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Tissue Engineering and Regenerative Medicine in Musculoskeletal Application / 2017 Annual Meeting of FARM

論文摘要 & 大會手冊

2017 年 02 月 18 日

台大醫學院103講堂

台北市仁愛路一段一號

主辦單位：亞東紀念醫院骨科部、台灣再生醫學學會

協辦單位：科技部生命科學研究推動中心

目　錄

Consent

Scientific Program

Time	Topic	Speakers & Authors	Institute	Moderator
09:00	**Registration 報 到** **開幕致詞**			
09:30~10:00 Oral Presentation Competition (Ⅰ)				
S-1 09:30~09:40	Assessment of Adult Blood-Derived Platelet-Rich Plasma for Chondrocyte Cell Proliferation	吳書璇[1] 許弘昌[2] 陳佳君[1] 郭書瑞[2] 蔡瑞哲[3] 方旭偉[1]	國立台北科技大學化學與生物科技系所[1] 中國醫藥大學附設醫院骨科部[2] 義守大學醫學工程學系[3]	陳敏慧 鄭乃禎
S-2 09:40~09:50	In Situ Forming Thermosensitive Hydrogel Combined with ACM for Cartilage Regeneration	沈宜珊[1,2] 陳郁君[1] 林峯輝[2] 張至宏[1]	亞東紀念醫院骨科部[1] 國立台灣大學醫學工程學研究所[2]	
S-3 09:50~10:00	3DP of ZrO_2-SiO_2 Ceramic Composites for Bone Scaffolds with Good Mechanical Properties and Cell Affinity	林致揚[1] 張志豪[2] 劉福興[3] 廖運炫[1]	國立台灣大學機械工程學系[1] 龍華科技大學機械工程學系[2] 國立台灣大學附設醫院骨科部[3]	
10:00~10:30 Coffee Break				
10:30~12:10 Invited Lectures (Ⅰ)				
I-1 10:30~11:10	Stem Cell-Based Cartilage Repair Using a Scaffold-Free Tissue Engineered Construct (TEC) Derived from Synovial Mesenchymal Stem Cells -From Bench To Clinic-	Prof. Norimasa Nakamura	Institute for Medical Science in Sports, Osaka Health Science University The center for Advanced Medical Engineering and Informatics, Osaka University Department of Orthopedic Surgery, Osaka University Graduate School of Medicine	劉華昌
I-2 11:10~11:30	The Role of Endothelial Progenitor Cell-Primed Angiogenesis in Skeletal Disorder	湯智昕 教授	中國醫藥大學生物醫學研究所	洪士杰 徐善慧
I-3 11:30~11:50	Design of Self-Assembled Peptide Biomaterials	林欣杰 副教授	國立交通大學材料科學與工程學系	
I-4 11:50~12:10	Forward Engineered 3D Biofabrication Solutions in Life Sciences	陳怡文 副主任	中國醫藥大學臨床醫學研究所 中國醫藥大學附設醫院 3D 列印醫療研發中心	
12:10 會 員 大 會				
12:10-13:30 Lunch Break				

Time	Topic	Speakers & Authors	Institute	Moderator
13:30~15:00 Invited Lectures (Ⅱ)				
I-5 13:30~13:50	Pegylated Nanocarrier Assembled with Messenger RNA-Based Therapeutics for Brain and Bone Diseased Animal Model Applications	林進裕 博士	Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo, Japan	王兆麟 黃玲惠
I-6 13:50~14:10	The Effect of Chitosan on Delaying the Senescence of Human Anterior Cruciate Ligament Cells and Synovial Cells	楊台鴻 教授	台灣大學醫學工程學研究所	
I-7 14:10~14:30	Polymers for Bone Tissue Engineering	賴伯亮 副教授	林口長庚紀念醫院骨科部	
I-8 14:30~14:50	Tendinopathy : From Basic Science Studies of Tenocyte Degeneration and Regeneration to Clinical Evaluation and Treatment Strategies	周一鳴 教授 吳柏廷 助理教授	義大醫院骨科部 成大醫院骨科部	
15:00-15:30 Coffee Break				
15:30-16:00 Oral Presentation				
O-1 15:30~15:40	Sesame Oil Improves Functional Recovery by Attenuating Nerve Oxidative Stress in a Mouse Model of Acute Peripheral Nerve Injury	許哲嘉[1] 吳柏廷[1] 戴大為[1] 周一鳴[2]	國立成功大學附設醫院骨科部[1] 義大醫院骨科部[2]	王至弘 方旭偉
O-2 15:40~15:50	Evaluating Laminin-Alginate, Adipocyte, and Adscs Interactions in an Autologous Fat Grafting Animal Model Using 7T MRI	陳右昇[1,2] 薛育昇[1] 陳彥宇[1] 羅承裕[3] 戴浩志[4] 林峯輝[1]	國立台灣大學醫學工程研究所[1] 亞東紀念醫院整形外科[2] 亞東紀念醫院病理科[3] 台大醫院整形外科[4]	
O-3 15:50~16:00	3D-Printing Bioceramic $CaSiO_3$ Bone Scaffold in Large Bone Defect Model	杜靜如[1] 林致楊[2] 劉福興[3] 廖運炫[2] 楊榮森[1] 張志豪[1]	國立台灣大學醫學院附設醫院[1] 國立台灣大學機械工程學系[2] 龍華科大機械工程學系[3]	
16:00-17:00 Oral Presentation Competition (Ⅱ)				
S-4 16:00~16:10	Spleen-Derived Stem Cells as a Therapy for a Mouse Steatohepatitis	邱瀛毅 沈延盛	國立成功大學臨床醫學研究所	陳敏慧 鄭乃禎
S-5 16:10~16:20	Oxidative Stress Induces Imbalance of Adipogenic/Osteoblastic Lineage Commitment In Mesenchymal Stem Cells (MSCs) Through Decreasing Longevity Gene SIRT1 Functions	張家齊[1, 2, 3] 林佳樺[3] 李柟葶[3] 鄭惠珊[3] 顏伶汝[2] 嚴孟祿[3]	國防醫學院生命科學研究所[1] 國家衛生研究院細胞及系統醫學所[2] 台灣大學醫學院醫學系婦產科[3]	
S-6 16:20~16:30	Application of Specific Media for the Treatment of Ischemic Stroke	陳韻安[1] 蔡力凱[2] 楊台鴻[1]	國立台灣大學醫學工程學研究所[1] 台大醫院神經部與腦中風中心[2]	
頒 獎 閉 幕				

Invited Lectures

10:30-11:10

I-1

Stem Cell-Based Cartilage Repair Using a Scaffold-Free Tissue Engineered Construct (TEC) Derived From Synovial Mesenchymal Stem Cells -From Bench To Clinic-

Norimasa Nakamura, MD, PhD, FRCS
Institute for Medical Science in Sports, Osaka Health Science University
The center for Advanced Medical Engineering and Informatics, Osaka University
Department of Orthopedic Surgery, Osaka University Graduate School of Medicine

Philosophy

Scaffold-free tissue engineered construct (TEC) is feasible to cartilage repair with advantages in various aspects such as safety issues, cost effectiveness, minimal surgical invasion and quick surgical time, with comparable repaired tissue quality with other cell-based therapies in cartilage repair.

Background

1. Immune-tolerance of MSCs
2. Safety issues regarding the implantation of animal-derived or chemical materials in clinical settings
3. High medical cost with the use of scaffold
4. Trends in promoting minimally invasive surgery
5. Risk of complications by long surgical duration

Large animal studies in cartilage repair

The objective was to in vitro generate a mesenchymal stem cell (MSC)-based tissue-engineered construct (TEC) to facilitate in vivo repair in a porcine chondral defect model. Porcine synovial MSCs were cultured in monolayer at high density and were subsequently detached from the substratum. The cell/matrix complex spontaneously contracted to develop a basic TEC. Immunohistochemical analysis showed that the basic TEC contained collagen I and III, fibronectin, and vitronectin. The basic TEC exhibited stable adhesion to the surface of a porcine cartilage matrix in an explant culture system. The TEC cultured in chondrogenic media exhibited elevated expression of glycosaminoglycan and chondrogenic marker genes. The TEC were implanted in vivo into chondral defects in the medial femoral condyle of 4-month-old pigs, followed by sacrifice after 6 months. Implantation of a TEC into chondral defects initiated repair with a chondrogenic-like tissue, as well as secure biological integration to the adjacent cartilage. Histologically, the repair tissue stained positively with Safranin O and for collagen II. Biomechanical evaluation revealed that repair tissue exhibited similar properties similar to those of normal porcine cartilage in static compression test but the TEC-repaired tissue had lower micro-friction properties than normal articular cartilage. We also conducted the same surgical model study using mature (12m-old-) pigs and there was no significant

difference in the modified ICRS histological scoring and biomechanical properties except for lubrication paroperties. However, precise structural and micro-mechanical analysis revealed that the TEC-repair tissue contains fibrous tissue at the superficial zone with the absence of “Lamina Splendense”. Mechanical testing showed the superficial zone has significant inferior water-retaining capacity.

Although his technology is not likely contribute to total tissue regeneration, it could potentially be a unique and promising method for stem cell-based cartilage repair.

Clinical Trial

Based on the preclinical results, we have forwarded to the clinical trial with the approval of the ministry of Health and Labor of Japan. This study is carried under GCP-based protocol and GMP-based quality control of cell-processing. Since the entry of the first case at March 2013, we have finished 5 cases of implantation. There has been no specific adverse effect reported. The clinical study was finished in 2015. We found no major adverse effect throughout the study. The summary of clinical results will be presented.

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11:10-11:30

I-2

The Role of Endothelial Progenitor Cell-Primed Angiogenesis in Skeletal Disorder

Chih-Hsin Tang
Graduate Institute of Biomedical Science, China Medical University, Taichung, Taiwan

Pannus formation and neovascularization of the osteochondral junction are widely acknowledged as being important characteristics of structural remodeling in arthritis. Osteoblasts also play a key role in bone formation, by synthesizing multiple bone matrix proteins. Moreover, bone is a highly vascularized tissue that relies upon an active blood vessel network for maintaining skeletal integrity. Thus, angiogenesis plays a key role in skeletal development and repair. However, the interaction between osteoblasts and angiogenesis in arthritis remains unclear. Our research therefore sought to better understand the mechanisms between osteoblasts and angiogenesis underlying arthritis pathogenesis. Our results indicate that CCN1 is an important proinflammatory cytokine in arthritis that increases angiogenic factor VEGF production in osteoblasts and promotes endothelial progenitor cells angiogenesis in arthritis disease. Our findings offer insights into the process of cellular and molecular interactions involved in skeletal remodeling, which may prove beneficial in the ongoing search for potential therapeutic targets of arthritis.

11:30-11:50

I-3

Cell-Material Interactions in 2D/3D Functional Self-Assembled Peptides

Hsin-Chieh Lin
Department of Materials Science and Engineering, National Chiao Tung University, Hsinchu, 300, Taiwan, Republic of China.; Email: hclin45@nctu.edu.tw; www.mse.nctu.edu.tw

In the past three decades, nanobiotechnology has grown explosively and evolved into a subfield of science. One approach to produce nano-sized materials is to use the functional peptide hydrogels which can be formed by self-assembly among designed subunits to yield shape-persistent and highly ordered nanostructures in water. Recently, we have detailed a new series of aromatic peptide materials and proved that controllable molecular packing can be used to promote the formation of the self-assembled nanostructures and hydrogels. In this study, we specifically linked laminin-derived bio-active peptdie motif on the C-terminal to enrich aromatic peptide amphiphiles as a functional peptide-based scaffold. The in vitro results showed that the materials can serve as a signal or guiding cue to direct the encapsulated stem cells adhesion and then towards neuronal differentiation. In addition, we also prove that light-emitting self-assembled system would be potentially useful for stem cell imaging. These results indicate the newly discovered hydrogelators are potential biomaterials. Our research illustrates the importance of structure-property relationship and provides new insights into the design of self-assembled nanobiomaterials.

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11:50-12:10

I-4

Forward Engineered 3D Biofabrication Solutions in Life Sciences

YiWen (Evin) Chen, Ph.D

Assistant Professor of Graduate Institute of Biomedical Science, China Medical University
Deputy Director of 3D Printing Medical Research Center (3DP MRC),
China Medical University Hospital

Abstract One of important field in regenerative medicine is “Tissue Engineering,” which is the use of a combination of cells, engineering and materials methods, and suitable biochemical and physicochemical factors to improve or replace biological tissues. Many recent frontier researches Additive Manufacturing, as known as threedimensional (3D) printing, is able to automated produce the composites of biocompatibility scaffold and cellular constituents, in addition, accurately place cells, matrix and materials in position for tissue culture, which is called biofabrication. Biofabrication involves additional complexities, such as the choice of materials, cell types, growth and differentiation factors, and technical challenges related to the sensitivities of living cells and the construction of tissues. Biofabrication is a platform technology for a broad range of tissues such as skin, nervous, cartilage, vascularized bone and blood vessels, as well as complete organs such as the heart, kidney, liver and bladder. Moreover, a high-throughput engineered tissue or organ models own high potential to develop medicine research, drug discovery, and toxicology studies. China Medical University 3D Printing Medical Research Center dedicated all effort and resources to be a world’s premium organization to develop and deliver advanced and affordable 3D printed medical care including biomedical devices, implants and therapeutics to improve the quality of life of the general public. This is a new design paradigm centered on cultivating materials with living cells, signals and bio-materials, which could be engineered to synthesize or fabricate medical implants with new functional and regenerative properties.

13:30-13:50

I-5

PEGylated Nanocarrier Assembled with Messenger RNA-Based Therapeutics for Brain and Bone Diseased Animal Model Applications

Chin-Yu Lin[1,2,3]*, Satoshi Uchida[2], Masaru Ikegami[2], Samuel Thomas Crowley[3], Keiji Itaka[2], Kazunori Kataoka[1,2,3]

Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo, Japan [1]. Laboratory of Clinical Biotechnology, Center for Disease Biology and Integrative Medicine, Graduate School of Medicine, The University of Tokyo, Japan [2] Innovation Center of NanoMedicine, Kawasaki Institute of Industry Promotion, Japan[3]

Abstract

Gene therapy using mRNA is a promising alternative with several advantages over that of plasmid DNA (pDNA). Compared to conventional methods of gene delivery using pDNA, mRNA-based gene delivery has several advantages. First, mRNA will not be integrated into the host cell genome, which avoids the possibility of insertional mutagenesis. Second, mRNA does not need to enter the nucleus, making it more effective in very slowly-dividing or non-dividing cells, such as neural cells. In addition, mRNA may allow for greater control over the level of protein expression, as it does not include promoter sequences or require transcription. Finally, mRNA does not contain additional sequences such as plasmid backbone or promoters originally derived from naturally occurring viruses. These points highlight the safety and effectiveness of mRNA for gene introduction into slowly-dividing cells. Nevertheless, the use of mRNA still has some issues to be addressed, such as instability under physiological conditions and the strong immunongenicity through recognition by Toll-like receptors. Therefore, a drug delivery system (DDS) capable of protecting the mRNA against nucleases and preventing recognition by TLRs is mandatory for achieving therapeutic outcomes.

In today's talk, we performed animal experiments to establish the feasibility and efficacy of mRNA for the treatment of Alzheimer's Disease (AD), spinal disk degeneration and calvarial critical bone defect. Therapeutic mRNA was used for treating the pathological conditions in the brain and bones. We developed a carrier for the mRNA administration that had been proven to be applicable for *in vivo* mRNA delivery based on the self-assembly of polyethylene glycol (PEG)-polyamino acid block catiomer with nucleic acids to form polyplex nanomicelles. The mRNA is incorporated into the core of the nanomicelles by association with a functionalized polyamino acid, poly[N'-[N-(2-aminoethyl)-2-aminoehtyl] aspartamide] (PAsp(DET)), and surrounded by a PEG outer layer. PAsp(DET) has a unique two-step protonation behavior due to the DET side chains, in which DET shows a distinctive *gauche to anti* conformational transition from pH changes from 7.4 to 5.0, resulting in pH-dependent destabilization of the cell membrane and endosomal escape. In addition, PAsp(DET) degrades to non-toxic metabolites after releasing mRNA in the cells, effectively preventing cumulative toxicity

after mRNA introduction. This nanomicelle system has successfully introduced mRNA into the target tissues, including neural tissues. As will be shown, the mRNA effectively provided therapeutic proteins for the pathological tissues in the brain and bones, resulting in the significant decrease of pathological markers or enrichment of new generated tissues, and shows the therapeutic potential of mRNA-based gene therapy for treating brain and bone diseases.

*This author is an International Research Fellow of the Japan Society for the Promotion of Science.

13:50-14:10

I-6

The Effect of Chitosan On Delaying the Senescence of Human Anterior Cruciate Ligament Cells and Synovial Cells

Tai-Horng Young
Institute of Biomedical Engineering, National Taiwan University

Fibroblasts have been extensively used as a model to study cellular senescence. In our previous study, chitosan has been successfully demonstrated to suspend human foreskin fibroblasts to form multicellular spheroids to delay the appearance of replicative senescence. From the tissue engineering standpoint, delaying the induction of senescence may be useful to maintain cells in a younger state. Therefore, we tried to apply the technique of the chitosan treatment-mediated life-span extension to different knee joint cells, including the anterior cruciate ligament cells and synovial cells from patients who need to undergo ACL reconstruction or knee replacement. Interestingly, the aging process of primary human anterior cruciate ligament cells and synovial cells also could be appropriately regulated by using the simple technique of the chitosan treatment. Finally, how chitosan affected cell senescence was discussed. Multicellular structure developed on chitosan and cell secreting growth factors regulated by chitosan were proposed to play important roles in mediating cell senescence program.

14:10-14:30

I-7

Polymers for Bone Tissue Engineering

Po-Liang Lai, MD PhD
Department of Orthopedic Surgery, Chang Gung Memorial Hospital at Linkou

Skeletal defects require surgery via using bone grafts. Autografts are the gold standard for bone grafting; however donor site morbidity limits the application. Allografts have the risk of disease transmission. These disadvantages of natural bone grafts have given rise to the development of various synthetic materials for bone substitutes. Ideal bone substitutes should be characterized with osteoconductivity and osteoinductivity.

Biodegradable synthetic polymers, such as polyanhydride, polycaprolactone (PCL), polylactide, polyglycolide, and associated copolymers express different degradation times, mechanical strengths and byproducts. Bioceramics, such as SiO_2, TiO_2, SrO, tricalcium phosphate (TCP) and hydroxyapatite (HAP) have been researched for osteogenesis. But ceramics tend to break because of their brittle nature. The combination of bioceramics and polymers as composites increases their bioactivity and biocompatibility. However, defects and cracks can form at the polymer/ceramic interface, resulting in uneven distribution of stress and subsequent inferior mechanical strength.

The concept of using composite materials as bone substitutes was proved by three steps. First, bone healing by the usage of polymers and bioceramics was confirmed by a critical bone defect model. Second, osteoconductivity of composite materials was improved by surface modification of nanoparticles. Third, mechanical strength was improved by the combination of PCL matrices and PCL surface-grafted hydroxyapatite. The three steps are listed below:

A thermosensitive diblock copolymer hydrogel mixed with different weight ratios of HAP/β-TCP preserved sol-gel transition at physiological temperatures. The composite gels increased pH value, decreased hydrogel degradation rate and also enhanced in vivo cell viability. With higher ratios of hydroxyapatite, both radiographic and gross union could be achieved. A critical bone defect model confirmed the results.

A ring-opening polymerization method was adopted to graft PCL onto the surfaces of four nanoparticles, and the resulting surface-modified nanoparticles were used to fabricate novel grafted nanoparticle/polycaprolactone matrix composite tablets. The grafted hydroxyapatite yielded the best osteogenic differentiation as determined by the alkaline phosphatase activity.

Grafted hydroxyapatite can increase cell attachment onto the surface of PCL composites. With surface-grafted hydroxyapatite in the copolymers, the composite exhibited good biocompatibility and active bioactivity.

14:30-14:50

I-8

Tendinopathy: From Basic Science Studies of Tenocyte Degeneration and Regeneration to Clinical Evaluation and Treatment Strategies

吳柏廷 [1,2,3,4] 周一鳴 [5]
Department of Orthopedics, College of Medicine, National Cheng Kung University[1]
Department of Orthopedics, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University[2]
Department of Biomedical Engineering, National Cheng Kung University[3]
Medical Device Innovation Center, National Cheng Kung University[4]
Department of Orthopedics, E-DA Hospital, Kaohsiung, Taiwan[5]

Tendinopathy is a chronic painful tendon disorder that is prevalent in the athletic and the sedentary. Usually, tendinopathy is a “failed healing response” to overuse or stress tendon injury, with haphazard proliferation of tenocytes, intracellular abnormalities in tenocytes, disruption of collagen fibers, and a subsequent increase in non-collagenous matrix. Many molecular changes occur within an injured tendon, but the exact pathogenesis of tendinopathy is still unknown. In this presentation, we would discuss the evaluation strategies and the possible treatment of tendinopathy from basic studies. The topics are the following: (1) kinetic evaluation in a tendinopathy rat model; (2) the correlation of ultrasound imaging and biomechanical parameters in tendinopathy; (3) the role of hyaluronate in tendinopathy treatment; (4) the injection site of hyaluronate in tendinopathy treatment?. We hope our researches could facilitate the understanding of tendinopathy and improve its evaluation and treatment strategies.

Oral Presentations

15:30-15:40

O-1

芝麻油對大鼠周邊神經傷害後神經再生與功能回復之作用

Sesame Oil Improves Functional Recovery by Attenuating Nerve Oxidative Stress in a Mouse Model of Acute Peripheral Nerve Injury

許哲嘉[1] 吳柏廷[1] 戴大為[1] 周一鳴[2]
國立成功大學附設醫院骨科部[1] 義大醫院骨科部[2]

Introduction：Peripheral nervous injury (PNI) is a common form of trauma in modern society, especially in sport players. Despite the advance of therapy for PNI, the recovery of function can never reach the preinjury level after treatments. Recently, inhibiting neural oxidative stress shows a beneficial effect in improving functional recovery after PNI. In addition, sesame oil has been reported to possess the excellent antioxidative properties. However, whether sesame oil can improve the functional recovery after PNI by its antioxidative effect has never been investigated.

Materials and Methods：Thirty mice were randomly divided into five groups of six: group I mice received sham operation; group II mice received sciatic nerve crush; and groups III-V mice daily ingested 0.5, 1 and 2 ml/kg of sesame oil for 6 days, respectively, after sciatic nerve crush. Oxidative stress, GAP43 and nuclear Nrf2 levels as well as spinal somatosensory evoked potentials were assessed on day 6, while paw withdrawal latency and sciatic function index were assessed on days 0, 3, and 6.

Results：Sesame oil significantly decreased lipid peroxidation and increased nuclear factor erythroid 2-related factor 2 and GAP43 expression in sciatic nerve. Furthermore, sesame oil improved electrophysiological and functional assessments in mice with sciatic nerve crush.

Discussion：Sesame oil may improve the functional recovery by enhancing the nerve regeneration process after peripheral nerve injury. GAP43, a growth-regulated protein produced during outgrowth and regeneration, is a biomarker for axonal sprouting, elongation and axonal regeneration. The expression of GAP43 is increased dramatically after nerve crush which promotes neurite outgrowth. Further, GAP-43 expression is closely related with periods of active growth cone function. In the present study, GAP 43 was overexpressed after sesame oil treatment in PNI mice. On the other hand, sesame oil significantly increased SFI, paw withdrawal latency levels, and SSEP amplitude levels, as well as decreased SSEP latency levels. It is likely that there is more rapid neural recovery after PNI in sesame-oil-treated mice. These electrophysiological and functional assessments indicated that sesame oil may have beneficial effects on sciatic nerve regeneration and functional recovery after crush injury.

Conclusions：sesame oil may improve nerve functional recovery by attenuating nerve oxidative stress in mouse acute peripheral nerve injury, at least partially. However, more investigations will be need to confirm this.

15:40-15:50

O-2

利用 7T 核磁共振評估自體脂肪移植結合海藻膠及自體脂肪衍生幹細胞之互動
Evaluating Laminin-Alginate, Adipocyte, and ADSCs Interactions in an Autologous Fat Grafting Animal Model Using 7T MRI

陳右昇[1,2] 薛育昇[1] 陳彥宇[1] 羅承裕[3] 戴浩志[4] 林峯輝[1]
國立台灣大學醫學工程研究所[1] 亞東紀念醫院整形外科[2]
亞東紀念醫院病理科[3] 台大醫院整形外科[4]

Introduction：Biomaterials are often added to autologous fat grafts both as supporting matrices for the grafted adipocytes and as cell carrier for adipose-derived stem cells (ADSCs). In this study, two new materials were synthesized by linking developmentally essential ECM constituents hyaluronic acid(HA) and laminin(L) to alginate(Alg). The production of new material was followed by and in vivo study, which used an autologous fat graft model to test the laminin-alginate biomaterial, adipocytes, and ADSCs in immune-competent rats.

Materials and Methods：We transplanted different combinations of shredded autologous adipose tissue [designated “A” for adipose tissue]), laminin-alginate beads [designated “B” for bead], and ADSCs [designated “C” for cell]) into the backs of 15 Sprague-Dawley rats. Group A received only adipocytes, Group B received only laminin-alginate beads, Group AB received adipocytes mixed with laminin-alginate beads, Group BC received laminin-alginate beads encapsulating ADSCs, and Group ABC received adipocytes and laminin-alginate beads containing ADSCs. Seven-tesla magnetic resonance imaging was used to evaluate the rats at the 1st, 6th, and 12th weeks after transplantation. At the 12th week, the rats were sacrificed and the implanted materials were retrieved for gross examination and histological evaluation.

Results：The results based on MRI, gross evaluation, and histological data all showed that implants in Group ABC had better resorption of the biomaterial, improved survival of the grafted adipocytes, and adipogenic differentiation of ADSCs. Volume retention of grafts in Group ABC (89%) was also significantly greater than those in Group A (58%) ($p<0.01$).

Conclusions：Our findings support that the combination of shredded adipose tissue with ADSCs in laminin-alginate beads provided the best overall outcome.

15:50-16:00

O-3

3D 列印矽酸鈣陶瓷骨架於大範圍骨缺損之治療
3D-Printing Bioceramic $CaSiO_3$ Bone Scaffold in Large Bone Defect Model

杜靜如[1]、林致楊[2]、劉福興[3]、廖運炫[2]、楊榮森[1]、張志豪[1]
國立台灣大學醫學院附設醫院[1]　國立台灣大學機械工程學系[2]　龍華科大機械工程學系[3]

Introduction：Large bone defect problems produced by diseases or accidents brought essential clinical needs on substituting bone scaffolds. Bioceramics made of $CaSiO_3$ (wollastonite) was used to manufacture bone scaffold because of its good bioactivity, biocompatibility and degradability. In this study, $CaSiO_3$ scaffold from bicomponents ($CaCO_3$/SiO_2-sol) was prepared by laser-aided gelling (LAG) method on a self-developed 3D printer. The scaffold shows good mechanical property, cell affinity and bone conductivity *in vivo* and *in vitro*.
Materials and Methods：$CaCO_3$, SiO_2 powder and SiO_2 sol were mixed homogeneously as the material of scaffold for LAG 3D printing. SEM, XRD and MTT assay are used for determination of physical properties and cell toxicity. For in vivo tests, a drill was used to induce a large bone defect on the femur of SCID mice. 3DP printed scaffold were designed as hollow cylinder with stainless pin penetrated from the middle. The scaffold with pin was then insert into the defect femur bone as implant. X-ray, CT scanning and histology were followed for 2 and 4 weeks.
Results：The $CaCO_3$ blended into a homogenous SiO_2-sol with weight ratios of 5/95 (w/w, CS5) is used for LAG 3DP and followed by sintering temperature of 1300°C. The manufactured scaffold showed 47 MPa on compressive strength and 34% percent on porosity. The cell test of the scaffold presented no cytotoxicity and good MG-63 osteoblast-like affinity. For 4 weeks after the scaffold implantation, the recovery of compact bone was found on the defect site of femur.
Discussion：CS5 scaffold showed good physical strength and porosity comparable to human bone. It also demonstrated good biocompatibility on MG-63 cells *in vitro*. New bone generation and callus formation after implantation of CS5 scaffold indicates that CS5 scaffold possessed good osteoconductive function. This property played an important role in bone healing.
Conclusions：3D-printing of $CaSiO_3$-based bioceramic bone scaffold is suitable for clinical application. This new scaffold has good biocompatibility and osteoconductivity. These properties enhanced cell seeding and proliferation leading to new bone formation. It is expected to be potential bone substitution/implant for clinical bone defect repairing in the near future.

09:30-09:40

S-1

成人高濃度血小板血漿對軟骨細胞生長評估
Assessment of Adult Blood-Derived Platelet-Rich Plasma for Chondrocyte Cell Proliferation

吳書璇[1] 許弘昌[2] 陳佳君[1] 郭書瑞[2] 蔡瑞哲[3] 方旭偉[1]
國立台北科技大學化學與生物科技系所[1] 中國醫藥大學附設醫院骨科部[2]
義守大學醫學工程學系[3]

Introduction：Platelet rich plasma (PRP), which is derived from the patient's blood and contains numerous growth factors, has the potential for arthritis treatment. Therefore, the study aimed to determine the effects of PRP on chondrocyte cell, under varying concentrations of PRP conditions.
Materials and Methods：Platelet-rich plasma was prepared from human adult peripheral blood and the properties were determined in vitro bioassays. To compare the ability of the various PRP products to stimulate proliferation of chondrocyte cells which were cultured in serum-free media for 1、4 and 7 days with different concentrations of PRP combinations.
Results：In this research, quantification of growth factors in PRP and platelet-poor plasma (PPP) fractions revealed the concentration of growth factors TGF-β1 and PDGF-AB higher than PPP. We observed that addition of as little as 1% PRP caused greater bioactivity of chondrocyte cells than other groups on 7 days.
Discussion：The results indicated that the beneficial effects of PRP on cell growth do not linearly increase with higher PRP concentrations in a short time period.
Conclusions：In conclusion, the study demonstrated that PRP derived from the patient's blood is able to proliferate chondrocytes cells and support the good effects of PRP application in the treatment of arthritis.

09:40-09:50

S-2

以即位成型感溫性水膠結合軟骨去細胞基質做一次性軟骨缺損治療

In Situ Forming Thermosensitive Hydrogel Combined with ACM for Cartilage Regeneration

沈宜珊[1,2] 陳郁君[1] 林峯輝[2] 張至宏[1]
亞東紀念醫院骨科部[1] 國立台灣大學醫學工程學研究所[2]

Introduction：Articular cartilage injury not only led to high health care costs in the country but also lowers the life quality of patients. Trauma, sport injury, biomechanical imbalance and degenerative joint disease were the most common causes. Recently, more and more extracellular matrix(ECM)-derived scaffolds had been developed and fabricated to offer a specific environment for cartilage repair or regeneration. In our project, we have successfully developed acellular cartilage matrix(ACM) from discarded cartilage tissue during total knee arthroplasty surgery by an efficient and simple decellularization method. The results showed that there were high proportion of GAGs and collagen retained in DNA removed cartilage matrix. Now, we developed an *in situ* forming hyaluronic acid-based thermosensitive hydrogel which exhibit good cell-compatibility, and promote cells synthesis type II collagen and aggrecan. We believed that it deserved to dedicate more efforts in research on porcine ACM, and it may be a better biological product to contribute clinical cartilage repair or regeneration.

Materials and Methods：Cartilage tissue was harvested from porcine knee purchased in traditional markets. It was cut into small pieces, and then immersed in liquid N_2 and grind into powders. The powders would be further treated with decellularized buffer to obtain ACM powders. ACM would be lyophilized overnight and sterilized by EO gas and preserved at -80 degree before hydrogel mixing. In order to prepare the ACM-Hydrogel, the acellular cartilage matrix (ACM) from cartilage fragment and then mixed with thermosensitive hydrogel to prepare ACM hydrogel for in vitro test. In the study, we would evaluate the extracellular matrix content of ACM, degradation, biocompatibility and the gene expression of the hydrogel.

Results：In the beginning, we evaluated the degradation ratio of the Hydrogel loss percentage was a little higher than ACM-Hydrogel. However, after Day 10, the behavior of both hydrogels were similar, and both of the them degraded about 30% after three weeks incubation. And the extracellular matrix content of the treated ACM had a similar content of GAG and collagen II to the un-treated fragment. The WST-1 assay was used to evaluate the cell compatibility of the hydrogel, results showed there were no significant difference between negative control and Hydrogel. The ACM-Hydrogel processes the highest cell viability, which indicated it could promote MSC proliferation. Real-time PCR was performed following one week cultivation. Compared to the results of Hydrogel group, we found ACM-Hydrogel can stimulate MSC synthesis much more collagen type II and SOX-9, and down-regulated collagen type I and X.

Discussion：Results showed that ACM-Hydrogel could promote cell proliferation, possess good biocompatibility with MSC, and enhance MSC to produce much more extracellular matrix (ECM). Besides, the ACM-Hydrogel could up-regulate MSC express type II collagen and SOX9, and down-regulate MSC express type I and type X collagen.
Conclusions：The *in situ* forming thermosensitive ACM-Hydrogel possess biocompatible, nontoxic, easily to use and ECM production promoting properties, and it could be a promising biomaterial for one-stage cartilage defect treatment.

09:50-10:00

S-3

具有良好之機械及生物特性之氧化鋯-氧化矽複合材料應用於骨支架之研究
3DP of ZrO_2-SiO_2 Ceramic Composites for Bone Scaffolds with Good Mechanical Properties and Cell Affinity

林致揚[1] 張志豪[2] 劉福興[3] 廖運炫[1]
國立台灣大學機械工程學系[1] 龍華科技大學機械工程學系[2] 國立台灣大學附設醫院骨科部[3]

Introduction：ZrO_2 has been used clinically. ZrO_2 has remarkable mechanical property and fracture toughness. However, the undesirable volume shrinkage and bioinert quality restrict its application on artificial bone scaffold and other medical devices. The aim of this study is to modify thermal shrinkage and cell affinity of ZrO_2 by SiO_2. According to the result, the best material prescription was SiO_2:ZrO_2=50:50 (S5Z5). In the ratio components, compressive strength, bending strength and volume shrinkage rate were 70.76 Mpa, 45.57 Mpa and 4%. Furthermore, S5Z5 showed minimal cytotoxicity and have good adhesive ability for MG63 cells. The composite can be expected to use in the bone repair market near future.

Materials and Methods：ZrO_2-SiO_2 bio-ceramic bone scaffold was fabricated by assembly 3DP machine. ZrO_2 powder, SiO_2 powder and SiO_2 sol were employed as raw materials and mixed by ball milling to ensure homogeneously materials. Three different weight rations of SiO_2 were added into ZrO_2 to find the appropriate material prescription and characterized by compressive strength, XRD, SEM, EDX and in vitro test.

Results：ZrO_2-SiO_2 composite materials shows volume shrinkage when temperature reached 900-1100°C, and even higher as ZrO_2 content increases. It is because of the ZrO_2 powder agglomerated gradually when sintering temperature rising. When heat treatment temperature further rise from 1100 to 1300°C, the volume of S5Z5 and S7Z3 transferred from shrinkage to expansion because of the volume of SiO_2 was expended by crystal phase transition from quartz to cristobalite.

Discussion：The mechanical properties of S5Z5 to S7Z3 were decreased due to the anisotropic transformation produced by the shrinkage of ZrO_2 and the expansion of SiO_2. For S5Z5, high mechanical properties are reached by sintering at 1300°C with the volume shrinkage for only 4%. Therefore, the S5Z5 was selected for further cell adhesion and growth tests.

Conclusions：The volume shrinkage of ZrO_2 was obviously inhibited by SiO_2 incorporation. As the SiO_2 crystal transformed from quartz to cristobalite, the expansion on its volume prevents ZrO_2-SiO_2 from shrinkage. However, the mechanical properties were decrease due to the anisotropic transformation. And this transformation caused crack in entire scaffolds. The ideal material composition was S5Z5 which show compressive and bending strength of 70.76 Mpa and 45.57 Mpa, respectively.

16:00-16:10

S-4

使用脾臟幹細胞治療小鼠之脂肪肝
Spleen-Derived Stem Cells as a Therapy for a Mouse Steatohepatitis

邱瀛毅　沈延盛
國立成功大學臨床醫學研究所

Introduction：Fatty liver disease is a common disease in our society. Fatty liver disease may become steatohepatitis and cirrhosis. Cirrhosis is a chronic liver disease that impairs hepatic function and causes advanced fibrosis. Mesenchymal stem cells have gained recent popularity as a regenerative therapy since they possess immunomodulatory functions to treat steatohepatitis.

Materials and Methods：

1.Spleen derived mesenchymal stem cell confirmation.
   a. Use flowcytometry to confirm the surface marks of MSC.
   b. Try to induce MSC to become different tissue to confirm MSC's function.
2.Set up mouse steatohepatitis model.
   a. Use high fat diet to feed B6 mice for 34 weeks.
   b. take mice's liver tissue for confirm steatohepatitis.
3.To provide the spleen-derived mesenchymal stem cells (sp-MSCs) therapy.
   a. Inject MSC to mice's spleen capsule, then to check liver tissue's condition and blood biochemistry.
   b. Check liver tissue's histology.

Results：

1.Confirm spleen derived MSC have specificity surface marker and ability to differentiation.
2.After feeding HFD, the mice's liver tissue are confirmed with steatohepatitis.
3.Mice s/p MSC treat. Liver fibrosis improved.

Discussion：About further work, we will use Immunohistochemistry stain to check liver tissue and to find out what kind of inflammation marker could be influenced by MSC.

Conclusions：Stem cells from spleen tissue can treat mouse steatohepatitis.

16:10-16:20

S-5

氧化壓力可經由降低長壽基因 SIRT1 的表現來造成間葉幹細胞往脂分化及骨分化的改變

Oxidative Stress Induces Imbalance of Adipogenic/Osteoblastic Lineage Commitment in Mesenchymal Stem Cells (MSCs) Through Decreasing Longevity Gene SIRT1 Functions

張家齊[1,2,3] 林佳樺[3] 李柟葶[3] 鄭惠珊[3] 顏伶汝[2] 嚴孟祿[3]
國防醫學院生命科學研究所[1] 國家衛生研究院細胞及系統醫學所[2]
台灣大學醫學院醫學系婦產科[3]

Introduction：With rapidly aging populations worldwide, the incidence of osteoporosis has reached epidemic proportions. Reactive oxygen species (ROS), a byproduct of oxidative stress and aging, has been thought to induce osteoporosis by inhibiting osteogenic differentiation of mesenchymal stem cells (MSCs). However, specific mechanisms of how ROS results in alterations on MSC differentiation capacity have been inconsistently reported.

Materials and Methods：Mouse MSC line C3H10T1/2 was treated with H_2O_2, an ROS, and then perform differentiation experiments. Oil Red O/Nile red staining were used for detecting adipogenesis, and Alizarin Red staining/alkaline phosphatase activity were used for assessing osteogenesis. MSC transcriptional programs of adipogenesis and osteogenesis were analyzed by real time PCR.

Results：We found that H_2O_2 simultaneously induced MSC lineage commitment toward adipogenesis and away from osteogenesis at the functional as well as transcriptional level. In addition, H_2O_2 decreased the activities of Sirt1, a histone deacetylase and longevity gene. By silencing and reconstituting SIRT1 in MSCs, we demonstrated that H_2O_2 exerted its disparate effects on adipogenic/osteoblastic lineage commitment mainly through modulating SIRT1 expression levels. Treatment with resveratrol, a SIRT1 agonist, can also reverse this ROS-induced adipogenesis/osteogenesis lineage imbalance. Moreover, SIRT1 regulation of RUNX2 transcriptional activity was mediated through deacetylation of the ROS-sensitive transcription factor FOXO3a.

Discussion：As stem cells, MSCs possess multilineage capacity that can be modulated by Oxidative stress and senescence-induced ROS. While the mechanisms involved in ROS-modulation of either of these two lineages has been independently investigated, the molecular events which simultaneously coordinate both lineages remain largely unexplored.

Conclusions：Our data implicates SIRT1 playing a vital role in ROS/age-directed lineage commitment of MSCs by modulating two lineages simultaneously. SIRT1 will be a target for maintenance of MSC stemness as well as a potential anabolic target in osteoporosis.

16:20-16:30

S-6

特殊培養基應用於缺血性中風治療之研究
Application of Specific Media for the Treatment of Ischemic Stroke

陳韻安[1] 蔡力凱[2] 楊台鴻[1]
國立台灣大學醫學工程學研究所[1] 台大醫院神經部與腦中風中心[2]

Introduction：According to the analysis from Ministry of Health and Welfare, clinically, stroke is the third major cause of death and motor disability in Taiwan, and over 85% are ischemic stroke. However, after stroke, there is no efficient therapy to recover the neurological deficits of brain. In addition, even with effective thrombolysis, most patients will have neurological deficits. Therefore, the purpose of this project is to develop an efficient therapy agent for neurological deficits caused by ischemic stroke.
Materials and Methods：In this project, the applicant will combine the specific media (medium B) to establish the condition for neuronal differentiation of neural stem/precursor cells (NSPCs) in vitro. Furthermore, the animal experiments for middle cerebral artery occlusion (MCAO) were followed the protocols as described previously. Neurological function was assessed via rotarod test, Neurological Severity Score, and body asymmetry test for 2 weeks. Infarct volume was analyzed by TTC stained. Neurogenesis were measured 15 days after MCAO using immunohistochemistry.
Results and Discussion：MCAO rat receiving medium B showed improved functional recovery, reduced infarct volume, and enhanced neurogenesis in the infarcted penumbra regions. The medium B treatment increased the number of Nestin-positive cells and GFAP-positive cells in SVZ and striatum, implying that medium B dominated neural stem cell in SVZ proliferation and migration to infarcted regions.
Conclusions：These findings demonstrated that treatment with medium B benefited ischemic stroke likely through promotion of the proliferation and migration of endogenous neural stem cell.

第七屆第二次會員大會

台灣再生醫學學會第七屆理、監事名單
(照筆劃順序排列)

理 事 長　洪士杰

秘 書 長　張至宏

常務理事　徐善慧、陳敏慧、楊榮森、嚴孟祿

理　　事　方旭偉、王兆麟、王至弘、林峰輝、林泰元
林頌然、張志豪、陳耀昌、黃玲惠、蔡清霖

候補理事　江清泉、何美泠、林高田、楊俊佑

常務監事　楊台鴻

監　　事　侯連圍、孫瑞昇、黃義侑、鄭乃禎

候補監事　顏伶汝

第七屆第二次會員大會議程

時間：民國106年2月18日(星期六) 12:10

地點：臺大醫學院103講堂(台北市仁愛路一段一號)

主席：洪士杰　理事長

一、大會開始

二、主席致詞

三、理、監事會工作報告

四、討論事項

1. 通過 105 年度工作報告、106 年度工作計劃
2. 通過 105 年度經費收支決算、106 年度收支預算

五、臨時動議

六、散會

105年度工作報告

理事會報告

一、召開理監事會議計三次。

二、會員實際人數一百八十一人。

監事會報告

一、理事會處理會務均係依據大會章程辦理，遇有重大事項召開理監事聯席會議商討決定。

二、理事會所編財務報告，業經本監事會審核無誤。

三、本屆理事會竭盡全力推展會務。

106年度工作計劃

一、招收會員

二、舉行三次理監事會議。

三、舉辦學術交流研討會。

四、隨時通知會員學會相關訊息。

台灣再生醫學學會
收支決算表
中華民國 105 年 1 月 1 日至 105 年 12 月 31 日止

科目				決算數	預算數	決算與預算比較數		說明
款	項	目	科目			增加	減少	
1			**本會收入**	**568,099**	**620,000**			
	1		會費收入	53,500	100,000		46,500	含入會費、常年會費
	2		捐款收入	500,000	500,000			廣告攤位收入、贊助捐款等
	3		利息收入	14,599	20,000		5,401	郵局、銀行利息
2			**本會支出**	**460,811**	**620,000**			
	1		人事費	181,000	220,000		39,000	員工薪資及加班費
	2	1	文具	1,690	5,000		3,310	
		2	印刷費	1,438	12,000		10,562	
		3	郵電費	3,018	6,000		2,982	
		4	雜項	4,930	8,000		3,070	
	3	1	業務費	41,312	60,000		18,688	
		2	會議費	49,000	70,000		21,000	召開理監事會及辦理相關研討會所需之費用
		3	交通費	13,220	28,000		14,780	
		4	其他業務費	136,798	180,000		43,202	召開3月份年會
	4		提撥基金	28,405	31,000		2,595	依收入總額提列5%作為準備基金
			本期餘絀	107,288				

理事長：洪士杰　秘書長：張至宏　常務監事：楊台鴻　會計：楊惠晶　製表：楊惠晶

台灣再生醫學學會
收支預算表
中華民國 106 年 1 月 1 日至 106 年 12 月 31 日止

科目				預算數	上年度預算數	本年度與上年度預算比較數		說明
款	項	目	科目			增加	減少	
1			**本會收入**	**600,000**	**620,000**			
	1		會費收入	80,000	100,000		20,000	含入會費、常年會費
	2		捐款收入	500,000	500,000			廣告攤位收入、贊助捐款等
	3		利息收入	20,000	20,000			郵局銀行利息
2			**本會支出**	**600,000**	**620,000**			
	1		人事費	200,000	220,000		20,000	員工薪資及加班費
	2	1	文具	4,000	5,000		1,000	
		2	印刷費	10,000	12,000		2,000	
		3	郵電費	5,000	6,000		1,000	
		4	雜項	8,000	8,000			
	3	1	業務費	58,000	60,000		2,000	
		2	會議費	70,000	70,000			召開理監事會及辦理相關研討會所需之費用
		3	交通費	25,000	28,000		3,000	
		4	其他業務費	190,000	180,000	10,000		年會
	4		提撥基金	30,000	31,000		1,000	依收入總額提列5%作為準備基金

理事長：洪士杰　秘書長：張至宏　常務監事：楊台鴻　會計：楊惠昌　製表：楊惠昌

台灣再生醫學學會

現金出納表

中華民國 105 年 1 月 1 日至 105 年 12 月 31 日止

收入		支出	
科目名稱	金額	科目名稱	金額
上期結餘	1,798,745	本期支出	432,406
本期收入	568,099	本期結餘	1,934,438
合計	2,366,844	合計	2,366,844

理事長：　秘書長：　常務監事：　會計：　製表：

台灣再生醫學學會

資產負債表

中華民國 105 年 1 月 1 日至 105 年 12 月 31 日止

資產		負債	
科目	金額	科目	金額
庫存現金	934,438	累計基金	$180,490
定期存款	$1,000,000	本期損益	107,288
--	--	累積餘絀	1,646,660
合計	1,934,438	合計	1,934,438

理事長：　秘書長：　常務監事：　會計：　製表：

台灣再生醫學學會章程

第一章 總 則

第 一 條 本會名稱為 **台灣再生醫學學會**(以下簡稱本會)。

第 二 條 本會以國內外人士共同發揚再生醫學之研究、教學及應用為宗旨。

第 三 條 本會以全國行政區域為組織區域。

第 四 條 本會會址設於主管機關所在地區。本會得視會員人數及分配與會務進行之需要設分會與各種委員會，其組織簡則由理事會擬訂，報請主管機關核准後實施，變更時亦同。

第 五 條 本會之任務如左：

一、提倡再生醫學之研究並發揚醫學倫理道德。

二、調查國內外再生醫學之發展，徵集有關圖書資訊以供各學術團體之參考及交流。

三、舉辦學術演講及討論會。

四、出版會誌及有關書刊。

五、獎助再生醫學及組織工程學人才及舉辦其他有關事宜。

六、與有關公司、廠商及機構合作，共求再生醫學及組織工程學之發展與應用。

第 六 條 本會之主管機關為內政部。

本會之目的事業應受各該事業主管機關之指導、監督。

第二章 會 員

第 七 條 本會會員申請資格如下：

一、個人會員：凡贊同本會宗旨、取得中華民國醫師執照者或取得與再生醫學、組織工程學相關博士學位者並經理事會通過後得申請為本會個人會員。

二、贊助會員：贊助本會工作之團體或個人。 申請時應填具入會申請書，經理事會通過，並繳納會費後，始得為本會贊助會員。

三、準 會 員：凡贊同本會宗旨的碩、博士班學生、博士後研究員、 住院醫師、研究助理或等同資格者，由會員二人推薦，經理監事會審查通過，得為本會準會員。

第 八 條 會員(會員代表)有表決權、選舉權、被選舉權與罷免權。每一會員(會員代表)為一權。 贊助會員、準會員無前項權利。

個人會員另享有 1. 參加本會年會及本會所舉辦之其他集會之權利。
2. 參加本會所舉辦各種活動或事業之權利。
3. 本會各種書刊訂閱優待之權利。

贊助會員享有 1. 參加本會年會及本會所舉辦之其他集會之權利。

2. 本會出版之資訊及刊物贈閱之權利。

準會員享有　　1. 參加本會年會及本會所舉辦之其他集會之權利。
2. 本會出版之資訊及刊物贈閱之權利。

第　九　條　會員有遵守本會章程、決議及繳納會費之義務。
會員每年年初需繳納會費，以利本會之運作。未繳納會費者，不得享有會員權利；連續二年未繳納會費者，視為自動退會。會員經出會、退會或停權處分，如欲申請復會或復權時，除有正當理由經理事會審核通過者外，應繳清前所積欠之會費。

第　十　條　會員(會員代表)有違反法令，章程或不遵守會員大會決議時，得經理事會決議，予以警告或停權處分，其危害團體情節重大者，得經會員(會員代表)大會決議予以除名。

第 十一 條　會員喪失會員資格或經會員大會決議除名者，即為出會。

第 十二 條　會員得以書面敘明理由向本會聲明退會。

第三章　組織及職權

第 十三 條　本會以會員大會為最高權力機構。
會員人數超過三百人以上時得分區比例選出會員代表，再召開會員代表大會，行使會員大會職權。會員代表任期二年，其名額及選舉辦法由理事會擬訂，報請主管機關核備後行之。

第 十四 條　會員大會之職權如左：
一、訂定與變更章程。
二、選舉及罷免理事、監事。
三、議決入會費、常年會費、事業費及會員捐款之數額及方式。
四、議決年度工作計畫、報告及預算、決算。
五、議決會員(會員代表)之除名處分。
六、議決財產之處分。
七、議決本會之解散。
八、議決與會員權利義務有關之其他重大事項。前項第八款重大事項之範圍由理事會定之。

第 十五 條　本會置理事十五人、監事五人，由會員(會員代表)選舉之，分別成立理事會、監事會。 選舉前項理事、監事時，依計票情形得同時選出候補理事五人，候補監事一人，遇理事、監事出缺時，分別依序遞補之。本屆理事會得提出下屆理事、監事候選人參考名單。

理事、監事得採用通訊選舉，但不得連續辦理。通訊選舉辦法由理事會通過，報請主管機關核備後行之。

第 十六 條　理事會之職權如左：

一、審定會員(會員代表)之資格。

二、選舉及罷免常務理事、理事長。

三、議決理事、常務理事及理事長之辭職。

四、聘免工作人員。

五、擬訂年度工作計畫、報告及預算、決算。

六、其他應執行事項。

第 十七 條　理事會置常務理事五人，由理事互選之，並由理事就常務理事中選舉一人為理事長。理事長對內綜理督導會務，對外代表本會，並擔任會員大會、理事會主席。理事長因事不能執行職務時，應指定常務理事一人代理之，未指定或不能指定時，由常務理事互推一人代理之。理事長、常務理事出缺時，應於一個月內補選之。

第 十八 條　監事會之職權如左：

一、監察理事會工作之執行。

二、審核年度決算。

三、選舉及罷免常務監事。

四、議決監事及常務監事之辭職。

五、其他應監察事項。

第 十九 條　監事會置常務監事一人，由監事互選之，監察日常會務，並擔任監事會主席。常務監事因事不能執行職務時，應指定監事一人代理之，未指定或不能指定時，由監事互推一人代理之。

監事會主席(常務監事)出缺時，應於一個月內補選之。

第 二十 條　理事、監事均為無給職，任期二年，連選得連任。理事長之連任，以一次為限。

第二十一條　理事、監事有左列情事之一者，應即解任：

一、喪失會員(會員代表)資格者。

二、因故辭職經理事會或監事會決議通過者。

三、被罷免或撤免者。

四、受停權處分期間逾任期二分之一者。

第二十二條　本會置秘書長一人，承理事長之命處理本會事務，其他工作人員若干人，由理事長提名經理事會通過聘免之，並報主管機關備查。但秘書長之解聘應先報主管機關核備。前項工作人員不得由選任之職員擔任。工作人員權責及分層負責事項由理事會另定之。

第二十三條　本會得設各種委員會、小組或其他內部作業組織，其組織簡則經理事會通過後施行，變更時亦同。

第二十四條　本會得由理事會聘請名譽理事長一人，名譽理事、顧問各若干人，其聘期與理事、監事之任期同。

第四章　會　　議

第二十五條　會員大會分定期會議與臨時會議二種，由理事長召集，召集時除緊急事故之臨時會議外應於十五日前以書面通知之。定期會議每年召開一次，臨時會議於理事會認為必要，或經會員(會員代表)五分之一以上之請求，或監事會函請召集時召開之。本會辦理法人登記後，臨時會議經會員(會員代表)十分之一以上之請求召開之。

第二十六條　會員(會員代表)不能親自出席會員大會時，得以書面委託其他會員(會員代表)代理，每一會員(會員代表)以代理一人為限。

第二十七條　會員(會員代表)大會之決議，以會員(會員代表)過半數之出席，出席人數較多數之同意行之。但章程之訂定與變更、會員(會員代表)之除名、理事及監事之罷免、財產之處分、本會之解散及其他與會員權利義務有關之重大事項應有出席人數三分之二以上同意。

本會辦理法人登記後，章程之變更以出席人數四分之三以上之同意或全體會員三分之二以上書面之同意行之。本會之解散，得隨時以全體會員三分之二以上之可決解散之。

第二十八條　理事會、監事會至少每六個月各舉行會議一次，必要時得召開聯席會議或臨時會議。前項會議召集時除臨時會議外，應於七日前以書面通知，會議之決議，各以理事、監事過半數之出席，出席人數較多數之同意行之。

第二十九條　理事應出席理事會議，監事應出席監事會議，不得委託出席。 理事、監事連續二次無故缺席理事會、監事會者，視同辭職。

第五章　經費及會計

第 三十 條　本會經費來源如左：

一、入會費：個人會員新台幣壹仟元，於會員入會時繳納。
贊助會員新台幣壹仟元，於會員入會時繳納。
準會員新台幣五百元，於會員入會時繳納。

二、常年會費：個人會員新台幣壹仟元。
贊助會員新台幣貳仟元。
準會員新台幣五百元。

三、事業費。
四、會員捐款。
五、委託收益。
六、基金及其孳息。
七、其他收入。

第三十一條　本會會計年度以曆年為準，自每年一月一日起至十二月三十一日止。

第三十二條　本會每年於會計年度開始前二個月由理事會編造年度工作計畫、收支預算表、員工待遇表，提會員大會通過(會員大會因故未能如期召開者，先提理監事聯席會議通過)，於會計年度開始前報主管機關核備。並於會計年度終了後二個月內由理事會編造年度工作報告、收支決算表、現金出納表、資產負債表、財產目錄及基金收支表，送監事會審核後，造具審核意見書送還理事會，提會員大會通過，於三月底前報主管機關核備(會員大會未能如期召開者，先報主管機關。)

第三十三條　本會解散後，剩餘財產歸屬所在地之地方自治團體或主管機關指定之機關團體所有。

第六章　附　　則

第三十四條　本章程未規定事項，悉依有關法令規定辦理。

第三十五條　本章程經會員(會員代表)大會通過，報經主管機關核備後施行，變更時亦同。

第三十六條　本章程經本會93年2月7日第一屆第一次會員大會通過。
報經內政部93年5月14日台內社字第0930018951號函准予備查。

台灣再生醫學學會會員名單：

編號	姓　名	編號	姓　名	編號	姓　名	編號	姓　名
001	劉華昌	029	林瑞模	061	鍾瑞嶂	091	李宣書
002	侯勝茂	030	徐郭堯	062	范揚峰	092	楊長彬
003	陳耀昌	032	吳輝傑	063	戴浩志	093	王貞棣
004	楊台鴻	033	蕭逸民	064	洪士杰	095	楊曙華
005	楊榮森	034	李建和	066	劉有漢	096	邱錦輝
006	楊俊佑	036	黃振勳	067	許致榮	097	郭兆塋
007	林峰輝	037	施庭芳	068	黃國淵	098	陳學明
008	林文澧	038	侯連團	069	李裕滄	099	林柳池
009	王清貞	039	陳志華	070	陳沛裕	100	潘如瑜
010	黃義侑	040	李炫昇	072	林頌然	101	楊維宏
011	王兆麟	041	張瑞根	073	游敬倫	102	劉明偉
012	江清泉	044	李敏旭	075	陳吳坤	103	王文志
013	石朝康	045	江鴻生	076	鄧文炳	104	方旭偉
014	蔡清霖	046	陳昭宇	077	鄭耀山	105	陳敏慧
015	張恆雄	047	張宗訓	079	簡松雄	106	張明熙
017	蘇芳慶	048	釋高上	080	郭繼陽	107	陳興源
018	陳瑞明	050	張至宏	081	王世杰	108	蔡文龍
019	陳全木	051	蔡慶豐	082	蔡友士	109	郭宗甫
020	童瑞年	054	楊治雄	083	王至弘	110	王禎麒
021	殷金儉	055	蔡文基	084	張志豪	111	湯月碧
022	何始生	056	林高田	085	趙建銘	112	黃玲惠
023	孫瑞昇	057	古鳴洲	087	曾鵬文	113	王佩華
026	陳文哲	058	宋信文	088	徐明洸	114	郭源松
027	周正義	059	姚俊旭	089	詹益聖	115	翁文能
028	陳英和	060	呂紹睿	090	吳錫銘	116	徐善慧

編號	姓　名	編號	姓　名	編號	姓　名	編號	姓　名
117	蘇正堯	143	胡育誠	168	鄭明德	193	傅尹志
118	楊世偉	144	黃維超	169	李源芳	194	陳達慶
119	林偉彭	145	陳安泰	170	嚴孟祿	195	吳順成
120	謝豐舟	146	謝清河	171	顏伶汝	196	陳郁君
121	方紀宇	147	彭慶安	172	林泰元	197	黃惠君
122	蘇慶華	148	劉滄梧	173	陳尹愷	198	洪堃哲
123	曾育弘	149	薛敬和	174	許元銘	199	曾庭箴
125	史　中	150	林毅成	175	鄭有仁	200	黃鉉琴
126	鄭乃禎	151	顏君哲	176	侯添財	201	許素菁
127	謝式洲	152	陳江山	177	賴文福	202	嚴勻謙
128	蘇鴻麟	153	侯君翰	178	施子弼	203	歐祖翔
129	曾清秀	154	吳俊昇	179	黃鼎鈞	204	馬惠康
130	劉百栓	155	廖振焜	180	陳宣佑		
131	唐逸文	156	傅再生	181	邵宏仁		
132	王清正	157	蔡宗廷	182	徐永康		
133	王盈錦	158	羅文政	183	賴瑞陽		
134	吳信志	159	王德原	184	薛元毓		
135	簡雄飛	160	賴志毅	185	施明光		
136	高國慶	161	吳佳慶	186	曾效參		
137	徐新生	162	沈延盛	187	趙崧筌		
138	許文明	163	李一麟	188	黃柏誠		
139	黃鶴翔	164	何美泠	189	彭凱彥		
140	陳偉勵	165	楊宗霖	190	李奎璋		
141	劉席瑋	166	吳坤佶	191	陳崇桓		
142	李冠瑢	167	趙本秀	192	朱恆毅		

台灣再生醫學學會　個人會員入會申請書

姓　　名		性別		出　生 年月日		出生地		身分證 號　　碼	
學　　歷	民國　　年　　月畢業於								
戶籍住址									
現任職務	醫院或單位：			科部：		職稱：			
服務單位 地　　址						專科醫師證書字號： (無者免填)			
電　　話	(公)			(宅)		傳真：			
其他連絡 方　　式	電子信箱(e-mail)：					行動電話：			
審查結果 (由學會填寫)		會員類別 (由學會填寫)			會員證號碼 (由學會填寫)				

本人贊同貴會宗旨，擬加入為會員，嗣後並願意遵守會章，共圖發展

此致　　台灣再生醫學學會　　申請人：　　(簽章)

中　華　民　國　　年　　月　　日

會員資料異動申請書

本單填妥後請回傳至台灣再生醫學學會

Fax: 02-8921-3969

會員姓名：

變 更 為：

郵遞區號：

通訊地址：

服務單位：

聯絡電話：

傳　　真：

e-mail：