



電子報第 165 期

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資料來源：

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- ◆ 秋冬已來，高濃度魚油陪伴你循環暢快

資料來源：<https://www.commonhealth.com.tw/article/article.action?nid=83103>

技術文摘

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- ◆ Identification and characterization of new potent inhibitors of dengue virus NS5 proteinase from *Andrographis paniculata* supercritical extracts on in animal cell culture and in silico approaches 穿心蓮超臨界萃取物中登革熱病毒 NS5 蛋白酶新有效抑製劑的鑑定和表徵在動物細胞培養和計算機方法中的應用
- ◆ Supercritical Fluid Extraction Enhances Discovery of Secondary Metabolites from *Myxobacteria* 超臨界流體萃取增強了黏桿菌二次代謝物之提取

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專家介紹

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李明哲教授過去的主要研究領域為熱物性質的量測與關聯，尤其著重於相平衡的研究。曾在台灣科技大學化工系建立熱物性研究室，組裝過多套用於密度、粘度、熱焓、反應動力，以及多種相平衡數據量測的裝置。曾量測過的系統包括由水、有機物、離子熔液、電解質、超臨界流體、特用化學品、分散性染料、寡聚物或高分子等物質所組成的混合物。該研究室也曾從事以超臨界流體技術，製備奈米級與次微米級微粒的研究。

李教授在 1982 年進入台灣科技大學化工系任教，1988 年取得 Purdue University 化工博士學位，並於 2020 年 2 月屆齡退休。任職期間曾 3 次獲得台灣化工學會最佳論文獎、4 次獲得台科大「傑出研究及創作獎」、1993 年榮獲教育部教學績優教師、2017 年獲得石延平教授論文獎、2020 年獲「化工傑作獎」。

李教授是協會的創始會員之一，曾擔任協會副理事長與理事、監事乙職，積極參與國內外之學術活動，對於推展會務不遺餘力。



專家介紹

【全研科技有限公司 孫傳家處長】



- ❖專長：自動化工程技術、整廠自動化、機械設計、夾治具設計
- ❖研究方向：自動化系統整合
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孫傳家處長曾在財團法人金屬工業研究發展中心服務 27 年，輔導過無數企業自動化，是推動產業自動化的重要推手。畢業於台灣科技大學機械工程系的他，從小就對任何事物抱持高度好奇心，年輕時非常喜歡研究發明，靠著技術和動手做的能力，迄今已擁有 37 件登錄在案的專利發明，孫處長擁有的發明專利中，中華民國登錄在案的就有 28 件，美國有 3 件，中國大陸 6 件，是一位不折不扣的發明家。

在金屬中心服務時，政府正在推動生產自動化，孫處長肩負起協助國內傳統工業技術升級的任務，籌組產業自動化輔導團推動八大產業自動化，用心經營 3 大產業自動化輔導團績效卓著，獲得工業局八大產業評比第一、二名；領導超臨界流體技術研究團隊發展技術與產業推廣，並以超臨界流體技術在嘉義創設經濟部嘉義產業創新研發中心，將超臨界流體技術推廣到產業開花結果。對台灣產業升級或自動化有諸多貢獻，孫處長謙虛的說，自己擁有的是踏實的技術和使命感，「熱心服務」的人格特質更讓孫處長推動產業自動化受到業界的肯定。

孫處長自 2005 年 1 月至 2018 年 11 月擔任台灣超臨界流體協會秘書長，13 年期間與歷屆理事長及理監事們為協會苦心擘畫經營，積極推動產、學、研界合作，促進協會各項活動，奠定了協會的基礎，多年服務於協會，貢獻良多。



Researchers improve plastics with waste coffee grounds

研究人員使用廢咖啡渣改良塑料

September 30, 2019

A plastic composite made partly from waste coffee grounds is a tough but environmentally friendly material for 3D printing, according to new Washington State University research.

The work could lead to new applications for 3D printing as well as make better use of waste materials. Reporting in the journal, **ACS Sustainable Chemistry and Engineering**, the researchers found that their material, made from up to 20 percent coffee waste, had a more than 400 percent increase in toughness over pure poly-lactic acid (PLA), the type of plastic that is most commonly used in 3D printing.

“Spent coffee grounds provide an excellent addition to the field of renewable resource and energy applications,” said Yu-Chung Chang, a graduate student who led the work.

PLA is a popular plastic material used for many medical and consumer products, such as in drug delivery, tissue engineering, food packaging, as well as for 3D printing. Made from corn starch, it is biodegradable. But, when used for 3D printing applications, products made from PLA lack strength and break easily. Products that are 3D printed, in fact, are almost entirely limited to being toys, trinkets, or display models.

“They are not high performance products,” Chang said. “I want to change that.” Researchers have been looking to add low-cost additives, such as wood fiber, silica, or clay, to enhance the material’s performance as well as to reduce manufacturing costs. Such additives from renewable sources could also keep waste materials from ending up in a landfill and creating additional pollution.

For their study, the WSU researchers decided to add coffee ground waste to the PLA. People around the world drink more than two billion cups of coffee every day, so waste coffee grounds are abundantly available.

“We have a virtually limitless supply of coffee grounds,” Chang said. “Our goal is to extend the life cycle for these waste products. We looked at what is overproduced and tried to make something useful out of it.”

The researchers didn’t use actual coffee grounds. Rather, they used a dry and odorless material that is left over after the coffee oil had been removed and used for biodiesel production.

“It is a waste, waste product,” Chang said.



After mixing their coffee material with the PLA, they printed out and tested their specimens.

“The oil-extracted spent coffee grounds can not only increase the impact toughness, but they also reduce the cost of overall 3D printing materials,” Chang said.

The researchers are hoping to continue the work and conduct further study on how the material will degrade in the environment.

咖啡渣經過清洗除脂，可用超臨界二氧化碳萃取技術。

資料來源：

<https://news.wsu.edu/2019/09/30/researchers-improve-plastics-waste-coffee-grounds/>



秋冬已來，高濃度魚油陪伴你循環暢快

2020/11/23

每到秋冬，許多銀髮族或平時忙於工作三餐不均的上班族，都會特別想要補充高濃度魚油，讓自己的循環暢快。台灣保健營養開拓者謝明哲教授在臉書發文表示，「補充進來的營養，總是要求最好的，超臨界、高濃度、好吸收的 Solutex 魚油就是不一樣」。

市售魚油怎去挑？建議選擇高濃度

這個問題也是困惑著許多的消費者，市售魚油百百種，怎麼挑？國內知名保健食品公司「營養師輕食」的負責人兼研發人江欣樺說：「要挑選好的魚油其實不難，把握高濃度、高純淨、高吸收，三個原則就足夠」。大部分市售的魚油 Omega-3 濃度介於 30%~50%之間，且很多廠商經常以高價位出售低濃度魚油賺取高額利潤。魚油的好壞是取決於有效成分 EPA+DHA 含量的多寡而決定，例如 80%機能魚油，EPA+DHA 加總後，除以魚油總重，濃度高達 80%，可謂市售魚油中的極品。

魚油濃度怎麼算？

$$\frac{\text{EPA+DHA}}{\text{魚油總重 (不含膠囊)}} \times 100\% = \text{濃度}$$

例如：



80% 機能魚油

$$\frac{480+320}{1000} \times 100\% = 80\%$$

80%機能魚油獲得 Solutex 製造大廠 CEO 唯一推崇

目前世界頂級魚油製造大廠西班牙 Solutex 利用全球唯一的淨化技術 (FLUTEX+CLEANTEX)，獨家的一段式製程，從前段超臨界萃取到後段層析純化，全程都在系統裡面不必取出，尤其是後端 Cleantex 除色除臭專利技術，去除有害物質，使魚油的色澤透徹更加純淨。

資料來源：<https://www.commonhealth.com.tw/article/article.action?nid=83103>



Bovine β -lactoglobulin peptides as novel carriers for flavonoids extracted with supercritical fluids from yellow onion skins

牛 β -乳球蛋白肽作為超臨界流體從黃洋蔥皮中提取的類黃酮的新型載體

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Abstract

Our study describes in detail the binding mechanism between the main flavonoids that were extracted from onion skins by **supercritical** CO₂ and peptides from whey proteins, from the perspective of obtaining multifunctional ingredients, with health-promoting benefits. The **supercritical** CO₂ extract had 202.31 ± 11.56 mg quercetin equivalents/g DW as the major flavonoid and antioxidant activity of 404.93 ± 1.39 mM Trolox/g DW. The experiments on thermolysin-derived peptides fluorescence quenching by flavonoids extract allowed estimating the binding parameters, in terms of binding constants, and the number of binding sites. The thermodynamic analysis indicated that the main forces involved in complex formation were hydrogen bonds and van der Waals interactions. Molecular docking tests indicated that peptide fluorescence quenching upon gradual addition of onion skin extract might be due to flavonoids binding by Val¹⁵-Ser²¹. All 7 to 14 amino acids long peptides appeared to have affinity toward quercetin-3,4'-O-diglucoside and quercetin-4'-O-monoglucoside. The study is important as a potential solution for reuse of valuable resources, underutilized, such as whey peptides and yellow onion skins flavonoids for efficient microencapsulation, as a holistic approach to deliver healthy and nutritious food.

Practical Application

A growing interest was noticed in the last years in investigating the interactions between proteins and different biologically active compounds, such as to provide knowledge for efficient development of new food, pharmaceutical, and cosmetic products. Recent studies suggest that flavonoid-protein complexes may be designed to improve the functional performance of the flavonoids. The results obtained in this study bring certain benefits in terms of exploiting the bioactive potential of both flavonoids and bioactive peptides, for developing of formulas with improved functional properties.



Identification and characterization of new potent inhibitors of dengue virus NS5 proteinase from *Andrographis paniculata* supercritical extracts on in animal cell culture and in silico approaches

穿心蓮超臨界萃取物中登革熱病毒 NS5 蛋白酶新有效抑制劑的鑑定和表徵在動物細胞培養和計算機方法中的應用

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Abstract

Ethnopharmacological relevance

About 2.5 billion peoples are at risk of dengue virus and the majority of people, use traditional plant-based medicines to combat dengue. The whole plant of *Andrographis paniculata* used traditionally over past decades for health promotion.

Andrographolide isolated from *Andrographis paniculata* is used as natural remedy for the treatment of various diseases in different parts of the world. Andrographolide has been reported to have antiviral activity against hepatitis B virus, hepatitis C virus, herpes simplex virus, influenza virus, chikungunya virus, dengue virus 2 and 4.

Aim of the study

The aim of the present study to isolate the andrographolide from the *A. paniculata* by [supercritical fluid extraction](#) technique and to characterize the isolated compound along with its anti-dengue activity against DENV-2 in vitro and in silico methods.

Materials and methods

[Supercritical extraction condition](#) for *A. paniculata* was standardised to isolate andrographolide compound at definite temperature and pressure on the basis of previous study. The andrographolide was identified by using Ultraviolet–Visible Spectroscopy (UV-VIS), Fourier-Transform Infrared Spectroscopy (FT-IR) and High Performance Thin Layer Chromatography (HPTLC) and Proton Nuclear Magnetic Resonance (¹HNMR). The maximum non-toxic dose of isolated andrographolide was detected by MTT assay using a micro plate reader at 595 nm. One hundred (100) copies/ml of the DENV-2 virus was used for antiviral assay in C6/36 cells lines and inhibition of virus due to andrographolide was determined by real-time PCR assay.



The purity of isolated andrographolide was determined by Differential Scanning Calorimetry (DSC). The dengue NS5 receptor protein was docked with andrographolide and evaluated on the basis of the total energy and binding affinity score by Auto Dock (V4.2.6) software.

Results

Andrographolide, a diterpene lactone was isolated from the *A. paniculata* [supercritical extract](#) at 40 °C temperature and 15 Mpa pressure. UV spectrophotometer analysis revealed that the curve of andrographolide plant extract was overlapped with reference compound at 228 nm and the similar bands were detected from FT-IR spectroscopy analysis at 3315, 2917, 2849, 1673, 1462 and 1454 cm^{-1} in isolated and standard andrographolide. HPTLC analysis shows the retention factor (R_f) of *A. paniculata* extract at 0.74 ± 0.06 as similar to standard andrographolide R_f values. The purity of isolated andrographolide was 99.76%. The maximum non-toxic dose of isolated andrographolide was found as 15.62 $\mu\text{g/ml}$ on the C6/36 cell line calculated by using MTT assay. The andrographolide showed the 97.23% anti-dengue activity against the dengue-2 virus in C6/36 cell lines. Results of molecular docking showed that the interaction between andrographolide and NS5 of dengue protein with the maximum binding energy as -7.35 kcal/mol.

Conclusions

It is concluded that isolated andrographolide from the *A. paniculata* possess anti-dengue activity against dengue-2 virus as revealed from in vitro and in silico method. Due to lack of the vaccine and anti-viral agents, andrographolide extracted from *A. paniculata* play a major role to inhibit the dengue replication. Hence, it could be a source for drug design and help to reduce the dengue infection.

Keywords : Dengue virus, Andrographolide, HPTLC, Antiviral assay, Molecular docking



Supercritical Fluid Extraction Enhances Discovery of Secondary Metabolites from Myxobacteria

超臨界流體萃取增強了黏桿菌二次代謝物之提取

Chantal D Bader, Markus Neuber, Fabian Panter, Daniel Krug, Rolf Müller

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Supercritical fluid extraction (SFE) is widely used for the isolation of natural products from plants, but its application in efforts to identify structurally and physicochemically often dissimilar microbial natural products is limited to date. In this study, we evaluated the impact of **SFE** on the extractability of myxobacterial secondary metabolites, aiming to improve the prospects of discovering novel natural products. We investigated the influence of different co-solvents on the extraction efficiency of secondary metabolites from three myxobacterial strains and the antimicrobial activity profiles of the corresponding extracts. For each known secondary metabolite, we found extraction conditions using **SFE** leading to superior yields in the extracts compared to conventional solvent extraction. Compounds with a log P higher than 3 showed the best extraction efficiency using 20% EtOAc as a co-solvent, whereas compounds with log P values lower than 3 were better extractable using more polar co-solvents such as MeOH. Extracts generated with **SFE** showed increased antimicrobial activities including the presence of activities not explained by known myxobacterial secondary metabolites, highlighting the advantage of SFE for bioactivity-guided isolation. Moreover, non-targeted metabolomics analysis revealed a group of chlorinated metabolites produced by the well-studied model myxobacterium *Myxococcus xanthus* DK1622, which were not accessible previously due to their low concentration in conventional extracts. The enriched SF extracts were used for isolation and subsequent structure elucidation of chloroxanthic acid A as the founding member of a novel secondary metabolite family. Our findings encourage the increased utilization of **SFE** as a part of future screening workflows of microbial natural products.