE/WHO Global Early Warning System Response (GLEWS)
Dr. Juan Lubroth FAO, Italy

OIE/FAO Animal Influenza Network (OFFLU)
Dr. Steve Edwards
Veterinary Laboratory Agency, UK

WHO Global Salmonella Surveillance
Dr. Jaap Wagenaar
Utrecht University, The Netherlands

The Challenge of International Biosecurity and the OIE Standards
Dr. Alejandro Schudel, OIE, France

Friday, 24 March 2006

Session 6: Where We Might Go from Here – Forecasting and New Technology

Friday, 24 March 2006
8:30am – 10:30am
Moderators:
Dr. Jay Butler, USA, and
Dr. Peter Schantz, USA

New Approaches to the Control of Zoonotic Diseases
Dr. Francois Meslin, WHO, Geneva

Risk Assessment as a Tool for the Control and Prevention of Rift Valley Fever Outbreaks
Prof. Dirk Pfeiffer
Royal Veterinary College, UK

Geography and Ecology of Disease Transmission: Insights from Biodiversity Data and Ecological Niche Modeling
Dr. Townsend Peterson
University of Kansas, USA

Food Safety Risk Assessment
Dr. Francois Meslin, WHO, Geneva

CDC Global Disease Detection Initiative
Dr. Scott Dowell, CDC, USA

Break

Friday, 24 March 2006
10:30am – 11:00am

Session 7: Where Are the Solutions?

Friday, 24 March 2006
11:00am – 1:00pm
Moderators:
Dr. Alejandro Thiermann, France, and
Dr. Thomas Gomez, USA

Beyond the Madness: Are We Ready for a Coordinated Approach to Emergency Management and Disaster Response?
Dr. Brian Evans
Canadian Food Inspection Agency
Canada

Decision Making in the Face of Uncertainty
Dr. John Clifford, USDA, USA

Leveraging Public-Private Partnerships to Address Emerging Zoonoses
Dr. Will Hueston
University of Minnesota, USA

The FAO/OIE GF-TADs Initiative
Dr. Joseph Domenech, FAO, Italy

Taking a Leap of Faith: Risk Communication
Dan Rutz CDC, USA

Close of the Symposium

Friday, 24 March 2006
1:00pm – 1:30pm
Sponsors

PRESENTATION ABSTRACTS

Session 1: Animals, Humans, and Disease

The Convergence of Human and Animal Health: the Dilemma of Connectivity
Lonnie J. King, DVM, MS, MPA, Centers for Disease Control and Prevention, USA

The convergence of human and animal health has given the animal and public health communities an unprecedented opportunity to join forces to address the increasing challenges of emerging zoonotic diseases. This talk will briefly discuss the critical factors that are creating this convergence and the need for new integrated strategies and actions to prevent and respond to this new group of infectious diseases. The nexus of wildlife, domestic animal, and human interactions has created novel epidemiologic dynamics and has also created a new era for the emergence or re-emergence of diseases. These disease challenges can no longer be addressed by separate health communities. New methods, techniques, and ways of working need to be created and implemented to be successful in the future to meet these remarkable challenges.

Migratory Birds – Victim or Vector?
Leslie A. Dierauf, VMD, National Wildlife Health Center, USA

In attempts to explain the rapid spread of newly emerging infectious and zoonotic diseases, migratory birds are easy target. Such shots in the dark polarize health professionals, conservationists, and politicians alike. We, as health professionals, must provide what epidemiological evidence we can in studying how disease moves across landscapes, being objective in assigning cause and prudent in disease management actions. This will be the only way to preclude unwarranted actions taken by panicked or uneducated members of the public. Migratory birds are part of the world's natural heritage, and a natural resource that we cannot afford to lose.

Bats and SARS: Virus Origin and Prevention Strategies
Linfa Wang PhD, CSIRO Australian Animal Health Laboratory, Australia.

Recently, we and another group have independently identified horseshoe bats (in the genus *Rhinolophus*) as the reservoir host of SARS-like viruses. Sequence analysis indicated the presence of a large group of viruses in different *Rhinolophus* species which have close genetic relationship with SARS coronavirus. Our current research focuses on 1) the susceptibility of non-bat mammals to any of these novel SARS-like viruses; and 2) identification of the bat species which harbour the SARS coronavirus responsible for the human disease outbreaks in 2002/3. The outcomes from these studies will enhance our understanding of spillover from reservoir host, which will in turn facilitate the development and implementation of prevention strategies.

Human Health and Societal Benefits of Interventions in Livestock

Jakob Zinsstag, DVM, PhD, Swiss Tropical Institute, Switzerland

It is widely recognised that zoonoses like human brucellosis can ultimately only be eradicated if the disease is controlled in the animal reservoir. However, from a health sector perspective, mass animal vaccinations or other control efforts such as culling are not cost effective. A recent economic analysis of a livestock brucellosis mass vaccination campaign to reduce human brucellosis in Mongolia has confirmed this. But if the benefits for the livestock sector are added and the costs of the intervention are shared between the public health and the agricultural sector proportionally to their benefits, the control of brucellosis is profitable and for both sectors. Such trans-sectoral assessments, considering both human and livestock economics from a societal economic perspective, open up new ways of zoonoses control in developing countries that would otherwise never be cost-effective from a health sector point of view alone.

Serological Study of Japanese Encephalitis Virus in Pigs, Horses, and Ducks in Nepal

Ganesh Pant, McS (Tropical Veterinary Science), Central Veterinary Laboratory, Nepal

Japanese encephalitis (JE) is an emerging viral disease, which causes encephalitis in human beings and horses, and abortion in pigs. Pigs and ducks are considered to be the most important amplifying host for JE virus. A serological study for JE was conducted in Nepal from 2002 to 2005. In total, 633 samples were collected randomly from 16 endemic and 3 non-endemic districts of the country. Serum was collected from different animal species: 534 sera of pigs, 25 of horses, and 74 of ducks, respectively. Competitive Enzyme-Linked Immunosorbent Assay (C-ELISA) was used for the detection of antibodies against JE virus. The sero-prevalence of JE in pigs, horses, and ducks was 57.67%, 68.0%, and 21.62 %, respectively.

Session 2: Role of Wildlife, Pet Trade in Zoonoses: Implications for Research and Control

Why Wildlife Matters

Thomas DeLiberto, PhD, DVM, US Department of Agriculture, USA

PRESENTATION ABSTRACTS

A Taxonomic and Ecological Overview of Potential Sylvatic Reservoirs of Human Monkeypox Disease

Darin S. Carroll, MS, PhD, Centers for Disease Control and Prevention, USA
(coauthors: Russell Regnery, Mary Reynolds, Christina Hutson, and Inger Damon)

Several efforts have been made to identify the sylvatic source of human monkeypox (MPX). Many of these attempts involved the collection of a taxonomically broad set of sampled species collected over short periods of time. Data from these investigations, as well as from the investigation of the US MPX outbreak in 2003, narrow the list of plausible reservoir species. However, the taxonomy of these candidate reservoir species is poorly understood. A comprehensive study addressing the taxonomy and ecology of each of these potential reservoir species would greatly improve our understanding of the primary zoonotic transmission of MPX virus to humans.

Emerging and Remerging Zoonoses from Wildlife Reservoirs to Exotic Pets

Bruno Chomel, DVM, PhD, University of California Davis, USA

Most emerging infectious diseases are zoonotic, with wildlife constituting a large and often unknown reservoir. Wildlife can also be a source for re-emergence of previously eradicated zoonoses. Although the discovery of such zoonoses is often related to better diagnostic tools, man-made modifications to natural habitats and human behaviors are the leading causes of emergence. It includes expansion of human populations and encroachment on wildlife habitat, changes in agricultural practices, trade globalization, wildlife trade and translocation, live animal and bushmeat markets, consumption of exotic foods, development of ecotourism, and access to petting zoos, as well as ownership of exotic pets.

Evolution and Emergence of Lyssaviruses

Noël Tordo, PhD, Pasteur Institute, France, and
Charles E. Rupprecht, VMD, PhD, Centers for Disease Control and Prevention, USA

Lyssaviruses are negative-stranded RNA viruses causing acute progressive fatal encephalitis known as rabies. From recent estimates of human health burdens, rabies remains the most important viral zoonosis in the world, having the highest case fatality rate for any infectious disease. At least 11 putative viral species are recognized, persisting among the Carnivora and Chiroptera, likely the keystone species responsible for adaptive radiation via progenitor rhabdoviruses. All modern biologicals are based upon traditional rabies virus, with less than ideal cross reactivity with divergent taxa. Given current patterns of global anthropogenic alterations, lyssaviruses will continue to evolve and emerge, presenting major public health and veterinary challenges throughout the 21st century.

Session 3: Agricultural Practices and Human Health

The Consequences of Mass Depopulation Campaigns

Larry M. Granger, DVM, Animal and Plant Health Inspection Service, USDA, USA

Depopulation plays a crucial role in the disease eradication process by preventing the further spread of infection into a susceptible population. Thus, the more quickly large-scale euthanasia activities can be completed, the more quickly pathogen transmission can be brought under control. The necessity of large-scale depopulation activities, however, is offset by the social, political, economic, and environmental effects of these efforts. Social effects include how euthanasia activities affect the well-being of personnel and livestock owners involved. Political concerns include how a depopulation event may affect international trade activities and depopulation as a public relations issue. Potential economic effects include the direct and indirect costs involved in large-scale euthanasia activities. And finally, the environmental effects include how carcass disposal efforts can affect environmental conditions.

Cultural Practices that Influenced the Emergence of Nipah

Peter Daniels, DVSc, MSc, PhD, MACVSc, Australian Animal Health Laboratory, Australia, *(coauthors: J Aziz, BL Ong, M Bunning)*

The outbreak of fatal Nipah viral encephalitis among people in Malaysia and Singapore had as a necessary condition a "jump" of Nipah virus from a wildlife reservoir in fruit bats to establish infection in pigs. The "jump" from the wildlife reservoir was not sufficient to result in the outbreak, which also had as necessary preconditions the intensive pig farming industry which resulted in propagation and amplification of the virus among susceptible pigs; movement of infected pigs from farm to farm to result in the infection of large naïve pig populations during the course of the outbreak; and close contact of large numbers of people in the pig industry with infected pigs. Hence at each point human activities played an important role. Decisions of where to farm and farming practices, resulting from culturally influenced behavior, created the opportunities for transmission of the virus from fruit bats to pigs, among pigs, and then from pigs to humans and their companion animals.

Farming and Cultural Practices in Developing Countries that Influence the Emergence of Avian Influenza

Vincent Martin DVM, MSc, Food and Agriculture Organization of the United Nations, Italy

Understanding underlying farming and cultural practices that influenced the emergence and spread of avian influenza in developing countries and more particularly in Asia have been instrumental to develop effective risk reduction measures in sector 1-4 farms in

the region. Developing countries should focus their attention on production sectors three (free-ranging chickens and ducks, pond ducks) and four (scavenging chickens and ducks), which represent a greater challenge, from a disease management and cultural point of view, for reducing the risk of avian influenza occurrence and subsequent human health infection. In situations where farm or village biosecurity could not be improved and there was significant challenge from HPAI viruses, including in wild birds, domestic ducks or bordering countries, veterinary authorities have considered the use of vaccination to minimize propagation by this sector, to protect susceptible birds from infection, and to manage associated human health risk. Vietnam has applied these principles and followed the vaccination pathway and has been highly successful in 2006 to control avian influenza.

Integrated Vaccination Delivery to Remote and Mobile Pastoral Families and their Animals

Esther Schelling, DVM, PhD, Swiss Tropical Institute, Switzerland
(coauthors: Mahamat Bechir, Abdoulaye Mahamat Ahmat, Kaspar Wyss, Thomas F. Randolph, Jakob Zinsstag)

Public health and veterinary vaccination interventions in remote rural settings often fail to achieve sufficient coverage due to financial and human resource shortages. In Chad, among mobile pastoralists we have demonstrated the feasibility and acceptability of combining vaccination programs for people – often never before vaccinated - and for livestock. Sharing of transport logistics and equipment between the public health and veterinary sectors reduced total costs. Authorities are currently going to scale with this joint approach that has proven an important strategy to reach the "hard to reach" with needed vaccinations such as polio for children and anthrax for livestock.

Session 4: The Challenge of International Trade and Traffic: Trial and Error – What We Know from Previous Experiences

Global Awareness and International Health Regulations

Ray Arthur, PhD, Centers for Disease Control and Prevention, USA

Avian Influenza: How to Control AI in Poultry?

Ilaria Capua, DVM, OIE/FAO Reference Laboratory for Newcastle Disease and Avian Influenza, Italy

Continuing outbreaks of highly pathogenic avian influenza (HPAI) across Asia, caused by a type A influenza virus of the H5N1 subtype appear out of control and represent a serious risk for animal and public health worldwide. Although vaccination programmes have been recommended recently, it will require concurrent management of local husbandry practices and industry compliance to eradicate the disease, rather than the

creation of an endemic situation. It should be clear that if vaccination is used and not managed appropriately, the goal of eradication may not be reached and the concomitant public health threat will remain.

Global Challenges to Accurate Surveillance for Zoonotic Viruses—the Highly Pathogenic Avian Influenza Experiences
Mike Purdue, PhD, World Health Organization, Switzerland

Surveillance for H5N1 avian influenza viruses has expanded dramatically in the last 3 years. Pressure from the press and from public health agencies to know exactly where the virus is located and its risk to humans has resulted in wide spread reporting and analysis of the virus in not only poultry but other domestic animals and now wild birds. Reluctance to be transparent because of the implications for human health appears to be waning, with migrating birds now dropping viruses all over Europe, western Asia, and Africa. An apparent new paradigm for H5N1 spread and the implications for international trade and traffic are unfolding as we watch.

Lessons Learned from Response to Emergence of West Nile Virus in the United States
Dan O'Leary, DVM, Diplomate, ACVPM, Centers for Disease Control and Prevention, USA

West Nile virus (WNV) is a neurotropic, mosquito-borne flavivirus from the Eastern Hemisphere that first emerged in the Western Hemisphere during an encephalitis outbreak in New York City in 1999. Since 1999, WNV has become established in North America where it has reemerged perennially, expanded its geographic range into the 48 contiguous United States, Canada, and Mexico, infected hundreds of mosquito and vertebrate host species, and caused regional epidemics, epizootics, and epornitics. The sudden, unplanned emergence and rapid spread of this exotic, vector-borne zoonosis required a rapid national response from human and animal health agencies. Since 2000, CDC has worked closely with state WNV surveillance specialists and other federal agencies to successfully implement standardized national WNV surveillance guidelines and ArboNET, a novel and effective internet-based surveillance platform that continuously collects and disseminates county-level surveillance data to health professionals and the public.

PRESENTATION ABSTRACTS

Session 5: Collaborative Achievements in Early Detection, Response, Surveillance (including Laboratories), Prevention, and Control

Surveillance and Control of Emerging Zoonotic Diseases Worldwide: Lessons Learned During Recent Outbreak Responses
Pierre Formenty, DVM, MPH, World Health Organization, Switzerland

In order to address the vitality of the microbial world, to detect emerging infectious diseases, to determine their potential threat to public health, and to establish effective interventions, the World Health Organization (WHO) has developed and coordinates the Global Outbreak Alert and Response Network (GOARN) which connects several surveillance networks. Some of these networks are specific to epidemic-prone diseases such as influenza, dengue, yellow fever, or meningitis. Others were especially designed to track unusual events —such as the emergence of SARS— that are naturally-occurring, accidental, or deliberately created (biological weapons, bio-terrorism). Lastly, a special effort is being made at the international level to modernize the International Health Regulations, now obsolete, and to support all the countries in the reinforcement of their outbreak alert and response capacity.

FAO/OIE/WHO: Global Early Warning System Response (GLEWS)
Juan Lubroth, DVM, PhD, ACVPM, Food and Agriculture Organization of the United Nations, Italy

OIE/FAO Animal Influenza Network (OFFLU)
Steve Edwards, DVM&S, MSc, MA, VetMB, MRCVS, Veterinary Laboratory Agency, UK

Both OIE and FAO designate international reference laboratories. These provide a core of expertise, supported by research and diagnostic activity, which can be called on to assist national laboratories and disease control authorities in the organizations' member countries. The FAO and OIE reference laboratories for avian influenza form the core of the OFFLU network, along with other centres of expertise around the world. It is further strengthened by a wider group of scientific collaborators. There is also close liaison with the WHO influenza network. OFFLU is established to facilitate exchange of information and materials between the members (e.g., RNA sequences, virus isolates, reference materials) and to provide scientific expertise in support of the global fight against this devastating epidemic.

WHO Global Salmonella Surveillance

Jaap Wagenaar, DVM, PhD, Animal Sciences Group, The Netherlands
(coauthors: Global Salm-Surv members)

The World Health Organization Global Salm-Surv (WHO GSS) is a collaborative effort of institutes and networks under the auspices of WHO. WHO GSS aims to reduce foodborne illness through enhancement of laboratory-based surveillance and outbreak response. It has 900 members in 142 countries. WHO GSS fosters communication between epidemiologists and microbiologists in food safety and veterinary and public health. WHO GSS has established five regional centers and seven training sites to help build infrastructure and capacity in their regions. WHO GSS activities include international training courses, a global proficiency test (EQAS), a Country Databank, focused projects, and an Electronic Discussion Group (EDG).

The Challenge of International Biosecurity and the OIE Standards

Alejandro A. Schudel, PhD, DVM, World Organisation for Animal Health (OIE)

Preventing the spread of disease through international trade is one of the primary objectives of the World Organisation for Animal Health (OIE). This is accomplished by establishing international standards and guidelines that facilitate trade while minimising the risk of introducing diseases. The OIE Standards are contained in the Terrestrial Animal Health Code (the Terrestrial Code) and the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (the Terrestrial Manual), and in the Aquatic Animal Health Code (the Aquatic Code) and the Manual of Diagnostic Test for Aquatic Animals (the Aquatic Manual). Since 1995 the standards developed by the OIE were formalised as international standards by the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) of the World Trade Organization (WTO). The OIE has developed and updated international standards to minimise the risk of the spread of animal infectious diseases and zoonosis though international trade. These standards included in the Terrestrial Code and the Aquatic Code considered procedures for surveillance and prompt reporting of animal diseases and zonosis outbreaks: requirements to be met for the Veterinary Services; requirements that should be met for a country or zone to be defined as free from certain animal infectious diseases and zoonosis; disease recommendations for the safe importation of animals, products, semen, and embryos; specific guidelines for surveillance; procedures for infectious agents destruction; and the general provisions that countries should meet to reduce the risk of spread of animal infectious diseases and zoonosis through trade. The Terrestrial Manual and the Aquatic Manual describe in detail the various tests and vaccines to be used in the diagnosis and control of infectious animal diseases. They provide a list of prescribed tests; these tests are required by the OIE Terrestrial and Aquatic Codes for the international movement of animals and animal products and are considered optimal for determining the health status of animals. They also contains specific Chapters on sampling methods, packaging and transport of samples, quality management of veterinary

laboratories, tests for sterility and freedom from contaminants, human safety in the veterinary microbiology laboratories, veterinary vaccine production, disinfection and inactivation procedures, and laboratory methodologies for bacterial antimicrobial susceptibility testing. Effective global biosecurity can only be achieved if all OIE Member Countries conscientiously comply with the standards and guidelines of the OIE, effectively train stakeholders, and ensure the availability of adequate human and material veterinary resources. Many countries share a common concern about the natural occurrence or deliberate misuse of pathogenic biological agents that could affect public health and food and animal production. Existing methods of disease prevention and containment, regulations, and international guidelines and standards are being extended at both national and international levels to improve the ability of countries to prevent, manage and recover from natural, accidental, or deliberate introduction of animal diseases.

Session 6: Where We Might Go from Here – Forecasting and New Technology

New Approaches to the Control of Zoonotic Diseases

Francois Meslin, DVM, PhD, World Health Organization, Switzerland

The significance of new emerging and neglected zoonotic diseases is expanding, and their health and socio-economic impacts are increasingly being experienced by many countries, particularly the developing ones. Zoonotic diseases continue to burden public health systems as well as to undermine efforts to boost the livestock industry and the production of safe foodstuffs of animal origin to satisfy national needs and exports. A change in policy and attitudes to the control of these diseases is needed, with veterinary and medical groups at all levels realizing through the understanding of VPH that cooperation will reap rewards for both people and their animals.

Risk Assessment as a Tool for the Control and Prevention of Rift Valley Fever Outbreaks

Dirk Pfeiffer, BVetSci, DVM, PhD, MACVSs, Dipl ECVPH, Royal Veterinary College, UK, *(coauthors: V Chevalier, F Roger, E Etter, ACA Clements, V Martin)*

Rift Valley fever represents an increasing threat to human health in some areas of the world, as a result of climate change, man-made environmental changes, and increased trade. Large parts of Africa are likely to be endemically infected, with outbreaks occurring subsequent to extended heavy rainfall periods associated with the El Nino phenomenon. This epidemiological pattern can be used to predict outbreak occurrence, so that risk-based disease management procedures can be implemented. Risk assessment methods provide a framework for dealing with this problem in a transparent and

scientifically sound manner. This paper will present examples of the use of this methodology by the European Union and Senegal.

Geography and Ecology of Disease Transmission: Insights from Biodiversity Data and Ecological Niche Modeling
A.Townsend Peterson, PhD, University of Kansas, USA

Biological phenomena lie behind many aspects of disease transmission—pathogens, vectors, and hosts all are species with individual ecological needs and requirements. Ecological niche modeling is a technique that uses occurrence data on these species in relation to raster GIS coverages to anticipate the potential geographic distributions of such species. The technique offers the possibility of interpolating geographic distributions when sampling is incomplete, evaluating invasive potential of species spreading across new regions, and projecting potential distributions of species over change events (e.g., climate change). Examples are given from my recent studies of Ebola and Marburg viruses, and for avian influenza.

Food Safety Risk Assessment
Francois Meslin, DVM, PhD, World Health Organization, Switzerland
(coauthor J Schlundt)

To design public health policies, data from foodborne disease tracking and from food monitoring systems need to be analyzed in combination. Microbiological Risk Assessment is designed to provide a cause-effect matrix with the objective to provide estimates of the probability of disease occurrence using the four steps of risk assessment: hazard identification, hazard characterization (dose-response), exposure assessment, and risk characterization. The integration of data within the MRA framework can also provide the basis for the attribution of foodborne disease to food groups, thereby informing specific preventive control action. Likewise, the framework constitutes a platform for international collaboration and sharing of data and tools. MRA efforts should be based on the farm-to-fork paradigm promoting integrated systems development, especially in developing countries.

CDC Global Disease Detection Initiative
Scott Dowell, MD, Centers for Disease Control and Prevention, USA

PRESENTATION ABSTRACTS

Session 7: Where Are The Solutions?

Beyond the Madness: Are We Ready for a Coordinated Approach to Emergency Management and Disaster Response?
Brian Evans, BSc Agr, DVM, Canadian Food Inspection Agency, Canada

Critical to the determination of the state of preparedness for emerging zoonoses is the recognition of the commonality of the source and the convergent factors that contribute to their evolution. Nevertheless, it is evident that while challenges do exist, progress is being made in developing a culture of shared commitment and a community of competencies among animal and public health officials in the area of emergency management and disaster response. The presentation undertakes to identify the investments being made in Canada, hemispherically and internationally, to create the appropriate environments for detection, reporting, response, and communication necessary for the protection of animal and human health and to maintain public confidence.

Decision Making in the Face of Uncertainty
John Clifford, BS, DVM, U.S. Department of Agriculture, USA

Uncertainty cannot be completely removed from decisions involving national animal health. However, by applying certain principles to the decision-making process, we can reduce uncertainty significantly. A multi-tiered approach which includes science-based risk mitigation, analysis of past events, and cooperation among agencies and stakeholders has thus far formed a solid basis for informed decision making. In the case of bovine spongiform encephalopathy (BSE), these methods include identifying specified risk materials, employing minimal risk region import policies, responding effectively to recent outbreaks, and preparing for possible disease events. We also strive for open communication among Federal agencies and cooperation among Federal, State, and local programs.

Leveraging Public-Private Partnerships to Address Emerging Zoonoses
Will Hueston, DVM, PhD, ACVPM, University of Minnesota, USA

Global reductions in public sector animal and public health workforce and resources have reduced the capacity to prevent, respond to, and control emerging zoonoses. In the face of increasing needs, public-private partnerships offer an opportunity to collaborate not only in emergency response, but also in strengthening infrastructure and workforce capacity-building. Cooperative initiatives involving food system businesses, academia, and non-governmental organizations in partnership with the OIE and UN agencies have identified opportunities to 1) promote development and implementation of science-based standards; 2) strengthen animal health and public health infrastructure; and 3) catalyze

leadership and workforce capacity-building. Collaborative efforts engaging both public and private partners increase the likelihood of long-term progress and sustainability.

The FAO/OIE GF-TADs Initiative
Joseph Domenech, DVM, Food and Agriculture Organization of the United Nations, Italy

Taking a Leap of Faith: Risk Communication
Dan Rutz, MPH, Centers for Disease Control and Prevention, USA

The emerging science of outbreak or outbreak risk communication establishes criteria including transparency, candor, and timely access to fully credible information. Keeping the public apprised of what is known, what is not known, and the process by which information is being developed builds trust and encourages compliance with recommendations or mandates. Messaging should be based on a foundation of trust in the public's capacity to cope with uncertainty and act responsibly, and should never attempt to palliate potentially dangerous situations through condescension or paternalism. Striking the appropriate balance between undue alarm and false reassurance is vital to effective risk communication. Feedback loops are essential to the process, inasmuch as effective risk communication requires responsiveness to public knowledge, attitudes, and beliefs.

SPEAKER BIOGRAPHICAL INFORMATION

Dr. Arthur is Associate Director for Global Health in CDC's National Center for Infectious Diseases. He received his PhD in virology at the Johns Hopkins School of Public Health, then joined the faculty of what is currently the Department of Molecular Microbiology and Immunology at Hopkins, working both in Baltimore and as the Head of the Virology Branch at the US Naval Medical Research Unit in Cairo where he directed research programs on arboviruses and viral hepatitis. He joined CDC in 1997 as NCID's Advisor for Emerging Diseases and was assigned to the Department of Communicable Diseases Surveillance and Response (CDS/CSR) at the World Health Organization's headquarters in Geneva with technical responsibility for surveillance and control of hemorrhagic fever virus, arbovirus, and orthopoxvirus infections. In this assignment, he actively participated in WHO's epidemic intelligence and response activities and helped coordinate activities of WHO and international field teams during outbreaks of Ebola hemorrhagic fever, Rift Valley fever, Crimean-Congo hemorrhagic fever, and other diseases. He was one of the key architects of the Global Outbreak Alert and Response Network. He returned to CDC headquarters in 2003 to lead the development of CDC's International Emerging Infections Programs. In addition to his IEIP responsibilities, he serves as a liaison with public health authorities in other countries and with international organizations in establishing collaborative programs and activities for preventing and controlling emerging infectious diseases. He has coordinated Atlanta-based CDC responses to the tsunami in Southeast Asia and to Marburg hemorrhagic fever in Angola, and led a multidisciplinary 20 person CDC/FDA team assisting the San Antonio Metropolitan Health Department in providing public health services to Hurricane Katrina evacuees. A member of several professional scientific societies, Dr. Arthur is the author of more than 60 scientific publications, book chapters, and reviews.

Dr. Ilaria Capua is currently Head of the Virology Department at Istituto Zooprofilattico Sperimentale delle Venezie, Padova, Italy, and Head of the National, FAO, and OIE Reference Laboratories for avian influenza and Newcastle disease. During her career as a veterinary virologist, her work has been recognized with her nomination as OIE and FAO expert for AI and ND. She has further been commended by the Director General of OIE for the development and validation of the "DIVA strategy" to combat avian influenza. From 1997 to the present, she has been invited to give 73 lectures as an international expert and as a guest lecturer at training courses in Europe, the US, Central and South America, Africa, and Asia. She was awarded the Houghton Lecture award in 2000. From 1990 to date, she has authored 187 publications, predominantly on viral diseases of poultry, including papers published in international refereed journals, papers and abstracts published in conference proceedings, guest editorials, reviews, and book chapters, and she has co-authored an atlas and text on avian influenza.

Dr. Darin Carroll earned his PhD in Biology from Texas Tech University. His primary area of interest is the ecology and evolution of zoonotic diseases with mammalian hosts. Currently, he is employed by ,CDC in the Division of Viral and Rickettsial Diseases' Poxvirus Program. He has participated in disease outbreak and surveillance investigations of arenaviruses, hantaviruses, Ebola, Nipah virus, and monkeypox. His research emphasis involves improving the knowledge of the ecology and evolution of viral zoonoses and their associated hosts, and identifying means of decreasing human exposure risks.

SPEAKER BIOGRAPHICAL INFORMATION

Dr. Bruno Chomel is a professor of Zoonoses at the School of Veterinary Medicine, University of California, Davis. He is also the Director of the WHO/PAHO Collaborating Center on New and Emerging Zoonoses. Dr. Chomel got his DVM (1978) and PhD (1984) degrees from the School of Veterinary Medicine and the University of Lyon, France. He also got a Master in Microbiology from the Pasteur Institute in Paris (1981) and a Master in Immunology (1982) from the University of Lyon. He served in the Epidemic Intelligence Service at CDC in Atlanta, GA, from 1985 until 1987. In 1989, he received his "Research directorship degree" (equivalent of a Doctorate in Sciences) from the University of Lyon, France, and became Professor and Infectious Diseases Department Chair at the School of Veterinary Medicine in Lyon, France. Dr. Chomel moved to California in 1990 and since then has been working on the epidemiology of zoonotic diseases, especially new and emerging zoonoses such as hantaviruses and *Bartonella* infections. He has published more than 100 peer-reviewed scientific papers in the field of zoonotic diseases and veterinary public health.

Dr. John R. Clifford is the Deputy Administrator for APHIS' Veterinary Services' (VS) program. In this position, he provides leadership for safeguarding U.S. animal health. Prior to becoming Deputy Administrator in May 2004, Dr. Clifford served as VS' acting Deputy Administrator. He was the Associate Deputy Administrator of the National Animal Health and Policy program where he led VS' efforts to protect, sustain, and improve productivity, marketability, and health of the nation's animals, animal products, and biologics. Dr. Clifford served as VS' Assistant Deputy Administrator from 1997-2002. He also has extensive field experience. Since joining APHIS in 1985, Dr. Clifford has also served as the area veterinarian in charge in Ohio, West Virginia, Michigan, and Indiana; the National Health Monitoring System coordinator in Ohio; and the brucellosis epidemiologist and veterinary medical officer in Kentucky. Before beginning his work with APHIS, Dr. Clifford was a private veterinarian in a mixed practice. He received his DVM and BS degrees in animal science from the University of Missouri.

Dr. Peter Daniels is Assistant Director at the CSIRO Australian Animal Health Laboratory in Geelong, Australia, an OIE Collaborating Centre for New and Emerging Diseases. He participated in the international team involved in the investigation and control of the Nipah virus outbreak in Malaysia in 1999, in subsequent research into the pathogenesis of Nipah virus infection in Pteropid bats and in the development and distribution of diagnostic tests and other information on how to work with and manage such dangerous zoonotic infections in the field. He has research interests in the emergence of Japanese encephalitis in Australasia and coordinates laboratory preparedness for avian influenza.

Dr. Leslie Dierauf is the Director of US Geological Survey's (USGS) National Wildlife Health Center in Madison, Wisconsin. Dr. Dierauf is a wildlife veterinarian and conservation biologist, who has worked in Federal service since 1990, first as a science advisor to the U.S. House of Representatives Merchant Marine and Fisheries Committee, then for the U.S. Fish and Wildlife Service conducting habitat conservation planning for threatened and endangered species in Texas, Arizona, New Mexico, and Oklahoma, including partner and stewardship efforts with the private sector, and now at USGS as the head of a biosafety level 3 laboratory. In late 1998, she was honored by the profession of veterinary medicine with the American Veterinary Medical Association's National Animal Welfare Award. She was also a Congressional Science Fellow (American Association for the Advancement of Science) in Washington DC in 1990. Prior to

SPEAKER BIOGRAPHICAL INFORMATION

1990, Dr. Dierauf practiced small animal emergency (nights and weekends) and marine mammal medicine (days) in northern California for 17 years. In 2001, Leslie published a second edition of *Marine Mammal Medicine*, a world-renowned, one-of-a-kind, 1,100 page textbook working with 66 contributors and 100 peer reviewers. Currently, she sits on the Consortium for Conservation Medicine's Executive Committee, the SeaDoc Society Advisory Board, the University of California – Davis's Wildlife Health Center Board, the U.S. Animal Health Association's Executive Board, the International Association of Fish and Wildlife Agencies Fish and Wildlife Health Committee, the USGS's Human Health Coordinating Committee, the U.S. Department of the Interior's Partnership and Collaboration Team, and the National Wildlife Health Center's Avian Influenza Team. She served for 8 years on the American Veterinary Medical Association's Environmental Affairs Committee, and for 8 years on the National Marine Fisheries Service's Marine Mammal Unusual Mortality Working Group, and co-founded a non-profit membership and educational group, the Alliance of Veterinarians for the Environment.

Prof. Steven Edwards is a veterinarian with career experience in virology research and in the development and application of laboratory diagnostic tests. He is currently Chief Executive of the Veterinary Laboratories Agency (VLA) in the UK, with a headquarters at Weybridge and a regional network of laboratories. The VLA is an international reference laboratory for many diseases of veterinary and public health importance, including avian influenza. Prof. Edwards is President of the OIE Biological Standards Commission, and chairs the steering committee of OFFLU (The OIE/FAO Animal Influenza Network). He is a visiting professor at the Royal Veterinary College, London, and at the Faculty of Veterinary Science, Liverpool.

Dr. Brian Evans has served as Canada's Chief Veterinary Officer for the past 8 years. He is an alumnus of the University of Guelph where he obtained a Bachelor of Science in Agriculture degree (BScAgr) in 1974 from the Ontario Agricultural College, with a major in animal science and genetics; he received his Doctor of Veterinary Medicine degree (DVM) from the Ontario Veterinary College in 1978. Following several years in private practice, he was recruited by Agriculture Canada to develop domestic and international standards for the movement of animal genetics and germplasm. With the creation of the Canadian Food Inspection Agency (CFIA) in 1997, Dr. Evans was appointed as Executive Director of the Animal Products Directorate with the responsibility for the animal-based food continuum from conception to consumption and as Canada's Chief Veterinary Officer. In 2004, in recognition of the increasing complexity and challenge of the international threat environment for animal and emerging zoonotic diseases, the stand alone office of the Chief Veterinary Officer was created reporting to the President of the CFIA. Nationally, he currently serves on the Advisory Councils of the Western College of Veterinary Medicine, the Ontario Veterinary College and the Atlantic Veterinary College in Canada. He is also a member of the steering committee for the newly announced veterinary faculty being established at the University of Calgary. At the international level, he is Canada's delegate to the 167 member country International Committee of the World Organisation for Animal Health (OIE), which is the standard setting and scientific reference body under the Sanitary and Phyto-Sanitary (SPS) Agreement of the World Trade Organisation (WTO) . He held the position of Secretary General for the OIE Regional Commission for the Americas from 2001 to 2003 and was subsequently elected to the eight-member Administrative Commission of the OIE in 2003 for a 3-year term.

SPEAKER BIOGRAPHICAL INFORMATION

Dr. Pierre Formenty is a DVM with a Master in Field Epidemiology and Pubic Health. He works for the World Health Organization (WHO) within the Global Alert and Response Team and has been involved in several outbreaks of viral haemorrhagic fevers (Ebola, Marburg, Lassa, Rift valley fever) and other emerging zoonotic diseases (monkeypox, SARS, Nipah, Chikungunya). His research interests include viral emerging zoonosis, outbreak response and epidemiological studies, Ebola, Marburg, climate change and emerging diseases, and ecological studies linked to emerging zoonosis. He has published more than 30 papers in peer-reviewed journals

Dr. Larry M. Granger currently serves as the Associate Deputy Administrator for Emergency Management (EM) in Veterinary Services (VS) within the Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA). His duties in EM include serving as the National Incident Commander as well as Leader of The National Incident Coordination Group for VS emergencies. Dr. Granger has been in his current capacity with USDA since June 2003. Before moving to his current position, he served as the Tuberculosis Program Coordinator for the State of Michigan Department of Agriculture. Prior to 2000, he worked as a Veterinary Consultant for the MDA Office of Agriculture Development; in addition, he served from 1990 to 1996 as the Pseudorabies Control and Eradication Program Leader. He began his public service career in 1988 as a field Veterinary Medical Officer (VMO) in Southern Ohio with the USDA, APHIS, VS team. Dr. Granger also spent nine years in large and small animal clinical practices after graduating from Michigan State University in 1979 with his Doctorate of Veterinary Medicine (DVM).

Dr. Will Hueston, an internationally recognized expert on bovine spongiform encephalopathy (mad cow disease), is the director of the University of Minnesota Center for Animal Health and Food Safety and a professor in the College of Veterinary Medicine and School of Public Health. In this capacity, Dr. Hueston leads a team of faculty addressing surveillance, risk analysis, and policy issues related to food-borne illnesses and emerging infectious diseases. Well known for his expertise in risk communications, Dr. Hueston works with academia, government, industry, and producers to assure that threats to our food supply are prevented and, in the worst case, detected and managed. Dr. Hueston holds a Doctor of Veterinary Medicine (DVM) degree and a PhD in epidemiology from the Ohio State University. His career has spanned both the private and public sectors, including private practice, serving as a resident veterinarian for a large agricultural cooperative, a faculty appointment at Ohio State, and senior positions in the U.S. Department of Agriculture (USDA). He has also been a visiting scientist at the Ministry of Agriculture in the United Kingdom. He served on an international panel of experts assisting Canada in evaluating their response to the emergence of BSE and also participated on the team tasked to investigate the US Washington State case. Prior to joining the University of Minnesota, Dr. Hueston was professor and associate dean for the University of Maryland campus of the Virginia-Maryland Regional College of Veterinary Medicine. In recognition of his professional achievements, Dr. Hueston has received awards from the National Academy of Practice, U.S. Department of Agriculture, the U.S. Food and Drug Administration, the American Veterinary Epidemiology Society, the National Association of Federal Veterinarians, the American College of Veterinary Preventive Medicine, the National Honorary Extension Fraternity, the Maryland Veterinary Medical Association, the Virginia Veterinary Medical Association, the Ohio Veterinary Medical

Association, the Minnesota Veterinary Medical Association, The Ohio State University Distinguished Alumni, and the Minnesota Department of Natural Resources Special Recognition Award (CWD).

Dr. Lonnie King received his Bachelor of Science and Doctor of Veterinary Medicine degrees from The Ohio State University in 1966 and 1970, respectively. He earned his Master of Science degree in epidemiology from the University of Minnesota while on special assignment with the U.S. Department of Agriculture in 1980. He also received his master's degree in public administration from American University in Washington, DC, in 1991. Dr. King has a broad knowledge of animal agriculture and the veterinary profession through his work with other governmental agencies, universities, major livestock and poultry groups, and private practitioners. Dr. King is a board-certified member of the American College of Veterinary Preventive Medicine, and has completed the Senior Executive Fellowship Program at Harvard University. He served as president of the Association of American Veterinary Medical Colleges from 1999-2000 and was the vice-chair for the National Commission on Veterinary Economic Issues from 2000-2004. Dr. King has also served as an Administrator for the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, in Washington, DC. In this role, he provided executive leadership and direction for ensuring the health and care of animals and plants to improve agricultural productivity and competitiveness and to contribute to the national economy and public health. Dr. King is currently serving in his tenth year as dean of the College of Veterinary Medicine, Michigan State University. While on leave of absence in 2005, Dr. King served as the first Director of the Office of Strategy and Innovation at CDC. He is a member of the National Academies of Science through his election into the Institute of Medicine, and is also on the Scientific Advisory Board for the FDA and a member of the newly formed Pew Commission Studying Animal Agriculture and Public Health.

Dr. Vincent Martin graduated in 1992 from the National Veterinary School of Toulouse, France, where he obtained his doctorate of Veterinary Medicine in 1993. He holds a Masters in Animal Production in tropical region as well as a post-graduate certificate in exotic diseases and epidemiology. He entered the French National School of Veterinary Services in 1993 where he studied for a year Veterinary Public Health and animal disease control and management strategies. His first working experience was in Zimbabwe at the epidemiology unit of the Central Veterinary Laboratory. His main duty was to strengthen the national disease surveillance system at the communal level using Geographical Information Systems. He then worked for two years in the French National Veterinary Services in the field of disease surveillance and disease control programs before joining the Food and Agriculture Organization of the United Nations (FAO) where he was granted several positions of increased responsibility in the area of early warning and response to disease emergencies

Dr F.-X. Meslin is presently responsible for zoonoses and Veterinary Public Health in the Department of Food Safety, Zoonoses and Foodborne Diseases at the World Health Organization (WHO) in Geneva, Switzerland. His functions include providing technical advise on the surveillance, prevention, and control of new, emerging zoonotic diseases as well as those endemic zoonoses affecting poor populations of the developing world such as rabies. He has previous experience in a variety of work settings, including technical assistance in the developing world in Asia and Africa. He is first editor of the second edition of the Laboratory techniques in Rabies

published in WHO in 1992 and was the convenor of the 8th Expert Committee on Rabies (Geneva, 1991) and of the WHO Expert Consultation on Rabies held in WHO in October 2004. He has recently authored or co-authored published articles on travellers and rabies and the re-assessement of the burden of rabies in Asia and Africa.

Dr. Dan O'Leary earned his Doctorate of Veterinary Medicine from the University of Wisconsin in 1988 and practiced as an equine and small animal veterinarian. CDR O'Leary began his career in public health in 1993, first as a US Air Force officer and for the last 8 years as an epidemiologist with the Centers for Disease Control and Prevention (CDC) where he has worked on epidemiology and prevention of Lyme disease, plague, relapsing fever, dengue, and West Nile virus. Since 2002, CDR O'Leary has worked in CDC's Division of Vector-Borne Infectious Diseases coordinating national West Nile virus surveillance efforts.

Dr. Ganesh Raj Pant received a Bachelor in Veterinary Science with first division from Rajendra Agricultural University, Patna, India, in 1982. He has worked in the Department of Livestock Services, His Majesty's Government of Nepal, since 1982. From 1982 to 1997, Dr. Pant worked as a chief at different District Veterinary Hospitals in Nepal and did diagnosis and treatment of sick animals and control of animal diseases. He passed Master in Tropical Veterinary Science in 1998 from the University of Edinburgh, UK. Dr. Pant currently is a Senior Veterinary Officer at the Central Veterinary Laboratory in Kathmandu, Nepal, and has been performing field investigation and laboratory diagnosis of animal diseases, especially diseases of public health importance such as Japanese encephalitis and avian influenza A virus, for last 3 years.

Dr. Mike Perdue is currently a senior scientist acting primarily as animal influenza liaison with the Global Influenza Programme at the World Health Organization. He received his PhD in virology from the University of Mississippi Medical Center in Jackson and held postdoctoral appointments at Duke University and the University of Minnesota. He then served on the faculty of the University of Kentucky Medical School where he performed National Institutes of Health-funded basic research on avian retroviruses, before joining the US Department of Agriculture. For 15 years, while with the USDA, he worked on avian influenza viruses at the Southeast Poultry Research Laboratory in Athens, GA, where he published scores of articles on various aspects of avian influenza virus molecular biology, molecular epidemiology, and vaccine development. Having been involved in the characterization of the first avian and human H5N1 influenza isolates that appeared in Hong Kong in 1997, Dr. Perdue has been closely following the spread and characteristics of the diseases caused by these H5N1 viruses that have now become endemic in Asian poultry and have been spread to Europe, Africa and the Middle East. Dr. Perdue recently coordinated the WHO headquarters response to the human H5N1 infections in Turkey. Thus far, this response has included coordinating with the European and Eastern Mediterranean WHO regional offices the response and deployment of some 6 WHO teams to 9 surrounding at-risk countries including Syria, Lebanon, Iran, Iraq, Egypt, Azerbaijan, Armenia, Georgia, and Romania. He has also been on WHO-sponsored assessment/assistance missions to Vietnam, China, S. Korea, and Romania since joining the Global Influenza Program.

Dr. A. Townsend Peterson is Professor in the Department of Ecology and Evolutionary Biology, University of Kansas, and Curator of Ornithology in the Biodiversity Institute, University of Kansas. His research centers on biodiversity, particularly on the ecological and evolutionary

determinants of species' geographic distributions, and has included many aspects of disease transmission such as geographic and ecological distributions of Ebola and Marburg viruses, likely filovirus reservoirs, and dengue mosquito activity.

Dr. Dirk U. Pfeiffer holds a Dr.Med.Vet. (Giessen, Germany), PhD (Massey University, New Zealand), and MACVSc. Diplomate of European College for Veterinary Public Health. He is Professor of Veterinary Epidemiology at the Royal Veterinary College, University of London, London, United Kingdom. His research interests include application of risk assessment to disease control policy development, development of decision support tools for disease control, spatial aspects of epidemiological investigations, as well as the epidemiology of diseases such as bovine tuberculosis, brucellosis, Rift Valley fever, and avian influenza.

Dr. Charles E. Rupprecht is currently the head of the rabies program at CDC, and Director of the World Health Coordinating Centre for Reference and Research on Rabies, and has been involved with both of these organizations since 1993. He received a BA in Ecology from Rutgers College, New Brunswick, New Jersey; MS in Zoology from the University of Wisconsin, Milwaukee, WI; VMD degree from the University of Pennsylvania, School of Veterinary Medicine, Philadelphia, PA; and a PhD in Biological Sciences from the University of Wisconsin, Milwaukee, WI. He has also served as an Expert Technical Advisor, Rabies, World Health Organization, 1990-present; Consultant, National Association of State Public Health Veterinarians, Inc., The Compendium of Animal Rabies Control Committee, 1993-present; and a Member, National Working Group on Prevention and Control of Rabies in the USA, 1993-99.

Dan Rutz has a MPH and serves as Special Assistant for Communications to the Director of the National Center for Infectious Diseases (NCID), Centers for Disease Control and Prevention (CDC), in Atlanta, Ga. His primary focus is emerging infectious diseases and bio-terrorism issues. In addition to serving as a communications lead for outbreak response, Rutz is involved in developing risk communications strategy as an integral component of crisis preparedness.
Prior to joining CDC in 2002, Rutz served (on-air) as Sr. Medical Correspondent and Managing Editor for the CNN domestic and international television and radio networks for 18 years.

Dr Esther Schelling has a DVM in epidemiology of Newcastle Disease in Switzerland and a PhD on the health of nomadic pastoralists and their livestock in Chad from the Swiss Tropical Institute (STI). She recently joined the International Livestock Research Institute (ILRI) in Kenya as a joint appointment scientist of ILRI and STI. Her current research interests include the identification and testing of cost-effective control strategies for zoonoses to preserve the health and livelihoods of small-scale livestock producers and of consumers of livestock products.

Dr. Alejandro A. Schudel is Head of the Scientific and Technical Department, at the World Organisation for Animal Health (OIE), in Paris, France. A graduate of the School of Veterinary Sciences at the Universidad Nacional de la Plata, in Argentina (1965), he holds a Magister Scientiae in Animal Pathology (Universidad Nacional de la Plata, Argentina, 1968) and a post-doctoral training in Argentina, USA, and Switzerland.

Dr. Jaap Wagenaar is an expert is the field of microbiological food safety and veterinary microbiology. He got his DVM and PhD from Utrecht University, the Netherlands. He worked at the USDA National Animal Diseases Center in Ames, IA, US, and the Animal Health Service in

the Netherlands until 1996, when he started his research group at the Animal Science Group, in Lelystad, the Netherlands, focusing on food safety and, in particular, on *Campylobacter*. In 2000, he became active in WHO-Global Salm-Surv, as a Steering Committee member, trainer in international training courses, and chair of the Laboratory Subcommittee. From September 2004 - March 2006, he has been on sabbatical leave working at WHO (Geneva, Switzerland, and Tsunami-area Indonesia), CDC (Atlanta, GA, US), and USDA (Albany, CA, US). In May 2005, he became Head of the OIE-reference laboratory for *Campylobacter*. In January 2006, he was appointed as chair of the Clinical Infectious Diseases at the Vet School, Utrecht University, the Netherlands.

Dr Linfa (Lin-Fa) Wang is a Senior Principal Research Scientist at the CSIRO Australian Animal Health Laboratory (AAHL), and a project leader in the Australian Biosecurity Cooperative Research Centre (AB-CRC) for Emerging Infectious Diseases. Dr Wang is a member of the WHO SARS Scientific Research Advisory Committee and participated in the WHO-FAO-Chinese Government joint mission to China on animal reservoir of the SARS-CoV and potential transmission to humans in August 2003. His current research focuses on emerging zoonotic viruses of bat origin, including SARS coronavirus, Hendra and Nipah viruses. Dr Wang completed his science degree in 1982 at the East China Normal University, Shanghai, followed by a PhD in Biochemistry (Molecular Biology) from the University of California, Davis, USA in 1986, where he went on to become a Postdoctoral Research Fellow with the Department of Biochemistry. After moving to Australia in 1989, Dr Wang spent 18 months working at Monash University and then joined CSIRO in1990. Dr Wang has more than 120 scientific publications to his name along with four patents and numerous conference abstracts. He is currently serving on four editorial boards for publications in the areas of virology, biotechnology and immunotechnology.

Dr. Jakob Zinsstag studied Veterinary Medicine in Berne, and then worked in rural practice and did post doctoral research on trypanosomiasis at the Swiss Tropical Institute. From 1990 through 1993, he led a livestock helminthosis project for the University of Berne at the International Trypanotolerance Centre in The Gambia. From 1994 to 1998, he directed the Centre Suisse de Recherches Scientifiques in Abidjan, Côte d'Ivoire. Since 1998 he has led a research group on the interface of human and animal health at the Swiss Tropical Institute in Basel. He holds a PhD in Tropical Animal Production from the Tropical Institute of Antwerp, Belgium, and has been Assistant Professor in Epidemiology since 2004. His main interests are to validate and foster the "one medicine" of Calvin Schwabe towards a "one health" concept by 1) trans-sectoral epidemiological models and economic analyses of zoonoses in developing countries and 2) the development of integrated human and animal health services for nomadic pastoralists.

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