陳崇桓 教授

再生醫學暨細胞治療研究中心
骨科學研究中心
生物醫學工程暨博士學位學程

- 2024-2025 年史丹佛大學公布全球前 2% 頂尖科學家

近年來，台灣逐漸邁入超高齡化社會，隨之而來的肌肉骨骼系統相關疾病，如骨折、骨質疏鬆與退化性關節炎，已成為老年族群中最常見的健康問題之一。因此，針對骨與軟骨的退化與修復機制進行研究，具有重要的臨床與學術價值。

本研究團隊近年聚焦於老化導致之退化性關節炎的分子機制與治療策略，並發表多篇相關研究成果。首先，我們探討綠茶兒茶素（Epigallocatechin-3-gallate, EGCG）於外傷性與老化性退化性關節炎中的治療潛力，結果顯示 EGCG 可誘發自噬作用、抑制軟骨細胞凋亡，進而改善關節軟骨退化情形。此外，我們亦發現賀爾蒙副甲狀腺素片段（PTH1–34）能有效改善外傷性與老化性關節炎，其療效主要透過直接作用於關節軟骨細胞而發揮，不影響關節下骨（subchondral bone）結構。

在治療策略開發方面，我們進一步研究關節內注射脂質奈米載體包覆藥物，並結合低強度超音波輔助治療之效果。研究結果顯示，脂質包覆的雷帕黴素（rapamycin）可穩定釋放藥物並降低毒性，搭配低強度超音波刺激可促進軟骨基質生成、減少發炎反應，進一步改善退化性關節炎的病程。

此外，在骨修復領域，我們以糖尿病動物模型探討凝血酶（thrombin）對骨母細胞分化及骨缺損癒合的影響。結果證實，凝血酶可促進糖尿病鼠骨組織再生，並於八週內達到最佳癒合效果，顯示其具臨床應用潛力。

在這幾年通過的整合型國科會計畫，我們發現不同來源幹細胞分泌出細胞囊泡(外泌體)其功能與分子機制差異會影響軟骨細胞的分化能力，期刊來源 Chang LH, Chuang SC, Wu SC, Fu YC, Chen JW, Wu CW, Lin YS, Liu CY, Chung YH, Chang JK, Chen CH, Ho ML. Comparisons of miRNA profiles of exosomes derived from human iPSCs, ADSCs, and BMSCs and effects on chondrocyte function. (Bone Joint

Res. 2025 Aug)

在臨床研究中及發表，本研究評估複合治療預防唑來磷酸治療骨質疏鬆引起的急性期反應，結果顯示合併使用氫化可的松、非類固醇消炎藥、乙醯胺酚及潑尼松龍可顯著降低嚴重不適並達到高比例症狀緩解，提升治療耐受性與臨床效果。(期刊來源 Chen CH, Yeap EK, Hsu CH, Lu YM, Cheng TL, Lee TC, Ho CJ, Li JY, Shen HY, Huang HT, Lu CC, Lin SY. Novel combined pharmacological strategy to alleviate acute phase response following zoledronic acid treatment. Arch Osteoporos. 2024 Oct)

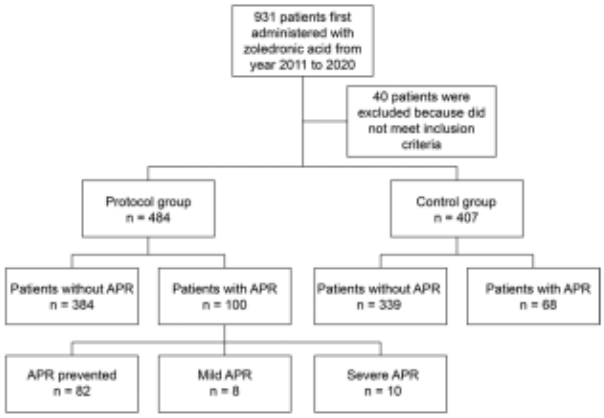


Fig. 1 Workflow of participant selection in the study APR: acute phase response

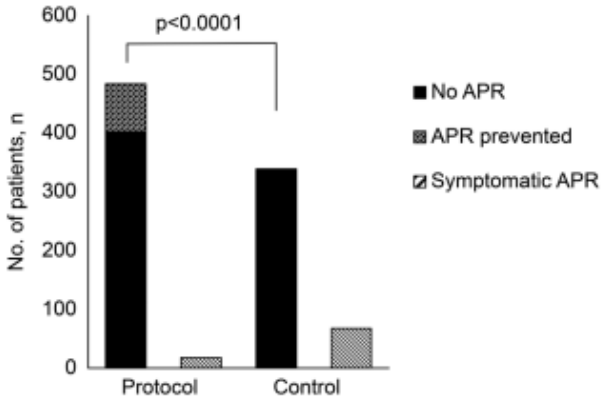


Fig. 2 Comparison of APR incidence following zoledronic acid infusion between protocol and control groups

【具體成果】

- 獲獎

1. 2024-2025 年史丹佛大學公布全球前 2%頂尖科學家之一。
2. 榮獲第八屆、第九屆、第 13 屆、第 14 屆、第 17 屆、第 21 屆、第二十一屆國家新創獎－學研新創獎、新創精進獎。
3. 111 年度優秀論文獎、研究計畫績優獎、專利獲證優良獎; 112 年研究計畫績優獎、專利獲證優良獎；113、114 年研究計畫績優獎、研究成果績優獎、技轉績優、專利獲證績優。
4. 榮獲經濟部產業技術司-2024 台灣創新技術博覽會科專成果-最佳展示獎

【研究團隊】

團隊成員：陳崇桓、林松彥、盧政昌、鄭琮霖、郭耀仁、傅尹志、王志光、王彥雄、何美泠、王國照、張瑞根、黃炫迪、吳順成、莊淑君、張玲華、鄒亞璇。

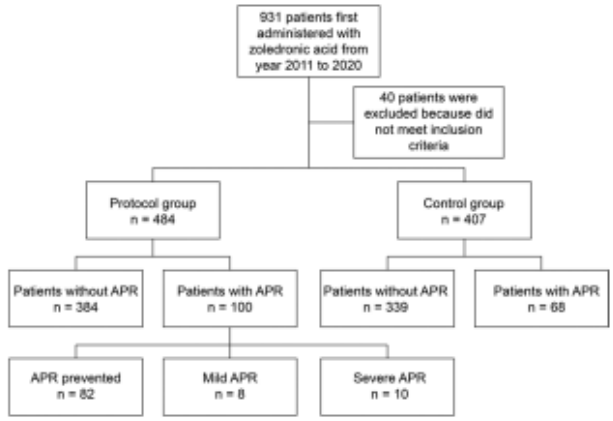
https://orthc.kmu.edu.tw/index.php/zh-TW/

團隊簡介：高雄醫學大學骨科學研究中心成立於 2001 年，宗旨在於深入探討國人常見骨骼與關節疾病的成因、預防與治療策略，建構從分子生物學、細胞生物學、組織學至活體基因治療的一貫性研究體系。高雄醫學大學骨科學研究中心成立於 2001 年，宗旨在於深入探討國人常見骨骼與關節疾病的成因、預防與治療策略，建構從分子生物學、細胞生物學、組織學至活體基因治療的一貫性研究體系。高雄醫學大學骨科學研究中心成立於 2001 年，宗旨在於深入探討國人常見骨骼與關節疾病的成因、預防與治療策略，建構從分子生物學、細胞生物學、組織學至活體基因治療的一貫性研究體系。

研究聯繫 Email：hwan@kmu.edu.tw; orthc@kmu.edu.tw

In recent years, Taiwan has been steadily progressing toward a super-aged society, accompanied by a rising prevalence of musculoskeletal disorders such as fractures, osteoporosis, and osteoarthritis. These conditions have become some of the most common health challenges among older adults. Consequently, research on the mechanisms underlying bone and cartilage degeneration, as well as their repair processes, holds significant clinical and academic value. Our research team has focused in recent years on elucidating the molecular mechanisms of age-related osteoarthritis and developing potential therapeutic strategies, resulting in multiple published findings. First, we investigated the therapeutic potential of epigallocatechin-3-gallate (EGCG) in both post-traumatic and age-associated osteoarthritis. Our results demonstrated that EGCG induces autophagy and suppresses chondrocyte apoptosis, thereby attenuating cartilage degeneration. In addition, we found that the parathyroid hormone fragment PTH1–34 effectively ameliorates both traumatic and aging-related osteoarthritis through direct action on articular chondrocytes, without altering the structure of subchondral bone. In the development of novel treatment approaches, we further examined intra-articular delivery of drug-loaded lipid nanoparticles combined with low-intensity ultrasound as an adjunctive therapy. Our findings showed that lipid-encapsulated rapamycin allows stable drug release and reduces cytotoxicity. When paired with low-intensity ultrasound stimulation, this strategy enhances extracellular matrix synthesis, reduces inflammatory responses, and further improves osteoarthritis progression. In the field of bone repair, we employed a diabetic animal model to investigate the effects of thrombin on osteoblast differentiation and bone defect healing. The results confirmed that thrombin promotes bone regeneration in diabetic rats and achieves optimal healing within eight weeks, highlighting its potential clinical applicability. Through our recent integrated NSTC (National Science and Technology Council) project, we also discovered that extracellular vesicles (exosomes) secreted by stem cells of different origins exhibit distinct functional and molecular characteristics that influence chondrocyte differentiation. These findings were published in Bone & Joint Research (Chang LH et al., 2025 Aug), demonstrating that variations in exosomal microRNA profiles from iPSCs, ADSCs, and BMSCs can significantly modulate chondrocyte function. In our clinical investigations, we evaluated a combined pharmacological regimen to prevent acute phase reactions induced by zoledronic acid treatment for osteoporosis. The results revealed that a combination of hydrocortisone, NSAIDs, acetaminophen, and prednisolone significantly reduced severe discomfort and

achieved a high rate of symptom relief, thereby improving treatment tolerability and clinical outcomes. This work was published in Archives of Osteoporosis (Chen CH et al., 2024 Oct).



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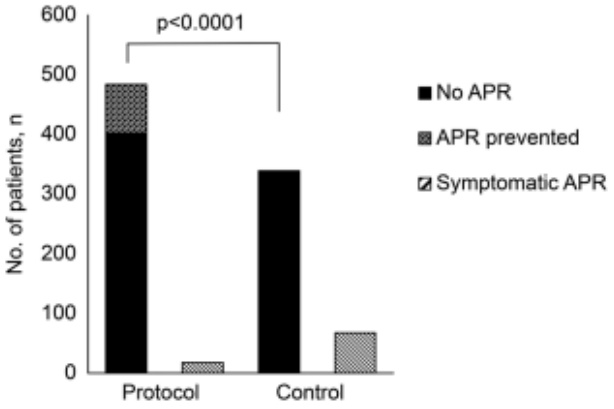

Fig. 2 Comparison of APR incidence following zoledronic acid infusion between protocol and control groups

【Concrete Results】

- **Awards**

1. Recognized by Stanford University as one of the World's Top 2% Scientists for 2024–2025.
2. Recipient of the 8th, 9th, 13th, 14th, 17th, 21st National Innovation Awards, including the Academic Research Innovation Award and Innovation Advancement Award.
3. Awarded the 2022 (Year 111) Excellent Paper Award, Outstanding Research Project Award, and Patent Achievement Award; the 2023 (Year 112) Outstanding Research Project Award and Patent Achievement Award; and the 2024–2025 (Years 113–114) Outstanding Research Project Award, Research Achievement Award, Technology Transfer Excellence Award, and Patent Excellence Award.
4. Recipient of the Ministry of Economic Affairs Industrial Development Administration's *Best Exhibition Award* at the 2024 Taiwan Innotech Expo – Program Achievement Showcase.

【Research Team】

Team Member: Chung-Hwan Chen, Sung-Yen Lin, Cheng-Chang Lu, Wang, Chih-Kuang, Wang, Yan-Hsiung, Wang, Gwo-Jaw, Ho, Mei Ling, Chang, Je-Ken, Fu, Yin-Chih, Huang, Hsuan-Ti, Kuo, Yur-Ren, Cheng, Tsung-Lin, Wu, Shun-Cheng, Chang, Ling-Hwa, Chuang, Shu-Chun, Chou, Ya-Shuan.

https://orthc.kmu.edu.tw/index.php/zh-TW/

Overview: The Orthopedic Research Center, established in 2001, aims to conduct in-depth research on the causes, prevention, and treatment of major bone and joint diseases in Taiwan. Its mission encompasses comprehensive research across molecular biology, cell biology, histology, and even in vivo gene therapy. A central focus is integrating the expertise and resources of orthopedics and related medical fields within the institution to drive innovative research. Key areas include investigating the causes and prevention of bone and joint diseases, developing drugs and medical materials for bone and joint regenerative medicine, as well as regenerative medicine for oral tissues, muscles, and ligaments.

The center provides education and training for young scholars in areas such as bone physiology, bone cell biology, stem cell biology, genetic engineering, and tissue engineering. It has established a school-wide platform for interdisciplinary research that bridges clinical and basic science. The team's projects have secured numerous research grants and include clinical-basic integrated research and the commercialization of findings. The center has achieved significant milestones, including 47 patents, 7 technology transfers, 4 start-up companies, and 1 merger and acquisition. It has also been honored with the prestigious Taiwan National Innovation Award.

Contact Email: hwan@kmu.edu.tw; orthc@kmu.edu.tw