

# 出國報告（出國類別：實習）

## 歐洲食品化學研討會研習

服務機關：衛生福利部食品藥物管理署

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## 摘要

歐洲食品化學(EuroFoodChem)研討會為歐洲化學與分子科學協會(European Association for Chemical and Molecular Sciences, EuCheMS)食品化學組(Food Chemistry Division)之旗艦會議，每隔年舉辦一次；本次第十九屆會議是與匈牙利化學學會與布達佩斯佐治伊斯特萬大學(Szent István University)食品科學系合作，於 EuCheMS 食品化學組之協助下舉辦，地點於匈牙利布達佩斯。研討會共分為七個主題，共計演講 77 場，壁報發表 112 篇，與會人數為 219 人。本人也於會中發表一篇壁報論文，題目為「食品中著色劑之快速檢驗方法」。本次會議成員大多為歐洲的專家、學者，期間大家熱烈地互相交流研究成果、想法與意見，所獲得之資訊對本署之食品相關研究具有很大的幫助；另歐洲國家對食品摻偽之管控、檢驗及鑑定等議題均相當關注，可藉參與此研討會學習歐洲國家對食品摻偽之因應策略，將所學應用在本署檢驗方法之開發，把關好食品安全，以保護國人的身體健康。

## 壹、目的

因應食品詐欺事件層出不窮，充分了解國際上管控食品摻偽之辦法及新興儀器與檢驗技術實屬必要。檢驗人員必須時時學習新知與國際情勢，始能提升檢驗智能，進一步保障國人食品安全與公平交易。為了解歐洲與國際食品摻偽鑑別與分析檢驗之現況，本人於 106 年 10 月 2 日至 8 日奉派前往匈牙利參加歐洲食品化學研討會。

本次會議議題著重在食品化學、食品安全、食品檢驗與食品詐欺，此行主要目地為了解國際上食品詐欺之稽查、檢驗趨勢及方向，再將國內研究檢驗與國際趨勢相互接軌。此外，還可以實際與國際專家學者討論交流，並建立聯繫管道，日後必要時可請其訪臺分享研究成果或檢驗經驗，或派員赴他國相關組織參訪學習，增加未來國際合作交流之機會。

## 貳、行程安排

時間	行程
10 月 2~3 日	台北-法國巴黎-匈牙利布達佩斯
10 月 4~6 日	出席 EuroFoodChem XIX Conference 會議地點: Danubius Hotel Flamenco 和 Szent István University
10 月 7~8 日	匈牙利布達佩斯-英國倫敦-泰國曼谷-台北

## 參、會議內容/過程

歐洲食品化學(EuroFoodChem)研討會是歐洲化學與分子科學協會(European Association for Chemical and Molecular Sciences, EuCheMS)食品化學組(Food Chemistry Division)之旗艦會議，每隔年舉辦一次，首次會議發起人是第一任主席 Peter Czedik-Eysenberg 教授。

本次第十九屆歐洲化學研討會(EuroFoodChem XIXth Conference)是匈牙利化學學會(Hungarian Chemical Society, MKE)與布達佩斯佐治伊斯特萬大學(Szent István University)食品科學系合作，於 EuCheMS 食品化學組之協助下舉辦；舉辦時間為 2017 年 10 月 4 日至 6 日，地點為匈牙利首都布達佩斯。這是匈牙利第二次舉辦歐洲食品化學會議，上一次布達佩斯舉辦此會議是 1999 年第十屆會議，當時的會議主席是 Radomir Lászity 教授。

EuroFoodChem 系列會議的重要目標是聚集經驗豐富專家與年輕伙伴，讓大家有機會互相交流食品相關領域之想法及意見，與會者涵蓋歐洲和其他國家的食品專家與大學專業人員以及研究機構、實驗室、工業機構、消費者和公家機關等專業人員。

本次會議議題聚焦在食品化學於食品科學中所扮演的核心角色之探討，涵蓋領域包括：1.食品成分、質量和安全，2.生物經濟之食品化學，3.食品成分之化學反應和交互作用，4.食品於加工和儲存時之化學變化，5.生物活性成分和微量元素，6.食品香料、色素和添加物，7.功能性食品和成分，8.新穎性食品和奈米材料，9.食品摻假、真實性和可追溯性，10.食品化學新穎性方法等相關主題。

研討會是由會議主席 Livia Simon Sarkadi [佐治伊斯特萬大學(Szent István University)食品化學與營養學系教授、匈牙利化學學會(Hungarian Chemical Society 主席)]和科學委員會主席 Marco Arlorio (義大利 University of Eastern Piedmont 食品科學系教授)進行開場演說，歡迎各位與會者，並介紹歐洲食品化學研討會之歷史與舉辦歷程。

隨後，Livia Simon Sarkadi 教授特別邀請匈牙利當地傳統舞蹈團蒞臨表演，該舞蹈團是由少年和兒童組成，穿著匈牙利傳統服飾，表演傳統舞蹈歡迎各國與會者。



圖一、研討會主席 Livia Simon Sarkadi 教授之開場演說



圖二、科學委員會主席 Marco Arlorio 教授之開場演說



圖三、匈牙利當地傳統舞蹈團之開場表演

本次會議與會人數為 219 人，共有 77 場演講，112 篇壁報發表。演講分七個主題，以全體講座及分組演講方式舉行，分組演講則在 Danubius Hotel Flamenco

和 Szent István University 兩個會場同時進行，兩個會場之步行距離約為 5 分鐘。

七個主題如下表所示：

主題	主題名稱
SESSION 1	機能性食品 and 生物活性成分
SESSION 2	食品加工 and 儲藏之化學變化
SESSION 3	食品摻假、真實性和可追溯性
SESSION 4	食品安全
SESSION 5	食品成分之化學反應及交互作用
SESSION 6	新穎性食品及分析方法
SESSION 7	食品組成及品質



圖四、Danubius Hotel Flamenco 會場



圖五、Szent István University 會場

本人於 SESSION 6 新穎性食品及分析方法發表壁報，題目為食品中著色劑之快速檢驗方法(The quick examination of food color additives)，分享本署利用快速檢驗技術測定食品中常見的 46 種合法及非法著色劑之研究成果。



圖六、壁報論文會場



圖七、壁報論文發表



首場演講是會議發起人 Peter Czedik-Eysenberg 名譽講座(Peter Czedik-Eysenberg honorary lecture)，演講者是來自於瑞士的 Dr. Reto Battaglia，其研究主要領域為建立本土和國際間食品鏈之品質確認及控制，在本次會議演講的題目是”食品化學家-一種最特別的物種。現今食品化學家在食品供應鏈之角色”，演講中特別提及會議創辦人 Dr. Peter Czedik-Eysenberg 對歐洲食品化學發展之貢獻。演講內容重點為食品品質確認及控制之行為，並說明檢驗分析結果之價值、不確定性與陷阱，以及目前認證和審查之相對重要性；也強調現代食品化學家應具備寬廣及跨學科知識，才足以完善管控食物鏈。

以下摘錄與本署近年研究相關演講之重點：

#### **(一) Challenges related to food fraud prevention and detection - Plenary lecture**

##### **『預防食品詐欺及檢測所面臨之挑戰』**

食品詐欺領域於會議第一天下午全體講座發表的是 Dr. Elke Anklam, Dr. Elke Anklam 目前擔任歐盟聯合研究中心(EC Joint Research Centre, EC-JRC)赫爾(Geel)分部及新 JRC Directorate F: Health, Consumers & Reference Material 之主席，這是由前 EC-JRC-IHCP (Independent Health & Care Providers)及 EC-JRC-IRMM (Institute for Reference Materials and Measurements)所合併成立之新單位，負責健康、消費者與參考物質相關業務。

Dr. Elke Anklam 表示，每個人民為了確保他們的飲食夠營養、健康，都有取得安全且高品質食物的權益，而不論是過去或現在的食品醜聞都引起許多消費者的關注，尤其是關於食品安全及摻偽的事件與議題。

除了食品安全外，確保食品品質和真實性與防止食品摻偽也相當重要，從古至今都有食品摻偽之事件，最常見之食品摻偽目的是為了獲取最高的利潤，因此，高價食品明顯成為摻偽的高風險群。食品摻偽不只損害食品工商界名譽也阻礙了經濟貿易，例如 2012 年底的歐洲馬肉風暴，不但造成食品業界名譽受損，也暴露出歐盟會員國執行食品鏈系統上強制性不足之弱點，且國與國之間無法進行有

效溝通與資訊交換，所以相關事件造成跨境衝擊(cross-border impact)；因此，預防食品摻偽當務之急是找出食物鏈系統有效的管理方法，以及建立國家間有效率的溝通管道。

食品摻偽有多種不同複雜性程度，舉例來說，從相對單純的牛奶加水稀釋，到複雜性高的特級初榨橄欖油摻偽，這些案件中，科學家們通常在找尋未知成分，相對地，不論是簡單還是複雜的食品摻偽鑑別方法，食品鑑識科學家(food forensic scientist)都會面臨到的三個主要挑戰，包括：

1. 鑑別出一個或多個可區分出食品或食品成分真實性與摻假狀態之標誌。
2. 獲取可當作標準物質之真實樣品，以建立正確標誌及鑑別方法。
3. 創建司法審查程序中足以信賴，且有足夠信心度之鑑識證據及數據。

另外，她也說明目前全球食品系統所面臨的挑戰是，未來狀況可能會變得比現在更嚴峻，會遭遇到更新且複雜之情況。因為新技術、氣候、人口改變、消費行為或貿易中斷等潛在因素，皆可能對現今食品和營養方面之政策和立法框架造成顯著壓力。

Dr. Elke Anklam 演講時也提到近來 JRC 致力在橄欖油、蜂蜜及魚之摻偽鑑別，並進行酒類資料庫建立與未知物分析，顯示 JRC 相當重視食品之經濟型摻偽。她最後也再度強調，除了在食品摻偽上找出有效的鑑別方法，各國間的農業-食品鏈系統之完整性和有效性也是亟需解決的問題。

演講後 Dr. Elke Anklam 因公務忙碌，隨即離開會場，因此沒機會與 Dr. Elke Anklam 直接進行面對面之交流，但會後我透過 email 方式與 Dr. Elke Anklam 聯繫，她相當親切，表示很歡迎我們到她的單位進行參訪。JRC 的業務和本組業務相似，包括食品中未知物之研究和食品摻偽之鑑別，期待將來能夠有機會到 JRC 參訪學習，必定對本署業務有相當幫助。



圖八、Dr. Elke Anklam 之演講

**(二) Harmonization of regulations of control food adulteration, composition and safety, and how to ensure that harmonized regulations are effective - Keynote lecture**

『協和食品摻偽之控制、組成和安全規範，及如何確保調和後之規範是有效的』

Dr. Huub Lelieveld 是全球標準協會(Global Harmonization Initiative, GHI)主席，他表示食品摻偽或詐欺是不肖商人為了獲取更高利潤，利用便宜的原料取代原本產品之成分，或者為了改善食品風味和顏色等特性，或延長保存期限而添加化學物質，這可能危害到人們的健康，也可能造成嚴重疾病甚至死亡。而不同國家對食品安全上有不同的規範，這可能促使食品詐欺的產生，雖然一些國家有明確法規規定不得添加於食品中的成分，但有些國家卻沒有完善的食品安全規範，食品摻偽事件除了發生在法規不完善國家中的小公司，跨國企業可能也經常涉入其中，這些危害健康的成分也有可能是非蓄意使用，因為原料供應商沒有提到他們有使用這些危害健康之成分，而下游廠商就算發現問題也可能選擇隱瞞，這都是不道德且構成犯罪的行為，例如，三聚氰胺這些國際事件，應可透過通報系統來避免，這些系統也可以用來揪出隱瞞或否認事實的公司。

此外，Dr. Huub Lelieveld 也提到法規制定必須考量到劑量因素，因為沒有真

正具有毒性之物質，只有達到產生毒性之劑量，且毒性試驗大多以動物進行分析，並不能真實地代表人類的情況，所以要制定法規前，必須多加考量真正會對人類造成毒性之劑量。因此，除了建立完善的通報系統，各國間最好有相似的規範，且制定劑量標準時，必須考量真正造成毒性的劑量，不要制定過於嚴格的標準，造成人民恐慌。

### **(三) Adulteration: lessons from the past**

#### **『摻偽：過往的教訓』**

Mr. Mike Saltmarsh 是歐洲自動售貨協會衛生委員會(European Vending Association's Hygiene Committee)的主席，他彙整了過往摻偽事件的種類，在演講中提到，自從有貿易行為就開始有食品摻偽的情況，我們應該汲取過往的經驗，以推估食品中有哪些可能的摻偽手段，再加以運用來預防摻偽。而摻偽基本手法不會改變，包含：

1. 簡單物理性摻偽，如加水增加產品重量或容量。
2. 用低品質成分稀釋高品質原料。
3. 用便宜的物質取代高品質成分。
4. 添加可提高產品賣相之物質。

從十六世紀到現在，常見的摻偽食品有麵包、啤酒、牛奶、香料、肉、橄欖油和酒，雖然不是所有的摻偽食品都對健康有害，但都屬於食品詐欺，消費者應記取過往的教訓，預防被不肖商人食品詐欺。

### **(四) Development of molecular markers for honey entomological origin authentication**

#### **『以分子標記鑑定蜂蜜昆蟲來源摻偽之開發』**

Ms. Sonia Soares 的研究是利用 DNA 標記來鑑別蜂蜜之產地，因為不同地理

位置的蜜蜂品種不一樣，可藉由蜜蜂採蜜時所殘留之基因進行蜂蜜產地鑑別。蜂蜜是由蜜蜂採集的天然甜味物質，根據歐盟法規，蜂蜜應該是由西方蜜蜂 *Apis mellifera* 採集，然而亞洲蜂蜜傳統上是由東方蜜蜂 *Apis cerana* 所採集，目前為止，只有少數幾個蛋白質檢測的方法被提出可用來評估蜂蜜之昆蟲來源，事實上這與地理位置起源有關，根據進化譜系之分析，不同地理位置範圍有著不同品種之蜜蜂。

Ms. Sonia Soares 以 DNA 分子標記鑑定蜂蜜是由 *Apis cerana* 或者 *Apis mellifera* 採集，此研究先以泰國、中國和越南的蜜蜂 *Apis cerana*，及歐洲國家 4 種 *Apis mellifera* 亞種蜜蜂(iberuebsis、mellifera、ligustica、carnica)，設計出 16S rRNA 和 tRNA<sub>lec-COII</sub> 基因間區段之目標引子，並以主成分分析(PCA)技術來確定其特異性和敏感度。結果顯示，此基因間區段之引子可成功鑑別出兩種蜜蜂，其 16S rRNA 皆可獲得正向放大，證明 Real-Time PCR 搭配高解析熱熔解分析(High-resolution melting analysis, HRM)可確實區分出兩種蜜蜂，此法也已成功運用在越南與葡萄牙蜂蜜樣品之產地鑑別。

會後，我與 Ms. Sonia Soares 交流，她表示目前她研究上所使用的亞洲蜂蜜都是來自越南，因為西方蜜蜂體型較大，採蜜量較多，所以中國和日本等許多亞洲國家都已經引進西方蜜蜂，因此生物分子標記不適合以這些國家的蜂蜜當作產地鑑別樣本。雖然台灣已有養殖西方蜜蜂 *Apis mellifera*，但我與 Ms. Sonia Soares 約定若有不同研究之樣本需求，可再進一步討論交流。

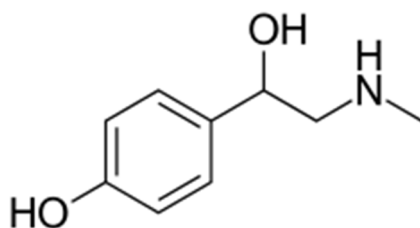


圖九、左為西方蜜蜂 *Apis mellifera*，右為東方蜜蜂 *Apis cerana*

## (五) Synephrine – a potential biomarker for orange honey authenticity

### 『辛弗林素 – 柑橘類蜂蜜真實性之潛在生物標誌物』

Dr. Maria Beatriz A. Gloria 是來自巴西的教授，她報告的研究主題是柑橘類蜂蜜之摻偽，由於單花源(monofloral)蜂蜜的特殊風味和保健特性，近來引起消費者的許多關注，柑橘類蜂蜜即是其中之一。蜂蜜真實性關係到全球性市場之發展，因此，找尋出可信賴的標記來區分蜂蜜的植物來源，是刻不容緩的課題。而 Dr. Maria Beatriz A. Gloria 利用柑橘類中特有成分-辛弗林素(synephrine)當作指標，以 LC-MS/MS 分析蜂蜜中 synephrine 之含量，來鑑別柑橘類蜂蜜的真偽，並配合蜂蜜孢粉學(melissopalynology)分析蜂蜜中花粉以佐證來源植物。



圖十、辛弗林素(synephrine)之結構

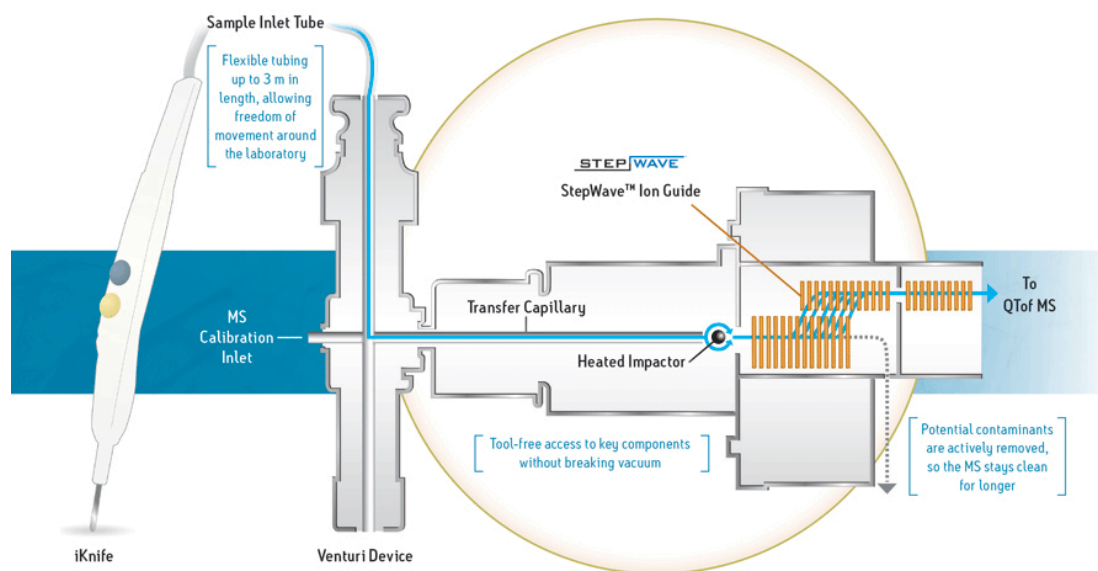
Dr. Maria Beatriz A. Gloria 的研究結果顯示，雖然柑橘類蜂蜜中 synephrine 含量落差大(約 79.2 - 432.2 ng/g)，但其他單花種蜂蜜未檢出 synephrine，而多花種蜂蜜中 synephrine 含量約為 9.4 - 236.5 ng/g，顯示多花種蜂蜜涵蓋柑橘類花卉之採集，此結果也再以蜂蜜孢粉學確認過。由此可知，synephrine 可當作單花源柑橘類蜂蜜真偽之辨別標記，作為附加的植物性判斷依據。

會後，我也與 Dr. Maria Beatriz A. Gloria 交流，談及其他食品或許也可以利用其特有成分，來當作摻偽鑑別之指標。然而，食物中特有成分不易找尋，這也是食品摻偽檢測中需要克服的主要難題。

**(六) Real-time identification of different food products: the fight against food fraud with rapid evaporative ionization mass spectrometry (REIMS)**

『即時鑑別不同食品：利用快速蒸發離子化質譜儀打擊食品詐欺』

Mr. Richard Schaffer 利用快速蒸發離子化質譜儀(rapid evaporative ionization mass spectrometry, REIMS)可得到食品之代謝指紋(metabolic fingerprints)，以鑑別食物有無摻偽，目前已應用在可可、乳製品和肉類等食品上。



圖十一、快速蒸氣離子質譜儀圖

REIMS 是相對新穎性的分析檢驗方法，此技術最剛開始被應用在外科手術上，當外科手術時醫師用電刀切開組織，組織被蒸發離子化收集至質譜儀分析，再立即與已知癌症腫瘤組織的化學成分組成進行比對，可快速得知該組織是否癌化，當場可以進行立即性處理。近來，此技術也已被用在碎肉上，進行肉品來源鑑別。

Mr. Richard Schaffer 的研究中，利用 REIMS 技術以自動、即時、有效率的方式鑑別食品中成分、原產地和添加物。由零售商購得巧克力、乳酪及不同肉類等產品，所有樣品立刻以改造過的透熱探針(diathermy probe)和獸醫用二氧化碳 IR

雷射進行分析，並搭配自動取樣機器(Tecan Freedom Evo 75)，可應用在高通量的分析，樣品熱切時產生之蒸氣再進入 REIMS (Xevo G2-XS ToF MS)大氣界面中，並收集 50-1200Da 範圍的光譜，最後以多變量統計(multivariate statistical algorithm)分析檢驗結果。結果顯示，肉類樣品主要差異成分是磷脂質、三酸甘油酯和脂肪酸，而巧克力及乳酪主要差別則是添加物，成功利用代謝指紋來區別樣品的品種和來源，證實快速蒸發離子化質譜儀為高通量、自動、即時、可信賴且簡單之方法，相當適合應用在食品安全和真偽之鑑別。



## 肆、心得與建議

### 一、心得

- (一) 國際上持續研發新穎、快速或高通量之食品摻偽檢驗技術，以求即時、準確的分析，且可同時檢測大量樣品，而此領域和本署業務有直接之相關性，應經常派員出席相關國際會議，以研習國際上摻偽檢驗技術之最新進展。
- (二) 各國家飲食習慣不盡相同，常見之食品摻偽類別也有所不同，目前本署比較重視的食品詐欺範圍，除了添加物和非法添加物之外，還有蜂蜜的摻偽，參加會議後，發現歐洲和其他國家仍相當重視蜂蜜摻偽及產地鑑別，其他還有橄欖油、酒類等，可知歐洲目前還是非常重視經濟類型的食品詐欺。
- (三) 國際間貿易相當頻繁，本次會議中許多食品摻偽專家，皆提出預防食品摻偽的首要重點，必須先從食物鏈管理層面中著手，而當務之急是先建立各國間良好之溝通管道，才能有迅速的資訊交流，以即時防堵摻偽事件之發生與蔓延。
- (四) 摻偽檢驗中，最困難的部分是獲得正確的真实樣品，例如鑑別蜂蜜的真实性和產地時，如何 100%確定當作標準樣品之蜂蜜是真正的純蜜，或確定其正確的產地來源；若不能確定其真實性，不但難以確認檢驗結果之正確度，也無法當作法律上判別之證據。
- (五) 參加此會議獲益良多，除了更深入了解到目前歐洲和國際上的食品詐欺檢驗研究趨勢，可將該研討會研習之內容，實際應用在我國食品檢驗研究之發展，以確保人民的食品安全與利益。也建立了一些國際人脈，包括歐盟官員與多國大學教授、博士生，及食品法律專業人員和其他專家。同時，會中發表本署研究成果，藉此可增進我國之國際能見度。

## 二、建議

### (一)持續進行經濟型食品詐欺之檢驗研究

各國依然相當重視經濟型食品詐欺，因此我國應持續進行經濟型食品詐欺之研究，現在本署已進行蜂蜜摻偽之相關研究，將來可進一步分析其他食品之摻偽。

### (二)食物鏈之管理溝通

國際間相當重視食物鏈之管理和溝通，以預防食品摻偽及其他食品安全問題，我國已推動食安五環政策，其中第一環的源頭控管及第二環的重建生產管理，都是針對食物鏈等系統加以管控，代表我國之政策能夠與國際接軌，我國應持續精進相關政策，讓食品安全防護網更加穩固強大。

### (三)食品指標性成分鑑別技術之建立

食品中特定成分為食品的重要標記，因此可應用作為食品摻偽鑑別之標的，然重要標記不易找尋，因此應持續與國際專家交流，接軌各國經驗，有利快速提升我國摻偽檢驗研究量能。

### (四)真實樣品之取得

進行食品摻偽鑑定前，必須先確定比對用的真實樣品是 100%正確，才能確保鑑別結果具有意義。

### (五)繼續參加國際研討會以掌握國際趨勢

此研討會同時聚集了幾十個國家的專家學者，能夠更多元地了解食品檢驗研究發展趨勢，建議持續派員參加此會議，以適時了解國際趨勢。

### (六)到其他國家的機關組織進行參訪研習

實際參訪他國之相關組織團體，藉此深入了解其他國家對食品安全之政策、管理辦法與檢驗分析方法。

# 研討會議程

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## SCIENTIFIC PROGRAM

### TUESDAY, October 3<sup>rd</sup> 2017

16:00 - 19:00 **GET TOGETHER: REGISTRATION AND COCKTAIL**  
*Danubius Hotel Flamenco\*\*\*\**

### WEDNESDAY, October 4<sup>th</sup> 2017

08:00 - 19:00 **REGISTRATION** – *Danubius Hotel Flamenco\*\*\*\**

09:00 - 09:30 **OPENING CEREMONY** – *Danubius Hotel Flamenco\*\*\*\**  
– *Lecture Hall*

**Peter Czedit-Eysenberg Lecture**

**Chair: Livia Simon Sarkadi**

09:30 - 10:10 PL1 **THE FOOD CHEMIST - A MOST SCEPTICAL SPECIES!**  
**TODAY'S ROLE OF THE FOOD CHEMIST IN THE**  
**FOOD SUPPLY CHAIN**  
**Reto Battaglia**

#### SESSION 1 Functional Foods and Bioactive Constituents

*Danubius Hotel Flamenco\*\*\*\* – Lecture Hall*

**Chair: Manuel Coimbra**

10:20 - 10:40 K1 **MINOR CEREALS: CHEMICAL COMPOSITION,**  
**FUNCTIONALITY, QUALITY AND UTILISATION**  
**Sándor Tömösközi, Regine Schoenlechner**

10:40 - 10:55 O1 **BUCKWHEAT AND SEA-BUCKTHORN: NATURAL**  
**SOURCES OF ASCORUTIN**  
**Zuzana Ciesarová, Kristina Kukurová, Viera Jelemenská,**  
**Martina Martina Benčičová, Blanka Tobolková, Elena Belajová**

10:55 - 11:05 SO1 **ARABINOXYLANS AS MAIN DIETARY FIBRE**  
**COMPONENTS IN OLD HUNGARIAN WHEAT**  
**LANDRACES AND NEW LINES**  
**Kitti Török, Mariann Rakszegi, Sándor Tömösközi**

11:05 - 11:15 SO2 **ASSESMENT OF CELIAC DISEASE-TRIGGERING**  
**PEPTIDES IN DIFFERENT WHEAT VARIETIES**  
**Fatma Boukid, Barbara Prandi, Arnaldo Dossena,**  
**Stefano Sforza**

11:15 - 11:45 **COFFEE BREAK, EXHIBITION, POSTER VIEWING**  
*Szent István University, Aula – 1<sup>st</sup> floor*

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15:35 - 15:45 SO4 **A BILBERRY ANTHOCYANIDIN PROTECTS COLON**  
**CELLS FROM THE GENOTOXICITY OF ALTERNARIA**  
**MYCOTOXINS**  
**Doris Marko, Julia Beisl, Georg Aichinger**

15:45 - 15:55 SO5 **BLACKBERRIES ANTHOCYANINS: IMPACT OF  $\beta$ -CD**  
**ADDITION ON THEIR STABILIZATION**  
**Ana Fernandes, M. Nuno, F.Victor**

15:55 - 16:05 SO6 **HEALTHY PROPERTIES OF SPENT COFFEE EXTRACTS**  
**Deborah Pacetti, M.R. Loizzo, R. Tundis, M. Leporini,**  
**T. Falc, O. Núñez, M. Balzano, N.G. Frega, D. Fiorini,**  
**S. Moret, L. Conte, P. Lucci**

16:05-16:35 **COFFEE BREAK, EXHIBITION, POSTER VIEWING**  
*Szent István University, Aula – 1<sup>st</sup> floor*

#### SESSION 1 cont. Functional Foods and Bioactive Constituents

*Danubius Hotel Flamenco\*\*\*\* – Lecture Hall*

**Chair: Heikki Kallio**

16:35 - 16:50 O6 **IDENTIFICATION OF FREE AND BOUND PHENOLIC**  
**COMPOUNDS IN VARIETIES OF OAT (*A. SATIVA*)**  
**AND QUINOA (C. QUINOA) FROM FINLAND, PERU**  
**AND CHILE USING UHPLC-DAD AND UHPLC-MS**  
**Sam Multari, Jukka-Pukka Suomela, Baoru Yang,**  
**Juha-Matti Pihlava**

16:50 - 17:05 O7 **MICROENCAPSULATION OF NATURAL-BASED**  
**PIGMENTS BY GREEN TECHNOLOGIES**  
**Ana N. Nunes, C. Saldanha do Carmo, C. Brazinha,**  
**C. M.M. Duarte, J. P. Crespo, Ana A. Matias**

17:05 - 17:20 O8 **CHARACTERIZATION AND POTENTIAL USES OF**  
**RETENTATE, A BY-PRODUCT OF APPLE JUICE**  
**ULTRAFILTRATION**  
**Elisabete Coelho, Marco Cruz, Rita Bastos, Mariana Pinto,**  
**João Ferreira, João Santos, Dulcinea Wessel,**  
**Manuel A. Coimbra**

17:20 - 17:30 SO7 **DETERMINATION OF THE OLIGOSACCHARIDE**  
**COMPOSITION IN DIFFERENT WORT SAMPLES BY**  
**CAPILLARY GEL ELECTROPHORESIS AND**  
**MONITORING THEIR METABOLISM OF DIFFERENT**  
**YEASTS**  
**Tamás Gábor Szilágyi, Beáta Hegyes-Vecseri, Zsuzsanna**  
**Kiss, László Hajba, András Guttman**

17:30 - 17:40 SO8 **A PROJECT OVERVIEW: IN MUSHROOM – PROCESSING**  
**FINNISH MUSHROOMS FOR NOVEL PRODUCTS**  
**Jani Trygg, Gabriele Beltrame, Pekka Majjala, Anu Hopia,**  
**Baoru Yang**

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#### SESSION 1 cont. Functional Foods and Bioactive Constituents

*Danubius Hotel Flamenco\*\*\*\* – Lecture Hall*

**Chair: Sándor Tömösközi**

11:45 - 12:00 O2 **COMPARATIVE CHEMICAL COMPOSITION AND**  
**FUNCTIONAL PROPERTIES OF SELECTED**  
**COLOMBIAN FRUITS FROM SOLANACEAE FAMILY**  
**Monica R. Loizzo, D. Pacetti, R. Tundis, M.C. Tenuta,**  
**D. Filatova, O. Núñez, E. Moyano, M. Balzano, N.G. Frega,**  
**S. Moret, L. Conte, P. Lucci**

12:00 - 12:15 O3 **FUNCTIONAL PROPERTIES OF RICE/ LEGUME**  
**COMPOSITE FLOURS EXTRUDED AND NON- EXTRUDED**  
**Claudia Arribas Martinez, B Cabellos, C Cuadrado,**  
**E Guillamón, M.M Pedrosa**

12:15 - 12:30 O4 **THE POLYSACCHARIDES FROM *PTEROSPARTUM***  
***TRIDENTATUM* (L.) WILLK. INFLORESCENCES AND**  
**THEIR CONTRIBUTION TO *in vitro* MACROPHAGE**  
**NITRIC OXIDE PRODUCTION**  
**Vitor Manuel R. Martins, Joana Simões, Isabel Ferreira,**  
**Maria T.Cruz, Maria R. Domingues, Manuel A. Coimbra**

12:30 - 12:40 SO3 **IMPROVEMENT OF THE GLUTEN-FREE SPONGE**  
**CAKE MUFFINS QUALITY USING BROCCOLI**  
**BY-PRODUCT: FOCUS ON GLUCOSINOLATES**  
**Natalia Drabińska, Ewa Ciska, Urszula Krupa-Kozak**

12:40 - 14:20

#### LUNCH

*Danubius Hotel Flamenco\*\*\*\**

#### PL2 Chair: Marco Arlorio

*Danubius Hotel Flamenco\*\*\*\* – Lecture Hall*

14:20 - 14:50 PL2 **CHALLENGES RELATED TO FOOD FRAUD**  
**PREVENTION AND DETECTION**  
**Elke Anklam**

#### SESSION 1 cont. Functional Foods and Bioactive Constituents

*Danubius Hotel Flamenco\*\*\*\* – Lecture Hall*

**Chair: Diána Bánáti**

15:00 - 15:20 K3 **HUMAN MILK AS A MODEL OF FUNCTIONAL FOODS:**  
**IDENTIFICATION OF THE 500 MAJOR TRIACYL-**  
**GLYCEROL REGIOISOMERS LIFTS THE VEIL**  
**Heikki P. Kallio**

15:20 - 15:35 O5 **STUDYING THE RELATIONSHIP BETWEEN GUT**  
**MICROBIOME VARIATION AND POLYPHENOL**  
**METABOLIC CONVERSIONS**

**László Abrankó, Ditta Kolimár, Alessandra Riva, David Berry**

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17:40 - 19:30 **POSTER SESSION**  
*Szent István University, Aula – 1<sup>st</sup> floor*

19:30 - 21:00 **WELCOME PARTY**  
*Danubius Hotel Flamenco\*\*\*\**

#### Parallel Sessions

*Szent István University, K2 Hall – 1<sup>st</sup> floor*

#### SESSION 2 Chemical Changes in Food Under Processing and Storage

*Szent István University, K2 Hall – 1<sup>st</sup> floor*

**Chair: Hans Jacob Skarpeid**

10:20 - 10:40 K2 **OPTIMIZING OXIDATIVE STABILITY IN OMEGA-3**  
**PUFA ENRICHED FOODS**  
**Charlotte Jacobsen**

10:40 - 10:55 O9 **EFFECTS OF PROCESSING ON THE ALKALOID**  
**CONTENT AND PROTEIN QUALITY OF SWEET**  
**LUPINE (LUPINUS ANGSTIFOLIUS)**  
**Marko Tarvainen, Matilda Lintunen, Eila Järvenpää,**  
**Minna Kahala, Ilkka Lehtomäki, Olavi Myllymäki, Baoru Yang**

10:55 - 11:10 O10 **KINETIC STUDY OF THE DEGRADATION OF**  
**GLUCOSINOLATES DURING COOKING OF**  
**VEGETABLES AND THE FORMATION OF THEIR**  
**BIOACTIVE BREAKDOWN PRODUCTS**  
**Franziska S. Hanschen**

11:15 - 11:45 **COFFEE BREAK, EXHIBITION, POSTER VIEWING**  
*Szent István University, Aula – 1<sup>st</sup> floor*

#### SESSION 2 cont. Chemical Changes in Food Under Processing and Storage

*Szent István University, K2 Hall – 1<sup>st</sup> floor*

**Chair: Hans Jacob Skarpeid**

11:45 - 12:00 O11 **NEO-CONTAMINANT MITIGATION DURING FRYING**  
**OF POTATO SLICES: EFFECT OF CONVENTIONAL**  
**BLANCHING COMBINED WITH ULTRASOUND AS**  
**A PRE-TREATMENT**  
**Franco Pedreschi, Alicia Ferrera, Andrea Bunger,**  
**Maria Mariotti**

12:00 - 12:15 O12 **SOME PROPERTIES OF POTATO STARCH INFRARED**  
**HEAT-MOISTURE TREATED BY ONE-STEP OR**  
**TWO-STEP MODIFICATION**  
**Arzu Basman, Asli Cihan**

12:40 - 14:20

#### LUNCH

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**SESSION 3 Food Adulteration, Authenticity and Traceability**  
Szent István University K2 Hall – 1<sup>st</sup> floor  
Chair: **Nóra Adányi**

15:00 - 15:20	K4	HARMONIZATION OF REGULATIONS TO CONTROL FOOD ADULTERATION, COMPOSITION AND SAFETY, AND HOW TO ENSURE THAT HARMONIZED REGULATIONS ARE EFFECTIVE <b>Huub Lelieveld</b>
15:20 - 15:30	S09	ADULTERATION: LESSONS FROM THE PAST <b>Michael E. Saltmarsh</b>
15:30 - 15:45	O13	DEVELOPMENT OF MOLECULAR MARKERS FOR HONEY ENTOMOLOGICAL ORIGIN AUTHENTICATION <b>Joana S. Amaral</b> , Sónia Soares, Liliana Grazina, Isabel Mafra, Joana Costa, M. Alice Pinto, Hanh Pham Duc, M. Beatriz P.P. Oliveira
15:45 - 15:55	SO10	SYNEPHRINE - A POTENTIAL BIOMARKER FOR ORANGE HONEY AUTHENTICITY <b>Maria Beatriz A. Gloria</b> , Patrícia A. S. Tette, Leticia R. Guidi, Esther M. A. F. Bastos, Christian Fernandes
15:55 - 16:05	SO11	EXPLOITATION OF A UNIQUE MASS SPECTRAL DATABASE WITH EMBEDDED LINEAR RETENTION INDEX FOR VOLATILE FRACTION CHARACTERISATION OF PISTACHIOS WITH DIFFERENT GEOGRAPHICAL ORIGIN <b>Margita Utezas</b> , Paolo Oliveri, Cristina Malegori, Éva Martos, Luigi Mondello
16:05 - 16:35		<b>COFFEE BREAK, EXHIBITION, POSTER VIEWING</b> Szent István University, Aula – 1 <sup>st</sup> floor

**SESSION 4 Food Safety**  
Szent István University, K2 Hall – 1<sup>st</sup> floor  
Chair: **Rita Tömösközi**

16:35 - 16:55	K5	TRENDS AND UNCERTAINTIES IN FOOD SAFETY AND NUTRITION <b>Diána Bánáti</b>
16:55 - 17:10	O14	IMPACT OF CONSUMER PRACTICES ON EXPOSURE TO ACRYLAMIDE: FROM RETAIL TO HOME, A CASE STUDY FOR FRENCH FRIES <b>Marta Mesias</b> , Francisco J. Morales
17:10 - 17:20	SO12	ARE THE OCCURRENCE OF 4-HYDROXY-2-TRANS-NONENAL AND 4-HYDROXY-2-HEXENAL A SAFETY CONCERN ON VEGETABLE OILS? <b>Tânia Gonçalves Albuquerque</b> , Helena S. Costa, Mafalda Alexandra Silva, M. Beatriz P.P. Oliveira

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17:20 - 17:30	SO13	QUANTIFICATION OF TROPANE ALKALOIDS IN SOIL AND IN MILLET SAMPLES <b>Eszter Borbála Both</b> , Zsuzsa Jókai, Mihály Demovics
17:40 - 19:30		<b>POSTER SESSION</b> Szent István University, Aula – 1 <sup>st</sup> floor
19:30 - 21:00		<b>WELCOME PARTY</b> Danubius Hotel Flamenco****
		<b>Parallel Session</b>
		<b>GHI Session Global Harmonization of Food Safety Regulations</b> Szent István University, K5 Hall – 1 <sup>st</sup> floor Chair: <b>Huub Lelieveld</b>
16:35 - 16:50	GHI01	A FAST GLOBAL ALERT SYSTEM TO REDUCE THE CONSEQUENCES OF HIDDEN FOOD SAFETY INCIDENTS <b>Huub Lelieveld</b> , Chin-Kun Wang, Veslemir Andersen
16:50 - 17:05	GHI02	OPENING A NEW ERA IN DETECTING CANCER CAUSING CHEMICALS IN FOOD <b>Firouz Darroudi</b>
17:05 - 17:20	GHI03	ENZYMES AND THE DIFFERENT GLOBAL REGULATORY APPROACHES <b>Gema Fernández Albujar</b>
17:20 - 17:35	GHI04	HEMP - AND OLD NEW CROP: NUTRITIONAL AND LEGAL ISSUES, GLOBALLY <b>Petras Rimantas Venskutonis</b>
17:35 - 17:50	GHI5	THE FUTURE OPTIONS OF REDUCING FOOD RELATED CANCER: CHEMICAL CHARACTERIZATION AND GENOMIC <b>Firouz Darroudi</b>
17:40 - 19:30		<b>POSTER SESSION</b> Szent István University, Aula – 1 <sup>st</sup> floor
19:30 - 21:00		<b>WELCOME PARTY</b> Danubius Hotel Flamenco****

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## Thursday, October 5<sup>th</sup> 2017

**PL3 Chair: Michael Murkovic**  
Danubius Hotel Flamenco\*\*\*\* – Lecture Hall

09:00 - 09:30	PL3	GLYCATION, LIPATION AND BEYOND: POST-TRANSLATIONAL MODIFICATIONS OF FOOD PROTEINS <b>Thomas Henle</b>
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**SESSION 5 Chemical Reactions and Interactions of Food Components**  
Danubius Hotel Flamenco\*\*\*\* – Lecture Hall  
Chair: **Juana Frias**

09:40 - 10:00	K6	CHEMICAL MODIFICATIONS DURING FOOD DIGESTION AND THE TRUE ENERGY CONTENT OF FOOD <b>Vincenzo Fogliano</b> , Edoardo Capuano, Teresa Oliviero, Nicoletta Pilegrini
10:00 - 10:15	O15	KINETIC STUDIES OF MAILLARD REACTION IN LOW MOISTURE SYSTEMS AT LOW TEMPERATURES <b>Philipp Brubns</b> , Timo Koch, Lothar W. Kroh
10:15 - 10:30	O16	ANTIOXIDATIVE AND PROOXIDATIVE BEHAVIOR OF EARLY STAGE MAILLARD REACTION INTERMEDIATES <b>Clemens Kanzler</b> , Paul T. Haase, Helena Schestkowa, Lothar W. Kroh
10:30 - 10:45	O17	STRUCTURE AND DYNAMICS OF D-FRUCTOSE AND RELATED AMADORI DERIVATIVES <b>Martin Kaufmann</b> , Clemens Mügge, Lothar W. Kroh
10:45 - 10:55	SO14	MITIGATION OF FURFURYL ALCOHOL IN COFFEE AND RELATED MODEL SYSTEMS <b>Abdullatif Albouchi</b> , Michael Murkovic
11:00 - 11:30		<b>COFFEE BREAK, EXHIBITION, POSTER VIEWING</b> Szent István University, Aula – 1 <sup>st</sup> floor

**SESSION 5 cont. Chemical Reactions and Interactions of Food Components**  
Danubius Hotel Flamenco\*\*\*\* – Lecture Hall  
Chair: **Vitor M.R. Martins**

11:30 - 11:45	O18	FATE OF GLYCATED AND OXIDIZED AMINO ACIDS DURING FERMENTATION WITH S. CEREVISIAE <b>Michael Hellwig</b> , Marie Bömer, Tom Boenke, Falco Beer, Thomas Henle
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EuroFoodChem XIX Conference, Budapest

Scientific Program

11:45 - 12:00	O19	USE OF SUGAR ACIDS AS AN ACRYLAMIDE MITIGATION STRATEGY – THE BALANCE WITH REDUCING SUGARS <b>Manuel A. Coimbra</b> , Cláudia P. Passos, Sónia S. Ferreira, António Seródio, Eva Basil, Lucie Marková, Kristina Kukurová, Zuzana Ciesarová
12:00 - 12:10	SO15	IMPACT OF MAIZE BRAN FERULOYLATED OLIGOSACCHARIDES FORTIFICATION ON THE ENDOGENOUS CONTAMINANTS AND THE QUALITY OF BISCUITS <b>Jie Zheng</b> , Shiyi Ou
12:10 - 12:20	SO16	ANTIOXIDANT ACTIVITY OF PHENOLIPIDS IN O/W FOOD MODEL EMULSIONS – CORRELATION BETWEEN CHEMICAL PROPERTIES, DISTRIBUTION AND EFFICIENCY <b>Fátima Paiva-Martins</b> , Marlene Costa, Mafalda Meireles, Inês Ferreira, Rui Silva, Sonia Losada-Barreiro, Luis Monteiro, Carlos Bravo-Díaz Laurence S. Romsted
13:00 - 14:20		<b>LUNCH</b> Danubius Hotel Flamenco****
		<b>PL4 Chair: Joanna S. Amaral</b> Danubius Hotel Flamenco**** – Lecture Hall
14:20 - 14:50	PL4	THE EUROPEAN FOOD DATABASE PLATFORM AND RESOURCES (EuroFIR) – HISTORY, APPLICATIONS AND FUTURE PLANS <b>Paul M. Finlay</b> , Roe, M., Sian B Astley, Angelika Matur, Susanne Westenbrink, Karl Presser, Maria Glibetic, Barbara Korusic Seljak
		<b>SESSION 5 cont. Chemical Reactions and Interactions of Food Components</b> Danubius Hotel Flamenco**** – Lecture Hall Chair: <b>Vincenzo Fogliano</b>
15:00 - 15:15	O20	HIGH-TEMPERATURE OXIDATION EFFECTIVELY REDUCES BITTER TASTE OF HONEYBUSH TEA – THE ROLE OF POLYPHENOLS <b>Lara Alexander</b> , Dalene de Beer, Magdalena Muller, Elizabeth Joubert
15:15 - 15:30	O21	WHEY PROTEIN INTERACTIONS WITH BERRY TANNIN <b>Bei Wang</b> , Marina Heinonen
15:30 - 15:45	O22	INTERACTIONS BETWEEN MACROMOLECULE-BOUND ANTIOXIDANTS AND FREE ANTIOXIDANT TROLOX IN LIPOSOME MEDIUM: A MULTIVARIATE APPROACH <b>Ecem Evrim Celik</b> , Jose Manuel Amigo Rubio, Mogens Larsen Andersen, Vural Gökmen

# 研討會議程

EuroFoodChem XIX Conference, Budapest		Scientific Program	EuroFoodChem XIX Conference, Budapest		Scientific Program
15:45 - 15:55	SO17	OXIDISED POLYPHENOLS ARE INVOLVED IN HAZE FORMATION IN APPLE-BASED BEVERAGES <b>Melanie Millet</b> , D. Zanchi, P. Poupard, J.-M. Le Quérec, S. Guyot	11:50 - 12:05	O25	A NON-TARGETED METABOLOMIC APPROACH TO IDENTIFY POTENTIAL FOOD BIOMARKERS IN TOMATOES <b>Martinez Bueno M.J.</b> , F.J. Diaz Galiano, V. Cutillas, L. Rajski, M.D Hernando, A. R. Fernández-Alba
16:30 - 23:00	<b>EXCURSION AND GALA DINNER</b> <b>Paralell Session</b> <i>Szent István University, K2 Hall – 1<sup>st</sup> floor</i> <b>SESSION 6 Novel Methods and Analytical Approaches</b> <i>Szent István University K2 Hall – 1<sup>st</sup> floor</i> <b>Chair: László Abrankó</b>		12:05 - 12:20	O26	APPLICATION OF INNOVATIVE ONLINE SAMPLE PREPARATION TECHNIQUES IN FOOD CONTAMINANT ANALYSIS <b>László Hollosi</b> , Michal Godula
09:40 - 10:00	K7	ANALYSIS OF PROCESSED FOOD USING MASS SPECTROMETRY <b>Nikolai Kuhnert</b>	12:20 - 12:35	O27	IDENTIFICATION OF POLYSACCHARIDES DP 12 – 19 IN HONEY BY LIQUID CHROMATOGRAPHY HIGH RESOLUTION MASS SPECTROMETRY <b>Fernando Tateo</b> , Monica Bononi, Giancarlo Quaglia
10:00 - 10:15	O23	REAL-TIME IDENTIFICATION OF DIFFERENT FOOD PRODUCTS: THE FIGHT AGAINST FOOD FRAUD WITH RAPID EVAPORATIVE IONISATION MASS SPECTROMETRY <b>Richard Schaffer</b> , Steven Pringle, Zoltan Takats, Julia Balog	12:35 - 12:45	SO19	COMPARATIVE ANALYTICAL INVESTIGATION OF AUTHENTIC HUNGARIAN HONEYS <b>Zsanett Bodor</b> , István Dalmadi, Fanni Adrienn Konecz, Mahmoud Said Rashed, Zoltán Kovács, Csilla Benedek
10:15 - 10:30	O24	ENZYME BASED AMPEROMETRIC BIOSENSORS FOR FOOD ANALYSIS <b>Nóra Adányi</b>	12:45 - 12:55	SO20	STEREISOIMER SEPARATION OF FLAVANONES AND FLAVANONE GLYCOSIDES BY NANO-LC AND CEC, USING A ORDERED MESOPOROUS SILICA FUNCTIONALIZED WITH $\beta$ -CYCLODEXTRIN DERIVATIVE CHIRAL STATIONARY PHASE. <b>Mariana Silva Lopez</b> , Damián Pérez-Quintanilla, Sonia Morante-Zarcoro, Isabel Sierra, María Luisa Marina, Zeineb Aturki, Salvatore Fanali
10:30 - 10:40	SO18	L-GLUTAMATE DETERMINATION IN FOOD PRODUCTS BY ENZYME BASED AMPEROMETRIC BIOSENSORS <b>Beáta Bóka</b> , Nikolett D. Kerezsi, Viktória Puizl, Miklós Lovas	13:00 - 14:20	<b>LUNCH</b> <i>Danubius Hotel Flamenco****</i> <b>SESSION 6 cont. Novel Methods and Analytical Approaches</b> <i>Szent István University, K2 Hall – 1<sup>st</sup> floor</i> <b>Chair: Juan Francisco Garcia-Reyes</b>	
10:40 - 10:55	SP01	HOW SAFE IS SAFE? – ANALYTICAL TOOLS FOR TRACING CONTAMINANTS IN FOOD <b>Uwe Oppermann</b> , Jan Knoop, Marcin Frankowski	15:00 - 15:15	O28	SHELF LIFE OF OLIVE OILS EVALUATED BY CONVENTIONAL AND E-SENSES ANALYSES <b>Gabriella Giovanelli</b> , Susanna Buratti, Simona Benedetti
11:00 - 11:30	<b>COFFEE BREAK, EXHIBITION, POSTER VIEWING</b> <i>Szent István University, Aula – 1<sup>st</sup> floor</i> <b>SESSION 6 cont. Novel Methods and Analytical Approaches –</b> <i>Szent István University, K2 Hall – 1<sup>st</sup> floor</i> <b>Chair: Nikolai Kuhnert</b>		15:15 - 15:30	O29	MEAT SPECIES IDENTIFICATION USING PROTEIN ELECTROPHORESIS AND PCR <b>Helmut K. Mayer</b> , Monika Galos
11:30 - 11:50	K8	MATRIX-EFFECT FREE QUANTITATIVE ANALYSIS USING NANOFLOW LIQUID CHROMATOGRAPHY HIGH RESOLUTION MASS SPECTROMETRY <b>Juan F. Garcia-Reyes</b> , David Moreno-Gonzalez, Jaime Alcantara-Durán, Bienvenida Gilbert-López, Antonio Molina-Díaz	15:30 - 15:45	O30	RECENT DEVELOPMENTS IN THE CUPRAC ANTIOXIDANT ASSAY APPLIED TO FOOD ANTIOXIDANTS <b>Resat Apak</b> , Sema Demirci Çekiç, Saliha E. Çelik, Burcu Bekdeğer, Mustafa Bener, Mustafa Özyürek, Kubilay Güçlü, Jülide Hýzal Yücesoy, Aytenur Tuñan Önem, Aytem Üzer Arda
<b>EuroFoodChem XIX Conference, Budapest</b>			<b>EuroFoodChem XIX Conference, Budapest</b>		
<b>Scientific Program</b>			<b>Scientific Program</b>		
15:45 - 16:00	O31	MINING VALUABLE MOLECULES FROM BERRY JUICE POMACE BY SUPERCRITICAL CARBON DIOXIDE, PRESSURIZED LIQUID AND ENZYME-ASSISTED EXTRACTION <b>Petras Rimantas Venskutonis</b> , Vaida Kityrić	<b>SESSION 7 cont. Food Composition and Quality</b> <i>Danubius Hotel Flamenco**** – Lecture Hall</i> <b>Chair: Marco Arlorio</b>		
16:00 - 16:15	SP02	HIGHLY SENSITIVE ANALYSIS OF UNDERIVATIZED POLAR PESTICIDES IN FOOD MATRICES BY LC-MS/MS <b>Euan Ross</b> , Benjamin Wuyts, Dimple Shah, Eimear McCall	10:50 - 11:05	O34	SENSORY PERCEPTION AND CHANGE IN NUTRITIONAL AND AROMA QUALITY DURING THE SHELF-LIFE OF MINIMUM PROCESSED CARROTS <b>Concetta Condurso</b> , Fabrizio Cincotta, Antonella Verzera, Filippo Giarratana, Gianluca Tripodi
16:30 - 23:00	<b>EXCURSION AND GALA DINNER</b>  <b>FRIDAY, October 6<sup>th</sup> 2017</b>		11:05 - 11:20	O35	PECTIC OLIGOSACCHARIDES (POS) FROM ONION SKINS <b>Stefania Baldassarre</b> , Barbara Prandi, Neha Babbar, Sandra Van Roy, Winnie Dejonghe, Elena Bancalari, Monica Gatti, Kathy Elst, Stefano Sforza
<b>PL5 Chair: Vieno Piironen</b> <i>Danubius Hotel Flamenco**** – Lecture Hall</i>			11:20 - 11:35	O36	DISCRIMINATION OF DIFFERENT CITRUS FRUITS BASED ON VOLATOMIC PROFILE AND CHEMOMETRIC ANALYSIS <b>José A. Figueira</b> , Priscilla Porto-Figueira, Ivo Viveiros, Gina Tavares, Jorge Pereira, José S. Câmara
09:00 - 09:30	PL5	MERCAPTANS IN FOODS: ONLY BAD GUYS OR KEY CONTRIBUTORS TO FOOD FLAVORS? <b>Peter Schieberle</b> , Susanne Stingl, Martin Steinhaus, Eric Li, Hitoshi Tamura, Sebastian Schönauer	11:35 - 12:05	<b>CLOSING CEREMONY</b> <b>Announcement of the XX EuroFoodChem 2019</b> <i>Danubius Hotel Flamenco**** – Lecture Hall</i>	
<b>SESSION 7 Food Composition and Quality</b> <i>Danubius Hotel Flamenco**** – Lecture Hall</i> <b>Chair: Livia Simon Sarkadi</b>			12:05	<b>FAREWELL COCKTAIL</b> <i>Danubius Hotel Flamenco****</i>	
09:30 - 09:50	K9	CHEMICAL PROFILING OF BY-PRODUCTS FROM CITRUS BERGAMIA RISSO <b>Marco Arlorio</b> , Fabiano Travaglia, Jean Daniel Cod'sson, Monica Locatelli, Matteo Bordiga, Nicola Cicero, Ivana Bonaccorsi, Giacomo Dugo			
09:50 - 10:05	O32	VOLATILE COMPOUNDS IN SMOKED DRY-CURED HAM <b>Nives Marušić Radović</b> , Sandra Petričević, Edi Listeš, Daniel Karolyi, Helga Medić			
10:05 - 10:20	O33	CHARACTERIZATION OF THE VOLATILE PROFILE OF FRUIT JUICES FERMENTED WITH LACTIC ACID BACTERIA <b>Martina Cirilini</b> , Annalisa Ricci, Gianni Galaverna, Camilla Lazzi			
10:20 - 10:50	<b>COFFEE BREAK</b> <i>Danubius Hotel Flamenco****</i>				

## 壁報論文摘要

### THE QUICK EXAMINATION OF FOOD COLOR ADDITIVES

Shin-Yu Chen<sup>1</sup>; Ming-Chih Fang<sup>1</sup>; Chia-Fen Tsai<sup>1</sup>; Ya-Min Kao<sup>1</sup>; Hwei-Fang Cheng<sup>1</sup>

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Global food trade is frequent; however the regulation of food color additive is not the same among countries. In order to accelerate the food inspection, Taiwan Food and Drug Administration is established the primary analysis for newly food color additive using liquid chromatography high-resolution mass spectrometry chromatography. The previously published method for food colors test is focused on eight legal food colors in Taiwan. This innovative method is amplified to 46 colors identification; it is a non-target and quick investigation technology. This method can highly improve the efficiency of food inspection and management. We applied this novel method on the examination of imported foods on the border inspection from January to October 2016. Thirty-six batches with unsatisfactory results or difficult analyzed candies and cookies were analyzed. The results indicated nine foods contain Taiwan's illegal food colors, included azorubine, amaranth and sulforhodamine B. These unsatisfactory products were blocked successfully on the border inspection. We are looking forward to expand this quick analysis with more food colors, as well as other kind of foods. It can improve the efficiency of food inspection, and further protect people's health.



# The quick examination of food color additives

Shin-Yu Chen<sup>1</sup>; Ming-Chih Fang<sup>1</sup>; Chia-Fen Tsai<sup>1</sup>; Ya-Min Kao<sup>1</sup>; Hwei-Fang Cheng<sup>1</sup>  
<sup>1</sup> Taiwan Food and Drug Administration, Taipei, Taiwan

## ABSTRACT

Global food trade is frequent; however the regulation of food color additive is not the same among countries. In order to accelerate the food inspection, Taiwan Food and Drug Administration is established the primary analysis for newly food color additive using liquid chromatography high-resolution mass spectrometry chromatography. The previously published method for food colors test is focused on eight legal food colors in Taiwan. This innovative method is amplified to 46 colors identification; it is a non-target and quick investigation technology. This method can highly improve the efficiency of food inspection and management. We applied this novel method on the examination of imported foods on the border inspection from January to December 2016. Sixty-nine with unsatisfactory results or difficult analyzed candies and cookies were analyzed. The results indicated nine foods contain Taiwan's illegal food colors, included azorubine, amaranth and sulforhodamine B. These unsatisfactory products were blocked successfully on the border inspection. We are looking forward to expand this quick analysis with more food colors, as well as other kinds of food. It can improve the efficiency of food inspection, and further protect people's health.

## INTRODUCTION

In order to accelerate the inspection of food color additives, especially on border food products. We applied a UHPLC-QE Orbitrap for the quick analysis on 46 legal and illegal color dyes.

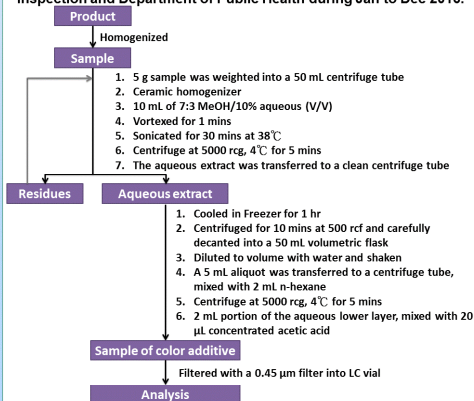
## METHODS

### Standard preparation

Standards were dissolved in acetonitrile, methanol or 50% methanol, based on its solubility. Then, the retention time and limit of detection were determined.

### Sample extraction

Totally 69 products were analyzed, including candy, cookie, chocolate and bakery products. They were collected from imported inspection and Department of Public Health during Jan to Dec 2016.



### UHPLC-QE-Orbitrap

The chromatography was performed on a Poroshell 120 EC-C18 column, 2.1 mm × 15 cm i.d., 2.7 µm. The injection volume was 5 µL. The column was maintained at 30°C and the flow rate was 0.5 mL/min. A gradient containing (A) 5 M ammonium acetate with 0.1% formic acid and (B) acetonitrile with 0.1% formic acid was applied.

Time (min)	Solvent A %	Solvent B %
0.0 - 1.0	90	10
1.0 - 11.0	0	100
11.0 - 19.0	0	100
19.0 - 20.0	90	10
20.0 - 25.0	90	10

UHPLC was carried out on a UltiMate 3000 UHPLC system coupled with a Q Exactive benchtop Orbitrap mass spectrometer. Q-Exactive was operated in full scan of positive and negative ion with electron spray ionization (ESI), the scan range was 100-900 m/z. Other parameters were resolution: 70000, spray voltage : 3.5 or -4.0 kV, capillary temperature : 250°C, vaporizer temperature : 240°C, sheath gas pressure : 45 psi and aux gas pressure : 5 psi.

## RESULTS

Table 1. The production ion and retention time of 46 color additives.

No.	Target	Formula	Charge	Precurser ion	Production	RT
1	V4 (Tartrazine)	C16H12N4O9S2	-	466.9972	197.9872	172.0068 134.0242 3.02
2	Amaranth	C20H14N2O10S3	-	536.9737	316.9669	237.0101 194.0043 3.17
3	Carmine Acid	C22H20O13	-	491.0831	357.6615	327.0851 447.0992 4.06
4	R6 (Cochineal red A, Ponceau 4R)	C20H14N2O10S3	+	536.9737	301.9578	428.0108 340.054 3.48
5	Y5 (Sunset yellow)	C16H12N2O7S2	-	407.0013	205.9917	327.0445 170.8995 3.68
6	Naphthol yellow S	C10H6N2O8S	-	312.9772	233.0203	295.9744 173.0244 3.68
7	Orange G (DNA binding)	C16H12N2O7S2	-	407.0013	301.956	158.0373 79.9573 3.74
8	R40 (Allura red AC)	C18H16N2O8S2	-	451.0275	205.9917	371.0707 79.9573 3.95
9	Yellene fast yellow 2G (Acid yellow 17)	C20H14N2O10S3	+	506.9597	108.0443	173.0141 130.0651 3.95
10	Scarlet GN	C18H16N2O7S2	+	437.0461	201.0454	118.0651 182.027 4.23
11	G3 (Fast green FCF)	C37H36N2O10S3	-	763.1459	497.1547	577.1115 170.0043 4.53
12	Ponceau SX	C18H16N2O7S2	-	435.0262	355.0748	199.0308 170.0223 4.46
13	Azorubine (Brilliant crimson red, R10)	C20H14N2O7S2	-	457.0169	377.0601	221.0151 170.0247 4.41
14	Light green SF	C37H36O9N2S3	-	747.151	683.1891	170.0043 497.1547 4.49
15	R1 (Brilliant blue FCF)	C27H46O9N2S3	-	747.151	661.1166	260.0512 170.0014 4.6
16	Lissamine green B (Green S)	C27H46N2O7S2	+	555.1254	392.1883	377.1648 473.1529 4.56
17	n-Naphthol orange (Acid orange 20)	C16H12N2O4S	-	327.0445	170.9995	247.0876 107.0376 4.76
18	Quinoline yellow S	C18H11NO5S	-	352.0285	288.0666	272.0717 79.9573 4.77
19	Patent blue V (Acid blue 1)	C27H33N2O7S2	+	561.1723	479.1999	435.1346 164.1069 5.28
20	Sulforhodamine B	C27H33N2O7S2	+	559.1567	515.0941	501.091 435.1346 5.21
21	B2 (Indigo carmine)	C16H10N2O8S2	+	422.9951	313.0277	356.0097 341.0026 5.61
22	Crocein orange G	C16H12N2O4S	-	327.0445	206.9995	142.0298 238.992 5.26
23	Allizarin green (Patent green)	C37H35CIN2O6S2	+	703.1697	517.1342	533.1655 437.1774 5.48
24	Orange II (Acid orange 7)	C16H12N2SO4	+	327.0445	170.9995	155.9874 107.0364 5.26
25	Chrysoidine G	C12H11N4	+	213.1134	121.0634	94.0525 105.0449 5.49
26	R7 (Erythrosine)	C20H8I4O5	+	836.6623	582.8521	329.0435 681.7611 6.4
27	Allizarin (Turkey red)	C14H8O4	-	239.0349	211.04	195.0451 167.0502 5.42
28	Rhodamine B	C28H30N2O3	+	443.2329	399.1703	355.1077 385.1672 7.58
29	Curcumin	C21H20O6	-	367.1187	134.1187	149.0608 173.0608 5.8
30	Sudan orange G	C12H10N2O2	+	215.0815	93.0573	95.0127 122.0236 7.09
31	Rosa bengal	C20H42I4O5	+	970.4818	672.6636	800.5293 768.5867 7.75
32	Para red	C16H11N3O3	+	294.0873	277.0843	128.0494 156.0443 8.53
33	Methyl yellow	C14H15N3	+	226.1338	95.0478	105.0447 120.0807 8.54
34	Sudan red G	C17H14N2O2	+	279.1128	123.0678	108.0443 80.0494 8.88
35	Sudan I	C16H12N2O	+	249.1022	128.0494	232.0992 156.4416 8.94
36	Ankaflavin (Monascus Colors)	C29H30O5	+	387.2166	215.1066	187.1117 139.1168 8.62
37	Diethyl yellow	C16H19N3	+	254.1651	95.0478	134.0943 105.0447 9.05
38	Sudan II	C18H16N2O	+	277.1335	121.0886	106.0651 149.026 9.95
39	Sudan black B	C29H24N6	+	457.2135	193.076	211.1104 247.1099 10.28
40	Sudan III	C22H16N4O	+	353.1396	196.0869	128.0494 156.0439 10.69
41	Sudan red 7B	C24H21N5	+	380.1869	169.076	183.0916 115.0542 10.95
42	Solvent green 3	C28H22N2O2	+	419.1754	327.1128	401.1648 401.164 10.79
43	Sudan IV	C24H20N4O	+	381.1709	224.1175	276.1121 115.0542 11.46
44	Phloxine	C20H48Cl4O5	+	784.5406	660.6238	580.7146 740.5508 7.72
45	Auramine O	C17H21N3	+	268.1608	147.0936	131.0603 252.1495 5.99
46	Citrus Red 2	C18H16N2O3	+	309.1233	138.0549	153.0784 110.06 8.9

Figure 1. The products contain Taiwan's illegal food colors.



## CONCLUSION

Illegal color additives can damage our health, therefore it is very important to have a wide and fast examination method on food dyes. This quick analysis on 46 color dyes can determine the food products contain illegal and mislabeled color additives successfully. We will continue to expand the number of color additives, as well as apply on more kinds of food product.