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計畫名稱 生活污水中個人保健品殘留化學物質之檢測技術建立研究
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計畫成果摘要 (本計畫案因列為限閱，故不予提供報告全文電子檔。)

中文摘要關鍵詞：個人保健品，液相層析串聯式質譜儀，生活污水

英文摘要關鍵詞：Personal care products, LC/MS/MS, Wastewaters

中文摘要：

本計畫完成探討個人保健品 (Personal Care Products, PCPs)文獻蒐集、調查個人保健品用量、建立分析方法、及方法驗證及調查。根據文獻，PCPs 可分為鎮痛解熱劑、荷爾蒙及作用類似物、清潔用品、防曬劑、驅蟲劑、興奮劑、美容用品、保健食品與草藥、及香料等九大類。

台灣市場用量由大至小順序為西藥製劑(含鎮痛解熱劑)、個人清潔用品(含消毒劑及抗菌劑)、美容用品(包含防腐劑及部份香料)、防曬乳、興奮劑、中醫成藥、抗微生物用藥及荷爾蒙類藥物。使用頻率較高的鎮痛解熱劑成份為 Diclofenac Sodium(12.9%)及 Acetaminophen(12.3%)；抗菌劑為 Triclosan(75.7%)；防曬劑為 Ethylhexyl Methoxycinnamate (44.1%)及 Oxybenzone(18.9%)；主要驅蟲劑成份為 DEET；興奮劑成份則為 Caffeine。綜合考量潛在毒性、市場用量、及不同檢測分析方法，排定台灣水體環境 PCPs 檢測之優先順序。

方法建立目標為建立可同時檢測多種 PCPs 之分析方法，選定之目標化合物為 Acetaminophen、Triclosan、DEET、Oxybenzone 及 Caffeine，以固相萃取法和液相層析串聯式質譜儀分析。檢量線 r 值皆大於 0.995，偵測極限介於 0.05 ppb ~0.5 ppb，回收率介於 51.0%~106.3%。

本計畫採集三處污水處理廠進流水及放流水樣本，及一處自然水體水樣。進流水水樣中，以 Acetaminophen 與 Caffeine 濃度最高，比其餘三者高出三個數量級。放流水中以 Caffeine 濃度最高，可高至 3900ng/L。自然水體水樣含有 Caffeine (4.0ng/L)及 Oxybenzone (0.8ng/L)，顯示台灣水體環境已存在 PCPs 這類化學物質。

英文摘要：

This project conducted literature survey on personal care products (PCPs), investigated consumption quantity of PCPs in Taiwan, and established and evaluated analytical methods for selected PCPs. According to the results of literature survey, PCPs can be classified into nine groups as 1. analgesic drugs, 2. hormones and mimics, 3. cleansers, 4. sun screens, 5. insect repellent, 6. stimulants, 7. cosmetics, 8. nutraceutical and herbs, and 9. fragrances.

The relative consumption of 9 PCP groups in Taiwan from high to low are pharmaceuticals (including analgesic drugs), cleansers, cosmetics, sun screens, stimulants, nutraceutical/ herbs, anti-microorganism, and hormones/mimics. The most frequent used ingredient in analgesic drugs are diclofenac sodium (12.9%) and acetaminophen (12.3%). The most frequent used antiseptic ingredient is triclosan (75%). The most frequent used ingredients in sun screens are ethylhexyl methoxycinnamate (44.1%) and oxybenzone (18.9%). And the major ingredient in insect repellents and stimulants are DEET and caffeine, respectively. Results of risk assessment showed that the PCPs have the highest potentials harmful to water environments in Taiwan are diclofenac, triclosan, indomethacin, oxybenzone, DEET, ibuprofen, caffeine, and acetaminophen in that order. Among them, five are the selected target compounds to be analyzed this year including acetaminophen (analgesic drugs), triclosan (antiseptic), DEET (insect repellent), oxybenzone (sun screen) and caffeine (stimulant).

We established a screening analytical method which can assess five target PCPs altogether with solid phase extraction and Liquid Chromatograph- Triple Quadrupole Mass Spectrometry. The results showed that the correlation coefficients of all calibration curves were greater than 0.995, the limits of detection were between 0.05ppb and 0.5ppb, and the recovery rates were between 51.0%~106.3%. Samples of surface waters, influents and effluents of three municipal wastewater plants were collected. The results