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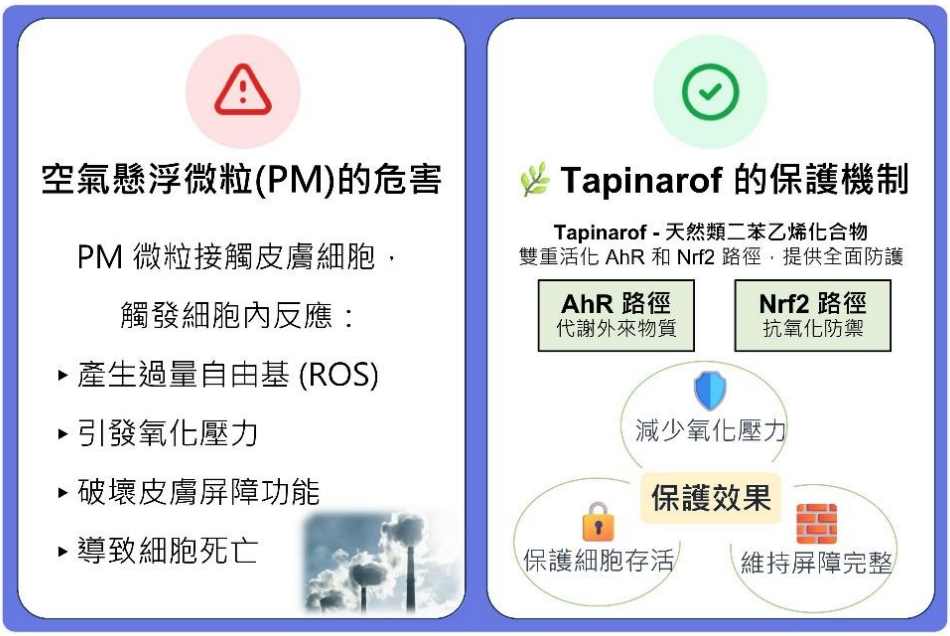
空氣污染已成為全球公共衛生的重大威脅，其中懸浮微粒(PM)對皮膚健康的危害日益受到關注。高雄醫學大學藥學院-陳宜芳老師研究團隊致力於開發天然化合物作為對抗環境污染損傷皮膚屏障的保護策略，並在 114 年度取得重要突破。研究團隊發現一種天然類二苯乙烯化合物 tapinarof—其為美國食品藥物管理局(FDA)核准用於治療用於乾癬及異位性皮膚炎的外用藥膏之主要活性成分—具有獨特的雙重保護機制，證實 tapinarof 能同時活化 AhR (芳香烴受體) 和 Nrf2 (抗氧化防禦系統) 兩大保護路徑，有效對抗懸浮微粒誘導的皮膚損傷。實驗結果顯示 tapinarof 不僅能提升關鍵保護蛋白 CYP1A1 和 HO-1 的表現，更能修復 PM 破壞的皮膚屏障結構，包括緊密連接蛋白 (ZO-1)、黏附連接蛋白 (E-cadherin/β-catenin) 及皮膚屏障蛋白 filaggrin。這項研究成果已發表於毒理藥理領域指標期刊《Toxicology and Applied Pharmacology》(Lin et al., 2025)，為開發新型空污防護產品提供了重要的科學基礎。

陳宜芳老師在神經保護藥物開發領域亦投入已久；與國立中山大學海洋生物科技暨資源學系鄭源斌教授的長期跨校合作，從海洋生物中發現多個具神經保護活性的新穎化合物。近期研究團隊從越南海葵(*Zoanthus vietnamensis*)中分離出 16 種生物鹼，包括 2 種全新骨架結構的化合物。這些海洋天然物能有效緩解化療藥物(如紫杉醇和奧沙利鉑)引起的神經毒性，且不影響化療藥物的抗癌效果，為解決化療引發的周邊神經病變提供了新的治療契機。此研究成果發表於有機化學代表期刊《The Journal of Organic Chemistry》(Chen et al., 2025)。

主要論文：Lin CH (林家璿)#, Ko HH#, Wu JY, Chang HS, Yen CH, Chiu CC, **Chen YF (陳宜芳)***. (2025) Dual activation of AhR and Nrf2 pathways by the natural stilbenoid tapinarof protects against particulate matter-induced skin barrier dysfunction.

Toxicology and Applied Pharmacology. 505:117559.

合作論文：Chen SR, Chang YC (張揚晨), Chen Y, **Chen YF (陳宜芳)**, Lin YC, Chiu CC, Cheng YB*. (2025) Discovery of Zoanthamine Alkaloids from *Zoanthus vietnamensis* with Antioxidant and Neuroprotective Activities. *The Journal of Organic Chemistry.* 90(14):5019-5035.



【具體成果】

- 獲獎

1. 高雄醫學大學專利獲證優良獎 (2025 年)

   專利名稱：大豆间座壳菌提取物用于抗紫外线伤害及减少色素沉着的用途 (中國發明專利)

2. 高雄醫學大學藥學院教學優良教師 (113 學年度/2025 年)

- 國科會專題研究計畫主持(114 年度)

計畫名稱：以多環芳香烴受體 AhR 及抗氧化防禦 Nrf2 路徑之雙重活化策略對抗懸浮微粒誘導之皮膚屏障損傷：從分子機轉到天然保護劑開發 (NSTC 114-2320-B-037-014-)

- 產學合作與技術應用

1. 高科大高醫產學合作計畫 (2025 年執行中)

   計畫名稱:以芝麻副產物開發緩解化療病人神經病變之新穎口服營養補給品

2. 專利成果

   已獲證發明專利共 4 件（台灣 2 件、中國 2 件）

   114 年新申請中專利 1 件：鴨舌癭綠色萃取物預防或治療空汙懸浮微粒誘導的皮膚氧化性損傷

【研究團隊】

團隊成員： 陳宜芳 (Yih-Fung Chen)，天然藥物研究所副教授；林家璿 (Chia-Hsuan Lin)，天然藥物研究所博士候選人；張揚晨 (Yang-Chen Chang)，天然藥物研究所博士候選人。

團隊簡介： 天然藥物研究所陳宜芳副教授之研究團隊，結合生理學、藥理學與生物影像技術，專注於天然藥物之細胞生理與生物影像研究，開發具臨床轉譯潛力的天然保護劑。陳宜芳老師專長於細胞鈣離子訊息調控及抗癌機轉、神經保護藥物開發、及皮膚屏障保護劑研究。林家璿博士候選人專研天然化合物對抗環境污染的皮膚保護機制，已發表 SCI 論文 3 篇；張揚晨博士候選人致力於神經保護天然物的開發，已發表 SCI 論文 2 篇。

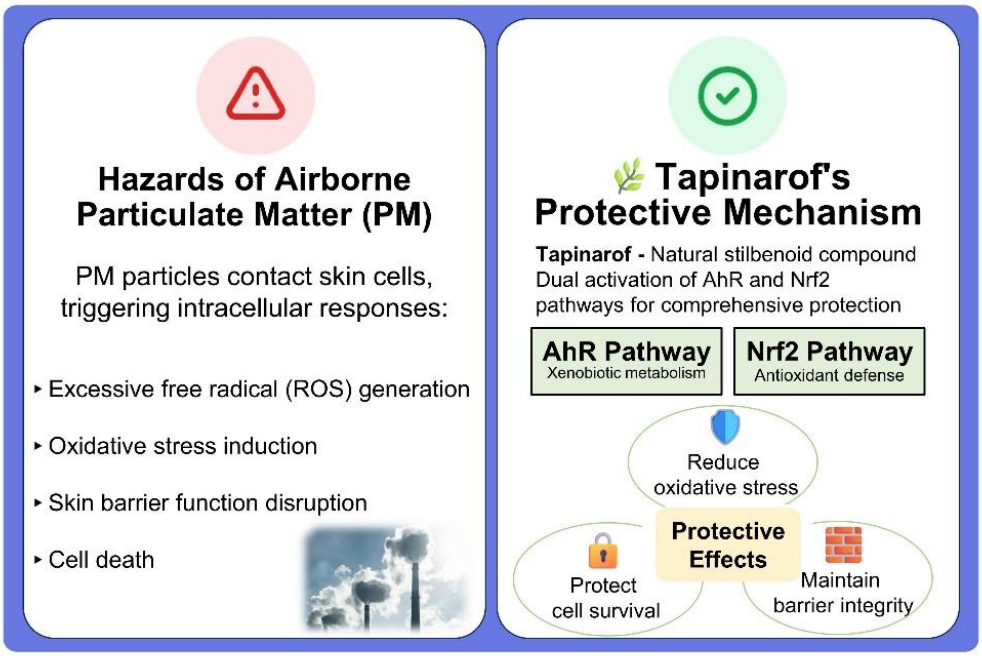
研究聯繫 Email： yihfungchen@kmu.edu.tw

Air pollution has emerged as a major global public health threat, with particulate matter (PM) posing increasing concerns for skin health. The research team led by Associate Professor Yih-Fung Chen at the College of Pharmacy, Kaohsiung Medical University, is dedicated to developing natural compounds as protective strategies against environmental pollution-induced skin barrier damage and achieved significant breakthroughs in 2025. The team discovered that the natural stilbenoid tapinarof—the active ingredient in FDA-approved topical treatment for treating psoriasis and atopic dermatitis—possesses a unique dual protective mechanism. The research confirmed that tapinarof can simultaneously activate both AhR (aryl hydrocarbon receptor) and Nrf2 (antioxidant defense system) protective pathways, effectively combating PM-induced skin damage. Experimental results demonstrate that tapinarof not only enhances the expression of key biomarkers CYP1A1 and HO-1 but also repairs PM-damaged skin barrier structures, including tight junction proteins (ZO-1), adherens junction proteins (E-cadherin/β-catenin), and the skin barrier protein filaggrin. This research has been published in the leading journal of toxicology and pharmacology, *Toxicology and Applied Pharmacology* (Lin et al., 2025), providing an important scientific foundation for developing novel air pollution protection products.

Dr. Chen has long been dedicated to the development of neuroprotective drugs. Through sustained cross-institutional collaboration with Professor Yuan-Bin Cheng from the Department of Marine Biotechnology and Resources at National Sun Yat-sen University, the team has discovered multiple novel compounds with neuroprotective activities from marine organisms. Recently, the research team isolated 16 alkaloids from the zoantharian *Zoanthus vietnamensis*, including two compounds with completely novel skeletal structures. These marine natural products effectively alleviate neurotoxicity caused by chemotherapeutic agents, such as paclitaxel and oxaliplatin, without interfering with their anticancer effects, offering new therapeutic opportunities for addressing chemotherapy-induced peripheral neuropathy. This research was published in the representative journal of organic chemistry, *The Journal of Organic Chemistry* (Chen et al., 2025).

Key publication: Lin CH (林家璿)#, Ko HH#, Wu JY, Chang HS, Yen CH, Chiu CC, **Chen YF** (陳宜芳)*. (2025) Dual activation of AhR and Nrf2 pathways by the natural stilbenoid tapinarof protects against particulate matter-induced skin barrier dysfunction. *Toxicology and Applied Pharmacology.* 505:117559.

Collaborative Publication: Chen SR, Chang YC (張揚晨), Chen Y, **Chen YF (陳宜芳)**, Lin YC, Chiu CC, Cheng YB*. (2025) Discovery of Zoanthamine Alkaloids from *Zoanthus vietnamensis* with Antioxidant and Neuroprotective Activities. *The Journal of Organic Chemistry.* 90(14):5019-5035.



【Concrete Results】

- **Awards**

1. Award of Patent Approval, Kaohsiung Medical University (2025)
2. Outstanding Teaching Award, College of Pharmacy, Kaohsiung Medical University (Academic Year 2024-2025)

- **Principal Investigator, NSTC Research Project (2025)**

Project Title: Coordinated activation of AhR and Nrf2 signalings against particulate matter (PM)-induced epidermal barrier dysfunction: From molecular mechanisms to natural protectant development (NSTC 114-2320-B-037-014-)

- **Industry-Academia Collaboration and Technology Application**

1. Industry-Academia Collaboration Project: NKUST-KMU (2025 ongoing)

   Project Title: Development of novel oral nutritional supplement from sesame by-products to alleviate chemotherapy-induced peripheral neuropathy in cancer patients

2. Patent Achievements

   Four granted invention patents (2 in Taiwan, 2 in China)

   One new patent application in 2025

【Research Team】

Team Member: Yih-Fung Chen, Associate Professor, Graduate Institute of Natural Products; Chia-Hsuan Lin, Ph.D. Candidate, Graduate Institute of Natural Products; Yang-Chen Chang, Ph.D. Candidate, Graduate Institute of Natural Products.

Overview: The research team led by Associate Professor Yih-Fung Chen at the Graduate Institute of Natural Products combines physiology, pharmacology, and bioimaging technologies, focusing on cellular physiology and bioimaging research of natural products to develop natural protective agents with clinical translation potential. Professor Chen specializes in cellular calcium signaling and anticancer mechanisms, neuroprotective drug development, and research on skin barrier protectants. Ph.D. candidate Miss Chia-Hsuan Lin specializes in skin protection mechanisms of natural compounds against environmental pollution and has published three SCI papers; Ph.D. candidate Mr. Yang-Chen Chang is dedicated to developing neuroprotective natural products and has published two SCI papers.

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