出國報告（出國類別：開會）

參加美國「國際公定分析化學家協會第139屆年會暨研討會」

服務機關：食品藥物管理署
姓名職稱：沈盈如 技正
派赴國家：美國
出國期間：**114**年**8**月**23**日至**114**年**8**月**30**日
報告日期：**114**年**11**月**18**日

摘要

第139屆國際公定分析化學家協會(Association of Official Analytical Collaboration (AOAC) International)年會暨研討會於8月23日至8月28日於美國聖地牙哥舉行。參與此次會議除將本署於污染物領域其中一項研究成果「Development of an Analytical Method for Per- and Polyfluoroalkyl Substances in Foods」分別於研討會壁報論文發表以及於臺灣分部會議(Taiwan Section Business Meeting)分享，期能讓其他國家有機會認識本署外，亦希藉此機會了解現階段之檢驗趨勢議題、研究成果及方向，進而幫助提升本署食品化學檢驗技術，並建立與國際檢驗專家之聯絡溝通管道。研討會主題多元且豐富，除研究成果壁報展覽及一般專題演講外，亦包含基礎訓練課程、主題會議、利害關係人(Stakeholder)專案會議，以及供應商展示會議(Vender Presentation)等，內容涵蓋污染物、藥物殘留、食品詐欺、大麻食品、DNA 鑑定及基因微生物鑑定技術等。觀察目前研究檢驗趨勢，發現大眾對食品安全所關注的範圍愈來愈大，對於檢測分析上的要求也愈來愈廣，基於現實之人力、時間及物力考量，快速、自動化及跨類別(污染物、農藥、動物用藥等)之多重分析技術逐漸受到重視，另亦感受到檢驗結果判讀的重要性，故適時結合客觀資訊有助於減少誤判的機率。研討會期間受益良多，建議應持續鼓勵同仁多參與此類國際型會議和持續關心國際間發表的學術期刊或文件來提升本署研究水平及視野。

目次

摘要.....2
目次.....3
壹、 目的.....4
貳、 過程.....4
參、 心得及建議.....8

附錄一、會議議程
附錄二、壁報論文發表資料

壹、目的

國際公定分析化學家協會(Association of Official Analytical Collaboration (AOAC) International)成立於1884年，源於美國農業部(USDA)及美國食品藥物管理局(USFDA)。AOAC International 是一獨立的非營利會員制協會，成員涵蓋全球政府、產業界及學術界的分析科學專業人士，其使命為透過標準、經驗證的測試方法以及實驗室品質管理體系，提升食品安全及產品完整性。

AOAC International 會定期舉辦年會，今年(第139屆)於美國加州聖地牙哥舉行，期間為8月23日至8月28日。本署由職代表並與臺灣 AOAC 代表一同出席。參與此次研討會主要目的除了解國際食品安全領域關注之議題、檢驗趨勢、研究成果及相關規範，亦將本署於污染物領域其中一項研究成果「Development of an Analytical Method for Per- and Polyfluoroalkyl Substances in Foods」分別於研討會壁報論文發表以及於臺灣分部會議(Taiwan Section Business Meeting)分享，期能讓其他國家有機會認識本署，並藉此機會與世界各地產、官、學界專業人士交流及建立聯絡溝通管道。

貳、過程

本次研討會主題多元且豐富，除研究成果壁報展覽及一般專題演講外，亦包含 Laboratory Accreditation Guidelines、Method Validation 及 Presentation 等訓練課程，Agricultural Materials、Mycotoxins、Contaminants、Microbiology、Nutrients、Metals、Color Additives 及 Food Allergens 等主題會議，Infant Formula and Adult Nutrition 等利害關係人(Stakeholder)專案會議，以及供應商展示會議(Vender Presentation)……，涵括污染物、藥物殘留、食品詐欺、大麻食品、DNA 鑑定及基因微生物鑑定技術等內容，會議議程詳附錄一。職因飛機抵達時間關係，未參與8月23日之訓練課程，會議行程緊湊，同一時段會同時安排不同主題演講或專案會議，故僅能擇一參與，慶幸的是主辦單位提供年會參與者會後可於網站上觀看經授權於會議期間錄製的演講內容之服務，雖不完整(有些作者未同意)，仍有助於補足會議期間無法完全汲取的資訊。研討會期間就所接觸到的食品安全相關研究及發展資訊，重點摘要如下：

一、礦物油 MOSH 及 MOAH 檢驗技術(Marco Nestola)

礦物油碳氫化合物可分為 MOSH (Mineral Oil Saturated Hydrocarbons)及 MOAH (Mineral Oil Aromatic Hydrocarbons) 2種類型，其可能透過食品包裝、加工潤滑劑、環境污染等途徑進入食物：MOSH 含飽和烴結構，可能累積於體內造成傷害；MOAH 含芳香環結構，具潛在致癌性。MOSH 及 MOAH 可

於 GC-FID 分析，因成分過於複雜，異構物之間無法層析分離，僅能以群峰方式定性及定量，另由於 MOSH 及 MOAH 於 GC 中滯留時間一致，故需先以 LC 分離2者後再搭配 GC-FID 分析。相關檢驗原理於1989年確立，至今仍為檢驗趨勢，檢驗流程簡述如下：礦物油以正向 LC 系統(或充填管柱)分離 MOSH 及 MOAH，續經皂化、衍生化及蒸發溶劑步驟後以 GC-FID 分析。由於此流程過於繁瑣且耗時，為維持實驗穩健、精確及重複性，目前已發展成一套自動化儀器分析系統：正向 LC 系統搭配 on-column transfer GC 系統，期間皂化及衍生化等程序亦於線上執行，另搭配特殊軟體進行分類和鑑別，上述自動化技術已被寫於 ISO 20122之文件中。

作者表示，礦物油自動化分析技術應用於植物油分析並無大問題，惟食品種類多且複雜，分析時需面臨不同挑戰。例如橄欖果實外皮之蠟層會干擾 MOSH 分析以及部分食物中含有 β-carotene 會影響 MOAH 分析等，這些需再搭配額外淨化程序；動物油部分，作者於精製魚油中發現 MOAH 呈現異常高之現象(未精製魚油無此現象)，此部分仍待進一步釐清。綜上，食品中礦物油分析仍具挑戰(包含不同食品類別研究調查及自動化硬體及軟體之專業訓練)。

二、國外大麻產品之監管及研究(Matej Maly)

大麻是全球最具爭議的植物之一，作為工業作物和藥用植物已有超過5000年的栽培歷史。它含有500多種生物活性代謝物，其中植物大麻素因其與人體內源性大麻素系統(調節關鍵生理過程)的獨特相互作用而備受科學界關注。在這些大麻素中，大麻二酚(CBD)和 Δ^9-四氫大麻酚(Δ^9-THC)的研究最為廣泛。CBD 不具有精神活性，廣泛用於各種製劑中；而 Δ^9-THC 則具有強烈的精神活性作用，在大多數國家受到嚴格監管。加拿大於2018年將大麻合法化，2019年確立含大麻產品必須遵守的食品安全規則，包括大麻產品必須包裝在兒童不易打開的容器中(大麻植株及大麻種子除外)，並須貼有強制性的健康警語、標準化之大麻符號，以及具體的產品資訊(包括品牌名稱、大麻類別、THC 及 CBD 資訊、許可證持有人資訊等)。這些措施旨在降低使用大麻的危害風險，減少大麻產品對青少年的吸引力，並為消費者提供在使用大麻之前所須了解之資訊。歐盟則是針對大麻籽、大麻籽衍生產品及大麻籽油訂有 Δ^9-THC (Δ^9-THC 及 Δ^9-THCA 總合)限量規定，分別為3.0、3.0及7.5 mg/kg。

作者利用 UHPLC-HRMS/MS 建立大麻產品中50種植物大麻素和2種多酚

之定量方法，並應用於大麻籽、大麻籽油、大麻粉及 CBD 油等相關產品篩檢。結果發現：某些大麻產品中 cis-Δ^9-THC 含量顯著(trans-Δ^9-THC 為強效精神活性化合物，cis-Δ^9-THC 則效力較低)；市售 CBD 油中多環芳烴化合物(PAHs)含量評估部分，由2016～2025篩檢結果來看，多個樣本測得高含量 PAHs。目前本署已建立「食用油中 Δ^9-四氫大麻酚、大麻酚及大麻二酚之檢驗方法(TFDAO0005.00)」，作者相關研究成果可作為本署未來研究精進之參考。

三、PFAS 自動化前處理技術(Kari Organtini)

近年環境及食品中 PFAS 議題逐漸受關注，相關規範及檢驗標準也陸續產生。目前食品中 PFAS 檢驗技術大多為經溶劑萃取後以 SPE 淨化，經轉溶及過濾後搭配 LC-MS/MS 分析。本署近期公開之「食品中全氟烷基物質之檢驗方法(TFDAO0048.00)」即以 QuEChERS 前處理技術及 EMR-Lipid 淨化，經轉溶及過濾後搭配 LC-MS/MS 分析。

此篇研究係儀器商 Waters 與 CEM 合作，建立食品中 PFAS 自動化前處理程序：樣品萃取以自動化溶劑萃取系統，隨後取 SPE (含 WAX 及 GCB 吸附劑)採自動化固相萃取系統淨化，實現樣品從萃取至淨化完全自動化，可應用於魚類產品中 PFAS 之檢驗分析。上述自動化前處理技術及相關研究成果可作為本署未來研究精進之參考。

四、真菌毒素多重分析檢驗技術(Jianru Stahl-Zeng)

目前真菌毒素檢測主要仍以具專一性免疫親和性管柱搭配光譜(LC-FLD 或 LC-DAD)分析，故大多為單一檢驗方法。因部分真菌毒素(例：黃麴毒素)於食品中之容許限量極低，如要捨棄專一性免疫親和管改以多重分析，則需加強評估淨化流程並改以質譜分析。本署真菌毒素檢驗方法以搭配免疫親和管之單一檢驗方法為主，另有1篇「食品中真菌毒素檢驗方法－多重毒素之檢驗(MOHWT0010.03)」係採 LC-MS/MS 分析，惟適用基質侷限於穀類及其製品。

此篇研究作者以 QuEChERS 前處理技術搭配 MRM3(產物離子經誘導碎裂後產生之第三對離子對)建立可應用於嬰兒食品、杏仁、葡萄汁及紅酒中多重毒素之檢驗方法。其可有效增加目標物之選擇性，並能滿足歐盟所訂定之食品中真菌毒素限量標準之要求。惟目前 LC-MS/MS 儀器多採前驅離子搭配一次碎裂之產物離子進行分析，如參照此篇研究需選擇具此功能之儀器。目前本署有此類功能之儀器，搭配其前處理流程，可作為本署未來研究精進

之參考。

五、利用高解析質譜(HRMS)進行藥物殘留分析及定量(Anton Kaufmann)

作者於 HRMS (TOF)發展初期即踏入此領域探索，嘗試將不同類型動物用藥合併於一個方法分析。對比 LC-MS/MS，經歷了包含靈敏度(sensitivity)差、選擇性(selectivity)不足、線性範圍受限，以及當目標分析物訊號過強造成質量偏移等情況。隨著科技的發展，儀器效能提升，作者以新一代的HRMS (TOF 及 Orbitrap)再次嘗試，並於退休前完成建立涵蓋所有動物用藥類別(包括類固醇和人工生長促進劑)以 LC-HRMS 進行定性及定量之分析方法。雖然目前 QqQ 分析仍是主流，其儀器靈敏度的發展仍優於 HRMS。但 HRMS 仍有讓人無法忽略的精確質量優勢：不易碎裂化合物的鑑別、Isptopic ratio 輔助鑑別以及基質複雜檢液中目標分析物高選擇性之能力。作者之實驗團隊以所建立之 HRMS 方法參與數十次的能力試驗測試皆獲得無系統性偏差之實驗結果，證實定量分析(精密度和準確度)在高解析度質譜儀及低解析度質譜儀之間沒有差異。近期蘇黎世州立實驗室(KLZH)、美國農業部(USDA-REE-ARS)及法國國家食品、環境及職業健康與安全局(ANSES Vet. Drug EU-RL)建構一項國際合作研究(2019～2027年)：Building international collaborative study for monitoring veterinary drug residues with use of LR-MS &/or HR-MS systems。目標為比較 LR-MS/MS 及 HR-MS(/MS)多類別動物用藥殘留檢測方法於多樣食品萃取物中的應用。

本署近年亦逐步建立各不同類型化合物之高解析質譜資料庫，上述相關研究成果有助於本署未來精進 HRMS 研究分析。

六、植物來源蛋白之元素含量研究(Jeffrey Sayen)

除了傳統的動物性蛋白質外，植物性蛋白質、昆蟲蛋白質、發酵蛋白、混合蛋白及細胞培養蛋白等亦逐漸發展。每種來源的蛋白質都有獨特的營養成分並存在可能潛在的風險。為確保非肉類蛋白或培養蛋白產品對人類食用安全，生產商必須遵守良好製造規範(GMP)。作者以 ICP-OES 及 ICP-MS 分析比較動物來源蛋白(牛、雞、豬、鮪魚)及植物來源蛋白(仿牛、仿雞、仿豬、仿鮪魚)中不同元素含量差異：結果發現，植物性和動物性產品之間存在顯著差異，植物性產品於砷及鎘之含量明顯較高。植物性產品某些元素含量較高可能是由環境吸收所致，另發現鮪魚中砷及汞此2種元素濃度相當高。

將作者於檢測所得牛、雞、豬及鮪魚中元素濃度對應我國「食品中污染物質及毒素衛生標準」，其中於鉛、鎘、汞及砷等危害元素部分皆低於限量

標準(鮪魚中砷除外)。依衛生標準，魚中砷及汞之限量係採無機砷及甲基汞計，而此篇研究檢測的為總砷及總汞，故無法進行對應。一般而言，水產品中有機砷含量高，但其毒性低，故鮪魚檢測出高含量砷，推測可能來自有機砷貢獻。此篇研究讓我們將目光朝向植物性蛋白產品時，亦能對其相關風險有進一步認識，是個相當有趣的研究。

參、心得及建議

此次研討會內容多元且豐富，由各會議中演講者分享及提問者之詢問可以感受到參與者對科學研究的熱情，儀器商為能吸引研究人員目光亦讓人感受到積極投入方法開發的企圖心，另 AOAC International 為鼓勵學生參與科學研究，提供獎學金獎勵，研究成果受青睞的學子(通常是求學中的博士生)將獲得獎學金及免費參與年會之機會，並能於會中口頭分享研究成果。置身於研討會中，專注體驗單純科學研究，讓人有所獲益之餘亦印象深刻。也許歸因於科技的發展，訊息及知識傳播快速，大家對食品安全所關注的範圍愈來愈大，對於檢測分析上的要求也愈來愈多，受限於人力、時間及物力，快速、自動化及跨類別(污染物、農藥、動物用藥等)之多重分析技術逐漸受到重視並可能成為趨勢。

檢驗結果是一種科學證據，但針對檢驗結果下結論時須回朔事實本質。例如精製魚油中 MOAH 含量異常高，是否為食品本身受礦物油污染?亦或是於加工時產生而無法藉由層析分離之副產物?以及是否有危害風險等；另，魚類檢出高含量之總砷是否代表高含量的無機砷?檢驗結果之判讀須小心謹慎，適時結合各方資訊有助於降低誤判風險。

以下為參與研討會後提出之建議：

一、建議持續鼓勵同仁積極爭取參與國際型會議的機會

臺灣為島嶼小國，經費及物力相對侷限，藉由參與此類型國際性會議不僅可以短時間內了解全球趨勢，有助於拓展視野、建立人脈，亦可幫助鎖定研究方向也能藉由參考他人的研究成果來增進檢驗研究效益，建議持續鼓勵同仁積極爭取參與國際型會議的機會。

二、建議可增購高階儀器及自動化分析設備

鑒於科技發展日新月異，檢驗技術推陳出新以及人力短缺，適時增購高階儀器及自動化分析設備有助於因應未來檢驗趨勢。

附錄一

2025 AOAC Annual Meeting & Exposition Schedule

Saturday, August 23, 2025

9:00 AM – 4:00 PM	Training Course: Laboratory Accreditation Guidelines (ALACC)	Palm 1
9:00 AM – 4:00 PM	Training Course: Method Validation	Palm 2
1:00 PM – 3:30 PM	Official Methods Board Meeting	Sunset 1-2
3:30 PM – 5:00 PM	The Presentation on Presentations	Palm 8

Sunday, August 24, 2025

8:00 AM - 9:00 AM	Women - Let's Network & Have Coffee, *Sponsored by S&A Scientific Laboratory*	Pacific C & Look Out Point
8:30 AM – 12:00 PM	Stakeholder Program on Infant Formula and Adult Nutritionals (SPIFAN) Mtg. - Morning Session	Pacific D
9:00 AM – 10:15 AM	Agricultural Materials Community Meeting	Palm 8
1:00 PM – 2:30 PM	Binary Methods: Goals, Performance Statistics, Validation, and Future Harmonization	Pacific C
1:00 PM – 2:30 PM	Chromatography Frontiers: Method Development for Complex Contaminant Analysis in Food Matrices	Town & Country C
1:00 PM – 2:30 PM	Fostering Students and Early Career Researchers: An Interactive Mentoring Session	Palm 3-5
1:00 PM – 2:30 PM	Mycotoxins Community Meeting	Pacific E
1:00 PM – 2:30 PM	SPIFAN Meeting - Afternoon Session	Pacific D
2:00 PM - 3:00 PM	ALACC Meeting	Palm 6
3:00 PM – 4:30 PM	Analytical Solutions Forum (ASF)	T&C B
4:30 PM - 5:30 PM	New Member and First Time Meeting Attendee Orientation, *Sponsored by Better Being Co.*	Palm 3-5
5:00 PM – 6:00 PM	Contaminants Community Meeting	Pacific D
5:00 PM – 6:00 PM	Microbiology Community Meeting	Pacific E
5:00 PM – 6:00 PM	Nutrients Community Meeting	Palm 8
6:00 PM – 7:00 PM	Community Mixer, *Sponsored by Neogen*	Pacific A & Look Out Point
7:00 PM – 9:00 PM	Exhibit Hall Grand Opening & President's Welcome Reception	Ballroom

Monday, August 25, 2025

7:00 AM – 8:00 AM	Vendor Presentation: Thermo Fisher Scientific	Pacific E
7:30 AM – 8:00 AM	Continental Breakfast	T&C Foyer
7:30 AM - 8:00 AM	Vendor Presentation: A2LA	Pacific D
8:00 AM – 10:00 AM	Awards Ceremony & Keynote Address	Town & Country A
10:00 AM – 3:00 PM	Exhibit Hall Open	Ballroom
10:00 AM – 5:00 PM	Poster Presentations: Agriculture, Environment, & Biostimulants, Botanicals & Dietary Supplements, Chemical Contaminants & Residues, Novel Foods & Ingredients, and Quality Assurance & Reference Materials, *Sponsored by NOW Foods*	Golden State Ballroom
10:00 AM – 10:30 AM	Refreshment Break	Ballroom
10:30 AM – 11:30 AM	Expert Discussion on Mineral Oil	Palm 3-5
10:30 AM – 11:00 AM	Vendor Pres.: NOW Foods/Biotage	Pacific D

Ballroom = Golden State Ballroom
Boardroom = Golden State Boardroom
T&C = Town & Country
CA = California

Monday, August 25, 2025 (cont.)

10:30 AM – 11:00 AM	Vendor Pres.: Verder Scientific	Pacific E
11:45 AM – 12:45 PM	Vendor Pres.: Agilent Technologies	Pacific D
11:45 AM – 12:45 PM	Vendor Presentation: Waters Corp	Pacific E
12:00 PM – 1:00 PM	Lunch Served in Exhibit Hall	Ballroom
12:00 PM – 1:00 PM	Poster Presenter Hour	Ballroom
1:00 PM – 1:40 PM	Wiley Award Address	T&C B
1:45 PM – 3:15 PM	AOAC INTERNATIONAL Microbiological Standards (AIMS) Program Meeting	Pacific C
1:45 PM – 3:15 PM	Contaminants in Cannabis: Understanding the Industry's Testing Landscape	Town & Country C
1:45 PM – 3:15 PM	Using Orthogonal Methods for Botanical ID by Qualitative and Quantitative Methods	Town & Country D
1:45 PM – 3:15 PM	Wiley Award Symposium: Three Decades of Advances in Analytical Methods for Vet Drug Residues and Chemical Contaminants in Foods and Onwards	Town & Country B
3:15 PM – 3:45 PM	Refreshment Break	T&C Foyer
3:45 PM – 5:15 PM	Current Developments in Analytical Testing Methods for Contaminants in Foods and Food Packaging	Town & Country B
3:45 PM – 5:15 PM	Gluten & Food Allergens (GFA) Program Meeting	Pacific C
3:45 PM – 5:15 PM	Metals Community Meeting	Palm 3-5
3:45 PM – 5:15 PM	The Future of Microbiological Method Validation: AOAC Appendix J Revision	Town & Country D
3:45 PM – 5:15 PM	Understanding Nutritional Composition with Updated Methods Fit for Novel Foods	Town & Country C
5:15 PM – 6:30 PM	New Member and First-Time Attendee Welcoming Reception, *Sponsored by Abbott Nutrition*	Pacific A & Look Out Point
5:15 PM – 6:15 PM	Technical Division for Laboratory Management (TDLM) Executive Committee Meeting	Board-room
5:45 PM – 6:45 PM	Color Additives Community Meeting	Palm 3-5
6:00 PM – 7:00 PM	Food Allergens Community Meeting	Pacific C
6:00 PM – 7:00 PM	Taiwan Section Business Meeting	CA 4
6:15 PM – 7:15 PM	Reception for Technical Division for Laboratory Management (TDLM)	Skyview 2

Tuesday, August 26, 2025

7:30 AM – 8:00 AM	Vendor Pres.: R-Biopharm Rhone Ltd	Pacific D
7:30 AM – 8:00 AM	Vendor Pres.: Restek Corporation	Pacific E
7:45 AM – 8:15 AM	Refreshment Break	T&C Foyer
8:00 AM – 10:00 AM	Stakeholder Program on Agent Detection Assays (SPADA) Meeting	Palm 7
8:15 AM – 9:45 AM	Complementary Analytical Methods and Robust Sampling for Comprehensive Quality Evaluation of Botanical and Fungal Dietary Supplements	Town & Country D
8:15 AM – 9:45 AM	From Raw Materials to Finished Products: Improving Food Safety across the Food Value Chain via Elemental Analysis	Town & Country C
8:15 AM – 9:45 AM	Future of Vitamins Analysis Meeting	T&C A

Schedule is subject to change.

Tuesday, August 26, 2025 (cont.)

8:15 AM – 9:45 AM	Leveraging Artificial Intelligence and Machine Learning Modeling for Enhanced Food Safety, Quality Control, and Product Development in a Laboratory Setting	Town & Country B
10:00 AM – 3:00 PM	Exhibit Hall Open	Ballroom
10:00 AM – 5:00 PM	Poster Presentations: Chemical Contaminants & Residues, Gluten & Food Allergens, Laboratory Management, Compliance, & Accreditation, and Microbiology & Molecular Biology Methods, *Sponsored by NOW Foods*	Golden State Ballroom
10:00 AM – 10:30 AM	Refreshment Break	Ballroom
10:15 AM - 11:45 AM	Best Practices and Practical Applications for Non-Targeted Analysis	Town & Country B
10:15 AM - 11:45 AM	Cannabis Analytical Science Program (CASP) Meeting	Pacific C
10:15 AM - 11:45 AM	Molecular-Based Analytical Methods for Safeguarding Food and Dietary Supplement Integrity	Town & Country D
10:15 AM - 11:45 AM	Navigating the Landscape of Accredited Dietary Fiber Methods	Town & Country C
12:00 PM – 1:30 PM	Committee on Sections Meeting	Palm 8
12:00 PM – 1:00 PM	Lunch Served in Exhibit Hall	Ballroom
12:00 PM – 1:00 PM	Poster Presenter Hour	Ballroom
12:00 PM – 1:00 PM	Vendor Presentation: SCIEX	Pacific E
12:00 PM – 1:00 PM	Vendor Presentation: Shimadzu Scientific Instruments, Inc.	Pacific D
1:00 PM – 2:30 PM	Dietary Fiber & Other Carbohydrates Program Meeting	Pacific C
1:00 PM – 2:30 PM	Hot Topic: Microbiological Food Safety Focus on *Salmonella*	Town & Country A
2:00 PM – 3:00 PM	Refreshment Break	Ballroom
2:00 PM – 3:00 PM	Sections & Communities Fair	T&C Foyer
2:00 PM – 2:30 PM	Vendor Pres.: Bruker Scientific LLC	Pacific D
2:00 PM – 2:30 PM	Vendor Pres.: CEM Corporation	Pacific E
3:00 PM – 4:30 PM	Bioinformatics in Foodborne Pathogen Genomics: From Sequence to Safety	Town & Country B
3:00 PM – 4:30 PM	Botanical Ingredients and Dietary Supplement Integrity (BIDSI) Program Meeting	Town & Country A
3:00 PM – 4:30 PM	Cannabis Pesticides Testing: Analytical Challenges and Addressing Evolving Regulatory Gaps in Consumer Safety	Town & Country D
3:00 PM – 4:00 PM	Committee on Statistics Meeting	Palm 7
3:00 PM – 4:30 PM	Contaminated: Determination of PFAS in Everyday Foods and Drinks	Town & Country C
3:00 PM – 4:30 PM	Dairy Protein Hydrolysates (DPH) Mtg.	Pacific C
3:00 PM – 4:30 PM	Sections Session: How Regional Sections Partner to Achieve AOAC INTERNATIONAL'S Strategic Plan	Pacific D
4:30 PM – 5:30 PM	BIDSI Reception, *Sponsored by Alkemist Labs*	Town & Country A
4:30 PM – 6:00 PM	Membership Committee Meeting	Sunset 1
4:30 PM – 5:30 PM	Sections Session Reception, *Co-Sponsored by Mérieux Nutrisciences and Waters Corp.*	Pacific E
5:00 PM – 6:00 PM	Cannabis Community Meeting	Pacific C
5:00 PM – 6:00 PM	Midwest Section Business Meeting	Boardroom
8:00 PM – 10:30 PM	Annual Meeting Celebration	Pacific A & Look Out Point

Wednesday, August 27, 2025

7:45 AM – 8:15 AM	Refreshment Break	T&C Foyer
8:15 AM - 9:45 AM	Advanced Analytical Methods in Nutraceutical Development: From Probiotics to Bioactive Compounds	Town & Country C
8:15 AM – 9:45 AM	Analyzing Chemical Contaminants: From PFAS to Natural Toxins	Town & Country D
8:15 AM - 9:45 AM	Non-Targeted Analysis for Quality, Safety, and Authentication of Natural Products	Town & Country B
8:15 AM - 9:45 AM	Organic Authenticity Program Mtg.	Palm 8
9:45 AM – 10:15 AM	Refreshment Break	T&C Foyer
10:00 AM – 11:00 AM	HWWA Committee Mtg. and Orientation	Sunset 1
10:00 AM – 5:00 PM	Poster Presentations: Bioinformatics, Chemometrics, & Data Analytics, Chemical Contaminants & Residues, Food Additives & Colors, Food Authenticity & Food Fraud, and Food Nutrition, *Sponsored by NOW Foods*	Golden State Ballroom
10:15 AM – 11:45 AM	Looking to the Future: How Molecular Confirmation Impacts Food Safety—Will Colony Confirmation Still Be Used in 10 Years?	Town & Country B
10:15 AM – 11:45 AM	Maintaining Public Trust in Food Safety and Quality: Expanding Testing Strategies to Address Emergent Contaminants and the Complexities of Ultra Processed Foods	Town & Country D
10:15 AM – 11:45 AM	Novel Foods Program Meeting	T&C A
10:15 AM – 11:45 AM	Probiotics Redefined: Strains, Standards and Solutions	Town & Country C
11:45 AM – 1:00 PM	Technical Programming Council Mtg.	Palm 3
12:00 PM – 1:00 PM	Poster Presenter Hour	Ballroom
1:00 PM – 2:30 PM	AOAC Contaminants and Residues Initiative Meeting	Town & Country A
1:00 PM – 2:30 PM	Biological Variance: The Achilles Heel for Databases and Authentication	Town & Country D
1:00 PM – 2:30 PM	Exposing Food Fraud: Novel Methods for Food Authenticity Testing	Town & Country B
1:00 PM – 2:00 PM	Fellows of AOAC Committee Meeting and Orientation	Sunset 1
1:00 PM – 2:30 PM	The Roles of Analytical Methods and Data in Food Allergen Risk Assessment	Town & Country C
2:30 PM – 3:00 PM	Refreshment Break	T&C Foyer
3:00 PM – 4:30 PM	Emerging Microbial and Molecular Biology Methodologies for Environmental Water Testing	Town & Country C
3:00 PM – 4:30 PM	Funky Food Forensics: Innovative Analytical Techniques for Species Authentication and Fraud Prevention	Town & Country B
3:00 PM – 4:30 PM	Per- and Polyfluoroalkyl Substances (PFAS) Initiative Meeting	Town & Country A
3:00 PM – 4:30 PM	USDA Organic Certification and the Role of Residue Testing	Town & Country D
5:00 PM – 6:30 PM	AOAC INTERNATIONAL Business Mtg.	Palm 8

Thursday, August 28, 2025

9:00 AM – 11:00 AM	Board of Directors Meeting	Palm 1-3

For the full schedule and meeting information, download AOAC's year-round app or visit the app's website at www.aoac.org/25AMweb.

附錄二

Development of an Analytical Method for Per- and Polyfluoroalkyl Substances in Foods

Yu Wu, Chia-Hsin Liu, Min-Chih Yuan, Guan-Jhih Peng, **Ying-Ru Shen**, Shu-Han Chang, Ya-Min Kao, Mei-Chih Lin, and Su-Hsiang Tseng

Division of Research and Analysis, Food and Drug Administration, Ministry of Health and Welfare, ROC (Taiwan)

Abstract

- **Per- and polyfluoroalkyl substances (PFASs)** are widely used in various industries due to their high stability and hydrophobic and oleophobic properties.
- The European Union has set the maximum levels for individual and sum of 4 PFAS in food stuffs in 2023, which for individual PFAS range from 0.2 to 50 μg/kg, and for sum of 4 PFASs range from 1.3 and 50 μg/kg.
- This study established a method for the determination of 19 PFASs in fish, meat, eggs, milk and edible offal using QuEChERS pretreatment and an EMR lipid solid-phase extraction cartridge, and a delay column to eliminate background interference from the analytical system by a liquid chromatograph-tandem mass spectrometer (LC-MS/MS).
- The results showed the recoveries ranged from 60.3 to 110.8% and the coefficients of variation ranged from 1.0 to 26.2%. The limits of quantification (LOQs) were 0.02-0.25 μg/kg for 19 PFASs in fish, meat, eggs, milk and edible offal.

Materials and Methods

- Sample preparation

Add 2-5 g of food sample and 100 μL of internal standard into a 50-mL PP centrifuge tube

↓

Add 5 mL of water, 10 mL of acetonitrile and 150 μL of formic acid

↓

Add QuEChERS salt packet (containing 6 g of $MgSO_4$ and 1.5g NaCl)

↓

Shake at 1000 rpm or manually for 1 min

↓

Centrifuge at 5000 ×g for 5 min and collect the supernatant

↓

Transfer 6 mL of the supernatant into a dSPE tube containing 900 mg of $MgSO_4$, 300 mg of PSA and 150 mg of GCB

↓

Shake at 1000 rpm or manually for 1 min

↓

Centrifuge at 5000 ×g for 5 min

↓

EMR lipid

Add 1 mL of supernatant into an EMR lipid tube and let pass through

Add 2 mL of supernatant into the above EMR lipid tube and collect the effluent

Add 1 mL of effluent to a 15-mL PP centrifuge tube

↓

N_2 dry at 40℃

↓

Dissolve with 1 mL of 50% MeOH containing 1% acetic acid

↓

Filter with a 0.2 μm RC (regenerated cellulose) filter

↓

LC-MS/MS

- LC-MS/MS condition

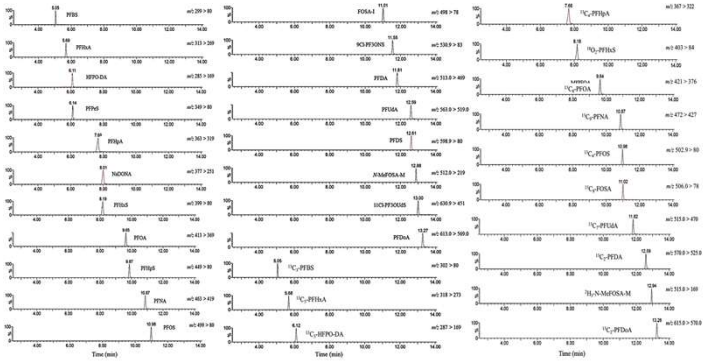
Parameter	Condition
LC system	ACQUITY UPLC I-Class with Sample manager (FL)
Column	Atlantis Premier BEH C18 AX (100 × 2.1 mm, 1.7 μm)
Delay column	Atlantis Premier BEH C18 AX (50 × 2.1 mm, 5 μm)
Column temperature	40℃
Flow rate	0.3 mL/ min
Injection volume	20 μL
Mobile phase	A：2 mM ammonium acetate in H_2O B：0.1% (v/v) ammonium hydroxide in methanol
Gradient program	Time (min) / A (%) / B (%) 0 → 2 / 99 → 99 / 1 → 1 2 → 3 / 99 → 75 / 1 → 25 3 → 8 / 75 → 50 / 25 → 50 8 → 15 / 50 → 15 / 50 → 85 15 → 16 / 15 → 0 / 85 → 100 16 → 20 / 0 → 0 / 100 → 100 20 → 20.1 / 0 → 100 / 100 → 0 20.1 → 23.5 / 100 → 100 / 0 → 0 23.5 → 24 / 100 → 99 / 0 → 1
MS instrument	Xevo TQ-XS
Ionization mode	ESI negative
Capillary voltage	0.5 kV
Desolvation temperature	400°C
Desolvation gas flow	1200 L/hr
Cone gas flow	250 L/hr
Ion source temp.	100°C

- MRM parameters of 19 PFASs by LC-MS/MS.

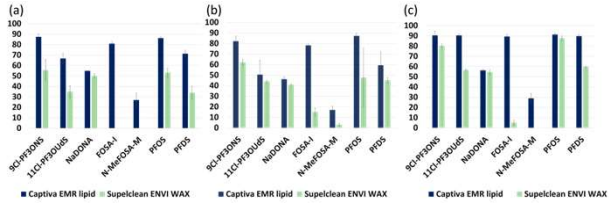
No.	Compound	Ion pair: Precursor ion (m/z) > product ion (m/z)	Cone voltage (V)	Collision energy (eV)	Internal Standard
1	11Cl-PF3OUdS	631.0 > 451 631.0 > 83	5	27 27	$^{13}C_2$-PFHxS
2	9Cl-PF3ONS	531.0 > 83 531.0 > 351	8	24 27	$^{18}O_2$-PFHxS
3	NaDONA	377 > 251 377 > 85	4	12 27	$^{13}C_2$-HFPO-DA
4	FOSA-I	498 > 78 498 > 169	4	30 30	$^{13}C_8$-FOSA
5	HFPO-DA	285 > 169 285 > 185	8	6 18	$^{13}C_3$-HFPO-DA
6	N-MeFOSA-M	512.1 > 219 512.1 > 169	4	24 27	$^{2}H_3$-N-MeFOSA-M
7	PFBS	299 > 80 299 > 99	5	27 27	$^{13}C_4$-PFBS
8	PFDA	512.9 > 469 512.9 > 169	8	12 21	$^{13}C_8$-PFDA
9	PFDS	599.0 > 80 599.0 > 99	5	54 45	$^{13}C_8$-PFOS
10	PFDoA	612.9 > 569.0 612.9 > 169	5	12 27	$^{13}C_2$-PFDoA
11	PFHpA	363 > 319 363 > 169	5	9 18	$^{13}C_4$-PFHpA
12	PFHpS	449 > 80 449 > 99	5	39 39	$^{18}O_2$-PFHxS
13	PFHxA	313 > 269 313 > 119	12	9 21	$^{13}C_2$-PFHxA
14	PFHxS	399 > 80 399 > 99	28	36 33	$^{18}O_2$-PFHxS
15	PFNA	463 > 219 463 > 269	15	15 15	$^{13}C_5$-PFNA
16	PFOA	413 > 369 413 > 169	16	9 18	$^{13}C_8$-PFOA
17	PFOS	499 > 80 499 > 99	16	42 39	$^{13}C_8$-PFOS
18	PFPeS	349 > 80 349 > 99	24	33 30	$^{18}O_2$-PFHxS
19	PFUdA	562.9 > 519.0 562.9 > 169	12	12 24	$^{13}C_2$-PFUdA

Results

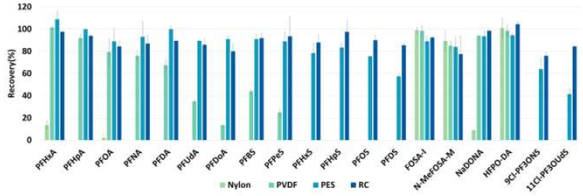
- MRM chromatograms for 19 PFAS standards and their isotope internal standards.



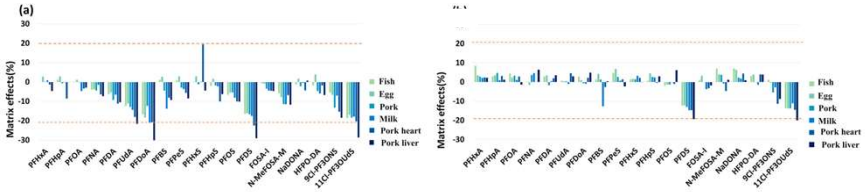
- Recovery (n=3) for 7 PFAS standards spiked into different food matrices and purified using Captiva EMR Lipid and Supelclean ENVI-WAX. food matrices: (a) fish; (b) egg; (c) pork.



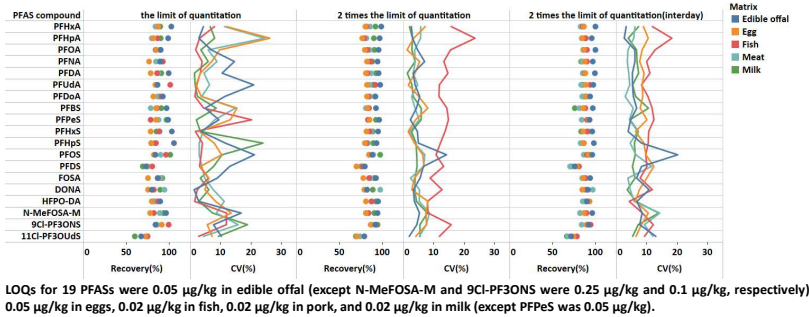
- Recovery (n=3) for 19 PFAS standards after filtration through four different membrane materials.



- Matrix effects of: (a) 19 PFASs in different matrices; (b) 19 PFASs in different matrices with 13 isotope-labeled internal standards.



- Method validation: Different samples spiked with 19 PFASs at 0.02-0.25 μg/kg respectively were used to validate.



LOQs for 19 PFASs were 0.05 μg/kg in edible offal (except N-MeFOSA-M and 9Cl-PF3ONS were 0.25 μg/kg and 0.1 μg/kg, respectively), 0.05 μg/kg in eggs, 0.02 μg/kg in fish, 0.02 μg/kg in pork, and 0.02 μg/kg in milk (except PFPeS was 0.05 μg/kg).

Conclusion

- In this study, the method developed is sensitive, stable, suitable for various kinds of food matrices with good accuracy and precision.
- This method could be applied to analyze 19 PFASs and LOQs were 0.02-0.25 μg/kg for 19 PFASs in fish, meat, eggs, milk and edible offal.
- In our future work, this method would be optimized and applied to more matrices, such as vegetables.