April, 2014　第13期

醫工學會

http://www.bmes.org.tw/

中華民國生物醫學工程學會

Taiwanese Society of Biomedical Engineering

E-Newsletter

P1 即日起至103-5-31 張冠諒教授紀念獎學金申請開始囉!

P18 103年醫工證書考試相關訊息

更多醫工動態盡在醫工學會電子報，請即刻閱讀！

學會為了嘉惠醫工大家庭，100年4月回復電子報發行，預計每三個月出刊一期，敬請期待，對於本學會電子報，有任何意見，歡迎來電指教 (06) 2760665

目錄

醫工學會秘書處：70101 台南市大學路一號
國立成功大學生物醫學工程系轉醫工學會
TEL: +886-6-2760665
FAX: +886-6-2343270
E-mail: tsbme@conf.ncku.edu.tw

【張冠諒教授紀念獎學金】

本會張冠諒教授紀念獎學金申請自即日起至 2014 年 5 月 31 日截止，相關訊息以及表單敬請參閱醫工學會網站：http://www.bmes.org.tw/notice_show.php?id=334

【2014 中華民國生物醫學工程創意競賽】

2014 中華民國生物醫學工程創意競賽已於 4 月 1 日網路公告書面報告初審結果，5 月 20 日將於南部科學園區-高雄園區舉辦創意實作競賽決賽。決賽注意事項請見創意競賽網站：http://proj.ncku.edu.tw/bmeic/index.html

2014 中華民國生物醫學工程創意競賽　決賽議程

2014 年 5 月 20 日 (二) 高雄路竹園區　(高雄市路竹區路科五路 88 號 1 樓)		
時間	內容	地點
9:00	台南高鐵站接駁	台南高鐵站
09:30 ~10:10	作品佈置 & 報到	1F 展位
10:00~10:40	開幕式 (主持人：成大醫工系黃執中助理教授) I. 貴賓致詞 II. 評審介紹 III. 競賽方式解說	會議室 A
10:40~12:10	作品報告&評審	1F 展位
12:15~13:30	午 餐 評審計分 自由觀摩與交流	會議室 B (學生) 會議室 A(評審及貴賓)
13:30~14:00	參觀聚落展示區	二期標準廠房北棟 2F
14:00~14:30	閉幕式 (主持人：成大醫工系黃執中助理教授) I. 獎項公佈 II. 領獎方式解說	會議室 A
14:30~15:00	作品撤場	1F 展位
15:00	搭車賦歸	1F 門口

【2014 第三屆醫工盃】

2014 年第三屆全國大專院校醫工盃聯誼賽將在 6 月 28 日至 6 月 29 日於國立成功大學舉行，請各大專院校醫工系踴躍報名參加。

一、 活動名稱：2014 第三屆全國大專院校醫工盃聯誼賽

二、 主辦單位：國立成功大學

三、 承辦單位：國立成功大學生物醫學工程學系

四、 協辦單位：各參與院校系學會、國立成功大學體育室

五、 活動地點：國立成功大學　光復校區—排球場、籃球場、網球場
自強校區—棒球場
中正堂—羽球、桌球

六、 活動時間：民國 103 年 6 月 28 日（星期六）籃球、排球、壘球
民國 103 年 6 月 29 日（星期日）羽球、桌球、網球

七、 報名辦法：由於公告報名時間已截止，請有意願報名參加之校系直接聯繫活動負責人陳昕怡 0910-499-527。並將「2014 醫工盃報名總表」及「選手個人資料表」填妥寄至成大醫工系辦（701 台南市東區大學路 1 號 生物醫學工程學系 系辦）。報名費統一匯款至「戶名：國立成功大學生物醫學工程學系系學會蔣蕙蕙，匯款帳號：0031071-0869435」以完成報名手續。

八、 活動項目及報名費：1. 男子籃球：1800 元/隊
2. 女子籃球：1500 元/隊
3. 男子排球：1400 元/隊
4. 女子排球：1300 元/隊
5. 桌球
   - 團體賽：1200 元/隊
   - 個人賽（男單）：200 元/人
6. 羽球
   - 團體賽：1700 元/隊
   - 個人賽（男單）：500 元/人
7. 網球：1400 元/隊
8. 壘球：1700 元/隊

九、 臉書粉絲專頁：https://www.facebook.com/BmeSuperBowl
對於比賽規則或賽程等有問題請於粉絲專頁上反應，之後也會提供住宿、美食和交通等相關資訊。

十、 主辦單位聯絡電話：總籌 陳昕怡 0910-499-527

【GCBME 2014 & APCMBE 2014 重要訊息】

本會第一屆全球生物醫學工程會議(GCBME 2014)及第九屆亞太生物醫學工程會議(APCMBE 2014)將於 2014 年 10 月 9-12 日共同於台灣台南成功大學醫學院舉辦，邀請各醫工領域的專家學者及學生踴躍投稿！欲了解更多詳情，請見研討會網站：http://conf.ncku.edu.tw/apcmbe9/index.html

投稿相關資訊如下：

線上投稿截止時間：2014/06/01

論文篇幅：如欲參加 Student Paper Competition 或 Young Investigators Competition 或要收錄進 IFMBE Proceedings 之論文必須為 2 頁以上之全文；反之可投稿摘要即可。

重要日程	
開放線上投稿	2014/04/01
截止線上投稿	2014/06/01
開放線上註冊	2014/07/01
論文接受通知	2014/07/15
論文修改截止	2014/08/01
註冊優惠截止	2014/08/15
會議日期	2014/10/09-12

國立中央大學
生物醫學工程研究所
Graduate Institute of Biomedical Engineering

一、 系所簡介與目標

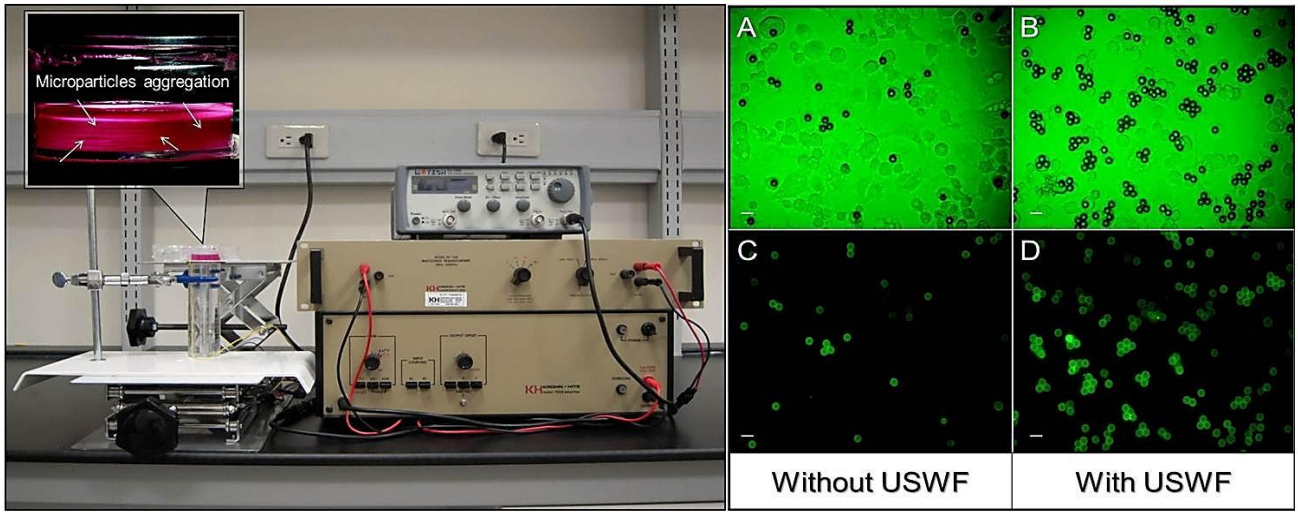
生物醫學工程為一跨領域的專門學科，結合了生物科學、臨床醫學與工程技術等三大專業領域，運用於醫療相關的研究上，以強化疾病的診斷或治療品質與效果。為因應生物醫學科技的蓬勃發展，中央大學於民國 96 年 8 月設立了生物醫學工程研究所(以下簡稱本所)，並於同年開始招收第一屆碩士班研究生。本所師資由從事多年生物醫學研究的機械、電機、化材、醫工及資工等背景教師組成，同時也和北榮、國泰、三總、桃醫、壢新等醫院在研究及教學上保持密切的合作關係。目前本所共有七位學有專長的專任師資、四位醫學暨產業專業的兼任教師、及三位資工專業的合聘師資。學生有碩士班學生 30 位，博士班學生 4 位。

二、 師資與研究

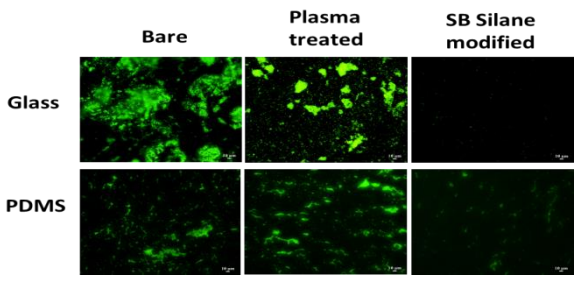
本所依照組成師資的專業將研究領域概分為兩大方向：生醫材料與技術及生醫訊號與器材。

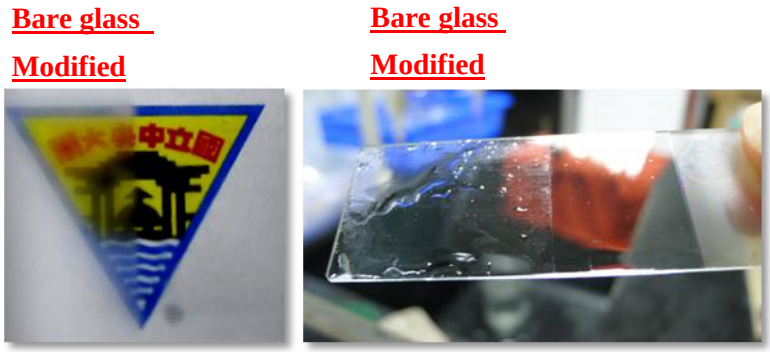
「生醫材料與技術」：

師資有陳文逸、李宇翔、黃俊仁及國泰醫院的簡志誠院長與鄭宇哲博士。主要研究為基因/蛋白質表現分析、組織工程用支架、藥物輸送、細胞生物工程、生物反應器、抗生物沾黏表面技術、超高靈敏生物檢測、奈米顯影材料。



Ultrasound Standing Wave Fields (USWF)-Mediated Gene Delivery

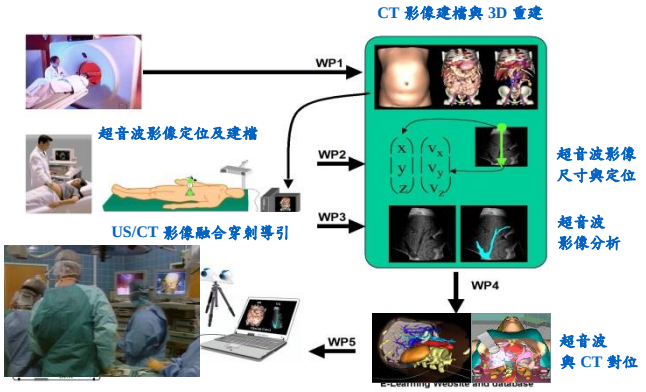




抗菌貼附(左)、抗霧(中)、抗油汙(右)表面製備

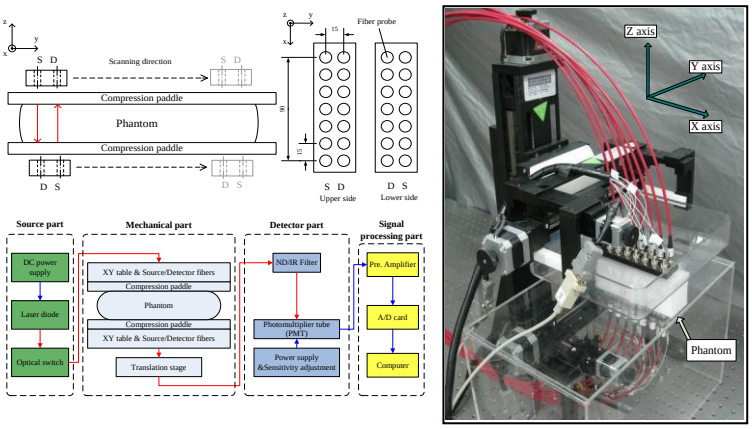
「生醫訊號與器材」：

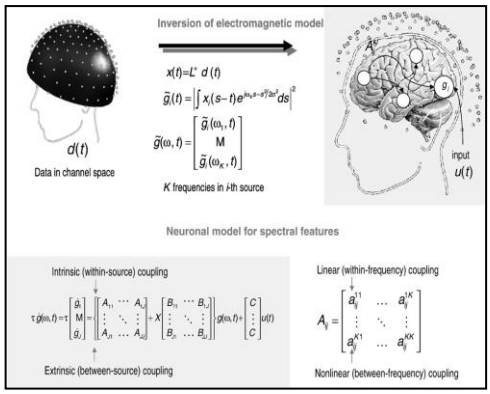
師資有曾清秀、潘敏俊、陳純娟、吳昌衛及桃園醫院的徐永年院長及業界的賴博雄教授。主要研究有**生醫訊號處理、生醫光電感測、電腦輔助診斷與手術導引系統。**



CT/US 影像融合於肝臟診斷及治療應用

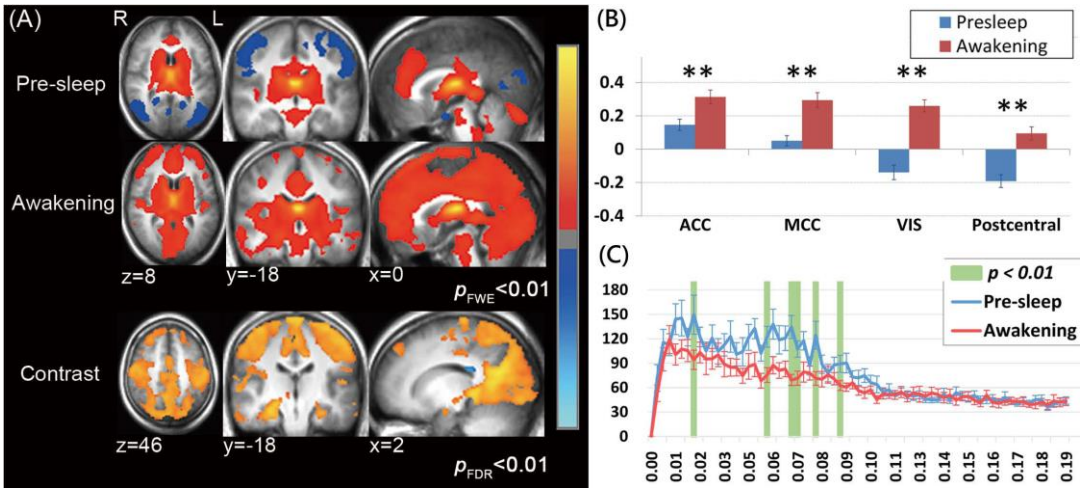
3D VR 復健輔具開發應用





近紅外光擴散光學斷層掃描研究暨乳房腫瘤篩檢應用

Dynamic Causal Modelling



睡眠對大腦之回復效果：以功能性磁振造影探討丘腦－皮質網路聯結於睡眠前後之變化

師資及其學術領域

曾清秀 特聘教授 兼所長	醫學影像輔助系統實驗室 http://www.me.ncu.edu.tw/cstseng/
➢ 美國 佛羅里達大學 機械工程博士 **研究專長:** 醫學影像輔助手術導引系統、機器人手術導引系統、組織工程用支架	
潘敏俊 教授	診斷與生醫量測實驗室 http://www.me.ncu.edu.tw/teacher/Teacher-35/DASD_serve/first.htm
➢ 比利時 荷語魯汶大學 機械工程博士 **研究專長:** 感測技術、生醫機械訊號處理、生醫光電、光電機器元件設計	Dynamic Causal Modelling
陳文逸 特聘教授	蛋白質工程實驗室 https://sites.google.com/site/biorecoglab/
➢ 美國 奧克拉荷馬州立大學 化工博士 **研究專長**: 生物辨識系統之熱力學與動力學、藥物控制釋放、生醫材料於幹細胞之純化與培養、生物晶片	
陳純娟 助理教授	計算神經科學實驗室 http://lcn.bme.ncu.edu.tw/
➢ 英國 倫敦學院大學(UCL) 博士 **研究專長:** 計算神經科學、腦電磁波分析處理、運動控制、中風復健	
李宇翔 助理教授	奈米生技實驗室
➢ 美國 南加州大學 化學工程博士 **研究專長:** 細胞/組織工程、藥物輸送、生醫材料、生物反應器	
吳昌衛 助理教授	生理律動實驗室
➢ 國立台灣大學 電機工程博士 **研究專長:** 生理訊號節律、睡眠神經影像、醫學影像與信號處理	
黃俊仁 助理教授	健康照護材料實驗室
➢ 德國 美因茨大學 **Johannes Gutenberg-Universität Mainz** 分子生物物理博士 **研究專長:** 生物材料, 生物感測器與分子診斷, 功能性生物界面, 表面工程與特性.	

三、 教學

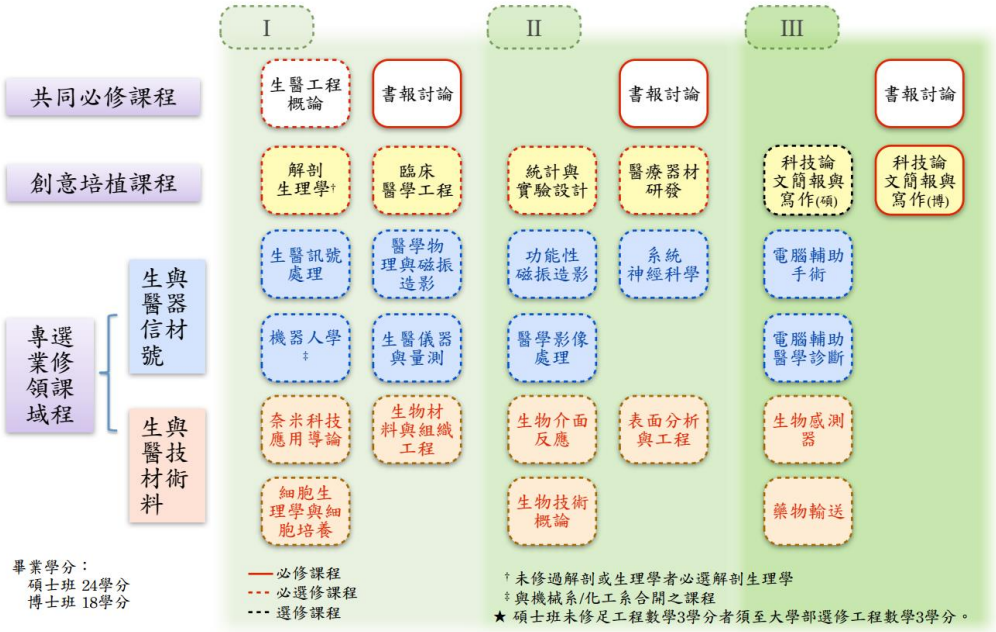
在教學方面，本所著重於生物、醫療及工程技術的整合與創新，以培養具跨領域能力之人才，其教育目標為：

1. 整合生物、醫療及工程技術，以培養具備跨領域能力之人才。
2. 培育具備獨立研究與創新能力之高階研發人才，以貢獻社會。
3. 拓展國際視野、追求學術卓越，養成終身學習的精神。

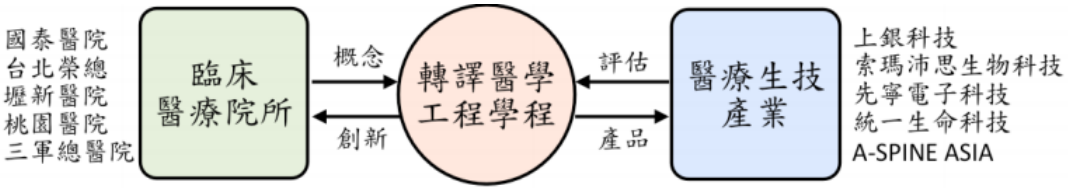
除了生醫工程專業能力的訓練，本所亦注重學生健全人格的培養。在全面教研並重的指導方針之下，本所學生核心能力：

1. 能夠具備生醫工程研究領域的專業知識及使用適當軟硬體工具，來分析、規劃與處理問題。
2. 能夠以創新與獨立思考的精神，來解決生醫工程專業領域之研究問題，並有助於研究論文之完成。
3. 能夠體認生醫工程專業倫理與社會責任，規劃終身自我學習成長。
4. 能夠協調與整合生醫工程領域的人員及具有領導與管理之能力，並具有國際觀。

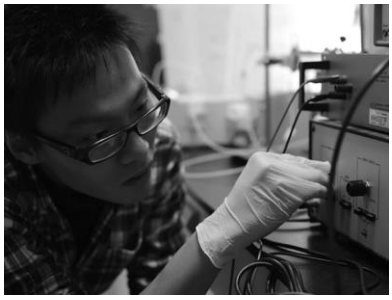
課程地圖



實務型課程規畫



四、 學生生活

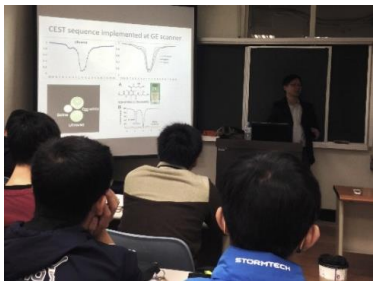


學生實驗室生活



迎新活動





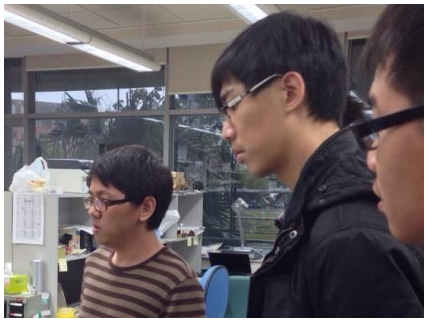
專題演講，促進業界與學界的交流



每月的師生交流聚會


學校運動會展現活力





校外實習與企業參訪


組團參加國內外會議

五、 結語

本所今年將加入本校新設的生醫理工學院，明年將與系統生物所,跨領域轉譯醫學所及認知神經科學所共同成立生醫科學與工程系。竭誠歡迎全國優秀人才加入本所，培育成為生醫產業及學術研究單位之精英分子。

聯絡方式

網址: http://bme.ncu.edu.tw/
地址:桃園縣中壢市中大路 300 號 中央大學生物醫學工程研究所
Tel: (03)280-6821
Fax: (03)280-4627
bme@ncu.edu.tw

國泰綜合醫院醫學工程組簡介

宗旨　以醫療服務回饋社會
願景　成為服務、教學、研究卓越的醫學中心
目標　成為以病人為中心的全人醫療照護機構
　　培育教學、研究與創新的卓越人才
　　強化急、重、難症醫療服務
核心價值　誠信、當責、創新

醫院簡介

霖園集團國泰人壽公司秉持「關懷社會，回饋社會」精神，創辦國泰醫療財團法人國泰綜合醫院，於西元一九七七年二月十五日正式開幕啟用。

草創之初，在國立台灣大學附設醫院全力支持及全體員工努力下，病人數不斷增加，規模從創院時的三百床擴建迄今的八百二十一床。由於獲得民眾肯定、為免病患舟車勞累，陸續成立內湖分院(二○○八年改由內湖診所繼續提供服務)、新竹分院(總病床數 338 床)與汐止分院(總病床數 597 床)、內湖國泰診所，形成兼具醫學中心、區域醫院、地區醫院與診所等四個等級的國泰醫療網，肩負著照顧北台灣廣大民眾的健康。

身為多次通過醫學中心評鑑與教學醫院評鑑肯定的醫學中心，以「病人為中心」的理念基礎下，在服務、教學與研究三大領域用心耕耘，致力建構一個提供全人照護的醫療體系。為提供民眾精緻化的高品質服務，建院以來，本院在軟體及硬體設備並重下發展，在軟體發展方面，本院積極培育醫療專業人才，派遣醫師至國外頂尖醫院學習醫學技術、引進國內提升醫療技術、造福病人。

醫療資訊系統設置完善可提升病人安全，本院近年來建置完整資訊系統開發結合醫療影像、臨床資訊、護理、檢驗等七大系統、六十五次系統，採用 Web-Based HIS 系統，二○一一年更開發完成行動醫療資訊系統(iMMIS)，整合門診、住院、急診等十七項系統，搭配為全院主治醫師配備的 iPad，讓醫師能隨時掌握病患病情，更提升病人安全。

在醫學中心教學任務上，本院與台灣大學醫學院、輔仁大學醫學院、台北醫學大學等醫學院建教合作，就醫學倫理、品質管理、病人安全與社區健康營造等各方面，加強醫學生教育，培育具備全人照護的醫學優秀人才。對於住院醫師及其他專業醫療人員，本院訂有完整教育訓練計劃，並設置 OSCE 臨床技術訓練中心，提供醫師、醫事人員臨床診斷及技術訓練，歷年來培訓與輔導住院醫師通過各專科醫師次專科百分之百考取證照。另外亦配合國家政策，代訓越南、巴拉圭、蒙古等友邦醫師及醫事人員，提供醫學知識、醫療相關訓練等，協助外國醫療專業人才養成。

醫療科技之進步，帶動各項醫學研究的發展，本院整合相關研究資源成立臨床醫學研究中心，並與國立中央大學跨領域合作，提供專業的研究環境，鼓勵同仁積極投入研究領域，目前在胚胎幹細胞、羊水幹細胞、糞便中大腸癌腫瘤標記篩檢皆有領先世界的具體成果，獲得台灣及美國專利；國科會、衛生福利部核准計劃件數亦逐年增加。

醫療服務不忘社會關懷，恪守「以醫療服務回饋社會」宗旨，本院積極投入各項醫療服務活動回饋社會，包括舉辦健康講座、社區防癌篩檢與愛心義診等，加強民眾正確醫療知識、防癌觀念，協助民眾早期發現、早期治療疾病，為社區民眾健康把關。對於弱勢病人也成立多項「蔡萬霖獎勵補助專戶」，補助經濟弱勢患者，讓他們就醫更無後顧之憂。此外，愛心公益不分國界，本著人道關懷精神，本院多次組醫療團隊遠赴四川及海地震災救援，至印度、巴拉圭、蒙古等地，進行醫療義診服務，讓醫療服務無遠弗屆。未來我們也將以「創新服務、追求卓越」理念，抱持「成為服務、教學、研究卓越的醫學中心」願景，持續努力，為廣大民眾的健康把關，成為備受病人信賴的醫學中心。

部門沿革

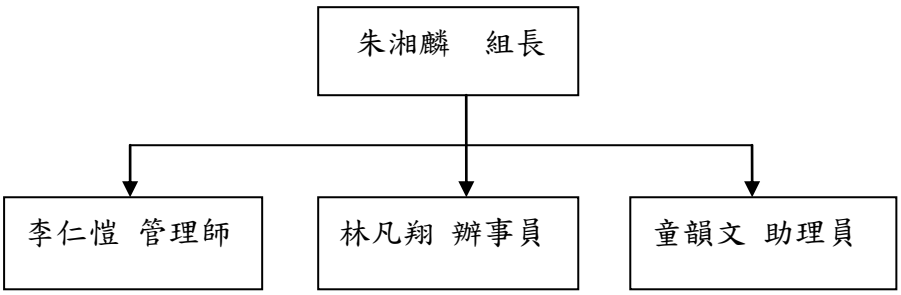
醫院成立之初，醫療器材維修保養業務由工務組機電股兼任，採購議價等業務由資材組辦理，1981 年由工務組機電股抽調一人專責醫儀分類、建檔、契約保養等事宜，維修仍由工務組機電股支援。

1991 年院長室聘賴敬恆先生負責督導維修保養採購等業務，1995 年總務部成立總務室，醫工業務由陳志彬先生負責，主責醫療器材保養維修等相關業務，2004 年起由林青龍先生負責醫工業務。2007 年因應教學醫院評鑑之業務需求，於總務部總務組下成立醫工股，仍由林青龍先生負責總務部醫工業務，並於 2008 年通過 ISO 9001-2000 品質管理系統的認證。

2010 年 7 月 1 日於台北總院總務部正式成立醫工組，聘朱湘麟先生為組長，負責台北總院及協助其他院區醫工之相關業務，2011 年通過 ISO9001-2008 品質管理系統的認證，並於 2012 年初於總院本館 B2 設置醫工維修室，從此醫工組有獨立維修作業空間，能及時並更有效率的執行維修保養校正相關作業。

組織編制

總院醫工組設組長一名，工程師二名，助理員一名，汐止分院及新竹分院皆於行政室下設有醫工一名，內湖診所之醫工業務概由總院負責。



核心目標

以「病人安全為中心」的是我們的核心目標，本組依照 ISO 規範，以有效品質管理方式，提供病人安全的優質醫療照護，並不斷提升醫療器材品質，來確保病人安全和提升醫療服務品質。

例行業務

（一） 建立醫療器材設備管制作業程序

製作醫療器材設備保養及校正計畫，並建置醫療器材維護保養卡及醫療器材設備履歷卡，並依計畫表進行維護保養校正作業，並及時完成單位醫療器材故障維修之需求，以維持醫療器材設備功能之正常運作。

（二） 醫療器材維護保養依分層負責管理原則，採第一級、第二級和第三級等方式進行。

第一級：使用單位每月執行例行的清潔保養、開機測試等初級保養。

第二級：由醫工組執行，分為高風險設備與一般性設備，巡檢週期前者為每季、後者為每半年，並執行生理監視器、電擊器、電子血壓計及體重計等醫療器材校正保養。

第三級：由醫工組擬定年度醫療器材保養及校正計劃表，並監督醫療器材設備廠商執行保養及巡檢並完成保養紀錄。

（三） 醫療器材故障維修處理

使用單位先參考『醫工組網頁』醫療器材設備簡易故障排除規範處理。若醫療器材仍無法正常運作，使用單位需填具財物修護申請單請修並知會醫工組人員到場處理，並另訂有假日及緊急事故處理辦法，以因應醫療器材假日故障及緊急維修作業。

（四） 醫療器材採購技術評估

針對醫療器材臨床需求（醫療、教學或研究）、採購緣由(新購或汰舊)、規格、價格、安全性、主要零件售價、主要耗材售價、零件取得時效、保固條件、維修、教育訓練、維修工具、維修軟硬體、廠商能力及未來維修合約等要項進行技術評估，並上呈醫療器材採購評估報告提供高階主管會議決策。

（五） 醫療器材委外維護保養

針對本院所有貴重精密之醫療器材設備，以有效率的保養方式訂定維護保養合約，使其維持安全、準確、可靠、穩定的功能，並得以提早發現醫療器材設備的潛在異常，事先防範非預期重大故障發生。

（六） 新購醫療器材驗收

為保障醫療器材臨床使用品質及安全的保證，以及減少潛藏性危險源之可能存在，本組監督新購醫療器材設備之安裝、測試與電性安全之驗收，並責成醫療器材商實施新購醫療器材操作及維修之教育訓練。

（七） 醫療器材報廢鑑定

負責鑑定各單位使用之醫療器材是否已失去原有性能不堪繼續使用，或基於實際情況不再適合臨床使用。

（八） 醫療器材教育訓練

透過適當教育訓練以確保醫療器材設備運作品質，並減少醫療器材非預期之事故。

1.新機操作之教育訓練：於訂定醫療器材採購合約時納入教育訓練計畫時程表，教育訓練需於驗收程序完成前執行完畢。

2.舊機操作之教育訓練：於保養合約內規範每年將定期舉辦教育訓練乙次。

3.原則由廠商支援技師擔任主講，於院內場地實施。

4.教育訓練課程執行狀況，以書面呈總務部、醫工組主管核閱。

5.由醫工組將教育訓練課程製成影像檔或電子檔置於院內醫工網頁供瀏覽參閱。

（九） 醫療器材安全管理會議

每半年依醫療器材設備故障及巡檢所發現之病安問題，透過醫療器材安全管理會議進行檢討與改善。

（十） 醫工聯合會議

每季召開一次三院區醫工聯合會議，加強總院、汐止分院及新竹分院醫工業務橫向聯繫溝通及教育訓練，提升總、分院醫工作業之品質及效能。

（十一）提供生物醫學工程學系學生暑期醫院實習

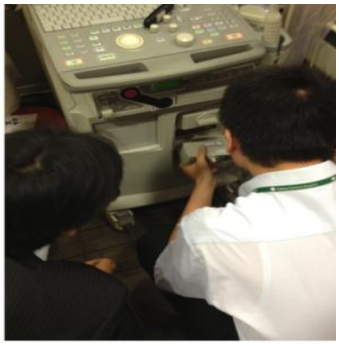
每年暑期提供生物醫學工程系學生醫院實習機會，計有弘光科技大學、銘傳大學及中原大學等生物醫學工程系學生來院實習。

未來展望

持續以工程技術服務配合醫院目標，強化醫療器材採購、管理、維修等智識技能，多方參與各類設備研討會與廠商及同業進行技術交流，協助各單位辦理醫療器材相關業務；期望本院醫工組人力資源持續成長與自我提升，為全院提供更佳的技術服務以達到最高效益。


醫療器材新機安裝及測試


醫療器材教育訓練


醫療器材維護保養作業



醫療器材校正作業

103 年醫工證書考試相關訊息

本會將於 2014 年 8 月 2 日(六)舉行本年度之臨床工程師、醫療設備技師、醫學工程師之醫工證書考試，考試簡章將於 4 月底前公布於學會網站上，敬請有意報考者密切注意。非會員報考者，亦可參加考試。待考試通過後，必須完成入會手續，始頒予證書。

報名日期：2014 年 5 月 1 日至 2014 年 7 月 1 日

筆試日期：2014 年 8 月 2 日(六) 上午 09:30-11:30

口試日期：2014 年 8 月 2 日(六) 下午 13:30-17:00 (暫訂)

※最新證書考試訊息，請至醫工學會網站查詢。

※證書報考類別選擇說明:

為配合推動國家專業證書制度，本學會實施工程技術人員服務於醫學相關領域之專業認證，證書檢定要求與類別說明如下。

醫工證書之認證類別依工作環境區分為二類：

(1) 服務於醫療院所之醫工相關單位人員之證書：

考量其年資及工作內容，學會比照歐美先進國家及國際醫工聯盟(IFMBE)的規範，將證書分為兩大類：『臨床工程師』(Clinical Engineer) 、『醫療設備技師』(Biomedical Equipment Technician) ，證書檢定要求如下表一。

(2) 服務於醫療院所醫工相關單位以外之醫學工程人員

如放射科、核子醫學科等學術研發單位以及業界之工程人員，可申請『醫學工程師』證書，其證書檢定要求如下表二。

表一、臨床工程師證書檢定要求

甄審資格	工作年資	甄審程序
本會之永久或個人會員且符合工作年資者	1.醫學工程相關研究所畢業，並有一年以上臨床工程之工作經歷。 2.醫學工程系（組）畢業，並有兩年以上臨床工程之工作經歷。 3.醫學工程科或大學相關系畢業，並有三年以上臨床工程之工作經歷。 4.專科相關科畢業，並有四年以上臨床工程之工作經歷。 5.實際從事臨床工程相關工作十年以上。 6.預計三年內符合以上任一資歷。 *考試及格後三年內學歷及累積工作年資符合後方可領證。	1.填寫甄試申請書(至學會網站下載) 。 2.準備文件：學位證明影本、工作年資證明**正本**、甄試費繳交收據。 ※以上資料連同甄試申請書寄送本會。 註：甄審費由本會理事會另訂之。

醫療設備技師		
（依工作領域區分為一般醫療設備技師、放射醫療設備技師、臨床檢驗醫療設備技師）		
甄審資格	**工作年資**	**甄審程序**
本會之永久或個人會員且符合工作年資者	1.醫學工程系（組）畢業，並有一年以上醫療設備之工作經歷。 2.醫學工程科或 大學以上相關系畢業，並有兩年以上醫療設備工作之經歷。 3.專科相關科畢業，並有三年以上醫療設備工作之經歷。 4.實際從事臨床工程相關工作四年以上。 5.預計三年內符合以上任一資歷，考試及格後三年內學歷及累積工作年資符合後方可領證。 註：申請放射醫療設備技師及臨床檢驗醫療設備技師者必須在近兩年有 40%或近五年有 25%之工作與該領域有關(需提出實際工作項目證明，例如主管證明等)。	1.填寫甄試申請書(至學會網站下載) 。 2.準備下列文件：學位證明影本、工作年資證明**正本**、甄試費繳交收據。 ※以上資料連同甄試申請書寄送本會。註：甄審費由本會理事會另訂之。

表二、醫學工程師		
甄審資格	**工作年資**	**甄審程序**
本會之永久或個人會員 且符合工作年資者	1.大學院校之醫學工程(生物醫學工程)系、所、組、學程畢業。 2.大學院校之相關系、所畢業，並有一年以上醫學工程之工作經歷。 3.專科院校之相關科畢業，並有二年以上醫學工程之工作經歷。 4.實際從事醫療產業相關工作四年以上 1.填寫甄試申請書(至學會網站下載) 。 5.預計三年內符合以上任一資歷 1.填寫甄試申請書(至學會網站下載) 。 ※考試及格後三年內學歷及累積工作年資符合後方可領證。	1.填寫甄試申請書 (至學會網站下載)。 2.準備下列文件：學位證明影本、工作年資證明**正本**、甄試費繳交收據。 ※以上資料連同甄試申請書寄送本會。 註：甄審費由本會理事會另訂之。 醫學工程師筆試及格者，需符合下列規定之一，方可領證：(1)持有大專院校畢業證書者；(2)持有實際從事醫療產業相關工作四年以上之證明文件。

2014 Vol. 34, No. 1

Review: Plasma-Sprayed Apatite Coatings: Review of Physical-Chemical Characteristics and Their Biological Consequences

Imane Demnati, David Grossin, Christèle Combes, Christian Rey

Hydroxyapatite (HA) is widely used as a coating on orthopedic medical implants to improve anchoring to bone tissue and facilitate bone repair. The use of plasma-sprayed HA coatings on metal implants has raised as much controversy as interest over the last decade. Although faster and stronger fixation and enhanced bone growth have been reported, the long-term performance of HA-coated implants has been questionned This ambivalent behaviour is related to the thermal decomposition of HA during the plasma spraying of HA powder, which has several observable consequences for the physical-chemical and biological properties of the coatings. This review presents the current knowledge on the characteristics of plasma-sprayed HA coatings and their biological consequences. Various schemes of chemical reactions and physical-chemical processes that can occur during HA-particle plasma spraying, HA-coating formation, or after implantation of HA coatings are presented. Standard and emerging methods developed for the characterization of HA coatings are reviewed, with a focus on Raman spectroscopy, which allows high-quality imaging. Finally, several promising trends that have been explored in recent years to improve the mechanical resistance of coatings and their adhesion on the substrate, to improve the coating microstructure and crystallinity, or to confer a therapeutic activity (e.g., antibacterial activity) on plasma-sprayed HA coatings are reviewed.

Effects of Bismuth Subgallate on Properties of Calcium Phosphate Bone Cement in Vitro

Wen-Cheng Chen, Shih-Ming Hsu, Jia-Huei Ko, Chia-Ching Lin, Dan-Jae Lin

This study evaluated the effects of combining the hemostatic agent bismuth subgallate (BS) with calcium phosphate bone cement (CPC) in hard-tissue regeneration. BS was added at 5, 10, and 15 wt.% in CPC with 1 M phosphate hardening solution. The radiopacity, physiochemistry, hemostasis, and cytocompatibility were characterized. The data were statistically analyzed using one-way analysis of variance followed by Tuckey's post-hoc test. The radiopacity of BS/CPC increased linearly with increasing BS content. The crystallite morphologies and X-ray diffraction patterns indicated a retardation effect on the phase transformation in all BS/CPC groups in vitro, resulting in a significant reduction in strength and prolonged setting time, but no significant changes in the relative working time, when compared with those of pure CPC. The analyses results show that 15 wt.% BS/CPC can shorten the blood clotting time by more than 50%. Moreover, the cell viability (as evaluated by the MTT assay) significantly increased after the addition of BS to a human osteosarcoma cell line (MG63) cultured for 1 and 24 h when compared with that obtained with pure CPC. The BS/CPC samples were highly radiopaque and are potential therapeutic candidates for shorting blood clotting time and thereby for correcting hemostatic failure and reducing bleeding risk in hypertensive patients.

Fabrication of Yttrium Phosphate Microcapsules by Emulsion Route for In Situ Cancer Radiotherapy

Toshiki Miyazaki, Takajin Suda, Yuki Shirosaki, Masakazu Kawashita

Radiotherapy is a novel, non-invasive cancer treatment. Radioactive hollow microspheres, i.e., microcapsules, are attractive for in situ cancer radiotherapy because they can effectively reach tumors without settling in blood vessels. In particular, microcapsules 20-30 μm in size are expected to exhibit not only a radiotherapy effect but also embolization that blocks the nutrient supply to cancer cells. -ray irradiation is the most suitable source for in situ radiotherapy because of its moderate range. Several kinds of -emitting yttria (Y2O3) microcapsules have therefore been developed. Yttrium phosphate (YPO4) should have a longer irradiation effect than that of Y2O3 because the half-life of 31P (14.3 days) is longer than that of 90Y (64.1 hours). However, the preparation of YPO4 microcapsules has not been reported to date. In the present study, YPO4 microcapsules were fabricated using a water/oil (W/O) emulsion prepared by first dispersing a YPO4 sol into toluene containing a surfactant, with mechanical homogenization. The emulsion was then added into butanol to dehydrate the water phase and precipitate microcapsules. These were then heat-treated to improve their mechanical strength and chemical stability. Microcapsule fragility at low YPO4 sol concentrations in the water phase was attributed to the thinness of the microcapsule shell. The size of the microcapsules decreased with increasing emulsification speed. The chemical stability of the prepared microcapsules is similar to those of previously reported YPO4 and Y2O3 microspheres in weakly acidic conditions. Thus, little leakage of radioactive species into nearby healthy tissues is expected. The obtained microcapsules are expected to be highly effective for cancer radiotherapy.

One-step Synthesis and Characterization of Nanosized Bioactive Glass

Shao-Ju Shih, Yu-Jen Chou, Chin-Yi Chen, Chung-Kwei Lin

Bioactive glasses (BGs) have been applied for bone transplant surgery, dentistry, and drug delivery due to their high reactive surface areas and excellent bioactive properties. Spray pyrolysis (SP) has been employed to fabricate BG in order to overcome the disadvantages of common techniques such as the conventional glass method (low purity and high calcination temperature) and the sol-gel method (difficulties in mass production). Bioactivity, the most important property of BGs, is directly related to surface area. It is well known that BG surface area increases greatly with decreasing particle size. Therefore, in this study, both submicron and nanostructured BG particles were synthesized in order to determine the effect of particle size on bioactivity by adjusting the SP calcination temperature. The surface structure, morphology, crystallography, chemical composition, and surface area of BG particles were characterized using scanning and transmission electron microscopy, selected area electron diffraction, Fourier transform-infrared spectroscopy, and the Brunauer-Emmett-Teller method. It was found that with increasing calcination temperature, the particle morphology changed from submicron solid structures to nanosized hollow structures. In addition, the surface area increased from 6.0 to 20.1 m2/g. The bioactivity test suggests that nanosized BG particles have a higher hydroxyl apatite formation rate due to their higher surface area. Based on these experimental results, SP formation mechanisms for BGs particles with various morphologies based on the “one-particle-per-drop” and “gas to particle conversion” mechanisms are proposed. By controlling the SP calcination temperature, BG morphologies crystallographic structures and surface areas have been correlated with their bioactivities. These findings demonstrate that SP can be used for BG fabrication.

Effect of Coloring on Mechanical Properties of Dental Zirconia

Seiji Ban, Takayuki Suzuki, Kentaro Yoshihara, Keisuke Sasaki, Tatsushi Kawai, Hiroshi Kono

Pre-sintered blocks of three kinds of yttria-stabilized tetragonal zirconia polycrystal (Y-TZP) and one ceria- stabilized tetragonal zirconia polycrystal (Ce-TZP)/alumina nanocomposite were stained with six kinds of coloring liquid (three ivory, two violet, and one pink). The crystal phases of the baking powder of the coloring liquids fired at 1100 ℃ for 30 min were characterized by X-ray diffractometry (XRD) and their constituent elements were detected by wavelength dispersive X-ray spectroscopy (WDS). The three ivory liquids contained mainly Fe ions, the two violet liquids mainly contained Co ions, and the pink liquid contained Er and Nd ions. After the final sintering, the color differences (ΔE) were determined with a chroma meter. Three-point flexural strengths were determined at a span length of 16 mm according to ISO 6872. Fracture toughness was determined by an indentation method in terms of Palmqvist cracks. The color difference of the nanocomposite was smaller than those of three Y-TZPs due to high light scattering. The three ivory liquids for the nanocomposite led to small ΔE values. The sintered zirconia stained with the pink liquid containing Er and Nd ions showed significant decreases in flexural strength and fracture toughness. An XRD study revealed that most of the crystal phase of the zirconia stained with Er and Nd was cubic. In contrast, the three ivory and two violet liquids led to no significant change in the flexural strength and fracture toughness of the zirconia.

Effects of Bismuth Oxide on Physicochemical Properties and Osteogenic Activity of Dicalcium Silicate Cements

Ting-Yi Chiang, Chung-Kai Wei, Shinn-Jyh Ding

This study examines the effects of bismuth oxide (Bi2O3) radiopacifier on the physicochemical properties and in vitro osteogenic activities of sol-gel-derived dicalcium silicate cements. The setting time, diametral tensile strength, radiopacity, solubility, pH value, and phase composition of the cements containing various amounts of Bi2O3 (5, 10, and 20 wt%) were evaluated and compared to those of ProRoot white-colored mineral trioxide aggregate (WMTA). The osteogenic activities, such as proliferation, differentiation, and mineralization, of MG63 human osteoblast-like cells on cements with and without Bi2O3 were also examined. The results show that the setting time increased significantly ($P < 0.05$) with increasing Bi2O3 content. The pH value and diametral tensile strength of the cements were slightly affected by the introduction of Bi2O3. After the addition of 5, 10, and 20 wt% Bi2O3, the radiopacity of the cements became significantly ($P < 0.05$) higher, with values equivalent to 3.3, 5.8, and 8.4 mm of Al, respectively, which are all greater than the 3 mm of Al recommended by *ISO 6876: 2001* standards. The solubility of the three radiopaque cements ranged between 0.8% and 1.1%, which is significantly ($P < 0.05$) lower than that of WMTA (1.4%). 20 wt% Bi2O3 led to lower cell proliferation, differentiation, and calcium deposits of MG63 cells on the cement surfaces at all culture times compared those obtained with the other cements. The addition of 10 wt% Bi2O3 to dicalcium silicate cement improves the setting time, radiopacity, and osteogenic activity, making the cement a potential alternative to WMTA as a root-end filling material.

In Vitro Cartilage Tissue Engineering Using Porous Collagen/PLLA Nanoparticle Hybrid Scaffold

Shaoquan Bian, Wei Lu, Cancan Xu, Yujiang Fan, Xingdong Zhang

Porous collagen/poly L-lactic acid (PLLA) nanoparticle hybrid scaffolds were evaluated for application in the construction of engineered cartilage in terms of biocompatibility and bioactivity. The hybrid scaffolds were prepared by mixing various amounts of surface-modified PLLA nanoparticles with collagen solution, freeze drying, and cross-linking. PLLA nanoparticles that were homogeneously distributed in the collagen matrix effectively improved the mechanical properties of the scaffold without significantly influencing the microstructure, and slowed down degradation. In vitro cell seeding and culture studies showed that cells infiltrated into the scaffolds and dispersed homogeneously. The proliferation of cells in the hybrid scaffold increased with increasing number of PLLA nanoparticles. In addition, strengthening the scaffolds with PLLA nanoparticles helped to resist the shrinkage of the engineered tissue during in vitro culture. The glycosaminoglycan (GAG) content in the hybrid scaffolds also increased with the addition of PLLA nanoparticles. hematoxylin-eosin (HE), toluidine blue, and immunohistochemical staining and reverse transcription polymerase chain reaction (RT-PCR) analysis of the chondrocyte/scaffold constructions indicated that the hybrid scaffold promoted the formation of cartilage tissue, resulting in engineered cartilage with a higher compressive modulus compared with that of cartilage cultured on a pure collagen scaffold. These results demonstrate that a porous collagen/PLLA nanoparticle hybrid scaffold is biocompatible, making it suitable for cartilage tissue engineering.

Improvement of Osteoblast Adhesion Through Polarization of Plasma-Sprayed Hydroxyapatite Coatings on Metal

Miho Nakamura, Akira Kobayashi, Kosuke Nozaki, Naohiro Horiuchi, Akiko Nagai, Kimihiro Yamashita

Hydroxyapatite coatings (HACs) have long been applied to orthopedic and dental implants made of titanium and its alloys because of their high biocompatibility and osteoconductivity. We have recently demonstrated that the charged surfaces on HAC induced by polarization enhance mineral deposition in simulated body fluid and osteoconductive capabilities in vivo. The present study evaluates the effects of the electrical polarization of HAC on surface characteristics and osteoblast adhesion. It was found that electrical polarization has no effect on surface roughness and crystallinity. Morphological observations and quantitative analyses of adhered osteoblasts on HACs revealed that the cell areas positively stained for actin, which indicates the degree of cell spreading, were distinctly larger on negatively and positively charged HAC than that on uncharged HAC.

Mechanical Effects of Micro-thread Orthodontic Mini-screw Design on Artificial Cortical Bone

Jian-Hong Yu, Yang-Sung Lin, Wen-Jen Chang, Yau-Zen Chang, Chun-Li Lin

This study evaluates the mechanical effects of the micro-thread design of a mini-screw using *in vitro* insertion/ removal torque, pull-out tests, and numerical simulation on artificial bone samples with various cortical bone thicknesses. Single-threaded (ST) (0.8-mm pitch) and dual-threaded (DT) (0.25-mm pitch in the cortical bone contact region) mini-screws (diameter: 1.6 mm; length: 9.5 mm) were inserted into, removed from, and pulled out of artificial cortical bones with 0, 1, and 2 mm thicknesses. Maximum insertion/removal torque (MIT/MRT), insertion/removal angular momentum (IAM/RAM), and maximum pull-out force (F max) were recorded and statistically analyzed for evaluating the micro-thread mechanical retention in cortical bone with various thicknesses. A parallel finite element (FE) analysis was performed to determine the mini-screw micro-motion at the mini-screw/bone interface and the surrounding bone strain development. The MRT, RAM, and F max tests show that DT screws exhibit higher retention than that of ST screws when cortical bone existed, but there was no significant difference ($p < 0.05$) for only medullary bone. The maximum pull-out force increased with increasing cortical bone thickness for both screw types. High MIT and IAM values were found for DT screws inserted into cortical bone with thicknesses of 1 mm (48 N·cm/1529 N·cm·s) and 2 mm (54 N·cm/1582 N·cm·s). The FE simulation results show that screw micro-motions were smaller than 5 μm for all cases, far from the critical bone remodeling threshold. Bone strain values for DT screws were lower than those for ST screws. DT screws had better mechanical stability with higher MRT, RAM, and pull-out force in the experimental tests and lower bone strain value in the FE analysis compared to those for ST screws. However, the DT design may need improvement to reduce the insertion torque and angular momentum to decrease the stress to the surrounding tissue.

Altered Wall Shear Stresses in Embryonic Chicken Outflow Tract Due to Homocysteine Exposure

Christian Poelma, Els Bon, Regine P. M. Steegers-Theunissen, Eric A. P. Steegers, Nicolette T. C. Ursem

The embryonic heart is already beating before cardiac morphogenesis is complete. Therefore, the effect of blood flow on cardiogenesis has been subject of many studies. Shear stress, acting on the endocardial cells, has been shown to alter the expression of shear-responsive genes implicated in heart development. The congenital heart defects (CHDs) induced in the chicken embryo after altering blood flow and intracardiac shear stress are comparable to the type of defects observed after homocysteine (Hcy) exposure. This may suggest that altered blood flow and shear stress have a role in the etiology of Hcy-induced CHDs. The aim of this study is to quantitate wall shear stress (WSS) in the outflow tract (OFT) of Hcy-exposed chicken embryos. WSS was derived from the velocity field obtained with microscopic particle image velocimetry in the OFT of the embryonic-day-3 Hcy- and sham-treated chicken embryos. Hcy treatment consisted of L-Hcy-thiolactone 30 μM solution injected into the neural tube of the embryos. The results suggest that Hcy has an inhibiting effect on WSS in the early embryonic chicken heart. These alterations in shear stress may cause altered gene expression and behaviour of endothelial cells, eventually contributing to the development of CHDs.

Effects of Type I Collagen and Fibronectin on Regulation of Breast Cancer Cell Biological and Biomechanical Characteristics

Yanqun Teng, Juhui Qiu, Yiming Zheng, Xiangdong Luo, Linlin Zhang, Li Chen, Guixue Wang

Type I collagen (Col I) and fibronectin (FN) are important matrix proteins. Their biological roles in breast cancer are still unknown. This study investigates the effects of Col I and FN on the biological and biomechanical characteristics of breast cancer cells. Breast cancer MDA-MB 231 and MCF-7 cell lines were cultured on Col-I- or FN-coated plates or coverslips. Cell adhesion, spreading, proliferation, migration, and elasticity assays were performed. Changes in proliferation and migration were observed after using antibodies inhibiting syndecan-1 (syn-1) or syndecan-4 (syn-4). It was found that Col I promoted cell adhesion and spreading, and induced cytoskeleton organization of the two types of breast cancer cell, especially MDA-MB 231 cells. FN promoted breast tumor cell proliferation. Atomic force microscopy data show that the Young's modulus of MDA-MB 231 (MCF-7) cells was much lower (higher) on Col I than on FN. After incubation with syn-1 or syn-4 antibodies, FN-induced cell proliferation was inhibited. These data demonstrate that Col I and FN have different effects on the biological and biomechanical characteristics of breast cancer cells, with syn-1 and syn-4 involved in FN-regulated proliferation.

Protective Effect of Non-Ionizing Radiation from Ceramic Far Infrared (cFIR)-Emitting Material Against Oxidative Stress on Human Breast Epithelial Cells

Ting-Kai Leung, Chi-Ming Lee, Shoei-Loong Lin, Chih-Hsiung Wu, Jeng-Fong Chiou, Pai-Jung Huang, Li-Kuo Shen, Chin-Sheng Hung, Yuan-Soon Ho, Hung-Jung Wang, Ching-Huei Kung, Yi-Hsiang Lin, Huey-Min Yeh

Previous research has identified that ceramic far infrared (cFIR)-emitting material can modulate various biological processes, particularly those involving hydrogen peroxide scavenging and antioxidant activities. The present study treated MCF-10A cells with 50 and 100 μM hydrogen peroxide before incubating them for 24 h on the top of The present study treated MCF-10A cells with 50 and 100 μM hydrogen peroxide before incubating them for 24 h on the top of cFIR or control powder. cFIR or control powder. Cells were also treated with ionizing radiation from a fluoroscopic X-ray source to induce cell damage and cultured for 48 h beneath cFIR or control powder. The effects of cFIR on cell survival were evaluated using XTT and MTT assays. A total accumulated radiation dose of 1 Gy to 2 Gy was sufficient to cause cell damage and reduce cell viability. In both the hydrogen peroxide toxicity and radiation exposure experimental models, the cFIR groups demonstrated significantly higher cell survival rates than those of the control groups ($p < 0.05$). Considering the relationship between indirect-ionizing-radiation- and oxidative-stress- induced cell damage and the accumulation of free radicals, these results indicate that the protection of cFIR against ionizing radiation is predominantly through an antioxidant mechanism. cFIR-emitting material has potential use in reducing radiation damage caused by medical instruments and radiation pollution.

Ceramic Macrostructured Acetabular Liner Integratingdirectly into Bone: Implant Design, Manufacturing, and In vitro Investigations

Stefan Eichhorn, Erwin Steinhauser, Hans Gollwitzer, Thomas Pandorf, Marita Zipperle, Rüdiger von Eisenhart-Rothe, Rainer Burgkart

The development of new ceramic materials for medical applications enhances the possibilities of implant design. Monolithic acetabular liners based on zirconia-platelet-toughened alumina with a macrostructured backside could increase patient mobility and prosthesis life span. This study developed a ceramic liner with an articulating diameter of 40 mm and a wall thickness of 3 mm. A macroporous coating with an average pore size of 300-400 µm was deposited at the backside of the liner during the manufacturing process. Cytotoxity testing, microscopic imaging, as well as mechanical examinations (four-point bending test; compressive strength test) were performed to characterize the properties of the implant in vitro. Examinations of the impact resistance and luxation stability were also conducted. The macrostructured backside could be manufactured homogeniously. No cytotoxic effects were detected in cell culture experiments. The mechanical examinations were passed without delamination of the coating. No cracks due to impact loading appeared for any of the samples tested. The range of motion of the joint and luxation stability both increased significantly compared to those of an established liner with a 28-mm diameter. The results show that the developed liner has outstanding mechanical and tribological properties.

Dual-Channel Neuromodulation of Pudendal Nerve with Closed-Loop Control Strategy to Improve Bladder Functions

Yin-Tsong Lin, Chien-Hung Lai, Te-Son Kuo, Chih-Chen Chen, Yu-Luen Chen, Shuenn-Tsong Young, Shih-Ching Chen, Jin-Shin Lai, Tsung-Hsun Hsieh, Chih-Wei Peng

Although sacral anterior root neuromodulation (SARN) has proven to be effective in patients with neurogenic bladder, it is not widely accepted due to the need to conduct a dorsal rhizotomy, and commercially available SARN devices are not usually equipped with a closed-loop controller for the automatic regulation of bladder functions. Therefore, there is still a need for a more effective electrical neuromodulation scheme to restore bladder function. Intravesical pressure (IVP) is the major biosignal that reflects the state of bladder conditions. The present study develops a closed-loop control strategy for improving bladder emptying and verifies its performance using animal experiments. Two channel outputs of electrical currents triggered by IVP-feedback signals were set to automatically regulate a rat's pudendal nerve for selective nerve stimulation and blocking. Under this experimental design, a series of in vivo animal experiments were conducted on anesthetized rats, including the computational characterization of biosignals, the development of an intermittent high-frequency blocking current waveform for blocking the nerve, and verification of the control strategy. Results show that the IVP-feedback control strategy for dual-channel pudendal neuromodulation performed well in animal experiments and could be utilized to selectively stimulate and block the pudendal nerve to augment bladder contraction and restore external urethral sphincter bursting activity to improve bladder emptying. This study demonstrates the feasibility of the IVP-based feedback-control strategy with animal experiments. The results could provide a basis for developing a sophisticated neural prosthesis for restoring bladder function in clinical use or for neurophysiological study.

Preliminary Evaluation of Chitosan Dental Plug

Yu Chiuan Wu, Shyh Ming Kuo, Shwu Jen Chang, Lain-Chyr Hwang, Po-Chou Chen

A dental plug fills the void after tooth extraction, preventing excessive growth of gingival tissue by preoccupying the space of alveolar bone and aiding hemostasis. This study evaluates a porous chitosan dental plug (Chi-DP) fabricated via lyophilisation and a gelation treatment with 1 N aqueous NaOH. The basic properties, including morphological structure, water content, swelling ratio, and degradation behavior, were studied. To evaluate swine alveolar bone regeneration characteristics, an existing collagen-based dental plug (Col-DP) was employed as a reference. Animal model studies, including radiographic observations combined with hematoxylin and eosin staining, were carried out. The preliminarily results reveal that Col-DP had a higher porosity (38.9%) than that of Chi-DP (34.7%), and that the former had higher swelling ratio than that of the latter. The soft, foamy prototype Chi-DP was flexible and resilient under compression in a hydrated state. Chi-DP degraded significantly slower than did Col-DP in a phosphate-buffered solution in a 30-day shaking test, with retentions of 70-80% and 15-20% of initial materials, respectively. Upon insertion into swine alveolar sockets, Chi-DP swelled readily and stopped bleeding instantly, whereas Col-DP was difficult to handle and exhibited limited hemostatic capability. Chi-DP was found to have slow biodegradability and exhibited high hemostatic efficiency. Its potential for applications in dentistry deserves further exploration.

國內研討會：

- 中華民國骨科醫學會【103 年度第 66 次春季聯合學術研討會】
  地點：台中榮民總醫院
  會議時間：2014-04-19
  網址：http://www.bone.org.tw/association_message/index.aspx
- 2014 中華民國手外科醫學會年會
  地點：台北國際會議中心
  會議時間：2014-05-10
  網址：http://handsurgery.com.tw/
- 台灣國際醫療展覽會 MEDICARE TAIWAN
  地點：台北世貿中心展覽一館
  會議時間：2014-06-19 ~ 2013-06-22
  網址：https://www.medicaretaiwan.com/zh_TW/index.html
- 中華醫學會 103 年度會員大會暨聯合學術研討會
  地點：台北國際會議中心
  會議時間：2014-06-28
  網址：http://www.taipei-cma.org/news.html

國際研討會：

- MONTREAL'2014: AES-ATEMA 17th International Conference.
  Montreal, Canada. June 16-20, 2014.
  http://aestr2014.com/

- The XX Congress of the International Society of Electrophysiology and Kinesiology(ISEK 2014 Biennial Congress)
  Rome, ITALY. July 15-18, 2014.
  http://isekconference2014.com/

- TORONTO'2014: AES-ATEMA 18th International Conference
  Toronto, Canada. August 11-15, 2014.
  http://aestr2014.com/

- The 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'14)
  Sheraton Hotel & Towers, Chicago, Illinois, USA. August 26-30, 2014.
  http://embc.embs.org/2014/

- 12th International Conference of Numerical Analysis and Applied Mathematics (ICNAAM 2014)
  Rodos Palace Hotel, Rhodes, Greece. September 22-28, 2014.
  http://www.icnaam.org/

- The 1st Global Conference on Biomedical Engineering held with the 9th APCMBE.
  National Cheng Kung University, Tainan, Taiwan. October 9-12, 2014.
  http://conf.ncku.edu.tw/apcmbe9/index.html

- The 16th IEEE International Conference on e-Health Networking, Application & Services (IEEE Healthcom 2014)
  Natal, RN Brazil. October 15-18, 2014.
  http://www.ieee-healthcom.org/index.html

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