



國立屏東科技大學生物科技系

天然物研究室

一. 主持教師：

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學歷：台灣大學博士 (1998)

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研究專長：天然物化學、天然物純化及構造鑑定、藥理活性篩選

研究方向：1. 中草藥藥理活性評估。

2. 中草藥有效成分之分離與化學結構鑑定。

3. 中草藥製程與品質管制之研究。

4. 活性成分與衍生物之製備。

二. 創立時間、沿革及目的：

本研究室 2003 年 8 月成立。主要目標在天然物新藥及保健食品的研究開發。

中草藥之研究開發包含藥材之基原鑑定、藥理活性評估、毒理試驗、臨床試驗與上市後之產品監控，在衛福部及世界許多國家皆已制定嚴謹之規範，以確保產品之安全性與有效性。而在這些研發過程中，我們致力於有效成份純化技術的研究，並利用核磁共振儀、紅外線光譜儀、紫外可見光譜儀與質譜儀等儀器進行其化學結構鑑定，進而建立藥材品質管制之高效能液相層析儀或核磁共振儀指紋圖譜，亦利用衍生化反應進行官能基修飾，探討分子結構與藥理活性之關係，在藥理活性研究方面，目前，我們已建立抗氧化、免疫、抗癌與抗發炎等藥理篩選模式，同時，藉由與藥理學專家密切合作，進行有效成份之作用機轉與活體試驗研究，提升中草藥與保健食品的研發深度與價值。

我們主要研究方向在苦瓜(*Momordica charantia*)、茶(*Camellia sinensis*)、漢氏山葡萄(*Ampelopsis brevipedunculata* var. *hancei*)、牛樟芝(*Antrodia cinnamomea*)與靈芝(*Ganoderma lucidum*)生物活性成分的研究，在這些研究中，最具代表性的是由苦瓜純化及鑑定出十六個個新的 cucurbitane-type 三萜類化合物，其中，有三個化合物具有改善細胞胰島素抗性活性，這些成果發表在 *J. Nat. Prod.* 與

Chem. Pharm. Bull. 期刊;另外，亦從茶葉純化出三個新穎類黃酮四配醣化合物-*quercetin 3-O-[2^G-(E)-coumaroyl-3^G-O-β-D-glucosyl-3^R-O-β-D-glucosylrutinoside]*、*kaempferol 3-O-[2^G-(E)-coumaroyl-3^G-O-β-D-glucosyl-3^R-O-β-D-glucosylrutinoside]* 與 *kaempferol 3-O-[2^G-(E)-coumaroyl-3^G-O-β-L-arabinosyl-3^R-O-β-D-glucosylrutinoside]* 發表於 *Chem. Pharm. Bull.* 期刊。目前，我們正在進行活性成分作用機轉、製備與定量條件的探討，期望能對中草藥產業化與人類健康維護有所貢獻。

三. 近五年執行的研究計畫

項次	計畫名稱	計畫內擔任之工作	起迄年月	補助或委託機構
1	產業升級創新平台輔導計畫(協助傳統產業技術開發計畫)—辣椒萃取製程研究計畫(MOST 106-2622-8-020-005)	主持人	2017/02/10-2017/11/30	科技部
2	辣椒萃取製程研究計畫	主持人	2017/02/10-2017/11/30	經濟部 久芳生物科技股份有限公司
3	辣椒鹼之純化與定量方法開發	主持人	2017/06/01~2018/05/31	久芳生物科技股份有限公司
4	泌甘露三號母豬專用保健配方之成分分析與品管方法建立	主持人	2017/05/01~2017/10/31	經濟部 京冠生物科技股份有限公司
5	草珊瑚指標成分定量分析	主持人	2018/08/01~2019/7/31	德馨科技服務有限公司
6	台灣產大葉桃花心木降血壓活性成分結構鑑定與功能性評估	主持人	2019/08/01~2020/7/31	科技部
7	大葉桃花心木降血脂活性成分結構鑑定、製備與功效評估(MOST 109-2320-B-020-001 -)	主持人	2020/08/01~2021/7/31	科技部
8	九節茶調節血脂活性成分與功效評估之研究(MOST 109-2622-B-020-003 -)	主持人	109/11/01 ~ 110/10/31	科技部
9	九節茶調節血脂活性成分與功效評估之研究	主持人	109/11/01 ~ 110/10/31	愛眾科技有限公司
10	白藜蘆醇丁酸酯在腺嘌呤誘發的慢性腎臟病幼鼠模型：純化及應用 屏科建字第 110001 號	主持人	110/01/01 ~ 110/12/31	鼓勵教師研提任務導向計畫 屏東科技大學校內計畫
11	冬蟲夏草活性成分之研究B11000360	主持人	110/09/01 ~ 114/8/31	英屬開曼群島商天萃控股股份有限公司
12	白藜蘆醇丁酸酯奈米顆粒在兒童慢性腎臟病的治療作用	主持人	111/01/01 ~ 111/12/31	鼓勵教師研提任務導向計畫
13	台灣香檬加工產品功效成分萃取與分析研究計畫 B111204	主持人	111/05/01 ~ 112/4/30	大樂檬生技股份有限公司

14	牛樟芝培育與樟芝酸 A 抗癌活性之研究 B111219	主持人	111/05/01 ~ 115/4/30	台灣新鼎生物研究發展 有限公司
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四. 近五年研究成果目錄：

A. SCI 期刊論文

1. **Chi-I Chang**, Chien-Chih Chen, Che-Yi Chao, Sheng-Yang Wang, Hsun-Shuo Chang, Ping-Jyun Sung, Guan-Jhong Huang, Yen-Cheng Li, Yueh-Hsiung Kuo, Sesquiterpenoids and Diterpenoids from the Wood of *Cunninghamia konishii* and Their Inhibitory Activities against NO Production, *Molecules*, **2016**, 21(4), 490.
2. Ho-Shin Huang, Jue-Liang Hsu, Chin-Chuan Yu, Lai-Chuan Chang, Chiy-Rong Chen, Tzou-Chi Huang, **Chi-I Chang**,* Qualitative and quantitative analysis of seven signature components in the fruiting body of *Antrodia cinnamomea* by HPLC-ESI/MS/MS, *Acta Chromatographica*, **2016**, 28, 387–402.
3. C. Phuakjaiphaeo, **Chi-I Chang**, O. Ruangwong, K. Kunasakdakul, Isolation and identification of an antifungal compound from endophytic *Streptomyces* sp. CEN26 active against *Alternaria brassicicola*, *Letters in Applied Microbiology*, **2016**, Jul;63(1):38-44.
4. **Chi-I Chang**, Chien-Chih Chen, Sheng-Yang Wang, Che-Yi Chao, Louis Kuoping Chao, Jih-Jung Chen, Horng-Huey Ko, Cheng-Chi Chen, Yueh-Hsiung Kuo, Three New Abietane-type Diterpenes from the Bark of *Cryptomeria japonica*, *Helv. Chim. Acta*, **2016**, 99(9), 710–715.
5. **Chi-I Chang**, Chien-Chih Chen, Sheng-Yang Wang, Hsun-Shuo Chang, Louis Kuoping Chao, Jih-Jung Chen, Cheng-Chi Chen, Yueh-Hsiung Kuo, Three New Abietane-type Diterpenes from the Bark of *Cryptomeria japonica*, *Phytochemistry Letters*, **2017**, 19(3), 46–49.
6. Yeh-Lin Lu, Shyr-Yi Lin, Sheng-Uei Fang, Ying-Ying Hsieh, Chiy-Rong Chen, Chi Wen, **Chi-I Chang**,* Wen-Chi Hou,* Hot-Water Extracts from Roots of *Vitis thunbergii* var. *taiwaniana* and Identified ϵ -Viniferin Improve Obesity in High-Fat Diet-Induced Mice, *Journal of Agricultural and Food Chemistry*, **2017**, 65(12), 2521-2529.
7. Chiy-Rong Chen, Yun-Wen Liao, Yueh-Hsiung Kuo, Jue-Liang Hsu, **Chi-I Chang**,* Cucurbitane-Type Triterpenoids from *Momordica charantia*, *Nat. Prod.*

- Commun.* **2017**, 12 (6), 889-892.
8. Chiy-Rong Chen, Yun-Wen Liao, Yueh-Hsiung Kuo, Jue-Liang Hsu, **Chi-I Chang**,* Cucurbitane-Type Triterpenoids from *Momordica charantia* New Norcucurbitane Triterpenoids from *Momordica charantia* var. *abbreviata*, *Nat. Prod. Commun.* **2017**, 12 (7), 1013-1016.
 9. Hui-Chuan Yu, Jue-Liang Hsu, **Chi-I Chang**, and Fa-Jui Tan*, Antioxidant properties of porcine liver proteins hydrolyzed using *Monascus purpureus*, *Food Science and Biotechnology*, **2017**, 26(5):1217–1225. Food Sci Biotechnol
 10. **Chi-i Chang**, Wei-Chu Chien, Kai-Xin Huang, Jue-Liang Hsu *, Anti-Inflammatory Effects of Vitisinol A and Four Other Oligostilbenes from *Ampelopsis brevipedunculata* var. *Hancei*, *Molecules*, **2017**, 22(7), 1195.
 11. **Chi-I Chang**, Chien-Chih Chen, Che-Yi Chao, Horng-Huey Ko, Hsun-Shuo Chang, Sheng-Yang Wang, Jih-Jung Chen, Cheng-Chi Chen, and Yueh-Hsiung Kuo,*Two New Abietane-type Diterpenes from the Bark of *Cryptomeria japonica*, *Nat. Prod. Commun.* **2017**, 12(10), 1553-1555.
 12. **Chi-I Chang**, Sheng-Yang Wang, Ming-Der Wu, Ming-Jen Cheng, Horng-Huey Ko, Hsun-Shuo Chang, Jih-Jung Chen, Cheng-Chi Chen, Yueh-Hsiung Kuo, * Two New Sesquiterpenoids from the Bark of *Cryptomeria japonica*, *Phytochemistry Letters*, **2017**, 22(12), 56-60.
 13. Hsueh-Ling Cheng,* Ming-Hao Yang, Rista Anggriana, **Chi-I Chang**,* Comparison of Anti-Inflammatory Activities of Structurally Similar Triterpenoids Isolated from Bitter Melon, *Nat. Prod. Commun.* **2017**, 12(12), 1847-1850.
 14. Chieh-Chih Shih, Hong-Ru Huang, **Chi-I Chang**, Huei-Meei Su, Pei-Chin Chen, Hsiao-Mei Kuo, Pei-Jyuan Li, Hui-Min Wang, Kuan-Hao Tsui, Yu-Chi Lin, Shi-Ying Huang, Zhi-Hong Wen, Anti-inflammatory and antinociceptive effects of ethyl acetate fraction of an edible red macroalgae *Sarcodia ceylanica*, *Int. J. Mol. Sci.* **2017**, 18(11), 2437.
 15. Hui-Chi Huang, Chung-Ping Yang, Sheng-Yang Wang, **Chi-I Chang**, Ping-Jyun Sung, Guan-Jhong Huang, Shih-Chang Chien and Yueh-Hsiung Kuo, Anti-inflammatory flavonol acylglycosides from the aerial part of *Lindera akoensis* Hayata, *RSC Advances*, **2017**, 7, 50868–50874. (‡ Equal contribution to this article)
 16. Zih-Yan Yang, Yu-Jen Wu, **Chi-I Chang**, Chien-Chih Chiu, Mei-Li Wu, The effect of bornyl cis-4-hydroxycinnamate on melanoma cell apoptosis is associated with mitochondrial dysfunction and endoplasmic reticulum Stress, *Int. J. Mol. Sci.* **2018**, 19(5), 1370.
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 20. **Chi-I Chang**, Jih-Jung Cheng, Chin Hsu, Cheng-Chi Chen, Wei-Yi Cheng, Sheng-Yung Wang, Ching-Kuo Lee, Ming-Jen Cheng, and Yueh-Hsiung Kuo, New Abietane-type Diterpenoids from the Bark of *Cryptomeria japonica*, *Nat. Prod. Commun.* **2019**, *14*(1), 97-100.
 21. **Chi-I Chang**, Cheng-Chi Chen, Chiy-Rong Chen, Ming-Der Wu, Ming-Jen Cheng, Ping-Jyun Sung, Yueh-Hsiung Kuo, Bioactive Dimeric Abietanoid Peroxides from the Bark of *Cryptomeria japonica*, *Molecules*, **2019**, *24*, 2178.
 22. **Chi-I Chang**, Ming-Jen Cheng, Sheng-Yang Wang, Jih-Jung Chen, Ming-Der Wu, Cheng-Chi Chen, Horng-Huey Ko, Yueh-Hsiung Kuo,* Two new dimeric abietane-type diterpenoids from the bark of *Cryptomeria japonica* and their enzyme inhibitory activity, *Phytochemistry Letters*, **2019**, *33*,84–89.
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 25. Chiy-Rong Chen, Yun-Wen Liao, Jue-Liang Hsu, Yun-Sheng Lin, and **Chi-I Chang**, * A new cucurbitane aldehyde from the fruit pulp of *Momordica charantia*, *Chemistry of Natural Compounds*, **2020**, *56*(5), 870–873.
 26. Bongani Sicelo Dlamini, Chiy-Rong Chen, Douglas J. H. Shyu, and **Chi-I Chang**,* Antioxidant and Antibacterial Properties of Flavonoids from *Tithonia diversifolia*, *Chemistry of Natural Compounds*, **2020**, *56*(5), 906–908.
 27. Yu-Jen Wu, Tzu-Rong Su, **Chi-I Chang**, Chiy-Rong Chen, Kuo-Feng Hung, Cheng Liu * (+)-Bornyl p-coumarate extracted from stem of *Piper betle* induced

- apoptosis and autophagy in melanoma cells, *Int. J. Mol. Sci.* **2020**, *21*, 3737.
28. **Chi-I Chang**, Cheng-Chi Chen, Sheng-Yang Wang, Jih-Jung Chen, Ming-Jen Cheng, Ming-Der Wu, Mei-Hwei Tseng, Chiy-Rong Chen, Yueh-Hsiung Kuo,* Two new dimeric abietanoid peroxides with xanthine oxidase and ACE inhibitory activities from the bark of *Cryptomeria japonica*, *Phytochemistry Letters*, **2020**, *40*, 15-20.
 29. Chiu-Haw Chao, Jue-Liang Hsu, Mu-Fen Chen, Ya-Hu Shih, Chia-Hui Lee, Mei-Li Wu*, and **Chi-I Chang**,* Anti-hypertensive effects of Radix Rehmanniae and its active ingredients, *Nat. Prod. Res.* **2020**, *34*(11), 1547-1552.
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 31. Lu-Te Chuang, Wen-Cheng Huang, Yu-Chen Hou, Jong-Ho Chyuan, Hsiang Chang, **Chi-I Chang**, Tsung-Hsien Tsai, and Po-Jung Tsai,* Suppressive effect of two cucurbitane-type triterpenoids from *Momordica charantia* on Cutibacterium acnes-induced inflammatory responses in human THP-1 monocytic cell and mouse models, *Molecules*, **2021**, *26*, 579.
 32. **Chi-I Chang**, Shi-Yie Cheng, Annisa Oktafianti Nurlatifah, Wei-Wen Sung, Jing-Hong Tu, Lin-Lee Lee, Hsueh-Ling Cheng, Bitter Melon Extract Yields Multiple Effects on Intestinal Epithelial Cells and Likely Contributes to Anti-diabetic Functions, *International Journal of Medical Sciences*, **2021**; *18*(8): 1848-1856.
 33. Chien-Ning Hsu, Chih-Hsing Hung, Chih-Yao Hou, **Chi-I Chang** *, You-Lin Tain,* Perinatal Resveratrol Therapy to Dioxin-Exposed Dams Prevents the Programming of Hypertension in Adult Rat Offspring, *Antioxidants*, **2021**, *10*(9), 1393.
 34. Tzung-Hsun Tsai, **Chi-I Chang**, Ya-Ling Hung, Wen-Cheng Huang, Hsiang Chang, Yueh-Hsiung Kuo, Jong-Ho Chyuan, Lu-Te Chuang,* Po-Jung Tsai,* Anti-inflammatory effect of charantadiol A, isolated from wild bitter melon leaf, on heat-inactivated Porphyromonas gingivalis-stimulated THP-1 monocytes and a periodontitis mouse model, *Molecules*, **2021**, *26*(18), 5651.
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Models, *Int. J. Mol. Sci.* **2021**, *22*, 13539.

37. Jui-Hsin Su, Chih-I Liu, Mei-Chin Lu, **Chi-I Chang**, Min-Ying Hsieh, Yu-Chi Lin, Chang-Feng Dai, Ya-Han Zhang, Zheng-Yu Lin and Yun-Sheng Lin,* New secondary metabolite with cytotoxicity from spawning soft coral *Asterospicularia lauriae* in Taiwan, *Nat. Prod. Res.* **2021**, *35*(6):967-975.
38. **Chi-I Chang**, Cheng-Chi Chen, Horng-Huey Ko, Jih-Jung Chen, Ming-Jen Cheng, Che-Yi Chao, and Yueh-Hsiung Kuo, Seco-abietanoids from *Cryptomeria japonica* and their inhibitory activity toward xanthine oxidase, *Chemistry of Natural Compounds*, **2022**, *58*(3), 478-481.
39. Pei-Chin Chen, Yi-Hao Lo, Shi-Ying Huang, Hsin-Lu Liu, Zhi-Kang Yao, **Chi-I Chang**,* Zhi-Hong Wen,* The anti-inflammatory properties of ethyl acetate fraction in ethanol extract from *Sarcodia suiae* sp. alleviates atopic dermatitis-like lesion in mice, *Bioscience, Biotechnology, and Biochemistry*, **2022**, *86* (5), 646–654.
40. Chien-Ning Hsu, Chih-Yao Hou, **Chi-I Chang**,* You-Lin Tain,* Resveratrol Butyrate Ester Protects Adenine-Treated Rats against Hypertension and Kidney Disease by Regulating the Gut-Kidney Axis, *Antioxidants*, **2022**, *11*, 83.
41. Lih-Geeng Chen, Ching-Chiung Wang, Yi-Shan Lee, Yi-Yan Sie, **Chi-I Chang**,* and Wen-Chi Hou, * Vitisin A, a Resveratrol Tetramer, Improves Learning and Memory Functions in Scopolamine-Induced Amnesiac Mice, *Biomedicines*, **2022**, *1*, 273.
42. Hui-Yun Tsai, Jia-Fang Yang, Hua-Han Chen, Fu-Nian You, Yu-Jie Zhao, Yi-Hsien Lin, Jue-Liang Hsu, **Chi-I Chang**, Yu-Kuo Chen, The Effect of Hot Water Extract of *Tilapia* on Exercise Capacity in Mice, *Appl. Sci.* **2022**, *12*, 2601.
43. Wu-Fu Chen, Yao-Hsiang Shih, Hsuan-Chih Liu, Cheng-I Cheng, **Chi-I Chang**, Chung-Yi Chen, In-Pin Lin, Mei-Ying Lin, Chien-Hsing Lee,* 6-Methoxyflavone suppresses neuroinflammation in lipopolysaccharide-stimulated microglia through the inhibition of TLR4/MyD88/p38 MAPK/NF- κ B dependent pathways and the activation of HO-1/NQO-1 signaling, *Phytomedicine*, **2022**, *99*, 154025.
44. Tsung-Ming Yeh, Ching-Dong Chang, Shyh-Shyan Liu, **Chi-I Chang**,* Wen-Ling Shih,* Tea seed flavonoid triglycoside attenuates LPS-induced systemic inflammation and ameliorates cognitive impairment in a mouse model, *Molecules*, **2022**, *27*(7), 2055.
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B. 技術轉移及專利

B.1 技術轉移

1. 潘敏雄、蔡晨瑜、**張誌益**、孫寶年，蠅之純化流程與純化物質。授權期間二十年(2013/6~2033/6)，授權予綠茵生技股份有限公司，技轉金額總計新台幣100萬元整，簽約日期中華民國102年6月10日。
2. **張誌益**、陳芝融、徐睿良。牛樟芝成分分析。授權期間十年(2012/12~2022/12)，授權予喬本生醫股份有限公司，技轉金額總計新台幣十萬元整，簽約日期中華民國101年12月15日。
3. **張誌益**、陳芝融、徐睿良。山葡萄葉降血壓活性成分分析。授權期間十年(2013/12~2023/12)，授權予天學生化科技股份有限公司，技轉金額總計新台幣十萬元整，簽約日期中華民國102年11月7日。
4. **張誌益**、施玟玲、徐睿良、陳芝融。山苦瓜預防B型肝炎萃取物製備。授權期間十年(2017/7/1~2027/6/20)，授權予芳盈生物科技股份有限公司，技轉金額總計新台幣二十萬元整，簽約日期中華民國106年7月1日。
5. **張誌益**、施玟玲、徐睿良、陳芝融。山苦瓜護肝萃取物製備。授權期間十年(2017/8/16~2027/8/15)，授權予開物生醫有限公司，技轉金額總計新台幣二十萬元整，簽約日期中華民國106年8月16日。

B.2 專利

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2. 鄭雪玲、**張誌益**、陳又嘉、周昌弘，化合物、其組合物、其用途及其製備方法 [二]，中華民國專利，發明第 I 339580 號。(通過日期 100.4.1)。/2011.4.1~2027.12.25

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5. 鄭雪玲、張誌益、陳又嘉、周昌弘，南瓜活性成分(22E,24R)-24-甲基-6 β -甲氧基-5 α -膽甾醇-7,22-二烯-3 β ,5-二醇及(22E,24R)-3 β -羥基麥角固醇-5,8,22-三烯-7-酮之用途，中華民國專利，發明第 I446913 號。(通過日期 103.8.1)。
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- Ph. D., Department of Chemistry, National Taiwan University, 1995–1999
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- Assistant Professor, Graduate Institute of Biotechnology, National Pingtung University of Science and Technology, 2003/8–2006/7
- Associate Professor, Graduate Institute of Biotechnology, National Pingtung University of Science and Technology, 2006/8–2010/8
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RESEARCH INTERESTS:

1. Isolations and Structural Elucidation of Bioactive Constituents from Herbs
2. Development and Establishment of Standardized quality control of medicinal plants.

SELECTED RECENT PUBLICATION:

1. **Chi-I Chang**, Chien-Chih Chen, Che-Yi Chao, Sheng-Yang Wang, Hsun-Shuo Chang, Ping-Jyun Sung, Guan-Jhong Huang, Yen-Cheng Li, Yueh-Hsiung Kuo, Sesquiterpenoids and Diterpenoids from the Wood of *Cunninghamia konishii* and Their Inhibitory Activities against NO Production, *Molecules*, **2016**, 21(4), 490.
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