出國報告（出國類別：開會）

赴新加坡參加第十屆流感防治大會（**OPTIONS X for THE CONTROL OF INFLUENZA**）

服務機關：衛生福利部疾病管制署
姓名職稱：新興傳染病整備組 技正 陳沛蓉
派赴國家：新加坡
出國期間：108 年 8 月 27 日至 9 月 2 日
報告日期：108 年 9 月 30 日

目次

壹、目的

國際流感及呼吸道病毒學會（The International Society for Influenza and Other Respiratory Virus Diseases, ISIRV）為成立於 2005 年的非營利組織，組成成員包含全球各國之科學家、臨床醫師及公共衛生學專家，該組織致力於促進流感等呼吸道病毒疾病的控制、預防、檢測和治療，除了規劃推動相關研究外，亦不定期舉辦各種教育訓練及交流。

流感防治大會（Options for the Control of Influenza）係由 ISIRV 所舉辦的國際會議之一，為流感領域中最重要的國際會議，每三至四年始召開一次，今年在新加坡新達城國際會議中心舉行，邀集全球傳染病、病毒學家、公共衛生和流行病學等領域專業人員及專家參與。會議為期五天，議題包含流感臨床科學、流感病毒學與發病機制、公共衛生、醫療保健政策及流感大流行的整備規劃等多個主題，透過包括會前工作坊（Pre-Conference workshop）、特別演講（Special Session）、全體會議（Plenary Session）等活動進行分享及交流。

參加由國際流感及呼吸道病毒學會舉辦之流感防治大會，瞭解流感預防、控制和治療之各國經驗、新知，以及政策觀點，可作為我國未來流感疫苗接種政策規劃之參考。

貳、過程

一、行程

本次出國行程共 7 天，含 5 天會議（8 月 28 日-9 月 1 日）以及來回 2 天路程。會議地點位於新加坡新達城國際會議展覽中心（Suntec convention and exhibition centre, Singapore），研討會位於展覽中心 4 樓演講廳，海報展示以及廠商商品展示位於 4 樓演講廳外側。

日期	工作日誌	地點	行程內容
108/08/27	啟程、抵達	新加坡	路程、抵達
108/08/28~108/09/01	會議	新加坡	研討會
108/09/02	返程	新加坡→台北	路程

二、議程

8 月 28 日至 9 月 1 日會議議程詳見附件。

三、重要報告摘述

本會議共歷時五天，除第一天為特別演講和開幕演講及最後一天為閉幕演講以外，每天早上 8 點半開始全體會議（Plenary Session）主題包括疫苗、流感大流行嚴重程度評估、病毒學、WHO 願景及方法，上午 10 點半至下午 6 點再就病毒學和發病機制、臨床科學、疫苗效益、流感共患感染、流感醣生物學、流感監測與預測、開發通用流感疫苗、優化疫苗策略、感染免疫學、特殊族群臨床方面、細胞分子生物學、禽流感和人畜共患流感、感染嚴重程度、宿主病原體相互作用、熱帶地區的流感、預防和控制季節性流感的政策觀點、病毒複製、模擬人類感染模型的研究挑戰、流感大流行防治和應對的政策觀點、流感病毒演化與人類生態學、嚴重的流感疾病、疾病負擔、非人類流感病毒、非藥物控制方式、血清流行病學、新出現的流感病毒、流行病學和傳播動力學等約 30 個主題，在同時段三個演講廳每廳安排 10-15 位專家或研究者進行專題演講/發表口頭報告，晚上 6 點-7 點半為海報展示，本次會議共有超過 800 篇海報分別安排在 4 天展示，內容相當多元豐富，因無法同時參加不同主題會議，就與本組相關流感防治、流感疫苗與抗病毒藥劑等主題的相關新知內容摘要分述如下。

(一)流感防治

1.新加坡準備和管理突發公共衛生事件的資源

Senior Minister of State, Ministry of Health and Ministry of Transport, Singapore / Dr. LAM PIN MIN 開幕演講指出新加坡作為一個全球貿易和旅遊中心，極易受到新興和再浮現傳染病的影響，2003 年新加坡面臨嚴重 SARS，2009 年面臨 A 型 H1N1 流感大流行，最近在 2016 年面臨 Zika，今年早些時候，新加坡遇到了第一例境外移入的猴痘病例，衛生部聯合多個利害相關方迅速做出反應，降低傳播並確保公共衛生不受損害。

新加坡為加強傳染病預防及管理的能力，2018 年建立了國家傳染病中心（National Centre for Infectious Diseases, NCID）取代原有百年歷史的傳染病中心，並於 2019 年正式啟用，該中心除了原有的傳染病臨床治療和疾病爆發管理的職責，還設有國家公共衛生和流行病學部門、國家公共衛生實驗室、傳染病研究與訓練辦公室及抗生素抗藥性辦公室等。該中心設有 330 個床位專門用於大型傳染病爆發時收治病患，並可擴展至 500 個床位，該中心最大的特色之一是設有第一個新加坡最先進的高級隔離單位（High Level Isolation Units, HLIU）內有 4 間高級隔離病房及 1 間臨床支持實驗室，可從病床取得病人的樣本後，直接進入化驗室進行隔離包裝，再送到該大樓生物安全三級（BSL3）實驗室檢驗，免去以往病人樣本要送到院外檢驗，減少樣本污染的可能性，HLIU 配備先進的工程控制技術、訓練有素的員工以及嚴格的 SOP，可安全收治如伊波拉（Ebola）等高傳染性、高死亡率的疑似或確診病例。NCID 另一項特色是為所有工作人員、訪客、病患提供即時定位系統（Real-Time Location System ,RTLS），訪客進入 NCID 前必須領取定位器，以追蹤他們在大樓內與哪些病患接觸；當與有病患近距離接觸，病患手腕上的定位器會記錄下對方的身份，病患擅自離開病房也會啟動警報；除了追蹤人與人之間的接觸（接觸的定義為 2 公尺內接觸 5 分鐘以上），

RTLS 還可以監控員工的手部衛生狀況，如果醫護人員在接觸病患前後雙手沒有消毒，胸前的定位器就會嗶嗶叫，另外定位器也裝在床和輪椅等設備上，能在第一時間避免傳染病疫情擴散。

國際合作對加強全球衛生安全非常重要，因此每個國家都必須加強自身的大流行防治，這些努力有助於建立全球抵抗公共衛生事件威脅的群體防禦能力。講者提到作為對 IHR（國際衛生條例，International Health Regulation）承諾的一部分，新加坡在 2018 年參加了 JEE（國際衛生條例聯合外部評核, Joint External Evaluation），客觀地評估了該國管理公共衛生事件威脅的能力以及確認需要改進的方向，這對新加坡來說是一次非常寶貴的學習經驗，講者表示很高興新加坡的評核結果在 19 個領域中有 18 個獲得好成績。

另外在全球合作方面，新加坡有國家公共衛生實驗室協助疫情調查、國家流感監測計畫定期報告流感病毒的分佈和流感病毒的遺傳特徵，以及新加坡指定國家流感中心協助全球流感監測和應變，也為 WHO 合作中心提供病毒分離株。

在流感研究方面，新加坡的研究機構，如科技與研究機構（A * STAR）、新加坡國立大學、杜克國立大學醫學院和南大帝國學院醫學院等，目前致力於了解流感免疫學、流感傳播和控制措施的研究，未來將持續發展流感相關研究，如提高疫苗效力和提高疫苗接種率等，並開發新的解決方案來應對流感未來的威脅。

2.WHO 未來十年全球流感戰略

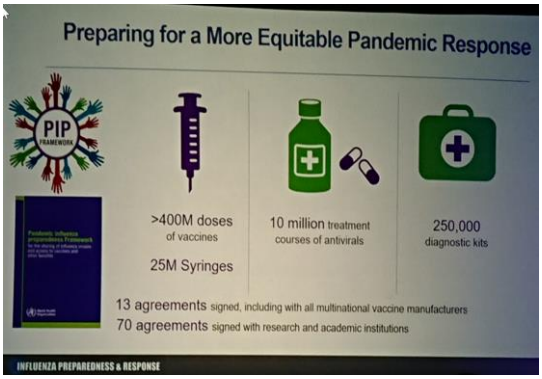
World Health Organization, Switzerland/ Dr. Ann Moen 說明流感依然是世界最大的公共衛生挑戰之一，每年全球估計有 10 億流感病例，其中 300-500 萬為重症病例，導致 29-65 萬流感相關死亡病例，因此 WHO 建議每年接種流感疫苗是預防流感最有效的方法，接種疫苗對於流感併發重症的高危險群和衛生保健人員特別重要。

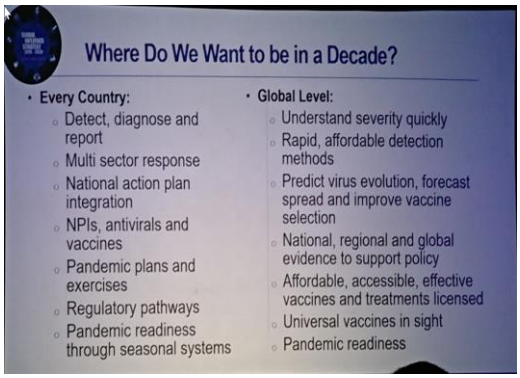
講者指出 2019 年 3 月更新的全球流感新戰略(Global Influenza Strategy for 2019-2030）是 WHO 為流感所制定最全面性和最具影響力的戰略，該戰略概述如何通過加強常規規劃為大流行做好準備,該戰略有兩個總體目標，第一個目標是在疾病監測、預防、控制及防治方面需要加強國家能力，為此，WHO 要求每個國家都需制定符合自己國家所需的流感防治規劃，以促進國家和全球的流感防治及公共衛生安全，第二個目標是為流感的預防、發現、控制和治療開發更好的工具，例如更有效的疫苗、抗病毒藥物和治療方法，目標是使所有國家都能獲得。

講者認為強化流感的預防、控制和防治的整備能力，可以提高整個衛生領域的核心能力，從國家層面來著手和國家自主決策，對於確保國家流感防治規劃的持續性具關鍵性及重要性，而這些規劃包含更大幅度加強衛生系統和流感大流行防治的投資，並認為流感大流行的威脅始終存在，新流感病毒從動物傳播給人類並可能導致大流行的持續風險是真實存在的，問題不是會不會再次發生流感大流行，而是什麼時候發生，我們必須保持警惕並做好準備，因為重大流感疫情的成本遠遠超過預防的價格，並強調國家必須通過常規計畫做好準備，而不是只是等待緊急疫情發生然後才準備。

因此，WHO 確實需要協助各國加強流感防治常規計畫，以利各國建立流感及其他新興傳染病防治整備的能力，為提高各國對大流行潛在威脅的

整備能力，WHO 也將擴大夥伴關係，增進全球流感防治工具的研究、創新和取得，使所有國家受益。



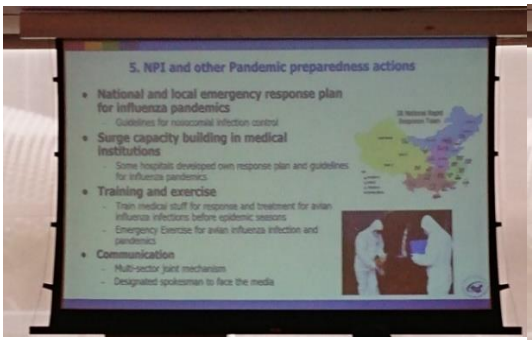


3.中國流感防治的國家準備計畫及現況

中國 CDC Dr. Lei Zho 演講指出東亞和東南亞被視為是未來流感大流行的熱點，也是科學家研究關注的焦點，特別是中國，中國渴望並努力為全球公共衛生和科學進步做出貢獻，中國在經歷 2013 年 3 月爆發人感染 H7N9 禽流感疫情，造成中國大陸 1,536 人感染發病， 611 人死亡，致死率近 40%，雖然 H7N9 病毒尚未獲得人與人間持續的傳播能力，但其高致死率及國際關注程度仍然為中國帶來極大挑戰。

為此，中國開展多項因應措施，如建立由衛生行政部門領頭，包括農業等多個部門在內的聯防聯控機制、針對活禽市場展開永久關閉、季節關閉及劃定限制區、針對活禽調運的檢疫措施、針對活禽養殖的疫苗接種措施、針對大眾的衛教宣導等措施。此外，為早期發現病例，當局展開相關監測、強化風險評估、強化與 WHO/美國 CDC 等國際夥伴的溝通，包括訊息通報、病毒株共享等，另為提升中國對於流感大流行因應和準備的能力，中國也訂有「國家流感大流行應急預案」，將流感大流行的整個過程劃分成 3 階段：對應準備階段、應急響應階段和恢復評估階段，從方案制定、疫苗準備、藥物儲備、應急物資與基金、風險評估、信息通報等 9 大項目對流感大流行整備作業進行規範。

然而，雖然當局已建立相關的規範，但在 2017-2018 年流感季冬季爆發流感疫情時，疫情高峰仍讓醫院收治病患超過負荷，以及部分城市出現抗病毒藥物緊缺情況，均突顯出醫療資源儲備和分配的不足，另外長期流感疫苗接種率低及嚴重院內交叉感染，也突顯出長期以來中國流感防治存在的問題，另外中國的版圖與城鄉差距極大，各省市地方自治區的文化、制度、習慣、人民收入差異大，都增加了中國 CDC 推動疾病防治的挑戰，以及近年中國 CDC 體系人員流動率高、穩定性不足也是新面臨的問題。因此，中國對應流感大流行的整備工作還有很多努力空間。

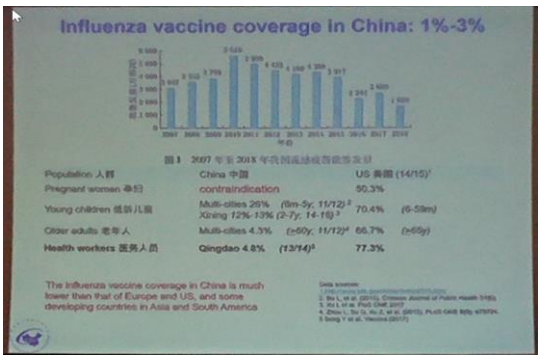


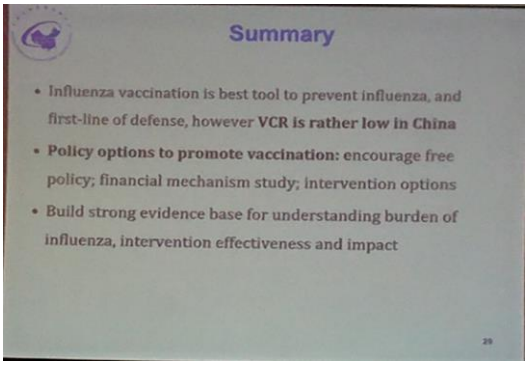
(二)流感疫苗

1.國家接種計畫推動經驗

(1)中國季節性流感疫苗政策制定與實施

中國 CDC Dr. Luzhao Feng 演講指出流感疫苗在中國是乙類疫苗屬於自費自願接種，每年平均接種率僅 1%~3%，遠低於歐美的接種率，接種族群包含孕婦、兒童、老人及醫事人員，接種率低的原因包括公眾對流感和流感疫苗認知不足、醫療人員極少推薦、接種服務可近性和費用等因素。為積極推動流感疫苗接種工作，降低流感對民眾的健康危害和經濟負擔，中國 CDC 正採取多項綜合政策措施，包括鼓勵免費接種政策、採用不同籌資方式和機制、提高重點族群的接種意願和接種率、改進接種服務的公平性和效率、提升醫事人員和民眾對於流感和流感疫苗的認識、推動臨床醫生對流感疫苗預防接種建議的推薦、加快預防接種工作體系的建立、加強新型流感疫苗研發支持力度，加快新型流感疫苗上市應用等。





(2)中國加速流感疫苗引入國家預防接種計畫規劃面臨的挑戰

Fudan University, China /Dr. Hongjie Yu 演講指出流感疫苗引入中國國家預防接種計畫的挑戰在於民眾對於預防流感並不重視，當務之急是提高高危險群的接種率，他認為政府應提供季節性流感疫苗接種的公共衛生政策和財政支持，講者進一步探討中國季節性流感疫苗接種政策推動困境及接種率無法提升的原因包括多項，疫苗價格高，季節性流感疫苗在中國成

人接種的價格約為 9-15 美金，這等於或高於很多地區的平均日工資，很多老人都不願意去接種流感疫苗，但有趣的是研究發現價格因素並不會影響家長攜帶兒童接種疫苗的意願，這反映出中國社會對兒童醫療保健投資意願較高，對老人醫療保健投資意願較低，另外接種率的城鄉差距極大。

接種便利性不足，在許多城市不鼓勵甚至禁止在學校或工作場所進行大規模疫苗接種，民眾只能在診所或醫院指定的接種地點接種疫苗，運輸成本、等待時間和休假時間都產生相當大的成本。

民眾缺乏意識，民眾對感冒與流感的差異無法了解，另外，由於流感病毒極易突變導致疫苗效益不佳，部分醫護人員甚至認為接種疫苗無效，醫護人員缺乏對每年接種流感疫苗的認知更不用說推薦給民眾、假疫苗事件讓中國消費者擔心疫苗安全和副作用，媒體對疫苗接種不良事件的報導也進一步引起民眾的恐慌。

受政府預算的限制，中央政府不太可能在短期內向所有目標族群免費提供流感疫苗，在中國醫療保健體系內不同的衛生政策議題之間相互競爭優先性，在中國的情況是治療性醫療仍然比預防性醫療具有更高的政策優先性，治療性藥物被認為是更好的政治投資。

本土流感/疫苗研究證據力不足，無法量化當地疾病負擔和缺乏高品質的研究分析，雖然先進國家在季節性流感疫苗有效性等方面已發表許研究，然而中國政策制定者往往需要更多當地證據來做出決定，儘管中國對老人或兒童接種流感疫苗的有效性已進行了一些研究，研究結果也顯示流感疫苗在老人和兒童的有效性是有益的，但是存在研究品質、樣本數和在同一個地方進行多年連續性研究等研究限制性的問題，普遍來說在中國仍然相當缺乏高品質、跨區域或系統性的流感疫苗相關研究。

另外講者提到與中國北方城市相比，廣東省的亞熱帶城市的流感模式明顯不同，另外中國目前僅採用 WHO 北半球流感病毒株建議組成之季節

性流感疫苗，這些疫苗可能無法對中國南方城市流行的流感病毒提供全面保護。

(3)韓國國家流感接種計畫推動經驗

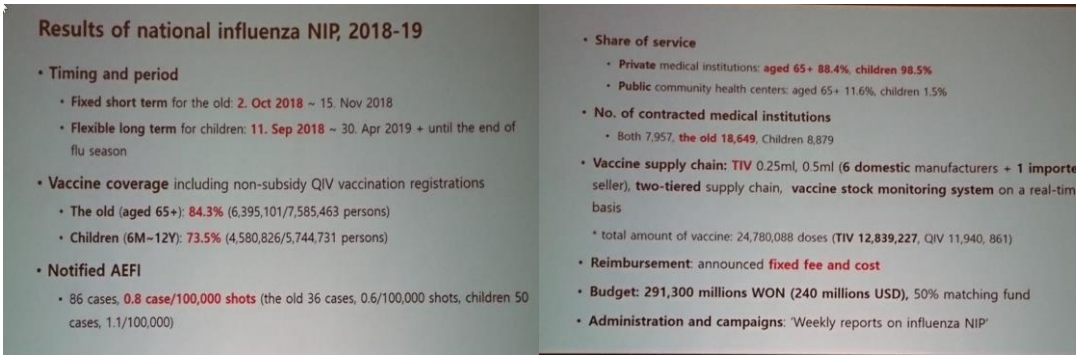
韓國 KCDC Dr. Kong Insik 演講指出韓國 65 歲以上老人接種率 84.3%是 2018-2019 年流感季 OECD 國家評比中最高的，可歸因韓國國家流感預防接種計畫（National Immunization Program, NIP for influenza）推動的成功。韓國國家流感預防接種計畫開始於 1997 年，一開始是為低收入老人接種的臨時計畫，至 2005 年擴及至為 65 歲以上老人免費接種流感疫苗，2015 年將老人的流感疫苗轉由私人醫療院所接種後，65 歲以上老人流感疫苗接種率（下稱老人接種率）高達 80%，講者提到韓國老人接種率也不是一開始就這麼高，1997 年當初由公共衛生單位為老人免費提供流感疫苗接種，但因等待時間長、接種不方便、安全問題，以及老人不太喜歡團體接種導致老人接種率低，後來改善接種可近性、便利性和安全性後， 老人接種率就從 2014-2015 年流感季的 73%增加到 2015-2016 年流感季的 80.9%，特別是 85 歲以上老人接種率增加最明顯，提升約 13%，顯示由私人醫療院所提供疫苗接種服務對於老人接種率的提升是一個相當成功的策略。

韓國國家流感預防接種計畫幾項重點策略是疫苗接種完全免費，包含醫師的費用、掛號費、疫苗費、疫苗注射相關耗材費；接種服務由合約私人醫療院所（5 年合約）及公共衛生中心提供，比例為九比一，沒有集體接種；接種前需由醫師評估；經費由國家財政補助（regional and local government 以 5 比 5 比例分攤）；NIP 的管理結構是由 KCDC、provincial/city public safety units 和 city/district/county public health units 共同組成，公共衛生單位（public health units）的職責確定疫苗需求、執行疫苗接種計畫、記錄和報告疫苗接種狀況和疫苗接種不良事件，公共安全單位（public safety

units）的角色為監督公共衛生單位的接種成果、對疫苗接種不良事件進行流行病學調查並將結果報告給 KCDC， KCDC 的角色是管理疫苗供應和登記、審查疫苗接種不良事件的流行病學調查結果，並提供補償。

韓國流感疫苗公費接種對象接種期間也不太一樣，以 2018 年為例，提供老人接種流感疫苗的時間是固定且短暫的從 2018 年 10 月 2 日到 2018 年 11 月 15 日大約一個半月、提供幼兒接種流感疫苗的時間是長期且彈性的從 2018 年 9 月 11 日到 2019 年 4 月 30 日（或至流感季結束）大約六個半月。2018 年老人接種率（包含自費接種四價）為 84.3%、6 個月至 12 歲兒童流感疫苗接種率為 73.5%，接獲疫苗不良事件通報 86 件，平均每十萬劑注射通報數約為 0.8 件。接種地點方面，老人的接種地點以私人醫療院所接種為主占 88%、12%的老人在公共衛生中心接種，幼兒方面也是以私人醫療院所接種為主占 98.5%。疫苗供應方面，韓國疫苗生技產業蓬勃發展，較不受國際疫苗供貨短缺因素影響，提供的公費流感疫苗為三價，由韓國國內六家疫苗製造廠及一家國外疫苗廠供應，每年提供國人的三價及四價流感疫苗約 2,500 萬劑，每年流感疫苗總預算約 240 millions 美金，沒有財政障礙（no financial barrier）。

儘管韓國老人接種率很高，但疫苗的有效性仍低，未來的挑戰有，最大化疫苗效益包括採用四價流感疫苗、佐劑流感疫苗或高劑量流感疫苗、制定流感疫苗接種對象補助優先順序、預測及應變疫苗供應鏈、強化疫苗效益調查的網絡能力（VE network capacity）以及對於疫苗接種不良事件調查應變的風險溝通。



(4)英國兒童流感疫苗接種計畫使用 LAIV 的經驗

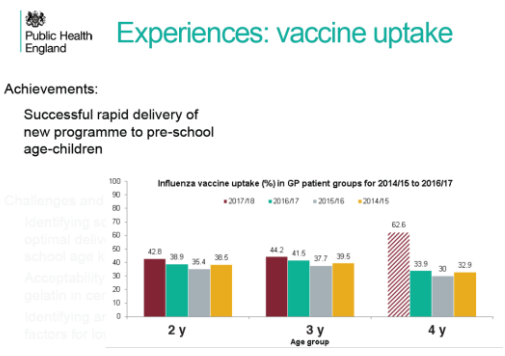
英國 PHE/ Dr. Richard Pebody 演講指出 2012 年英國疫苗和預防接種聯席委員會（The Joint Committee on Vaccination and Immunisation ,JCVI）建議應將國家季節性流感計畫(Seasonal Influenza Programme)擴展至兒童族群，並建議 2-16 歲兒童使用當時剛拿到許可證的鼻噴劑型活性減毒流感疫苗（LAIV），於是 2013 年英國 PHE 開始實施兒童流感疫苗接種計畫（The National Childhood Flu Immunisation Programme），當年先向所有 2-3 歲兒童及一些試辦地區（pilot areas）的國小學生提供 LAIV，爾後每年逐步擴增兒童年齡層，直到 2019-2020 年流感季兒童流感疫苗接種計畫已包括所有 2-10 歲的兒童（包含幼兒園和國小一至六年級學生）、2-17 歲有健康狀況的兒童（如糖尿病、氣喘、心臟病或肺部、腎臟、肝臟疾病等）。

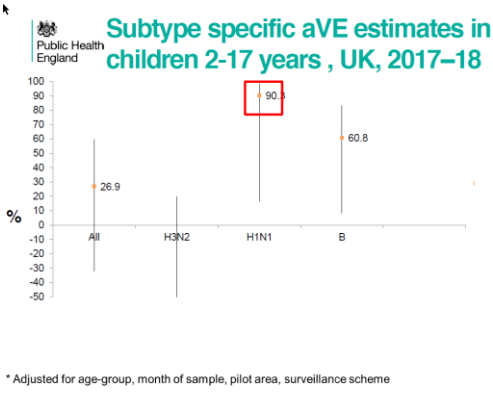
在提供兒童流感疫苗種類部分，英國提供兩種流感疫苗，第一種為鼻噴劑型活性減毒流感疫苗（Live Attenuated Influenza Vaccine, LAIV），第二種為不活化流感疫苗(Inactivated Influenza Vaccine, IIV)，英國兒童以接種 LAIV 為主，如有 LAIV 接種禁忌症不適合接種者才選擇接種 IIV。在接種地點方面，2-3 歲的兒童在一般診所（General Practice, GP）接種，國小學生在學校接種，少部分地區的國小學生會在初級保健機構（Primary Care Settings）接種，另外講者提及在家接受教育的兒童，只要符合接種年齡，也可免費接種流感疫苗。

在疫苗效益部分，講者指出 LAIV 已在美國和部分歐洲國家使用，幾項

LAIV 在兒童的研究均顯示 LAIV 較 IIV 更具效益，一般而言 LAIV 對兒童有效性高達 80-90%以上，且 LAIV 已被證實安全有效。然而，2016 年美國 ACIP 公布 2015-2016 年流感季 2-17 歲兒童接種 LAIV 有效性的數據，發現 LAIV 對於流感病毒 A 型（H1N1）在兒童中有效性只有 3%，鑑於對 LAIV 有效性的顧慮，CDC 把 LAIV 從 2016-2017 年流感季流感疫苗推薦名單中移除，同年英國 JCVI 審查了所有英國和其他國際證據，與美國不同的是，雖然 LAIV 對於流感病毒 A 型（H1N1）有效性較低，但是整體來說 LAIV 的有效性是好的，特別是對流感病毒 B 型，因此，英國 JCVI 建議英國兒童流感預防接種計畫繼續使用 LAIV，隔年英國評估 2017-2018 年流感季 2-17 歲兒童接種 LAIV 有效性的數據，對流感病毒 A 型（H1N1），LAIV 有效性高達 90.3%，對流感病毒 B 型有效性為 60.8%。

在接種率部分，2014-2015 年至 2017-2018 年流感季 2 歲、3 歲、4 歲兒童接種率分別為 38.9%、40.7%、39.9%，2016/17 流感季國小學生接種率平均為 55.4%(其中國小一年級接種率為 57.6%、國小二年級接種率 55.4%、國小三年級接種率 53.3%)。講者認為 LAIV 以鼻孔噴霧給藥不用打針具有很大的優勢，對怕打針的兒童來說鼻孔噴霧給藥快速且無痛，LAIV 幾乎沒有副作用，最常見的副作用是接種疫苗幾天後出現流鼻水症狀。英國的經驗 LAIV 能提升兒童接種流感疫苗的意願，且比 IIV 更具效益，非常推薦在兒童流感疫苗接種計畫中使用 LAIV。



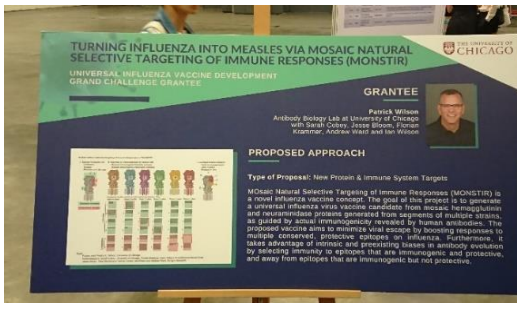


* Adjusted for age-group, month of sample, pilot area, surveillance scheme

2.通用/新型流感疫苗

(1)現行流感疫苗的限制

World Health Organisation, Switzerland/ Dr. Martin Friede 演講說明流感季來臨前接種一劑流感疫苗，是目前預防流感的最有效方法，然而目前全球流感疫苗發展面臨重大挑戰，流感疫苗明顯表現不佳，流感病毒突變快速，當新突變的流感病毒出現後，原有的流感疫苗就會失去保護力，WHO 每年都根據對下一個季節流感病毒流行株的預測結果，提出全球流感疫苗株的建議組成，全球疫苗廠根據 WHO 的預測結果，重新生產當年的流感疫苗，但流感病毒突變快速，對於流行病毒株的預測非常困難，這樣研發出來的季節性流感疫苗有效性大約 20~60%，預測病毒株與實際流行病毒株不符，是季節性流感疫苗效果不佳的原因之一，因此研製一種可對抗所有流感病毒，且無需每年接種的通用流感疫苗，成為全球科學家的迫切希望。此外目前流感疫苗每年需重新接種一次，疫苗生產需長達 6 個月以上的製備期以及長達兩年龐大的全球流感監測資料收集分析、全球流感病毒實驗室協同合作等準備期，都是造成全球季節性疫苗接種的障礙，特別在中低收入國家，中低收入國家能獲得的疫苗最多只能提供部分或最小部分的民眾保護，非常明顯，季節性流感疫苗在公共衛生需求上尚未得到滿足。

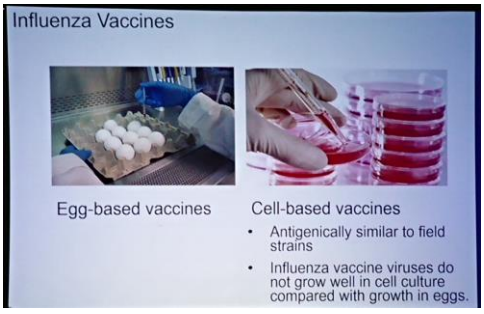


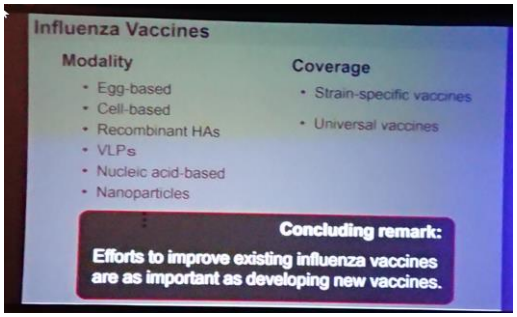
University of Wisconsin-Madison, USA and University of Tokyo, Japan/ Dr. Yoshihiro Kawaoka 演講說明高科技基因技術為 H3N2 病毒在雞蛋培養（egg base）中生長緩慢且易於變異的問題提供了新的解決方案和希望。由 A 型

流感 H3N2 病毒為主要流行的流感季通常對老人、慢性疾病患者造成嚴重的疾病，講者提及流感疫苗的作用是使人類免疫系統具有識別環境中流感病毒的能力，進而可以抵抗感染，但是在疫苗生產過程中常發生病毒突變導致免疫系統反應不足，因此限制疫苗製作過程中病毒突變對於生產效果良好的疫苗來說很重要，美國 Wisconsin 大學開發一種新細胞系，在新的基因編輯工具的幫助下能對疫苗株中 H3N2 病毒有更好的匹配進而改善疫苗效益，講者說 H3N2 病毒在雞蛋、部分細胞系中生長不好，例如 Mandin-Darb（MDCK），2005 年他在東京大學的研究小組修改了 MDCK 細胞，稱為 AX4 細胞，AX4 細胞因可以包含更多人類受體而讓 H3N2 病毒生長更好，但病毒仍然容易突變。

這次講者和他的研究小組使用 CRISPR-Cas9 基因編輯工具，透過加強呈現人類病毒受體和降低禽流感病毒受體（overexpress human virus receptors and reduce avian virus receptors）來修飾 MDCK 細胞，稱為 hCK 細胞，hCK 細胞更能模擬人類上呼吸道中的細胞，與 MDCK 細胞和 AX4 細胞相比，H3N2 病毒在 hCK 細胞中生長更快更好，而且發現 H3N2 病毒在 hCK 細胞生長過程中不太發生突變，進而提高疫苗株中 H3N2 病毒匹配的機率。

講者認為這一發現在公共衛生和疫苗生產中非常重要，美國衛生研究院（National Institutes of Health, NIH）對於使用 hCK 細胞培養 H3N2 病毒相當感興趣，他也已將新細胞系提供給 NIH 並已申請專利，他認為現在研究一窩蜂在研發通用/新型流感疫苗，但是努力改善現有疫苗與發展新疫苗一樣重要。





(2)通用/新型流感疫苗的研究發展

University of Michigan School of Public Health, USA/ Dr. Arnold Monto 演講指出儘管目前的流感疫苗具有安全性和有效性，但疫苗技術和開發需要改進，講者談到了疫苗供應、生產和開發的國內外問題，他認為能夠儘早辨識病毒，就病毒傳播方式有更好的風險溝通，以及對更好的技術是非常關鍵的。基於講者在美國的經驗，大部分的疫苗在第二波流行的高峰期才能獲得，如果較早期提供疫苗，那將會產生很大的不同。疫苗生產技術也正在普及，像墨西哥、巴西、印度和印尼等國家也有能力產製疫苗，如果開發中國家的疾病負擔需求被證實，講者認為他不會擔心開發中國家的疫苗使用量，反而關注使用哪一種疫苗以及如何試圖解決目前使用疫苗的缺陷。對於流感疫苗的未來講者有四大期許，在某些人群中有更好的有效性、涵蓋更多的流感病毒株、更快的疫苗生產方式和更好的因應突發需求量能（surge capacity）。對於流感疫苗開發的短期方法，講者建議應優先考慮基於細胞培養的平台和水包油佐劑（oil-in-water adjuvants），流感疫苗開發的長期方法應考慮新型疫苗技術和交叉保護策略。

NIAID Dr. Barney Graham 說明對流感病毒研究越多，就越能意識到人類對流感病毒認知甚少，現行疫苗效益不佳除了病毒變異所造成的原因以外，另一個原因則與原始抗原效應（Original Antigenic Sin, OAS）有關，當免疫系統遇到某種病毒後，會產生相對應的抗體，但若這種病毒發生變異再次攻擊免疫系統，免疫系統仍然會產生對應第一次遇到病毒的抗體，因而減弱免疫系統對變異病毒的防禦效果，這就稱為 OAS。為了進一步研究 OAS，美國國家過敏和傳染病研究所（National Institute of Allergy and Infectious Diseases, NIAID） 於 2019 年資助研究計畫，該研究計畫大規模對嬰兒進行長達 7 年的追蹤，觀察嬰兒首次罹患流感對後續免疫反應的影響，研究人員將從嬰兒出生開始進行長期追蹤，以釐清早年留下的 OAS 會對嬰兒未來

應對不同流感病毒的抵抗能力產生何種影響，這也可能是研發通用流感疫苗的思路之一，因為這樣的疫苗能比現行流感疫苗提供更多的保護。另外，講者提及研發通用流感疫苗可能不得不摒棄現在流感疫苗研發針對的 H 抗原和 N 抗原，因為 H 抗原和 N 抗原容易突變，科學家發現這些抗原的莖部（Stem）通常不太容易變化，這讓「莖部」這個位置成為通用流感疫苗誘發抗體的理想標的物。

許多全球科學家正努力加快通用流感疫苗的問世，包含研發流感病毒殼變異性較小的 M2 蛋白成分的 M2e 通用流感疫苗、研究血凝素（HA）的通用流感疫苗（如美國喬治亞州立大學和賽諾菲巴斯德公司研究的疫苗）、或是研究多肽的通用流感疫苗（如默克公司研究的疫苗）。依 2018 年 NIAID 資料顯示， 18 個研究團隊在臨床前發展階段（Preclinical Development）、4 個研究團隊在臨床試驗階段（Phase I-II），尚未有上市的通用流感疫苗，通用流感疫苗的研究還有很長的路要走，研究者需要加快步伐。

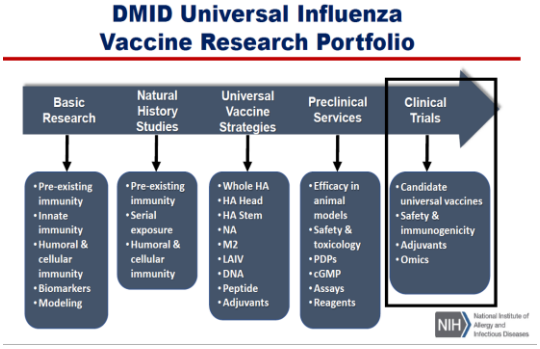
目前的好消息是研發進度最快的以色列 Ness Ziona 的 BiondVax 製藥公司所開發和生產的 Multimeric-001 （M-001）通用流感疫苗，宣布由二期臨床試驗邁入三期，M-001 通用流感疫苗係由美國 NIH 所贊助研發， M-001 通用流感疫苗並不含病毒，但包含了幾乎所有 A 型和 B 型流感病毒共有的 9 種抗原，是透過基因工程重組技術進行純化製備，這也是全球首例宣布進入三期臨床試驗的通用流感疫苗，預計將在 2020 年揭曉三期臨床試驗結果。

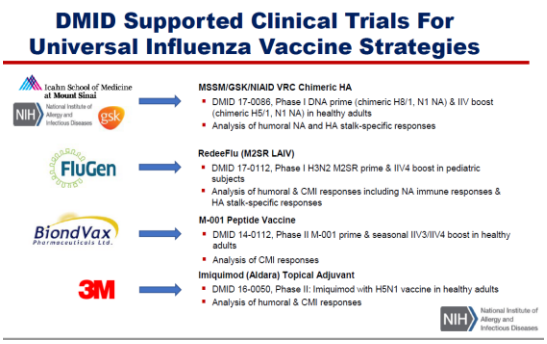
(3)推動通用流感疫苗研發

Bill & Melinda Gates Foundation, USA/ Dr. Padmini Srikantiah 演講中宣布美國蓋茲基金會先前宣布投入 1200 萬美金，專門用於通用流感疫苗研發，諸多項目中的佼佼者有機會獲得最高 200 萬美金的資金支持計畫，今日會議將公布獲選 7+1 個研究團隊名單，講者提及蓋茲一直關注流感大流行對低收入國家造成的危險，這些國家通常不使用流感疫苗，並且幾乎沒有希望能在大流行中購買任何流感疫苗，蓋茲希望真正激發在普及流感疫苗的問題上創新性的工作，講者分析現行在普及流感疫苗的問題上有兩大陣營，一大陣營正在漸進式尋求使流感疫苗提供更廣泛保護的方法，包含開發更廣泛保護力的候選疫苗，但這並不是開發一種可以預防所有流感病毒的疫苗，儘管這些方法背後有些技術適用於通用流感疫苗。另一個陣營正在研究如何設計一種能夠抵禦大自然中存在的所有流感病毒的流感疫苗，在流感病毒突變時不需要經常更新，蓋茲基金會決定補助第二陣營用於更基礎的研究工作，蓋茲基金會透過廣徵全球好手，期待全球科學家以所有方式有效驅動或利用免疫反應的非傳統方法開發通用流感疫苗，目標在 2021 年開始臨床試驗。

NIH Dr. B Kanta Subbarao 說明在通用流感疫苗的研發資金贊助部分，除了美國蓋茲基金會投入 1200 萬美金，其實美國 NIH 早在 2017 年斥資超過 6000 萬美金，NIAID 今年也將有 1.6 億美金用於通用流感疫苗的研發，因此對科學家和疫苗廠商來說，通用流感疫苗的吸引力無限大。但是為何研發通用流感疫苗需要不斷花錢，主要因為通用流感疫苗的研發涉及到各種不同的設計、製備策略、需要進行篩選和優化、疫苗還需要細胞/動物/臨床試驗等不同環節的驗證，每一個步驟都是相當花錢的。另外為了推動通用流感疫苗的研發 2018 年 2 月 NIAID 發布了通用流感疫苗戰略計畫（A Universal Influenza Vaccine: The Strategic Plan）概述 NIAID 的研究重點，著重

於三個具體的研究領域，同時也促進對流感免疫的基本知識，並藉由研究工作來推動通用流感疫苗的發展。





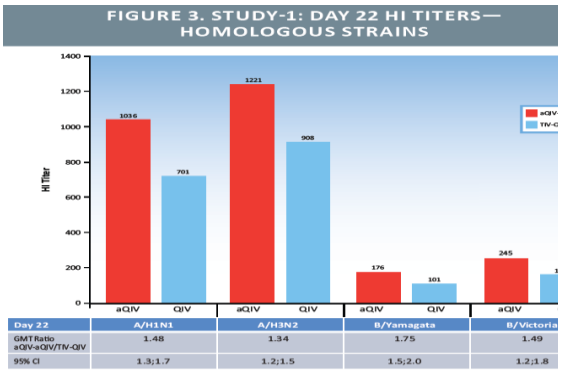
3.佐劑型/高劑量流感疫苗

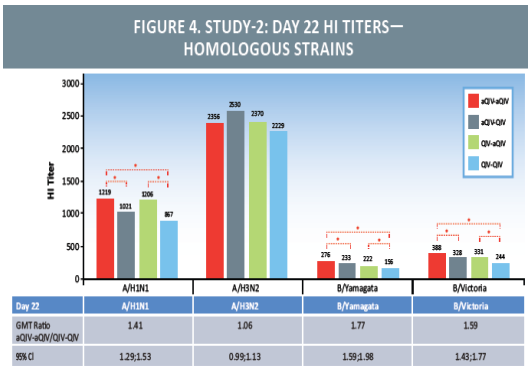
(1)MF59 佐劑型流感疫苗在曾接種疫苗兒童之免疫原性研究

University of Tampere Medical School, Vaccine Research Center, Tampere, Finland / Dr. Timo Vesikari 演講指出 6 歲以下兒童的流感疫苗效益不佳（40-60%），特別是 6-23 個月的幼齡兒童，為了加強幼兒接種流感疫苗效益，該公司開發的含佐劑 MF59 三價流感疫苗（MF59-adjuvanted trivalent influenza vaccine, aTIV）及四價流感疫苗（MF59-adjuvanted quadrivalent influenza vaccine, aQIV）在臨床試驗中已證實能增加兒童的抗體濃度，但再次接種 aQIV 對先前曾接種疫苗的兒童的免疫原性和安全性的影響尚未得到評估。講者說明他一共做了兩個研究，第一個研究收集了 607 名美國和芬蘭的兒童，分成 2 組，第一組第 1 年接種 aQIV，第 2 年接種 aQIV、第二組第 1 年接種不含佐劑三價流感疫苗（non-adjuvanted trivalent influenza vaccine, TIV），第 2 年接種不含佐劑四價流感疫苗（non-adjuvanted quadrivalent influenza vaccine, QIV）；第二個研究收集了 1,601 名芬蘭，泰國和菲律賓的兒童，分成 4 組，第一組第 1 年接種 aQIV，第 2 年接種 aQIV，第二組第 1 年接種 aQIV，第 2 年接種 QIV，第三組第 1 年接種 QIV，第 2 年接種 aQIV，第四組第 1 年接種 QIV，第 2 年接種 QIV，評估第 1-7 天的兒童接種免疫原性及第 1-366 天疫苗安全性。

第一個研究結果顯示與接種不含佐劑流感疫苗的兒童相比，用 aQIV 再次接種對四種流感病毒（A/H1N1、A/H3N2、B/Yam、B/Vic）能產生更高的 HI titer，第二個研究結果顯示與接種不含佐劑流感疫苗的兒童相比，用 aQIV 再次接種對三種流感病毒（A/H1N1、B/Yam、B/Vic）能產生更高的 HI titer，在安全性的部分，儘管與不含佐劑型流感疫苗相比，非嚴重的不良事件發生率略有增加，但 aQIV 再次接種後引起的嚴重不良事件發生率與初次接種後相似，講者認為在 18 個月至 6 歲的兒童再次接種使用 aQIV 仍然有利。

研究結果支持使用 aQIV 對幼兒進行年度疫苗接種。





(2)高劑量三價流感疫苗在老人的疫苗效益比較

Leslie Dan School of Pharmacy, University of Toronto,Canada / Dr. Jason Lee 研究指出老人罹患流感是嚴重的公共衛生問題，評估接種流感疫苗在老人族群中能發揮的效果是很重要的，他的研究是首篇使用系統性文獻回顧和 meta 分析（systematic review and meta-analysis）的方法，利用隨機和觀察研究評估老人接種高劑量三價流感疫苗（High-Dose Inactivated Trivalent Influenza Vaccine, HD-IIV3）和標準劑量三價流感疫苗（Standard-Dose Inactivated Trivalent Influenza Vaccine, SD-IIV3）在流感的相關臨床結果之差異。研究結果發現，接種 HD-IIV3 在預防流感（可能或實驗室確診流感）的相關臨床結果方面的效果比 SD-IIV3 更好，包含能降低類流感（Influenza-like illness, ILI）、流感住院、肺炎住院、心肺疾病住院、全原因住院等項目。即使排除觀察性研究的結果，老人接種 HD-IIV3 在預防流感的相關臨床結果也比接種 SD-IIV3 更有效，包含能降低 ILI、肺炎住院和全原因住院等項目。研究支持在 65 歲以上族群常規使用高劑量流感疫苗。

Table 2. Pooled relative vaccine efficacy or effectiveness of HD-IIV3 versus SD-IIV3 against influenza-related outcomes.

Clinical outcome	Pooled relative vaccine efficacy or effectiveness[a] (95% CI)	*p*-Value
All studies *(Observational + Randomized Studies)*		
Influenza-like illness	19.5% (8.6–29.0)	<0.001
Influenza hospitalization	17.8% (8.1–26.5)	<0.001
Pneumonia hospitalization	24.3% (13.9–33.4)	<0.001
Cardiorespiratory hospitalization	18.2% (6.8–28.1)	0.002
All-cause hospitalization	9.1% (2.4–15.3)	0.009
Post-influenza mortality	22.2% (−18.2 to 48.8)	0.240
All-cause mortality	2.5% (−5.2 to 9.5)	0.514
Randomized studies only[b]		
Influenza-like illness	24.1% (10.0–36.1)	0.002
Pneumonia hospitalization	27.3% (15.3–37.6)	<0.001
All-cause hospitalization	11.9% (2.0–20.7)	0.019
All-cause mortality	4.9% (−6.5 to 15.1)	0.381

CI: confidence interval.
[a]A random-effects model with DerSimonian–Laird estimators was used to calculate the pooled ORs across multiple studies and influenza seasons.
[b]Includes both individual-level randomized and cluster-randomized studies.

4.熱帶地區流感疫苗接種頻率的策略探討

(1)熱帶地區老人每半年打一次流感疫苗保護力研究

National Centre for Infectious Diseases, Singapore/ Dr. Barnaby Young 演講指出流感疫苗的設計主要是應對南半球或北半球進入冬季時出現的流感，但在新加坡等熱帶國家，除了 12 月至 2 月和 6 月至 8 月流感疫情有明顯波峰外，國人全年都可能罹患流感，因此有必要重新檢視老人接種流感疫苗的頻率。研究找來 200 名來自樂齡活動中心的 65 歲以上老人，參與為期 1 年的試驗，將老人隨機分成「一年接種組」及「半年接種組」。

研究結果顯示在第 7 個月，在半年接種組中，對於流感病毒 A 型（H1N1）抗體濃度（HI titer ≥1：40）增加了 21.4%，但是對於流感病毒 A 型（H3N2）或流感病毒 B 型則無顯著差異，另外如果測量 GMT，在第 7 個月，在半年接種組中，對於流感病毒 A 型（H1N1）和流感病毒 A 型（H3N2）抗體濃度均顯著增加，但對於流感病毒 B 型則無顯著差異。另外在流感臨床相關結果方面，半年接種組在接種後 6 個月內 ILI 發生率顯著降低（相對疫苗有效性 57.1%）。安全性方面，在半年接種組和一年接種組中，不良事件的發生頻率相似。整體來說老人接種流感疫苗 6 個月後抗體濃度和疫苗有效性均下降，可能需要每年進行兩次的疫苗接種，以便在熱帶地區這種全年都有流感流行的地區提供全年保護，講者並建議當局替代國家當前疫苗接種策略，與談人也與講者討論推行一年接種兩次流感疫苗接種實務的可行性與面臨極大的挑戰。

M	A/H1N1						A/H3N2						B					
	GMT			HI ≥1:40 (%)			GMT			HI ≥1:40 (%)			GMT			HI ≥1:40 (%)		
	Annual	6-monthly	p-value	Annual	6-monthly	p-value	Annual	6-monthly	p-value	Annual	6-monthly	p-value	Annual	6-monthly	p-value	Annual	6-monthly	p-value
7	35.7 (28.8-44.4)	63.9 (52.7-77.4)	<0.001	60.0 (50.0-69.3)	81.4 (72.6-87.9)	0.003	174.0 (141.1-214.6)	238.7 (195.3-291.8)	0.030	94.7 (88.3-97.8)	99.0 (94.4-99.8)	0.116	104.1 (90.7-119.5)	114.8 (104.2-126.3)	0.248	97.9 (92.6-99.4)	100 (96.2-100)	0.244
12	25.4 (20.3-31.7)	31.5 (25.9-38.2)	0.152	43.0 (33.4-53.2)	54.6 (44.7-64.2)	0.114	153.6 (127.9-184.4)	164.1 (133.7-201.3)	0.618	97.9 (92.5-99.4)	97.9 (92.8-99.4)	1	95.5 (83.3-109.6)	90.3 (81.1-100.6)	0.752	96.8 (90.9-98.9)	97.9 (92.8-99.4)	0.678

	Annual n (%)	Semiannual n (%)	RR	NNT	*P* Value
Respiratory infections					
ARI	33 (34.7)	19 (19.6)	0.564 (0.346–0.920)	6.6 (3.6–36.2)	**.021**
ILI	16 (16.8)	7 (7.2)	0.429 (0.185–0.994)	10.4 (5.3–185.1)	**.047**
Unscheduled healthcare visits					
Outpatient	26 (27.4)	12 (12.4)	0.452 (0.243–0.843)	6.7 (3.8–25.5)	**.011**
Hospital attendance[a]	15 (15.8)	10 (10.3)	0.653 (0.309–1.380)	18.2 (6.7–∞)	.289
Due to respiratory infection	3 (3.2)	0 (0)	0.140 (0.007–2.673)	31.9 (14.1–∞)	.191

Abbreviations: ARI, acute respiratory infection; IRI, influenza-like illness; RR, relative risk; NNT, number needed to treat.

[a]Includes either emergency department visits or hospitalizations.

(2)熱帶地區接種策略成本效益評估

National University of Singapore/ Dr. Mu Yue 演講指出熱帶地區的流感流行與有流感高峰流行的地區相比，熱帶地區流感全年流行，疫情呈現多峰也難預測，因此，開發了一個流感傳播的數理模型，模擬研究熱帶/亞熱帶地區最佳疫苗接種時間，並評估在新加坡、臺北和東京三個國家/城市最佳疫苗接種頻率的成本效益。該模型模擬人類接觸網絡，提出 3 種疫苗接種策略：（1）每年接種一定比例的老人，（2）一年兩次接種一定比例的老人，（3）每年接種所有老人和接種其他年齡組的一部分人。

研究結果顯示在新加坡以固定的流感疫苗接種率來看，「一年兩次接種一定比例的老人」比「每年接種一定比例的老人」產生較高的遞增成本效果比（Incremental Cost-Effectiveness Ratio, ICER），使得「一年兩次接種一定比例的老人」比「每年接種一定比例的老人」較不具成本效益。「每年接種所有老人和接種其他年齡組的一部分人」的策略無論在新加坡/台北/東京都是三個策略中最具成本效益的策略，這一發現在不同年度的流感季中是一致的。另外講者提及新加坡願意支付價格（Willing to pay, WTP）為$52,961/健康生活品質校正生命年（Quality-adjust life-year, QALY），因此「每年接種一定比例的老人」及「每年接種所有老人和接種其他年齡組的一部分人」兩種策略都具有成本效益，但「一年兩次接種一定比例的老人」則不具成本校益。總體來說無論是熱帶地區的新加坡、亞熱帶地區的台北或是溫帶地區的東京採用「每年接種所有老人和接種其他年齡組的一部分人」的接種策略都是三個策略中最具成本效益的選擇，該研究支持新加坡老人流感疫苗接種的重要並提供接種策略決策參考。

Singapore				
Strategy	**Coverage (%)**	**Incremental cost (million US dollars)**	**QALY gains**	**ICER ($000/QALY)**
Annual, elderly only	20	0.04 (0.02-0.05)	0.66 (0.39-0.92)	53.90 (30.81-97.06)
	40	0.06 (0.05-0.07)	1.55 (1.28-1.82)	38.20 (28.61-50.00)
	60	0.10 (0.08-0.11)	2.17 (1.91-2.43)	44.18 (36.78-52.86)
	80	0.15 (0.13-0.16)	2.52 (2.25-2.79)	57.97 (50.65-66.55)
	100	0.18 (0.16-0.19)	3.28 (3.02-3.54)	53.67 (48.19-59.83)
Biannual, elderly only	20	0.08 (0.06-0.09)	0.82 (0.56-1.08)	92.48 (66.40-139.09)
	40	0.17 (0.15-0.18)	1.38 (1.13-1.64)	119.18 (98.49-148.59)
	60	0.25 (0.24-0.27)	1.94 (1.68-2.20)	130.72 (114.09-152.12)
	80	0.33 (0.31-0.34)	2.85 (2.59-3.11)	114.28 (103.80-126.69)
	100	0.41 (0.40-0.42)	3.48 (3.23-3.74)	117.78 (108.86-128.03)
Annual, all elderly and a proportion of other age groups	20	-1.89 (-1.90 to -1.88)	40.14 (39.90-40.38)	Cost saving
	40	-3.03 (-3.04 to -3.02)	64.35 (64.14-64.56)	Cost saving
	60	-3.53 (-3.54 to -3.52)	75.05 (74.85-75.25)	Cost saving
	80	-3.79 (-3.79 to -3.78)	81.18 (80.99-81.36)	Cost saving
	100	-3.91 (-3.92 to -3.90)	84.90 (84.71-85.08)	Cost saving

Taipei seasonality				
Strategy	**Coverage (%)**	**Incremental cost (million USD)**	**QALY gains**	**ICER ($000/QALY)**
Annual, elderly only	20	0.03 (0.01-0.05)	0.73 (0.40-1.05)	40.40 (17.14-83.92)
	40	0.07 (0.06-0.09)	1.16 (0.84-1.48)	63.26 (44.75-92.48)
	60	0.11 (0.09-0.12)	1.80 (1.47-2.13)	59.88 (47.34-76.61)
	80	0.15 (0.13-0.16)	2.30 (1.98-2.62)	64.15 (53.82-77.09)
	100	0.18 (0.17-0.20)	2.91 (2.58-3.24)	62.86 (54.63-72.68)
Biannual, elderly only	20	0.08 (0.06-0.09)	0.80 (0.47-1.13)	95.52 (63.04-168.12)
	40	0.17 (0.15-0.18)	1.29 (0.97-1.62)	130.16 (101.61-176.51)
	60	0.25 (0.23-0.26)	2.06 (1.73-2.39)	119.04 (100.98-143.42)
	80	0.34 (0.32-0.35)	2.52 (2.20-2.84)	133.70 (117.55-154.21)
	100	0.42 (0.41-0.44)	3.12 (2.80-3.44)	135.77 (122.34-152.51)
Annual, all elderly and a proportion of other age groups	20	-1.98 (-1.99 to -1.96)	41.88 (41.56-42.20)	Cost saving
	40	-3.12 (-3.13 to -3.10)	65.90 (65.6-66.19)	Cost saving
	60	-3.62 (-3.64 to -3.61)	76.69 (76.41-76.97)	Cost saving
	80	-3.81 (-3.83 to -3.8)	81.64 (81.36-81.92)	Cost saving
	100	-3.89 (-3.9 to -3.87)	84.29 (84.02-84.57)	Cost saving

Tokyo seasonality				
Strategy	**Coverage (%)**	**Incremental cost (million US dollars)**	**QALY gains**	**ICER ($000/QALY)**
Annual, elderly only	20	0.02 (0.00-0.04)	0.94 (0.60-1.28)	21.67 (3.95-45.88)
	40	0.07 (0.05-0.09)	1.29 (0.95-1.62)	53.75 (37.60-77.82
	60	0.10 (0.08-0.11)	2.05 (1.70-2.39)	47.42 (37.07-60.55)
	80	0.13 (0.12-0.15)	2.63 (2.30-2.97)	20.98 (42.73-60.90)
	100	0.17 (0.15-0.19)	3.25 (2.91-3.58)	52.38 (45.47-60.41)
Biannual, elderly only	20	0.09 (0.07-0.10)	0.65 (0.31-1.00)	130.98 (81.51-227.84)
	40	0.16 (0.15-0.18)	1.47 (1.12-1.81)	112.29 (88.45-149.47)
	60	0.25 (0.24-0.27)	2.04 (1.69-2.39)	124.18 (104.47-151.36)
	80	0.34 (0.32-0.35)	2.76 (2.42-3.09)	121.56 (107.17-139.62)
	100	0.40 (0.39-0.42)	3.73 (3.39-4.08)	108.29 (98.19-120.25)
Annual, all elderly and a proportion of other age groups	20	-2.12 (-2.14 to -2.10)	45.04 (44.72-45.35)	Cost saving
	40	-3.55 (-3.57 to -3.54)	74.92 (74.63-75.21)	Cost saving
	60	-4.28 (-4.30 to -4.27)	89.95 (89.69-90.21)	Cost saving
	80	-4.57 (-4.58 to -4.55)	96.57 (96.30-96.85)	Cost saving
	100	-4.66 (-4.67 to -4.64)	99.61 (99.35-99.86)	Cost saving

ICER indicates incremental cost-effectiveness ratio; QALY, quality-adjusted life year.

5.疫苗保護力/特殊族群研究

(1)流感住院的嬰兒人數至少被低估 2 倍

美國 CDC Dr. Mark Thompson 演講指出嬰兒流感的疾病負擔並不像大齡兒童那樣廣泛研究，大多數研究將嬰兒視為 0-2 歲或 5 歲以下的兒童。但是，嬰兒與大齡兒童不同，嬰兒特別容易產生流感併發症，因此分開研究嬰兒特別重要，講者指出有近三分之一罹患流感的嬰兒在出院時沒有被診斷出急性呼吸道疾病，為確定當前監測系統可能低估流感併發重症的嬰兒數，CDC 研究人員和全球合作在四個中等收入國家（阿爾巴尼亞、約旦、尼加拉瓜和菲律賓）招募了近 2,000 名住院嬰兒，研究人員在入院時收集嬰兒咽喉/鼻咽拭子及血液樣本，然後在 3-4 週後再次採血，以分子檢測及血清學檢測確認流感感染，研究發現當僅使用分子檢測結果時，大約 40%流感感染的嬰兒被遺漏，如合併考慮呼吸診斷和分子檢測，則嬰兒的流感相關住院率被低估 2.6 倍，講者指出如果 1 歲以下流感住院的嬰兒真實人數確為先前估計的兩倍，這將大幅增加全球兒童流感疾病負擔的估計，並對孕/產婦和兒童接種疫苗計畫的預防價值產生深遠影響，特別是在流感疫苗資金和公共衛生基礎設施可能面臨更多挑戰的中低收入國家，可能會對其政策決定產生重大影響。此外，研究再次強調監測系統所估算的流感疾病負擔往往只是流感真實世界冰山的一角，例如美國 CDC 在 2017-2018 年流感季接獲報告 187 例兒童因流感相關的死亡事件，但 CDC 使用數學模型推估，該季兒童流感相關死亡的實際人數接近 600 例，幾乎是現有報告機制的三倍，講者強調任何數量的嬰兒和兒童罹患嚴重流感併發症都是悲劇，最佳方法就是每年接種流感疫苗，對於年齡小於 6 個月而無法接種流感疫苗的嬰兒，強調孕婦接種流感疫苗的重要性以保護母親和嬰兒，研究支持孕婦、6 個月及上嬰兒接種流感疫苗的重要性。

(2)免疫功能低下者接種流感疫苗的重要性

University Health Network, Canada/ Dr. Deepali Kumar 說明免疫功能低下者接種季節性流感疫苗的重要性。講者認為免疫功能低下的人罹患流感並產生併發症的風險很高，這些人群包括器官移植、造血幹細胞移植、癌症、惡性血液疾病和接受生物製劑治療的自體免疫疾病患者，講者分享了該族群流感感染的影響以及疫苗有效性和免疫原性的證據。總體而言，免疫功能低下者因流感引起的下呼吸道疾病很常見，但其接種疫苗有效性很低，但儘管如此，接種流感疫苗已證明可有效減少嚴重疾病，並嘗試各種改善流感疫苗效益的策略，包括在同一年流感季節中接種兩次疫苗、使用佐劑和高劑量流感疫苗。鑑於免疫功能低下者接種流感疫苗效益不佳，可以透過照顧這群人的家庭成員、護理人員和醫療保健專業人員進行疫苗接種，以間接保護免疫功能低下者，另外衛生保健專業人員提供接種建議是免疫功能低下者流感疫苗接種率提升的重要因素。

(三)抗病毒藥劑

1.流感抗病毒新藥 Xofluza （baloxavir marboxil）介紹

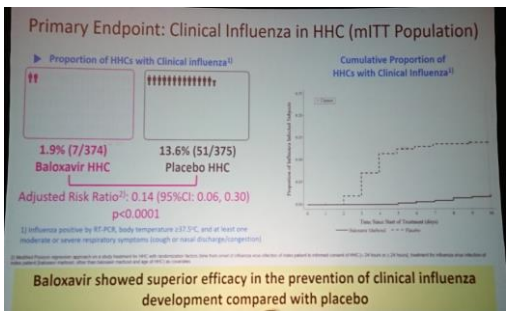
Shionogi & Co., Ltd., Japan/ Dr. Takeki Uehara 介紹流感抗病毒新藥 Xofluza。Xofluza 是一種單劑量的口服藥物，可治療多種流感病毒的感染包含 oseltamivir-resistant strains and avian strains （H7N9、H5N1），與目前可用的流感抗病毒藥劑作用機轉不同，Xofluza 的作用機轉在抑制對病毒複製非常重要的流感核酸內切酶（cap-dependent endonuclease）以抑制流感病毒 RNA 複製。Xofluza 目前在日本被批准用於治療兒童、青少年和成人 A 型和 B 型流感，2018 年 10 月已在美國批准用於治療 12 歲以上急性無併發症的流感患者，在流感症狀出現 48 小時內使用，常見的副作用為腹瀉、支氣管炎、噁心、鼻咽炎和頭痛等，講者提及本次會議將公布 Xofluza 兩個三期臨床試驗的結果（包括 BLOCKSTONE 及 MINISTONE-2），整體來說 Xofluza 在幾個族群中（包含 otherwise-healthy, high-risk, children）無論是治療流感或暴露流感後的預防性投藥均有效，另外該公司也正在進行另一項有關 1 歲以下嬰兒及流感重症住院患者的三期臨床試驗，以評估減少流感傳播的可能性。Xofluza 是由日本鹽野義製藥（Shionogi & Co., Ltd.）研發，後來與羅氏集團（包括美國的 Genentech）合作進一步開發和商業化。

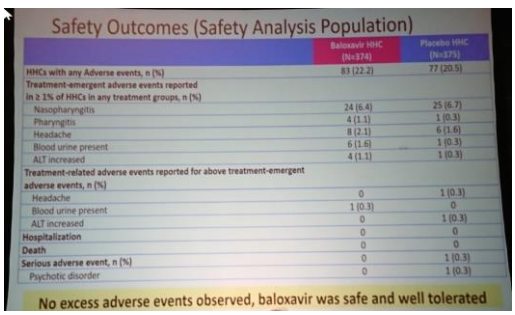
講者提及日前日本東京國立感染症研究所（NIID）發現六種對 Xofluza 具抗藥性的病毒株，這個問題其實在臨床試驗階段就已被發現，當時在後期測試階段，發現近四分之一的兒童身上發現帶有對 Xofluza 具抗藥性的病毒，但是該藥在美國上市後尚無出現抗藥性的報告，美國 Genentech 認為這些病毒株當時在 FDA 的定義下不算是抗藥性，而是藥效較弱（reduced susceptibility），不過講者也指出應該進行更多的研究來檢視這些病毒突變株的傳播力和危險性，也正在瞭解 Xofluza 對於全球流感流行病學的影響，呼籲醫師謹慎用藥。

2.Xofluza 三期臨床試驗（BLOCKSTONE）結果

Ricerca Clinica Co., Japan/ Dr. Hideyuki Ikematsu 說明 BLOCKSTONE 三期臨床試驗的研究結果。BLOCKSTONE 是一項 III 期、隨機、暴露後預防的研究（phase III, randomised, placebo-controlled, post-exposure prophylaxis study），評估與罹患流感的患者共同生活的家庭成員（成人和兒童）使用單劑量 Xofluza 與安慰劑相比預防流感的效果。該研究由日本鹽野義製藥在日本 2018-2019 年流感季進行，參與者是與罹患流感的患者共同生活的家庭成員，其隨機接受單劑量的 Xofluza 或安慰劑，研究主要終點評估家庭成員流感病毒檢測陽性且發燒的比例，以及第 1-10 天之間家庭成員有一種或多種呼吸道症狀的比例，次要終點是評估臨床療效、藥物動力學、安全性和耐受性。

研究結果顯示使用 Xofluza 進行預防性投藥可顯著降低同住家庭成員罹患流感 86%的風險，使用 Xofluza 預防性投藥的家庭成員只有 1.9%罹患流感，而安慰劑組則有 13.6%罹患流感。而且，在預防不同亞型的 A 型流感中，相比於安慰劑組，Xofluza 預防性投藥組均表現出統計學上顯著差異，此外，在流感高危險的家庭成員及更容易罹患流感的未滿 12 歲兒童的家庭成員中也觀察到這種差異。Xofluza 預防性投藥組的不良事件發生率為 22.2%，而安慰劑組為 20.5%，沒有嚴重不良事件的報告。研究支持 Xofluza 在健康人、流感高危險群及兒童中無論是症狀治療或是預防性投藥都有益處。

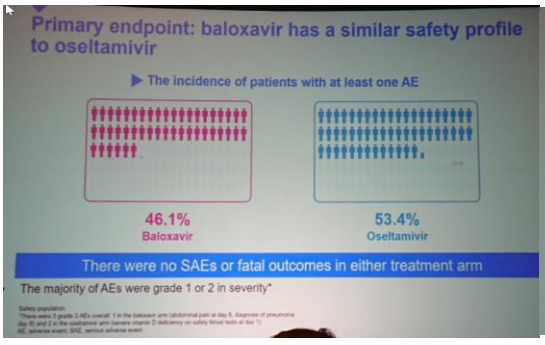


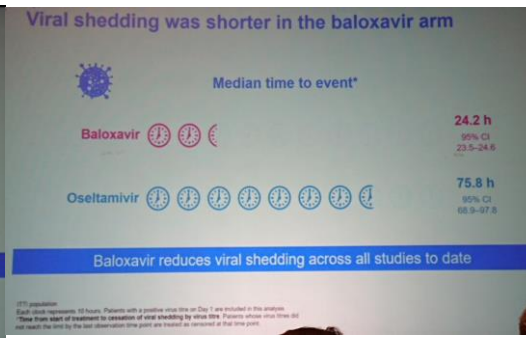


3.Xofluza 三期臨床試驗（MINISTONE-2）結果

Clinical Research Prime, USA/ Dr. Jeffrey Baker 講者說明 MINISTONE-2 是第一個 Xofluza 用於兒童的全球研究，MINISTONE-2 為 III 期、多中心且隨機雙盲研究（phase III, multicentre, randomised, double-blind study），研究評估 1-12 歲罹患流感的兒童使用 Xofluza 與 Oseltamivir 治療的安全性、藥物動力學和療效。兒童依年齡分 2 組，第一組為 5-12 歲和第二組為 1-5 歲，兩組兒童被隨機分配接受一劑 Xofluza（對於 20kg 或以上的患者為 2mg/kg 或對於 20kg 或以上的患者為 40mg）或 Oseltamivir（每天兩次持續 5 天根據體重給藥）。該研究主要終點評估截至研究第 29 天出現不良事件（AEs）或嚴重不良事件的患者比例，次要終點評估藥物動力學及流感症狀持續時間，包括發燒。

研究結果顯示在接受 Xofluza 治療組中，出現不良事件的比例為 46.1%，而 Oseltamivir 組為 53.4%。此外，與 Oseltamivir 相比，Xofluza 使兒童體內流感病毒排出的時間（viral shedding）縮短了兩天多（病毒排出的時間中位數分別為 24.2 小時與 75.8 小時），這個數據與成人和青少年的研究數據是一致的。研究支持單劑量 Xofluza 對未滿 12 歲罹患流感的兒童而言，是一種耐受性良好且有效的治療。





參、心得與建議

透過本次會議能更深入瞭解各國流感疫苗接種計畫推動經驗、流感疫苗研發新知、熱帶地區疫苗接種策略、抗病毒藥劑研發等資訊，今年大會也第一次引入政策制定的主題，提供較易理解的關鍵決策問題和研究轉化為政策的重點，對於非臨床、研究發展或學術領域的與會者在流行病學及公共衛生政策的研擬上助益較大。

接種流感疫苗是預防流感最有效的方式，在本次會議中強調制定國家流感疫苗接種計畫的重要性，對於提升流感疫苗接種率措施提出的重點，包括：免費接種政策、採用不同籌資方式和機制、提升醫護人員和民眾對流感和流感疫苗的認知、推動醫護人員對流感疫苗預防接種的推薦、建立預防接種工作體系、提升接種可近性、公私部門協同合作、強化風險溝通及國家投入宣導資源等。在流感疫苗的研發部分，各國科學家提出許多精闢的研究成果，全球需要更好的流感疫苗，能在某些人群中獲得更好的療效、更高的疫苗涵蓋率、更快的疫苗生產和更好的疫苗效益，對於流感疫苗開發的短期方法，應優先考慮細胞培養的平台、水包油佐劑和高劑量流感疫苗，另外通用流感疫苗、新型疫苗技術和交叉保護策略被認為是疫苗開發的長期方法。

面對流感的威脅，在本次會議中提出許多重點，包括：加強動物流感病毒的監測、研發病毒快速檢驗試劑、當流感大流行發生時除給予抗病毒藥物治療、抗病毒藥儲備、預防性投藥、適時抗生素治療次發細菌性感染、針對高危險群給予疫苗注射，也可考慮在家自主隔離、關閉學校、取消公眾集會及源頭根除等非藥物性的阻斷防疫措施以防堵流感病毒之傳播、研發通用/新型流感疫苗、優化疫苗接種策略、提升流感疫苗接種率等。

本次會議內容相當豐富且多元化，建議在經費許可的情況下，未來可增派人員持續參加此會議，建議由與流感相關病毒研究、疫情監測、疫情

預測、流感防治、流感疫苗、抗病毒藥劑及流感整備等領域相關之同仁皆能一同參與，可於同時段分別參與不同主題會議，以取得更多元的資訊，拓展視野。

附錄 1、相關照片

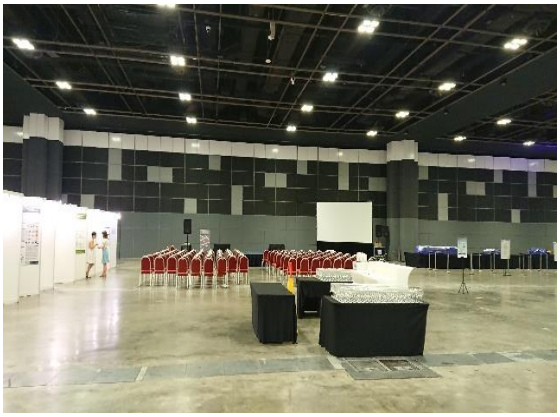
1. 會議會場Suntec convention and exhibition centre外觀

2. 註冊

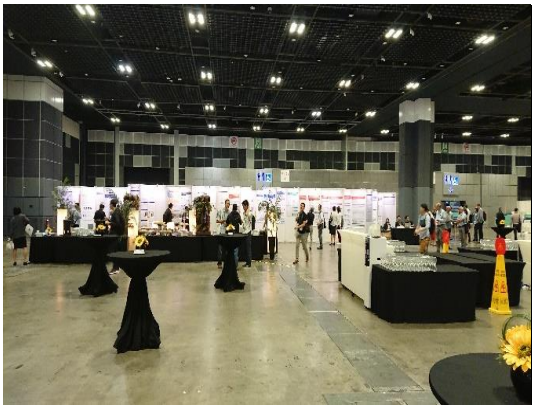
3. 會前工作坊（Pre-Conference workshop）

4. 主場/分場展覽廳



5. 海報展示區




6. 廠商商品展示區


ON THE
FRONT LINE
Segirus


xofluza
xofluza
ITS TIME IS UP


OPTIONS X
for the Control of
INFLUENZA


FLU. HOSPITALIZATION. DEATH.
X8

附錄 2、議程

Day 1: 28/8/2019 Wednesday

Latest Research from China / Level 3, Room 331 /
Session Chair: **John Tam** */The Hong Kong Polytechnic University, Hong Kong/*

09.00am **Opening Remarks**
Liang Xiao Feng */Chinese Preventive Medicine Association ,China/*

09.15am **Part 1: Animal and Zoonotic Influenza in China**
The Avian Influenza Control in China
Chengjun Li */Chinese Academy of Agricultural Sciences ,China/*
Human Infections with Zoonotic Influenza Virus in China
Dayan Wang */Chinese National Influenza Center,China/*
Human Infections with Novel Influenza Viruses and Pandemic Preparedness in China
Lei Zhou */Chinese Center for Disease Control and Prevention ,China/*
Seasonal Influenza Vaccine Policy Development and Implementation in China
Luzhao Feng */Chinese Center for Disease Control and Prevention ,China/*

11.15am **Tea Break / Level 3, Room 331 /**

11.30am - 1.00pm **Part 2: Pharmaceutical Research in China (with a Focus on Chinese Medicine)**
Adjuvant Use of Traditional Chinese Medicine in Influenza and Pneumonia
Bin Cao */China-Japan Friendship Hospital,China/*
Repress Antiviral Genes STAT1/2 in Avian Influenza Infection
Chengyu Jiang */Peking Union Medical College,China/*
Prediction of Zoonotic Influenza Virus Transmission and Clinical Severity Using Biomarkers
Yuelong Shu */Sun Yat-sen University, China/*

Official Opening Ceremony / Level 4, Hall 406CX /

3.00pm **Vernon Lee** */Chair, Options X/*
Lance Jennings */Chair, ISIRV/*
Lam Pin Min */Senior Minister of State, Ministry of Health and Ministry of Transport, Singapore/*
Presentation of ISIRV Awards
ISIRV Lifetime Achievement Award:
Frederick Hayden */University of Virginia School of Medicine, USA/*
Geoffrey Schild Lecture:
Barney Graham */National Institute of Allergy and Infectious Disease, USA/*
ISIRV Wiley Young Investigator Award:
Khristine Joy Antigua */Chungbuk National University, Republic of Korea/*

3.45pm **Tea Break / Exhibition Hall 405EX /**

Opening Keynote / Level 4, Hall 406CX /
Session Chair: **Vernon Lee** */Ministry of Health, Singapore/*

4.15pm **Pandemic and Seasonal Influenza: The Known Unknowns**
Malik Peiris */University of Hong Kong, Hong Kong/*
A Bird's Eye View of Influenza Research
Kanta Subbarao */Peter Doherty Institute for Infection and Immunity, Australia/*
The Geoffrey Schild Lecture: Design Options for Universal Influenza Vaccines
Barney Graham */National Institute of Allergy and Infectious Disease, USA/*

6.00pm **Opening Reception / Dinner / Exhibition Hall 405EX /**

6.30pm -8.00pm **Clinical Sciences and Co-Infection Poster Session + Poster Reception / Exhibition Hall 405EX /**

6.30pm -8.00pm **Shortlisted Poster Presentations for Poster Awards / Exhibition Hall 405EX /**

Day 2: 29/8/2019 Thursday

Plenary Talks: Vaccines / Level 4, Hall 406CX /
Session Chair: **Mark Tompkins** */University of Georgia, USA/*

8.30am **Challenges in Influenza Prevention and Control**
Dan Jernigan */Centers for Disease Control and Prevention (CDC), USA/*

Global Coordination Activities on Universal Vaccines and Priorities
Martin Friede */World Health Organisation, Switzerland/*

10.00am **Tea Break / Exhibition Hall 405EX /**

Day 2: 29/8/2019 Thursday

Session 1

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Virus Pathogenesis & Transmission **Session Chairs:** **Jessica Belser** */Centers for Disease Control and Prevention, USA/* **Sander Herfst** */Erasmus MC, The Netherlands/*		**Clinical (I)** **Session Chairs:** **Maria Zambon** */Public Health England, UK/* **Dale Fisher** */National University Hospital, Singapore/*		**Vaccine Efficacy/Effectiveness (I)** **Session Chairs:** **Sheena Sullivan** */WHO Collaborating Centre for Reference and Research on Influenza, Australia/* **Esther Kissling** */Epiconcept, France/*	
10.30am	**Influenza Transmission in Experimental and Field Settings** **Hui-Ling Yen** */University of Hong Kong, Hong Kong/*	10.30am	**Rapid Molecular Point of Care Tests: Strategies for Use** **Maria Zambon** */Public Health England, UK/*	10.30am	**Do Influenza Vaccines Attenuate the Severity of Breakthrough Infections?** **Mark Thompson** */Centers for Disease Control and Prevention, USA/*
10.50am	**Pathogenesis and Transmission of Emerging Influenza Viruses** **Sander Herfst** */Erasmus MC, The Netherlands/*	10.50am	**Shifting the Diagnostic Paradigm from Pathogen to Host** **Ann Falsey** */University of Rochester, USA/*	10.50am	**Impact on Cardiovascular Outcomes** **Jeff Kwong** */ICES, Canada/*
11.10am	**Implications of Incomplete Viral Genomes for Influenza A Virus Fitness** **Anice Lowen** */Emory, USA/*	11.10am	**Innovation in Pandemic Influenza Response** **Rick Bright** */U.S. Department of Health and Human Services, USA/*	11.10am	Variations in seasonal influenza vaccine effectiveness due to biological characteristics: A systematic review and META-analysis of test-negative design studies **(Abstract No 10311)** **George Okoli** */University of Manitoba, Canada/*
11.30am	Autophagy-mediated restriction of avian influenza virus replication in mammalian cells **(Abstract No 10440)** **Siwen Liu** */The University of Hong Kong, Hong Kong/*	11.30am	The impact of syndromic molecular point-of-care testing for respiratory viruses in adults presenting to hospital with exacerbation of airways disease: Further analysis form a randomised controlled trial **(Abstract No 10563)** **Nathan Brendish** */University Hospital Southampton NHS Foundation Trust, UK/*	11.22am	Vaccine effectiveness against influenza hospitalization in the 2018-2019 season: comparison between cell-based and egg-based influenza vaccines **(Abstract No 10395)** **Hung Fu Tseng** */Kasier Permanente Southern California, USA/*
11.42am	Haemagglutinin mutation and higher neuraminidase activity enhanced the adaption of H5N6 avian influenza viruses to mammalian hosts **(Abstract No 10855)** **Honglei Sun** */China Agricultural University,China/*	11.42am	Evaluation of the Febridx host response point-of-care test to differentiate viral from bacterial aetiology in adults hospitalised with acute respiratory illness during Influenza season **(Abstract No 10565)** **Nathan Brendish** */University Hospital Southampton NHS Foundation Trust, UK/*	11.34am	Influenza vaccine effectiveness against laboratory-confirmed influenza mortality in older adults **(Abstract No 10881)** **Jeff Kwong** */ICES, Canada/*
11.54am	Assessment of zoonotic transmission of swine influenza A viruses from pigs to naïve or vaccinated ferrets **(Abstract No 10945)** **Ian Brown** */Animal and Plant Health Agency, UK/*			11.46am	Relative vaccine effectiveness of high dose versus adjuvanted influenza vaccine: A retrospective cohort study **(Abstract No 10499)** **Robertus van Aalst** */Sanofi Pasteur, USA/*
12.00pm	**Lunch / Exhibition Hall 405EX /**				
12.00pm	**Sponsored Lunch Symposium (Sanofi Pasteur) / Level 4, Hall 406CX /** **Beyond Acute Respiratory Disease: How to Demonstrate the Full Public Health Impact of Influenza and its Prevention**				
1.30pm	**ISIRV Annual General Meeting / Level 4, Hall 406D /**				

Day 2: 29/8/2019 Thursday

Session 2

/ Level 4, Hall 406CX /	/ Level 4, Hall 406D /	/ Level 4, Hall 405B /
Co-Infection	**Clinical Sciences**	**Public Health**
Co-infection **Session Chairs:** **Keith Klugman** */Bill & Melinda Gates Foundation, USA/* **Nahoko Shindo** */World Health Organization, Switzerland/*	**Clinical (II)** **Session Chairs:** **Norio Sugaya** */Keiyu Hospital, Japan/* **Frederick Hayden** */University of Virginia School of Medicine, USA/*	**Vaccine Efficacy/Effectiveness (II)** **Session Chairs:** **Mark Thompson** */Centers for Disease Control and Prevention , USA/* **Sarah Cobey** */University of Chicago, USA/*
2.30pm **The Potential of Vaccines to Address Antimicrobial Resistance** **Padmini Srikantiah** */Bill & Melinda Gates Foundation, USA/*	2.30pm **Neuraminidase Inhibitors: In Pursuit of Laboratory Correlates of Clinically Relevant Resistance** **Larisa Gubareva** */Centers for Disease Control and Prevention, USA/*	2.30pm **Explaining Differences in Vaccine Effectiveness and Virus Circulation in the Southern Hemisphere, 2019** **Sheena Sullivan** */WHO Collaborating Centre for Reference and Research on Influenza, Australia/*
2.50pm **Bacterial Interactions: The Role of Influenza in the Epidemiology of Pneumonia** **Pej Rohani** */University of Georgia, USA/*	2.50pm **Antiviral Resistance [Polymerase Inhibitors]** **Aeron Hurt** */Peter Doherty Institute, Australia/*	2.50pm **Immune Responses to Repeated Vaccination** **Annette Fox** */Doherty Institute, Australia/*
3.10pm **Management of Co-infection in Emerging Influenza– Insights from the WHO New Standard Influenza Clinical Management Guidance** **Nahoko Shindo** */World Health Organization, Switzerland/*	3.10pm **Clinical Studies on Immunopathogenesis** **Jake Dunning** */Public Health England, UK/*	3.10pm **Variable Effects of Annually Repeated Influenza Vaccination: Evidence, Mechanisms, and Implications** **Danuta Skowronski** */British Columbia Centre for Disease Control, Canada/*
3.30pm Epidemiology of influenza-associated community-acquired pneumonia admissions: A 7-year retrospective cohort study in Singapore **(Abstract No 10912)** **Win Mar Kyaw** */Tan Tock Seng Hospital, Singapore/*	3.30pm Rapid molecular testing for influenza in children improves patient management in acute care setting **(Abstract No 10877)** **Rangaraj Selvarangan** */Childrens Mercy Hospital, USA/*	3.30pm Birth cohort-specific vaccine effectiveness against influenza A(H1N1)PDM09 in seasons with different A(H1N1) PDM09 virus vaccine components, I-MOVE multicentre primary care study, Europe, 2013/14 TO 2018/19 **(Abstract No 11047)** **Esther Kissling** */Epiconcept, France/*
3.42pm Evaluating the window of susceptibility to secondary bacterial infections post-influenza infection in ferrets **(Abstract No 10904)** **Edin Mifsud** */Peter Doherty Institute, Australia/*	3.42pm Seasonal and other influenza viruses with reduced susceptibility to Baloxavir and Pimodivir **(Abstract No 10750)** **Larisa Gubareva** */Centers for Disease Control and Prevention, USA/*	3.42pm Viral genomic variation and vaccine effectiveness across consecutive influenza A(H3N2) epidemics in Canada, 2016-17 and 2017-18 **(Abstract No 10983)** **Danuta Skowronski** */British Columbia Centre for Disease Control, Canada/*
4.00pm	**Tea Break / Exhibition Hall 405EX /**	

Session 3

/ Level 4, Hall 406CX /	/ Level 4, Hall 406D /	/ Level 4, Hall 405B /
Virology & Pathogenesis	**Clinical Sciences**	**Public Health**
Influenza Glycobiology **Session Chairs:** **Sarah Londrigan** */The University of Melbourne, Peter Doherty Institute, Australia/* **Robert de Vries** */Utrecht Institute for Pharmaceutical Sciences, The Netherlands/*	**Clinical (III)** **Session Chairs:** **Andrew Pavia** */University of Utah, USA/* **David Lye** */National Centre for Infectious Diseases, Singapore/*	**Surveillance & Forecasting** **Session Chairs:** **Alex Cook** */National University of Singapore, Singapore/* **Jeff Kwong** */ICES Canada/*
4.30pm **Evolution of Virus-Glycan Interactions** **Andrew Thompson** */Scripps Research Institute, USA/*	4.30pm **Inhibiting Viral Polymerase in Treating Influenza: Clinical Updates** **Nelson Lee** */University of Alberta, Canada/*	4.30pm **Forecasting Seasonal Influenza Activity** **Jeff Shaman** */Columbia University, USA/*
4.50pm **N-Glycolylneuraminic Acid as a Receptor for Influenza A Viruses** **Robert de Vries** */Utrecht Institute for Pharmaceutical Sciences, The Netherlands/*	4.50pm **Polyclonal and Monoclonal Antibodies for the Treatment of Influenza** **John Beigel** */National Institute of Allergy and Infectious Diseases, USA/*	4.50pm **Building a Forecasting Capability for Australian Public Health** **Robert Moss** */The University of Melbourne, Australia/*
5.10pm **Defining Correlates of Immunity against Influenza Using Systems Serology** **Galit Alter** */Ragon Institute of MGH, MIT and Harvard, USA/*	5.10pm **Management of Antiviral Resistance: Lessons from the Transplant Population** **Mike Ison** */Northwestern University,USA/*	5.10pm **Forecasting Virus Strains** **Trevor Bedford** */Fred Hutchinson Cancer Research Center, USA/*

Day 2: 29/8/2019 Thursday

Session 3

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Influenza Glycobiology		**Clinical (III)**		**Surveillance & Forecasting**	
5.30pm	Influenza A virus surface proteins are organized to help penetrate host mucus **(Abstract No 11089)** **Michael Vahey** */Washington University in St. Louis, USA/*	5.30pm	Emergence of viruses with reduced susceptibility to Baloxavir Marboxil: Impact on clinical and virologic outcomes in patients with influenza at high risk of complications (Capstone-2) **(Abstract No 10753)** **Simon Portsmouth** */Shionogi Inc., USA/*	5.30pm	Globalization complicated emergence and spread of H3N2 seasonal influenza A viruses **(Abstract No 11184)** **Xiu-Feng (Henry) Wan** */University of Missouri-Columbia, USA/*
5.42pm	Seasonal H1N1 and antigenically drifted H3N2 influenza viruses that have limited binding to sialic acid bind to phosphorylated high mannose glycans from the human lung **(Abstract No 10964)** **Lauren Byrd-Leotis** */Harvard Medical School, USA/*	5.42pm	Neuraminidase-targeted hapten immunotherapy to treat influenza **(Abstract No 10900)** **Xin Liu** */Purdue University , USA/*	5.42pm	FluSight: Six seasons of forecasting influenza in the United States, 2013–14 to 2018–19 **(Abstract No 10347)** **Matthew Biggerstaff** */Centers for Disease Control and Prevention , USA/*
6.00pm -7.30pm	**Sponsored Evening Symposium (Hoffmann La-Roche)/ Level 4, Hall 406CX / Can We Stop Flu Going Viral?**				
6.00pm -8.00pm	**ISIRV Epidemiology Group Session / Level 4, Hall 406D /**				

Day 3: 30/8/2019 Friday

Plenary Talks: PISA & Virology / Level 4, Hall 406CX /
Session Chair: **Ben Cowling** */University of Hong Kong, Hong Kong/*

8.30am **Combination Influenza Therapy: Concept to Clinical Reality**
Frederick Hayden */University of Virginia School of Medicine, USA/*

Challenges in Influenza
Yoshihiro Kawaoka */University of Wisconsin-Madison, USA and University of Tokyo, Japan/*

10.00am **Tea Break / Exhibition Hall 405EX /**

Session 4

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
NextGen/Universal Vaccines		**Clinical (IV)**		**Optimising Vaccine Strategies (I)**	
Session Chairs: **Diane Post** */National Institutes of Health,USA/* **Kanta Subbarao** */Peter Doherty Institute for Infection and Immunity, Australia/*		**Session Chairs:** **Jake Dunning** */Public Health England, UK/* **Nelson Lee** */University of Alberta, Canada/*		**Session Chairs:** **Alicia Fry** */Centers for Disease Control and Prevention, USA/* **George Okoli** */University of Manitoba, Canada/*	
10.30am	**The Influenza Virus Neuraminidase as a Vaccine Target** **Florian Krammer** */Icahn School of Medicine at Mount Sinai, USA/*	10.30am	**Adjuvant Therapy for Severe Influenza Infection** **Ivan Hung** */University of Hong Kong, Hong Kong/*	10.30am	**Strategies to Enhance Local Protective Influenza-Specific Immunity in the Respiratory Tract** **Andrea Sant** */University of Rochester Medical Center, USA/*
10.50am	**Next-generation Broadly Reactive Influenza Vaccines** **Ted Ross** */University of Georgia, USA/*	10.50am	**Adjuvant Use of Corticostroids in Influenza and Pneumonia** **Cao Bin** */China-Japan Friendship Hospital, China/*	10.50am	**Comparative Immunogenicity of Enhanced Influenza Vaccines in Older Adults in Hong Kong: A Randomized Controlled Trial (PIVOT)** **Ben Cowling** */University of Hong Kong, Hong Kong/*
11.10am	**T Cell Vaccines Against Influenza** **Sarah Gilbert** */University of Oxford, UK/*	11.10am	**Potential Host Targeted Therapies in Influenza** Andrés Pizzorno */Centre International de Recherche en Infectiologie, France/*	11.10am	Serologic response to sequential influenza vaccination in older adults from a randomized trial **(Abstract No 10390)** **Huong McLean** */Marshfield Clinic Research Institute, USA/*
11.30am	Characterising human memory B cells with cross- lineage recognition of the influenza B hemagglutinin following seasonal immunisation **(Abstract No 11170)** **Adam Wheatley** */University of Melbourne, Australia/*	11.30am	Development of a new class of broad spectrum influenza PB2 inhibitors **(Abstract No 11025)** **Sam Lee** */Cocrystal Pharma Inc., USA/*	11.22am	Prior infection enhances the magnitude and breadth of anti-H3N2 antibody responses to influenza vaccination and reduces the risk of subsequent A/H3N2 virus infection **(Abstract No 11171)** **Maria Auladell** */Peter Doherty Institute for Infection and Immunity, Australia/*

Day 3: 30/8/2019 Friday

Session 4

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
NextGen/Universal Vaccines		**Clinical (IV)**		**Optimising Vaccine Strategies (I)**	
11.42am	Intranasal M2SR (M2-deficient single replication) influenza vaccine induced protection against challenge with a substantially drifted H3N2 virus in a phase 2 study **(Abstract No 11110)** **Joseph Eiden** */FluGen, USA/*	11.42am	Intravenous Peramivir in emergency department high-risk patients with influenza: A multicenter randomized controlled study **(Abstract No 11127)** **Yu-Hsiang Hsieh** */Johns Hopkins University School of Medicine, USA/*	11.34am	Does strain change influence vaccine effectiveness against influenza A (H3N2)? **(Abstract No 10609)** **Huong McLean** *Marshfield Clinic Research Institute, USA/*
11.54am	A human broadly cross-reactive anti-neuraminidase antibody protects against different subtypes of influenza A and B viruses in the mouse model **(Abstract No 10535)** **Daniel Stadlbauer** */Icahn School of Medicine at Mount Sinai, USA/*	11.54am	Human-to-human transmission of influenza A(H3N2) viruses exhibiting reduced susceptibility to Baloxavir due to a PA I38T substitution in Japan **(Abstract No 10475)** **Emi Takashita** */National Institute of Infectious Diseases, Japan /*	11.46am	Repeat vaccination reduces antibody affinity maturation irrespective of influenza vaccine platform in humans **(Abstract No 10561)** **Surender Khurana** */Center for Biologics Evaluation and Research (CBER), FDA,USA/*
12.06pm	Pre-existing immunity to the conserved hemagglutinin stalk of influenza virus may drive selection for an escape mutant virus in humans **(Abstract No 10880)** **Jae-Keun Park** */National Institute of Health, USA/*	12.06pm	Pharmacokinetics of Favipiravir (T-705) in combination with Oseltamivir for treatment of critically ill patients with severe influenza **(Abstract No 11286)** **Yeming Wang** */Institute of Respiratory Medicine, Chinese Academy of Medical Science,China/*	12.58pm	Comparison of influenza antibody titers among women who were vaccinated in the 2nd and 3rd trimesters of pregnancies **(Abstract No 10385)** **Joshua A. Mott** */U.S. Centers for Disease Control and Prevention, Thailand/*
12.18pm	RNACTIVE©: A promising mRNA based influenza vaccine **(Abstract No 10980)** **Lidia Oostvogels** */CureVacAG, Germany/*	12.18pm	A randomized controlled trial on the effect of fever suppression by antipyretics on influenza **(Abstract No 11217)** **Dennis Kai Ming Ip** */The University of Hong Kong, Hong Kong/*	12.10pm	Heterologous prime-boost using AS03 adjuvanted A(H5N1) pandemic stockpiled influenza vaccines induces broader cross-clade antibody responses than homologous prime-boost **(Abstract No 10375)** **Min Levine** */Centers for Disease Control and Prevention,USA/*
12.30pm	Immunogenicity of chimeric hemagglutinin-based universal influenza virus vaccine candidates: interim results of a randomized, placebo-controlled, phase 1 clinical trial **(Abstract No 11735)** **Florian Krammer** */Icahn School of Medicine at Mount Sinai, USA/*				
12.30pm	**Lunch / Exhibition Hall 405EX /**				
12.30pm - 2.00pm	**Sponsored Lunch Symposium (Seqirus) / Level 4, Hall 406CX / Raising Defenses: Strengthening Influenza Protection**				

Session 5

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Immune Response to Infection **Session Chairs:** **Nicole La Gruta** */Monash University, Australia/* **Andrea Sant** */University of Rochester Medical Center, USA/*		**Special Populations – Clinical Aspects** **Session Chairs:** **Ann Falsey** */University of Rochester, USA/* **Paul Tambyah** */National University of Singapore, Singapore/*		**Optimising Vaccine Strategies (II)** **Session Chairs:** **Barbara Rath** */Vienna Vaccine Safety Initiative,USA/* **Abu Muhammad Zubair Akhtar** */ icddr, b, Bangladesh/*	
2.00pm	**Human CD8+ T cell Cross-reactivity Across Influenza A, B and C Viruses** **Katherine Kedzierska** */University of Melbourne, Australia/*	2.00pm	**Impact of Influenza Vaccination during Pregnancy on the Mother, Fetus, and Infant** **Marta Nunes** */University of the Witwatersrand, South Africa/*	2.00pm	**Efficacy of Live-attenuated Vaccines** **Martin Friede** */World Health Organization, Switzerland/*
2.20pm	**How the Host Response Determines Disease Outcome After Influenza Virus Infection** **Paul Thomas** */St. Jude Children's Research Hospital, USA/*	2.20pm	**Influenza and Older Adults: Frailty, Function and Healthy Ageing** **Melissa Andrew** */Dalhousie University and Canadian Centre for Vaccinology, Canada/*	2.20pm	**Influenza Vaccination of Children – What Have We Learnt?** **Richard Pebody** */Public Health England,UK/*

Day 3: 30/8/2019 Friday

Session 5

/ Level 4, Hall 406CX /	/ Level 4, Hall 406D /	/ Level 4, Hall 405B /
Virology & Pathogenesis	**Clinical Sciences**	**Public Health**
Immune Response to Infection	**Special Populations – Clinical Aspects**	**Optimising Vaccine Strategies (II)**
2.40pm **The Pandemic Matrix Gene Enhances Innate Immune Responses During Infection** **Mark Tompkins** */University of Georgia , USA/*	2.40pm **Influenza in Children: Challenges and Unanswered Questions** **Andrew Pavia** */University of Utah, USA/*	2.40pm The United Kingdom's childhood influenza vaccination programme: Review of uptake and vaccine effectiveness over the first six seasons **(Abstract No 10811)** **George Kassianos** */Royal College of General Practitioners, UK/*
3.00pm Annotation and recovery of ferret-specific immunoglobulin sequences **(Abstract No 10528)** **Julius Wong** */University of Melbourne, Australia/*	3.00pm Lower cognition among toddlers who experience acute respiratory illnesses in Panama and El Salvador **(Abstract No 11345)** **Eduardo Azziz-Baumgartner** / *Centers for Disease Control and Prevention , USA/*	2.52pm Impact of the introduction of the paediatric live attenuated influenza vaccine (LAIV) programme: An inter-country comparison across the United Kingdom and the Republic of Ireland **(Abstract No 11195)** **Mary Anissa Sinnathamby** */Public Health England, UK/*
3.12pm Broadened cross-reactive immunity in ferrets after repeated influenza A/H3 exposures **(Abstract No 10490)** **Hang Xie** */Center for Biologics Evaluation and Research, US Food and Drug Administration, USA/*	3.12pm Long-Term Care/Nursing Home admission following hospitalization with influenza and acute respiratory illness: The role of social vulnerability. A report from the Canadian Serious Outcomes Surveillance Network. **(Abstract No 11300)** **Melissa K Andrew** */Dalhousie University, Canada/*	3.04pm First trimester seasonal influenza vaccination and major congenital malformations: A 2010-2016 UK retrospective cohort study **(Abstract No 10913)** **Punam Mangtani** */London School of Hygiene and Tropical Medicine, UK/*
3.24pm Molecular and functional dissection of the influenza virus-specific CD8+ T-cell receptor repertoire during aging **(Abstract No 10471)** **Carolien van de Sandt** */The University of Melbourne at The Peter Doherty Institute, Australia/*	3.24pm Effect of treatment with neuraminidase inhibitors on the risk of in-hospital death among influenza patients reported from EU countries, 2010–2019 **(Abstract No 10712)** **Cornelia Adlhoch** */European Centre for Disease Prevention and Control, Sweden/*	3.16pm Viral shedding in recipients of live attenuated influenza vaccine in the 2016/17 and 2017/18 influenza seasons in the United Kingdom **(Abstract No 10749)** **David Jackson** */Public Health England, UK/*
3.36pm Innate-like signatures of influenza-specific CD8+ resident memory T cell responses in the human lung **(Abstract No 11035)** **Suzanna Paterson** */Imperial College, UK/*	3.36pm Impact of antiviral therapy on short- and long-term outcomes of patients with Copd following influenza infection **(Abstract No 11163)** **Christopher Wallick** */Genentech, USA/*	3.28pm Cost-effective analysis for influenza vaccination coverage and timing in tropical and subtropical climate settings: a modelling study **(Abstract No 10376)** **Mu Yue** */National University of Singapore, Singapore/*
3.48pm Subdominance and diminished TFH elicitation constrain humoral immunity against the influenza Ha-stem **(Abstract No 11216)** **Hyon-Xhi Tan** */Peter Doherty Institute for Infection and Immunity at the University of Melbourne, Australia/*	3.48pm Treating influenza with antivirals is associated with a decreased burden of complications and health resource utilization in high risk patients **(Abstract No 11161)** **Christopher Wallick** */Genentech, USA/*	3.40pm Costs and effects of childhood influenza vaccination in The Netherlands: Important risk of undesirable effects**(Abstract No 10332)** **Pieter de Boer** */National Institute for Public Health and the Environment, The Netherlands/*
4.00pm	**Tea Break / Exhibition Hall 405EX /**	

Session 6

/ Level 4, Hall 406CX /	/ Level 4, Hall 406D /	/ Level 4, Hall 405B /
Virology & Pathogenesis	**Clinical Sciences**	**Public Health**
Cellular and Molecular Virology **Session Chairs:** **Wendy Barclay** */Imperial College London, UK/* **David Wentworth** */Centers for Disease Control and Prevention, USA/*	**Avian and Zoonotic Influenza** **Session Chairs:** **Leo Yee Sin** */National Institute for Infectious Diseases, Singapore/* **Andrew Bowman** */The Ohio State University, USA/*	**Infection Severity** **Session Chairs:** **Richard Pebody** */Public Health England,UK/* **Hasina Joelinotahina Rabarison** */Institut Pasteur de Madagascar, Madagascar/*
4.30pm **Next Generation Orally Efficacious Influenza Drug Candidate with High Genetic Resistance Barrier** **Richard Plemper** */Georgia State University, USA/*	4.30pm **Lessons and Experience of Clinical Diagnosis and Treatment on Avian Influenza Cases in Guangzhou, China** **Zhong Nanshan** */The First Affiliated Hospital of Guangzhou Medical University, China/*	4.30pm **Pandemic Severity Assessment** **Carrie Reed** */Centers for Disease Control and Prevention, USA/*

Day 3: 30/8/2019 Friday

Session 6

	/ Level 4, Hall 406CX /	/ Level 4, Hall 406D /	/ Level 4, Hall 405B /
	Virology & Pathogenesis	**Clinical Sciences**	**Public Health**
	Cellular and Molecular Virology	**Avian and Zoonotic Influenza**	**Infection Severity**
4.50pm	**Structural Snapshots of Actively Transcribing Influenza Polymerase** **Stephen Cusack** */European Molecular Biology Laboratory in Grenoble, France/*	**Zoonotic Transmission of Influenza A Viruses at Agricultural Fairs** **Andrew S Bowman** */The Ohio State University,USA/*	**Disease Severity in Influenza and Other Respiratory Viral Infections** **Barbara Rath** */Vienna Vaccine Safety Initiative, USA/*
5.10pm	**The Interplay Between Influenza and Cellular Sphingolipids** **Hassan Zaraket** */American University of Beirut, Lebanon/*	**Clinical Features of Influenza A(H5N1) Infection and Other NA Subtypes** **David Hui** */The Chinese University of Hong Kong, Hong Kong/*	**The FLU CATs Study - Validation of Triage Tools for Use Across a National Healthcare System during Surge in Healthcare Demand Due to Pandemic Influenza** **Calum Semple** */University of Liverpool, UK/*
5.30pm	Dissecting the mechanism of signaling-induced nuclear export of influenza virus vRNPs **(Abstract No 11313)** **Stephan Ludwig** */University of Muenster, Germany/*	Incidence and seroprevalence of avian influenza viruses among Egyptian backyard poultry growers: Results from a prospective cohort study **(Abstract No 10853)** **Ghazi Kayali** */Human Link, Lebanon/*	Burden and severity of influenza-like illness in Australia: 10 years of flutracking online surveillance **(Abstract No 11254)** **Craig Dalton** */University of Newcastle, Australia/*
5.42pm	Differential regulation of Post-Trans-lational Modification (PTM) status of influenza A viral Ribonucleoproteins (RNPs) during different stages of the viral life cycle **(Abstract No 10698)** **Lin Zhu** */Hong Kong Baptist University, Hong Kong/*	Clinical evaluation of adjuvanted recombinant hemagglutinin H7 vaccine to highly pathogenic A(H7N9) influenza virus **(Abstract No 10966)** **Ruben O. Donis** */BARDA, USA/*	Estimating the influenza disease pyramid in Singapore **(Abstract No 10547)** **Rachael Pung** */Ministry of Health, Singapore/*
6.00pm -7.30pm	**Virology and Pathogenesis Poster Session + Poster Reception / Level 4, Exhibition Hall 405EX /**		
6.10pm -7.30pm	**Shortlisted Poster Presentations for Poster Awards**		

Day 4: 31/8/2019 Saturday

Plenary Talks: WHO Vision and Approaches / Level 4, Hall 406CX /
Session Chair: **Cheryl Cohen** */National Institute for Communicable Diseases, South Africa/*

8.30am **Global Influenza Strategy: Where We Want to Be in a Decade**
Ann Moen */World Health Organization, Switzerland/*

Pandemic Influenza Preparedness – 10 Years After Pandemic H1N1 2009
Wenqing Zhang */World Health Organization, Switzerland/*

Measuring Influenza Severity: Where We Are and Where We Will Go
Katelijn Vandemaele */World Health Organization, Switzerland/*

10.00am **Tea Break / Exhibition Hall 405EX /**

Session 7

	/ Level 4, Hall 406CX /	/ Level 4, Hall 406D /	/ Level 4, Hall 405B /
	Virology & Pathogenesis	**Clinical Sciences**	**Policy**
	Host-pathogen Interactions Session Chairs: Randy Albrecht */Icahn School of Medicine at Mount Sinai, USA/* Ryan Langlios */University of Minnesota, USA/*	**Influenza in the Tropics** Session Chair: Jean-Michel Heraud */Institut Pasteur de Madagascar, Madagascar/*	**Policy Perspectives for the Prevention and Control of Seasonal Influenza** Session Chair: Sheena Sullivan */WHO Collaborating Centre for Reference and Research on Influenza, Australia/*
10.30am	**Immunity to Influenza in Dirty Mice** **Ryan Langlios** */University of Minnesota, USA/*	**Influenza in the Tropics** **Lance Jennings** */University of Otago, New Zealand/*	**Effectiveness of Influenza Vaccination in Different Populations** **Brendan Flannery** */Centers for Disease Control and Prevention, USA/*
10.50am	**Obesity as a Risk Factor in Influenza Virus Infection** **Stacey Schultz-Cherry** */St. Jude Children's Research Hospital, USA/*	**"Seasonality" of Influenza in the Tropics Due to Waning of Protection** **Alex Cook** */National University of Singapore, Singapore/*	11.00am **Rational Policy for Neuraminidase Inhibitors** **Jonathan Nguyen Van Tam** */Department of Health and Social Care, UK/*

Day 4: 31/8/2019 Saturday

Session 7

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Policy**	
Host-pathogen Interactions		**Influenza in the Tropics**		**Policy Perspectives for the Prevention and Control of Seasonal Influenza** Session Chair: Joseph Bresee */Centers for Disease Control and Prevention, USA/*	
11.10am	**ANP32 Proteins: Host Factors that Impact Influenza Virus Polymerase Activity and Host Range** **Wendy Barclay** */Imperial College London, UK/*	11.10am	**Monitoring Influenza Activity and Burden in the Tropics** **Mark Chen** */National University of Singapore, Singapore/*	11.30am	**Evolutions of National Influenza Immunization Program in the Republic of Korea** **Kong Insik** */Ministry of Health and Welfare, Republic of Korea/*
11.30am	Abstract No 10428: Spatial and temporal quantification of putative lung regenerating cells during early recovery from influenza pneumonia **Joe Ong** */National University of Singapore, Singapore/*	11.30am	Resistance development in influenza A viruses infecting mallards exposed to low levels of Peramivir **(Abstract No 11211)** **Josef Järhult** */Uppsala University, Sweden/*	11.45am	**Evidence Needed to Accelerate Influenza Vaccine Introduction into National Immunisation Programme in China** **Hongjie Yu** */Fudan University,China/*
11.42am	Obesity increases the cardiac complications of influenza virus infection (Abstract No 11138) **Kirsty Short** */University of Queensland, Australia/*	11.42am	Live attenuated influenza vaccine induces early tonsillar follicular T helper cell responses correlating with durable systemic antibody responses **(Abstract No 10100)** **Sarah Larteley Lartey Jalloh** */University of Bergen, Norway/*		Session Chair: Chong Chia Yin */KK Women's and Children's Hospital, Singapore/*
11.54am	A history of obesity reduces the immune response to influenza virus in an NLRP3 dependent manner **(Abstract No 11112)** **Katina D. Hulme** */University of Queensland, Australia/*	11.54am	Development of a universal Influenza A T cell-based vaccine **(Abstract No 11289)** **Elizabeth Eagling-Vose** */Vaccitech, UK/*	12.00pm	**Panel Discussion on Overcoming Challenges for Implementation of Prevention and Control of Seasonal Influenza** **Kong Insik** */Ministry of Health and Welfare, Republic of Korea/* **Hongjie Yu** */Fudan University, China/* **Seng Heng** */Ministry of Health, Cambodia/* **Chong Chee Kheong** */Ministry of Health, Malaysia/*
12.06pm	Repeated seasonal influenza vaccination results in reduced protection against influenza A(H3N2) infection in ferrets compared to single vaccination **(Abstract No 10740)** **Ian York** */Centers for Disease Control and Prevention,USA/*	12.06pm	Prevention of influenza during mismatched seasons in older adults: a randomized efficacy study of an MF59-adjuvanted quadrivalent influenza vaccine **(Abstract No 11792)** **Jonathan Edelman** */Seqirus Inc, USA/*		
12.18pm	MHC class II proteins mediate cross-species entry of bat influenza viruses **(Abstract No 10591)** **Thiprampai Thamamongood** */University of Freiburg, Germany/*	12.18pm	Vaccination with 1/6th standard dose of a split inactivated influenza vaccine using a high-density micro-projection array patch induces comparable immune responses to conventional full-dose intramuscular injection; results from a phase I randomized controlled clinical trial **(Abstract No 11748)** **Angus Forster** */Vaxxas Pty Ltd, Australia/*		
12.30pm	**Lunch / Exhibition Hall 405EX /**				
12.30pm - 2.00pm	**Sponsored Lunch Symposium (GSK) / Level 4, Hall 406CX /** **Prevention of Paediatric Influenza: Why and How?**				

Session 8

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Co-Infection**		**Policy**	
Viral Replication **Session Chairs:** **Victor Huber** */University of South Dakota, USA/* **Marciela DeGrace** */National Institute of Allergy and Infectious Diseases, USA/*		**Controlled Human Infection Model (CHIM) Challenge Studies** **Session Chairs:** **Peter Openshaw** */Imperial College London, UK/* **Chris Woods** */Duke University, USA/*		**Policy Perspectives for Pandemic Influenza Preparedness & Response** **Session Chair:** **Gabriel Leung** */The University of Hong Kong, Hong Kong/*	
2.00pm	**How Antiviral Proteins can Stimulate Influenza Virus Replication** **Andrew Mehle** */University of Wisconsin Madison, USA/*	2.00pm	**Insight into Host-pathogen Interactions in the Upper Respiratory Tract from Live Attenuated Influenza Vaccine Studies in Children** **Thushan de Silva** */The Gambia @LSHTM, UK/*	2.00pm	**Non-pharmaceutical Public Health Measures for Mitigating the Risk and Impact of Epidemic and Pandemic Influenza** **Ben Cowling** */The University of Hong Kong, Hong Kong/*

Day 4: 31/8/2019 Saturday

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Co-Infection**		**Policy**	
Viral Replication		**Controlled Human Infection Model (CHIM) Challenge Studies**		**Policy Perspectives for Pandemic Influenza Preparedness & Response**	
2.20pm	**Visualizing Influenza Virus Assembly** **Seema Lakdawala** */University of Pittsburgh, USA/*	2.20pm	**Mucosal Immunity in Pathogenesis and Protection Against Human Influenza Infection Challenge** **Chris Chiu** */Imperial College London,UK/*	2.30pm	**Policy Considerations for Pandemic Preparedness and Response** **Vernon Lee** */Ministry of Health, Singapore/*
2.40pm	**Mini viral RNAs: Consequences of RNA Structure for Genome Replication and Innate Immune Sensing** **David Bauer** */University of Oxford, UK/*	2.40pm	**Harnessing the Host Response to Generate Biomarkers for Influenza and Other Respiratory Tract Infections** **Chris Woods** */Duke University,USA/*		**Session Chair: Ann Moen** */World Health Organization, Switzerland/*
				2.45pm	**Policy Considerations for Pandemic Preparedness and Response Planning: Thailand's Experiences** **Supamit Chunsuttiwat** */Ministry of Public Health, Thailand/*
3.00pm	New genomic approaches to understand the heterogeneity of viral replication in single cells **(Abstract No 10606)** **David Bacsik***/Fred Hutchinson Cancer Research Center, USA/*	3.00pm	Correlates of protection for better, faster influenza vaccine development **(Abstract No 11082)** **Armen Donabedian** */US Health and Human Services, USA/*	3.00pm	**Panel Discussion on Overcoming Challenges for Pandemic Preparedness Planning** **Vernon Lee** */Ministry of Health, Singapore/* **Supamit Chunsuttiwat** */Ministry of Public Health,Thailand/* **Seng Heng** */Ministry of Health, Cambodia/* **Chong Chee Kheong** */Ministry of Health, Malaysia/*
3.12pm	ANP32 proteins from different mammalian species act as host range barriers and shape influenza polymerase adaptation **(Abstract No 10843)** **Thomas Peacock** */Imperial College London, UK/*	3.12pm	Pre-existing NP specific T-cell response correlates with reduction of symptoms in a human Influenza challenge model **(Abstract No 10943)** **Delphine Guyon-Gellin** */Osivax , France/* **Nicolas Noulin** */hVivo,UK/*		
3.30pm	**Tea Break / Exhibition Hall 405EX /**				

Session 9

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Influenza Evolution & Human Ecology **Session Chairs:** **Richard Neher** */University of Basel, Switzerland/* **Nicola Lewis** */Royal Veterinary College, UK/*		**Critical Influenza Illness** **Session Chairs:** **David Hui** */The Chinese University of Hong Kong, Hong Kong/* **Tan Thuan Tong** */Singapore General Hospital, Singapore/*		**Disease Burden, Impact, and Severity** **Session Chairs:** **Cecile Viboud** */National Institutes of Health, USA/* **Mark Chen** */National University of Singapore, Singapore/*	
4.00pm	**Mapping Selection on Influenza Virus from Polyclonal Human Serum** **Jesse Bloom** */Fred Hutch Cancer Research Center,USA/*	4.00pm	**REMAP-CAP: A Platform Trial to Advance Knowledge of Optimal Treatment for Critically Ill Patients with Influenza** **Steve Webb** */Royal Perth Hospital, Australia/*	4.00pm	**Influenza Burden and Links to Policy - Building the Pyramid** **Cheryl Cohen** */National Institute for Communicable Diseases, South Africa/*
4.20pm	**Influenza in the Age of Mammals** **Martha Nelson** */National Institutes of Health,USA/*	4.20pm	**Neurological Complications Associated with Influenza** **Tim Uyeki** */Centers for Disease Control and Prevention, USA/*	4.20pm	**Global Estimates of Influenza-associated Hospitalization from the InfluEnza BurdEn, Global Project (IcEBErG)** **Danielle Iuliano** */Centers for Disease Control and Prevention, USA/*
4.40pm	**Evolution of Seasonal Influenza Viruses** **Colin Russell** */University of Amsterdam, The Netherlands/*	4.40pm	**Cardiovascular Complications of Influenza** **William Fischer** */University of North Carolina, USA/*	4.40pm	The burden of in-hospital and out-of-hospital deaths among patients hospitalized with influenza, FluSurv-NET, 2010–2016 **(Abstract No 11044)** **Shikha Garg** */Centers for Disease Control and Prevention, USA/*
5.00pm	The evolutionary dynamics of influenza A and influenza B viruses in naturally infected human hosts **(Abstract No 10822)** **Adam Lauring** */University of Michigan, USA/*	5.00pm	Potential therapeutic role of bone marrow-derived mesenchymal stem cells in acute lung injury induced by highly pathogenic avian influenza virus A/H5N1 **(Abstract No 11151)** **Resti Yudhawati Meliana** */Airlangga University/Dr. Soetomo Hospital, Indonesia/*	4.52pm	Estimating the number of deaths due to Influenza — An alternative to regression-based estimates of excess influenza mortality **(Abstract No 10858)** **Melissa Rolfes** */Centers for Disease Control and Prevention, USA/*

Day 4: 31/8/2019 Saturday

Session 9

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Influenza Evolution & Human Ecology		**Critical Influenza Illness**		**Disease Burden, Impact, and Severity**	
5.12pm	Predicting evolutionary pathways to 'fit' oseltamivir resistant influenza viruses **(Abstract No 10995)** **Rubaiyea Farrukee** */University of Melbourne, Australia/*	5.12pm	Baloxavir for the treatment of Influenza virus infection in hematopoietic stem cell transplant recipients who failed oseltamivir **(Abstract No 11309)** **Mirella Salvatore** */Weill Cornell Medicine, USA/*	5.04pm	Community burden of influenza in a rural and an urban setting, South Africa, 2016-2017 **(Abstract No 10667)** **Cheryl Cohen** */NICD, South Africa/*
				5.16pm	Under-detection of laboratory-confirmed influenza-associated hospitalizations among infants in a multi-country prospective study **(Abstract No 10362)** **Mark Thompson** */Centers for Disease Control and Prevention, USA,/*
5.30pm -7.00pm	**Public Health Poster Session + Poster Reception / Level 4, Exhibition Hall 405EX /** **Shortlisted Poster Presentations for Poster Awards**				
7.30pm - 10.45pm	**Gala Dinner at Flower Field Hall, Gardens by the Bay**				

Day 5: 1/9/2019 Sunday

Session 10

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Non-Human Influenza Viruses **Session Chairs:** **David Swayne** */U.S. Department of Agriculture,USA/* **Andrew Bowman** */The Ohio State University,USA/*		**Non-pharmaceutical Interventions** **Session Chairs:** **Ben Cowling** */The University of Hong Kong, Hong Kong/* **Angela Chow** */Tan Tock Seng Hospital, Singapore/*		**Imprinting, Sero-epidemiology, Age Profile Differences** **Session Chairs:** **Annette Fox** */Doherty Institute, Australia/* **Robert Moss** */The University of Melbourne, Australia/*	
8.30am	**Ten Years after the 2009 "Swine Flu" Pandemic: A Perspective from a Veterinary Biomedical Researcher** **Kristien van Reeth** */Ghent University, Belgium/*	8.30am	**Contagious Phenotypes of Influenza Virus Infection** **Donald Milton** */University of Maryland School of Public Health, USA/*	8.30am	**Epidemiological Consequences of Immune Memory** **Sarah Cobey** */University of Chicago ,USA/*
8.50am	**The Emergence, Epidemiology and Evolution of the H3N8 and H3N2 Canine Influenza Virus** **Colin Parrish** */Cornell University, USA/*	8.50am	**Spread of Pandemic Influenza in US Communities in 1920 and 2009: What Changed in the Last Century?** **Simon Cauchemez** */Institut Pasteur, France/*	8.50am	**Influenza in Context: Insights into Universal Vaccination against Influenza** **Patrick Wilson** */University of Chicago, USA/*
9.10am	**Repeated Outbreaks of H5 Highly Pathogenic Avian Influenza in Wild Birds and Poultry in Europe between 2014 and 2019** **Thijs Kuiken** */Erasmus University Medical Centre, The Netherlands/*	9.10am	Quantifying the effects of school closures on mitigation of influenza epidemics in Hong Kong **(Abstract No 10910)** Sheikh Taslim Ali */The University of Hong Kong, Hong Kong/*	9.10am	**Using Serological Data to Reconstruct Historical Influenza Dynamics** **Adam Kucharski** */London School of Hygiene & Tropical Medicine, UK/*
9.30am	Improving avian influenza surveillance through wetland sampling **(Abstract No 11198)** **Lauren Tindale** */University of British Columbia, Canada/*	9.22am	Access to Telework, Paid Leave Benefits, and Work Attendance in Adults with Medically-Attended Acute (Abstract No 10466) Respiratory Illness (ARI) **Faruque Ahmed** */Centers for Disease Control and Prevention, USA/*	9.30am	Effect of maternal pandemic vaccination on seroprevalence against influenza in children at birth and at 4 years **(Abstract No 11088)** **Anna Hayman Robertson** */Norwegian Institute of Public Health, Norway/*
9.42am	Repeated crow (corvus spendens) mortality events linked to H5N1 influenza virus circulation in live bird markets, Bangladesh **(Abstract No11253)** **Ariful Islam** */EcoHealth Alliance, USA/*	9.34am	A global, randomized, double-blind, placebo-controlled study evaluating safety and efficacy of VIS410 in combination with OSELTAMIVIR versus OSELTAMIVIR alone in hospitalized adults with influenza A requiring oxygen **(Abstract No 11754)** **David Oldach** */Visterra Inc, USA/*	9.42am	Risk factors and attack rates of seasonal influenza infection: Results of the SHIVERS Seroepidemiologic cohort study **(Abstract No 11349)** **Sue Huang** */Institute of Environmental Science and Research, New Zealand/*

Day 5: 1/9/2019 Sunday

Session 10

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Non-Human Influenza Viruses		**Non-pharmaceutical Interventions**		**Imprinting, Sero-epidemiology, Age Profile Differences**	
9.54am	Characterizing the functionality of the Wuhan Spiny Eel Influenza Virus surface Glycoproteins **(Abstract No.11794)** **Guha Asthagiri Arunkumar** */Icahn School of Medicine at Mount Sinai, USA/*	9.46am	Reduced susceptibility viruses to baloxavir marboxil: Prognosis factors of the emergence and impact on clinical and virologic outcomes in pediatric patients in Japan **(Abstract No 10812)** **Takeki Uehara** */Shionogi & Co., Ltd., Japan/*	9.54am	Serosolver: An open source tool to infer epidemiological and immunological dynamics from serological data **(Abstract No 11206)** **Steven Riley** */Imperial College, UK/*
10.06am	Low literacy program for safe slaughter of poultry in developing countries to reduce human infection with avian influenza virus **(Abstract No.10355)** **David Swayne** */U.S. Department of Agriculture,USA/*	9.58am	Single-dose Baloxavir is well tolerated and effective for treatment of influenza in otherwise healthy children aged 1 to <12 years: A randomized, double-blinded, active-controlled study (miniSTONE-2) (Abstract No 11756) **Jeffrey Baker** */Clinical Research Prime, USA/*	10.06am	Antibody response and influenza-like illness among healthcare workers after influenza vaccination **(Abstract No 11162)** **Vivian Leung** */Peter Doherty Institute for Infection and Immunity, Australia/*
10.18am	The bat influenza H17N10 can be neutralized by BNMABS and its NA facilitates viral egress **(Abstract No. 10108)** **Nigel Temperton** */University of Kent, UK/*	10.10am	Single-dose Baloxavir for the prevention of Influenza among household contacts: A randomized,double -blinded, placebo controlled post-exposure prophylaxis study (BLOCKSTONE) **(Abstract No 11718)** **Hideyuki Ikematsu** */Ricerca Clinica Co., Japan/*	10.18am	Hemagglutinin and neuraminidase antibodies are induced in an age- and subtype-dependent manner after influenza virus infection. **(Abstract No 11051)** **Sook-San Wong** */Guangzhou Medical University, China/*
10.30am	**Tea Break / Exhibition Hall 405EX /**				

Session 11

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Emerging Influenza Viruses **Session Chairs:** **Ghazi Kayali** */Human Link , Lebanon/* **Zeynep A Kocer** */IZMIR Biomedicine and Genome Center, Turkey/*		**Vaccines** **Session Chairs:** **Arnold Monto** */University of Michigan School of Public Health, USA/* **Louis Chai** */National University Hospital, Singapore/*		**Epidemiology and Transmission Dynamics** **Session Chairs:** **Adam Kucharski** */London School of Hygiene & Tropical Medicine, UK/* **Carrie Reed** */Centers for Disease Control and Prevention,USA,/*	
11.00am	**Fighting Influenza from a One Health Perspective** **Albert Osterhaus** */TiHO, Germany/*	11.00am	**Influenza Vaccination of the Immunocompromised** **Deepali Kumar** */University Health Network, Canada/*	11.00am	**Healthcare Outbreaks of Influenza** **Paul Tambyah** */National University of Singapore, Singapore/*
11.20am	**Emergence of Swine Influenza in Australia** Vijay Dhanasekaran */Monash University, Australia/*	11.20am	**On Waning and Boosting: Is There a Sweet Spot for Influenza Vaccination Strategies in the Tropics?** **Barnaby Young** */National Centre for Infectious Diseases, Singapore/*	11.20am	**Deep Sequencing and Mapping Chains of Transmission** **Sebastian Maurer Stroh** */A*STAR, Singapore/*
11.40am	**Emergence of Avian Influenza Viruses in Asia** **Maria Zhu** */The University of Hong Kong, Hong Kong/*	11.40am	Vaccine induced mucosal IgA contributes to protection against influenza infection in humans **(Abstract No 10324)** **Sean Tucker** */Vaxart, Inc., USA/*	11.40am	Preliminary estimates of the incidence of influenza-associated acute respiratory infection among adults aged >60 years in a multi-site community cohort in India **(Abstract No 10448)** **Rakesh Kumar** */All India Institute of Medical Sciences, India/*
12.00pm	**Reverse Genetic Analysis of Bat Influenza Viruses: A Journey Full of Surprises** **Martin Schwemmle** */University of Freiburg, Germany/*	11.52am	Towards an improved wild-type sequence based hemagglutination inhibition assay for the evaluation of influenza vaccines: challenges and new developments **(Abstract No 11083)** **Vivek Shinde** */Novavax, USA/*	11.52am	Influenza virus transmission from symptomatic and asymptomatic individuals in a rural and an urban setting, South Africa, 2016-2017 **(Abstract No 10352)** **Meredith McMorrow** */Centers for Disease Control and Prevention, South Africa/*

Day 5: 1/9/2019 Sunday

Session 11

/ Level 4, Hall 406CX /		/ Level 4, Hall 406D /		/ Level 4, Hall 405B /	
Virology & Pathogenesis		**Clinical Sciences**		**Public Health**	
Emerging Influenza Viruses		**Vaccines**		**Epidemiology and Transmission Dynamics**	
12.20pm	Few substitutions of H5 gene belonging to Clade 2.3.4 have altered the NA gene preferences of the virus other than N1 **(Abstract No 11179)** **Khristine Joy Antigua** */Chungbuk National University, Republic of Korea/*	12.04pm	First-in-man clinical trials of influenza vectored vaccines against tuberculosis with intranasal and sublinqual routes of administration **(Abstract No 10944)** **Marina Stukova** */Smorodintsev Research Institute of Influenza, Russian Federation/*	12.04pm	Impact of influenza antigenic evolution on disease dynamics in the United States **(Abstract No 10702)** **Amanda Perofsky** */Fogarty International Center, National Institutes of Health, USA/*
12.32pm	Comprehensive mapping of adaptation of the avian influenza polymerase protein PB2 to humans **(Abstract No 10649)** **Shirleen Soh** */Fred Hutchinson Cancer Research Center, USA/*	12.16pm	OVX836, A novel universal influenza A vaccine candidate: First results of a phase I clinical trial in humans **(Abstract No 10937)** **Alexandre Le Vert** */Osivax, France/*	12.16pm	Determinants of influenza transmission in households in rural North India **(Abstract No 10492)** **Aslesh Ottapura Prabhakaran** */US Centers for Disease Control and Prevention India Office, India/*
12.44pm	Mitigating pandemic risk with influenza A virus field surveillance: Mia (Mobile Influenza Analysis) **(Abstract No 10960)** **John R. Barnes** */Centers for Disease Control and Prevention, USA/*	12.28pm	Immune history to influenza is a novel correlate of protection of influenza vaccination **(Abstract No 11095)** **Tomer Hertz** */Ben-Gurion University of the Negev, Israel /*	12.28pm	Effect of host genetic polymorphism on transmission of influenza virus infection in a household setting **(Abstract No 11200)** Dennis Kai Ming Ip */The University of Hong Kong, Hong Kong/*
		12.40pm	Induction of broadly cross-reactive immune responses against A(H3N2) viruses: results of a phase 2 trial of a novel recombinant hemagglutinin saponin-adjuvanted nanoparticle influenza vaccine **(Abstract No 11073)** **Vivek Shinde** */Novavax, USA/*	12.40pm	The Epidemioloogical Signature of the influenza B/Victoria and B/Yamagata Lineages in the 21st Century **(Abstract No 11001)** **John Paget** */Nivel, The Netherlands/*
1.00pm	**Lunch / Exhibition Hall 405EX /**				

Closing Plenary Talks / Level 4, Hall 406CX /

Session Chair: **Paul Tambyah** */National University of Singapore, Singapore/*

1.30pm **Mitigating Against Geopolitical Determinants of Global Public Health and Envisioning Counterfactual Futures for Outbreak Preparedness and Response**
Gabriel Leung */University of Hong Kong, Hong Kong/*

The Future of Influenza Vaccines
Arnold Monto */University of Michigan School of Public Health, USA/*

Influenza Pandemic Preparedness: Progress Since 2009 and Remaining Gaps
Sylvie Briand */World Health Organization, Switzerland/*

3.00pm **Closing Ceremony**
Presentation of Best Oral and Poster Awards
Handover to Options XI