台灣再生醫學學會

2011年度台灣再生醫學學會學術研討會暨會員大會
2011 Annual Meeting of Formosa Association of Regenerative Medicine

論文摘要 & 大會手冊

2011 年 02 月 26 日
台大醫學院 103 講堂
台北市仁愛路一段一號

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Consent

2011 年度台灣再生醫學學會學術研討會暨會員大會
2011 Annual Meeting of Formosa Association of Regenerative Medicine
Scientific Program

Time 時間	Topic 演講題目	Speakers & Authors 作者	Institute 所屬單位	Moderator 座長
08:00	Registration 報 到			
08:30-09:00 Oral Presentations				
08:30-08:40 O-1	A Procedure of Fast Isolation of Adipose - Derived Stem Cells For Clinical Cosmetic Use	黎莉婷[1] 許至皓[2] 方旭偉[3] 鄧守成[4]	國立台北科技大學工程博班[1] 國立台北科技大學生物科技研究所[2] 國立台北科技大學化學工程與生物科技系[3] 三軍總醫院整形外科[4]	楊台鴻 教授
08:40-09:00 O-2	Development of Custom Made Living Bone Substitute Via Tissue Engineering and Rapid Prototyping for Emergency Cases of Bone Loss	Mohammad Syahril Izwan Bin Abd Rahim[1] Will J.P Horng[2] Toshiyuki Akamine[3]	Director of Biological Process System Technology sdn bhd (Malaysia)[1] Project Manager AMPOC FAR-EAST Co (Taiwan)[2] Autostrade Co,. Ltd / Standard Creation Technology Ltd (Japan / Hong Kong)[3]	
09:00-10:10 Oral Presentation Competition				
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09:10-09:20 S-2	Modulation of Gene Expression and Collagen Production of Anterior Cruciate Ligament Cells through Cell Shape Change on Polycaprolactone/ Chitosan Blends	邵宏仁[1] 劉政道[2] 李裕滄[1] 陳江山[2,3] 王至弘[1]	國立台灣大學醫學院骨科[1] 國立台灣大學醫學工程研究所[2] 亞東紀念醫院[3]	
09:20-09:30 S-3	Anti-IL-20 Antibody is a Potential Therapeutic Agent for Rheumatoid Arthritis	許育祥[1] 張明熙[1,2]	國立成功大學藥學生物科技研究所[1] 國立成功大學生物化學研究所[2]	

Time 時間	Topic 演講題目	Speakers & Authors 作者	Institute 所屬單位	Moderator 座長
09:30-09:40 S-4	Comparison of the Osteogenic Differentiation Capacity of Human Placenta-derived Mesenchymal Stem Cells and Bone Marrow-Derived Mesenchymal Stem Cells on Different Degradable Polymer Materials and its Signal Pathways Analysis	陳江山 [1,2] 楊子聖 [3] 侯勝茂 [4]	亞東紀念醫院 [1] 國立台灣大學醫工所 [2] 台北科技大學 [3] 新光吳火獅紀念醫院 [4]	陳文哲 教授 孫瑞昇 教授
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10:10-10:30 Coffee Break				
10:30-12:00 Invited Lectures				
10:30-11:15 I-1	Modulation of Neural Stem Cells on Culture Substrates with Surface-Anchored Growth Factors	Koichi Kato, Shuhei Konagaya, Tadashi Nakaji-Hirabayashi Hiroo Iwata	Institute for Frontier Medical Sciences, Kyoto University	侯勝茂 教授
11:15-12:00 I-2	Trends in Tissue Engineering Approach for Periodontal Regeneration	Po-Chun Chang 張博鈞醫師	Faculty of Dentistry, National University of Singapore, Singapore, Singapore University Dental Cluster, National University Hospital, Singapore, Singapore	侯連圍 教授
12:00-12:30 會 員 大 會				
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Invited Lectures

10:30-11:15

I-1

Modulation of neural stem cells on culture substrates with surface-anchored growth factors

Koichi Kato, Shuhei Konagaya, Tadashi Nakaji-Hirabayashi, and Hiroo Iwata
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Neural stem cells (NSCs), capable of self-renewal and differentiation into multiple cell types including neurons, astrocytes and oligodendrocytes, are found in the fetal and adult brain. Neural precursor cells can also be derived from embryonic stem (ES) and induced pluripotent stem (iPS) cells. In recent years, many studies have been made on the utilization of these cells for cell replacement therapy of central nervous disorders such as Parkinson's disease.

One of the next challenges in this are is to establish methodology for reproducibly producing adequate cells that can be clinically used for transplantation. In this paper, we will present our recent achievements concerning the efficient production of neural stem and progenitor cells and dopamine-producing neurons. The key strategy adopted in our technology is to use culture substrates with surface-anchored growth factors for modulating the proliferation and differentiation of NSCs.

First we screened various growth factors and their combinations for the efficient proliferation and differentiation of NSCs by cell-based assays on a growth factor array. A hierarchal cluster analysis for the expression of differentiation markers provided the information on the most effective growth factor candidates.

Based on the information obtained from the cell-based assays, we fabricated culture substrates with surface-anchored growth factors to study the selective proliferation of NSCs. It was found that NSCs from the fetal rat brain can be selectively expanded on the substrates with surface-anchored epidermal growth factor (EGF). On the other hand, human neural progenitor cells were shown to selectively proliferate on the substrates with both EGF and basic fibroblast growth factor (bFGF).

Our technology was further applied to the efficient induction of dopamine-producing cells. For this purpose, we tethered brain-derived neurotrophic factor (BDNF) and glial cell line-derived neurotrophic factor (GDNF) on the surface of culture substrates. It was found that dopamine-producing cells were efficiently induced by culturing rat NSCs on this substrate.

11:15-12:00

I-2

Trends in tissue engineering approach for periodontal regeneration
牙周組織再生之組織工程學應用趨勢

Dr. Po-Chun Chang (D.D.S., Ph.D.)
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Faculty of Dentistry, National University of Singapore, Singapore, Singapore
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Periodontitis, characterized by bacteria-induced tooth-supporting structure destruction, had been affected 40-60% population in most developed countries and reported as one of the biggest threats to dental health. The current therapeutics mainly relied on pathogen debridement and regenerative surgeries utilizing a variety of grafting materials, bioactive molecules, and biocompatible membranes. However, a high degree of variability in clinical outcome still existed regardless of treatment modalities and appears to be associated with the inability to control the spatial and temporal activity of cells and biomolecules. It is of interest to utilize the concept of tissue engineering developing potential treatment modality facilitating periodontal regeneration.

Based on the current understanding of periodontal formation, we developed an *in vivo* gene therapy modality to sustain the expression of platelet-derived growth factor (PDGF), a potent mitogen and chemotactic factor, within the periodontal defect. Our results demonstrated significant alveolar bone and periodontal tissue regeneration without any systemic adverse effect. Therefore, considering the complexity of the biological cascade during regeneration, we design injectable co-axial double-layered biodegradable microspheres to carry PDGF and simvastatin, an anti-cholesterol drug which is capable induce osteogenesis, whereby the microspheres control those biomolecules releasing simultaneously or sequentially. Furthermore, to optimize the outcome of periodontal regeneration, we are developing a dual-compartmental modality to reconstruct the soft (periodontal ligament) and hard (alveolar bone) periodontal tissue component respectively. The periodontal ligament is reconstructed by a biodegradable micro-sheet containing enamel matrix derivative (EMD), a group of molecules responsible for tooth root formation and cementogenesis, and the alveolar bone component is restored by microspheres encapsulating simvastain-PDGF. We will further move our investigations forward to large animal models and potential human trials, and hopefully could develop an ideal and accessible approach toward periodontal regenerative therapy.

Oral Presentations

08:30-08:40

O-1

快速分離脂肪幹細胞之程序用於醫學美容使用
A procedure of fast isolation of adipose - derived stem cells for clinical cosmetic use

黎莉婷[1] 許至皓[2] 方旭偉[3] 鄧守成[4]
國立台北科技大學工程博班[1] 國立台北科技大學生物科技研究所[2]
國立台北科技大學化學工程與生物科技系[3] 三軍總醫院整形外科[4]

[Introduction]

Adipose tissue is not only an ideal material for soft tissue filling and augmentation, but also a plentiful source of adipose – derived stem cells (ADSCs) [1].The combination of fat with ADSCs , a strategy called cell-assisted lipotransfer (CAL), could become a mainstream strategy for cosmetic filed[2]. Presently, procedures are tedious, time-consuming, and not suitable for clinical application. In addition, each step of isolation can affect the cell viability and numbers. The objective in this study is to develop a simpler and faster procedure for the isolation of adipose derived stem cells for clinical cosmetic use.

[Materials and Methods]

We modified the influence factors in procedures, and the cells harvested using different protocols were analyzed. The total cell numbers of a stromal vascular fraction were calculated by cell count. To determine the presence of adipose- derived stem cells after cultivation, we used flow cytometric analysis which is based on surface marker expression.

[Results]

The results indicated that a digestion duration of 30 min. and centrifugation on 1200 g force obtained higher cell numbers than other conditions. After cultivation, ADSCs expressed several surface markers and had fibroblastic-like morphology.

[Discussion]

The optimized protocol, both simple and fast, for clinical use consists of: washing 1 time, going through digestion duration of 30 min. and centrifuging on 1200g force for 3min.

[Conclusions]

In conclusion,this method could be applied in clinical lipotransfer and tissue engineering.

08:40-09:00

O-2

Development of custom made living bone substitute via tissue engineering and rapid prototyping for emergency cases of bone loss

Mohammad Syahril Izwan Bin Abd Rahim[1], Will J.P Horng[2], Toshiyuki Akamine[3]
Director of Biological Process System Technology sdn bhd (Malaysia) [1]
Project Manager AMPOC FAR-EAST Co (Taiwan) [2]
Autostrade Co,. Ltd / Standard Creation Technology Ltd (Japan / Hong Kong) [3]

[Introduction]

We have proposed the development of a new process device also known as the biological processing system (BIPS) that incorporates rapid prototyping technology with tissue engineering concept. The system allows the simultaneous incorporation of living cells during the fabrication of the 3D scaffold in order to produce a living tissue substitute. The use of a software that could translate 3D imaging information of the exact size and shape of the target tissue defect enables the exact fabrication of a living tissue substitute that can be immediately implanted. The rapid fabrication of such tissue substitute allows instant replacement of the tissue defect in an emergency setting such as in traumatic injuries. Our most latest trial work was under the 4 hour for total process. Our target of commerce level technology will focus for under the 1 hour and it is already in the range distance.

[Materials and Methods]

Rapid prototyping device is a device or system for quick fabrication of 3-D model prototypes. It has long thrived in the mechanical / machinery industry for making prototype models. It was later adopted in the healthcare industry for making biological implants such as plate, screws or nailing device. At the turn of the 21st century, tissue engineering took a great leap with the advent of stem cell biology. Tissue engineering involves the incorporation of living cells into 3D scaffold to mimic the structure of the original tissue that it is meant to restore. A scaffold provides a 3D framework for cell anchorage and proliferation and creates a border/ containment for tissue regeneration. The scaffolds are usually made porous or their surface modified to encourage cell anchorage and proliferation. Hence, a wide range of biocompatible material (alone or as composites) were studied and developed.

At the same time, different methods of producing these scaffolds had been developed including the conventional solvent-casting, freeze-drying or sintering methods. Even rapid prototyping system alone, there exists different competitive technology e.g. Selective bond sintering in powder system, Fused deposition modelling (FDM), Stereolithography (SLA) and electrospinning.

[Results]

We are success of making 3D shape (aggregate animal) from mainly TGP polymer (NIPAAm) and live cell.

[Discussion]

This technology is just making 3D shape from MRI data. And we need to make junction structure in space of separate cell. This process will need many case study by target cell and 3D shape

[Conclusions[

In short, we proposed a comprehensive solution by merging the two existing technologies i.e. tissue engineering technology and the rapid prototyping technology using optical light stereolithography of BPS Technology Sdn Bhd to bring about a paradigm shift in the fabrication of living tissue substitute for therapeutic purposes.

09:00-09:10

S-1

促進神經幹細胞增生及分化之培養基
A proliferation and differentiation-promoting medium for neural stem/precursor cells

李亦宸, 林泳沖, 楊台鴻
國立台灣大學醫學工程研究所

[Introduction]

Regulating neural lineage differentiation from neural stem/precursor cells (NSPCs) is a challenge of neuroscience research. Many investigators have concentrated on elucidating the role of extrinsic and intrinsic signals coming from medium components, culture substrates, and intercellular interactions in the regulation of behaviors of NSPCs. Serum is a complex mixture containing a variety of components with different molecular weights. It has been shown that NSPCs are influenced by a numerous of factors in serum including various growth factors, cytokines, neurotransmitters, proteins, and polyamines. Furthermore, many components in serum might have a synergistic effect to influence stem cells. NSPCs have demonstrated that they were principally induced to differentiate into astrocytes and neuron when utilizing the medium contained 10% fetal bovine serum (FBS) in the absence of additional growth factors or biomaterials. Therefore, we combine with the serum components, growth factor, and biomaterials to do a microenvironment for neural stem cells, could have stimulated cell differentiation.

[Materials and Methods]

In this study, serum components were prepared by using centrifugal process method. NPSCs were prepared form pregnant Wistar rat embryos on days 14-15, and then we identify the behavior of stem cell, which were differentiation, function, in the culture microenvironment.

[Results]

The results shows demonstrated that both proliferation- and differentiation-promoting molecules were present in the serum, which could be divided. In addition, serum components combine with biomaterials could interact synergistically with growth factor to exert progression effects on NSPC proliferation or differentiation into more MAP2-positive neurons.

[Discussion]

The result of differentiated neurons dominating the pattern of NSPC could be combined administration of bFGF and different serum fraction significantly altered NSPC phenotypic choice. And this pattern also could be applied to other biomaterial substrates. In our previous studies, PVDF, EVAL and PVA with different hydrophilic/hydrophobic

properties could exert different influences on NSPC fate specification. More differentiated neurons were observed on all substrates, which is different from biomaterial itself inducing non-neural differentiation pathways in cultured NSPCs or inhibiting NSPC suspension. This suggests that substrates cannot solely influence the behavior of NSPCs. Therefore, the behavior of NSPCs is versatile, which is dependent on the complex environmental conditions.

[Conclusions]

Combining with serum components, growth factors was a culture medium could have induced cells to proliferation and differentiation in vitro.

09:10-09:20

S-2

利用聚己內酯/幾丁聚醣混摻材料控制前十字韌帶細胞形狀達到調控基因及膠原蛋白表現

Modulation of gene expression and collagen production of anterior cruciate ligament cells through cell shape change on polycaprolactone/chitosan blends

邵宏仁[1] 劉政道[2] 李裕滄[1] 陳江山[2,3] 王至弘[1]
國立台灣大學醫學院骨科[1] 國立台灣大學醫學工程研究所[2] 亞東紀念醫院[3]

[Introduction]

Based on the different adhesion characteristics of human ACL cells on chitosan and PCL, the present study is concerned with the gene expression and ECM production of ACL cells through cell shape changes on blends of chitosan with PCL, which has been illustrated as a suitable material for cell adhesion. It is possible to combine the advantages of chitosan and PCL to create a new blended material, which could maintain the viability and stimulate the collagen synthesis of human ACL cells simultaneously.

[Materials and Methods]

Substrate preparation: 5, 10, 15, 25, 50 and 75 wt % PCL in PCL/chitosan solution, different volume of 10 wt % PCL solutions. *Cell culture:* Human ACL explants were obtained from patients who underwent ACL reconstruction. *Cell morphology:* Hitachi S-800 scanning electron microscope, *Cell proliferation:* MTT assay, *Immunofluorescenc:* rhodamine-labeled phalloidin. *protein synthesis:* ELISA kit. *Real-time PCR:* the gene expression of TGF- ı, collagen type I and collagen type III and GAPDH

[Results]

We found that the morphology, viability and gene expression of human ACL cells on the chitosan/PCL blends could be effectively regulated. With the increase of PCL content in blends, human ACL cells presented more flatten shape, well-organized cytoskeleton, and higher proliferated ability. Compared to flatten shape, human ACL cells with round shape exhibited higher levels of mRNA expression of TGF- ıand collagen type III through 3-day culture period. Furthermore, these blended materials could up-regulate protein synthesis of human ACL cells, which corresponded to their gene expressions.

[Discussion]

We successfully demonstrated that the miscible PCL/chitosan blends could be used to modulate the gene expression of human ACL cells through changing the cell shape without any chemical reagent. The different cellular morphologies on the blends were attributed to the different cell adhesion characteristics of PCL and chitosan. We further found that the collagen type III synthesis could be upregulated by modulation of cellular morphologies. Therefore, it is possible to combine the advantages of chitosan and PCL to

create a new blended material, which could control cellular morphologies specifically, and further to regulate the gene expression and protein production of cells for specific applications.

[Conclusions]

Therefore, it is possible to combine the advantages of chitosan and PCL to create a new blended material, which could control cellular morphologies specifically, and further to regulate the gene expression and protein production of cells for specific applications. We expected this concept, controlling the cell shape through biomaterial to modulate the behavior of cells, could provide a new vision for the material selection of ligament tissue engineering.

09:20-09:30

S-3

拮抗介白素二十單株抗體：具有治療潛力的類風濕性關節炎新標的
Anti-IL-20 antibody is a potential therapeutic agent for rheumatoid arthritis

許育祥[1] 張明熙[1,2]
國立成功大學藥學生物科技研究所[1] 國立成功大學生物化學研究所[2]

[Introduction]

Interleukin (IL)-20 is a proinflammatory cytokine involved in the pathogenesis of rheumatoid arthritis. We investigated whether anti-IL-20 antibody treatment would modulate the severity of the disease in the collagen-induced arthritis (CIA) rat model.

[Materials and Methods]

We generated a CIA model. CIA rats were subcutaneously treated with anti-IL-20 antibody 7E, TNF blocker (etanercept), or 7E combined with etanercept. Arthritis severity was determined by hind-paw thickness, severity score, bone mineral density, and cytokine production, which were evaluated using radiological scans, microcomputed tomography, and ELISA. To analyze gene regulation by IL-20, rat synovial fibroblasts (SFs) were isolated and analyzed for the expression of receptor activator for nuclear factor-κB ligand (RANKL), IL-17, and TNF-α. We also used RT-PCR and flow cytometry to determine whether IL-20 regulated RANKL in mouse osteoblastic MC3T3-E1 and Th17 cells.

[Results]

In vivo, 7E alone or combined with etanercept significantly reduced the severity of arthritis by decreasing hind-paw thickness and swelling. 7E prevented cartilage damage and bone loss. 7E also reduced the expression of TNF-α, IL-20, IL-6 and IL-1β in synovial tissues. *In vitro,* IL-20 induced TNF-α expression in CIA SFs. IL-20 markedly induced RANKL production in CIA SFs, osteoblasts, and Th17 cells.

[Discussion]

About 40% of RA patients are resistant to a TNF-α blockade, which suggests that some TNF- -independent pathogenesis occurs in these patients and indicates a need for new anti-rheumatoid arthritis therapeutics. 7E alone and etanercept were equally efficacious for reducing the severity of arthritis by inhibiting the inflammatory response and by preventing bone destruction and cartilage damage in inflamed joints. The therapeutic efficacy of 7E was increased when it was combined with etanercept, which indicated that IL-20 and TNF- synergistically promote synovial inflammation.

[Conclusions]

Selectively blocking IL-20 inhibited inflammation and bone loss in CIA rats. Combining 7E with etanercept synergistically protected CIA rats. Our findings provide evidence that IL-20 is a novel target, and that 7E may be a potential therapeutic for rheumatoid arthritis.

09:30-09:40

S-4

比較人類胎盤幹細胞(hPDMC)與人類骨髓幹細胞(hBMSC)在可分解材料上的骨分化能力及機轉分析

Comparison of the osteogenic differentiation capacity of human placenta-derived mesenchymal stem cells and bone marrow-derived mesenchymal stem cells on different degradable polymer materials and its signal pathways analysis

陳江山[1,2] 楊子聖[3] 侯勝茂[4] 楊台鴻[2]
亞東紀念醫院[1] 國立台灣大學醫工所[2] 台北科技大學[3] 新光吳火獅紀念醫院[4]

[Introduction]

The goal of this study is to compare osteogenic differentiation capacity of human placenta derived mesenchymal stem cells (hPDMC) and human bone marrow derived mesenchymal stem cells (hBMSC) when cultivated on different degradable polymer surface. Few investigations were designed to compare the osteogenic capacity of stem cells from different origin and to evaluate the possible signal pathways responding to the osteogenic processing from the materials.

[Materials and Methods]

Study design: hBMSCs and hPDMCs were cultured on selected degradable polymer surface. Biodegradable materials, including chitosan, gelatin, hyaluronic acid, poly(ethylene glycol)(PEG), poly-l-lactic acid (PLLA), poly(lactic-co-glycolic acid) (PLGA), poly-ε-caprolactones (PCL),and poly-(β-hydroxybutyrate) (PHB) were tested. Cell morphology, viability, cytotoxicity, and osteogenic related markers including BMP-2, osteocalcin and alkaline phosphatase were analyzed. Alizarin red staining was performed for mineralization evaluation. Four major pathways, including Wnt-β-catenin pathway, BMP-Smads pathway, ERK-MAPK pathway, and Pl3k-Akt pathway , were tested with adding inhibitor respectively to see the effect of ALP activity alternation by MSCs after osteoinduction.

[Results]

hPDMCs and hBMSCs expressed similar fibroblast-like morphology after adhesion on these degradable material surfaces except chitosan. No significant cytotoxic effect was noted by LDH assay when culture both MSCs on these degradable polymer surface. Human BMSC expressed higher MTT activity on PCL surface than other materials. Human BMSC showed superior osteogenic capacity than hPDMCs by stronger expression in alkaline phosphatase activity and Alizarin red staining in osteoinductive medium. Human BMSC expressed higher ALP activity on poly-ε-caprolactones (PCL), hyaluronic acid, and gelatin surface in osteoinductive medium, and further experiment showed PCL could be considered as optimal material in bone regeneration based on 1) human BMSC showed strong mineralization staining on the 28th day without osteoinduction and 2) PCL

accelerated human PDMC mineral deposition on the 14th day in osteoinductive medium . For hBMSC culture in osteoinductive medium, the ALP activity dropped statistically by interfering Pl3k-Akt pathway by its inhibitor, LY294002.

[Conclusions]

Human BMSC was considered as preferable cell source for bone regeneration than hPDMC. PCL could be selected as optimal scaffold for bone regeneration based on its apparent ALP expression and mineral deposition effect than other degradable materials. The Pl3k-Akt pathway should be the major signal pathway responding to the osteogenesis by mesenchymal stem cells on PCL surface.

09:40-09:50

S-5

脂肪組織幹細胞在甲殼素薄膜表面形成球狀體現象之探討
Spheroid formation of human adipose-derived stem cells on chitosan films

鄭乃禎 [1,2] 楊台鴻 [1]
國立台灣大學醫工所 [1] 國立台灣大學醫學院附設醫院 外科部 整形外科 [2]

[Introduction]

Because of their abilities of rapid proliferation and differentiation into multiple cell types, mesenchymal stem cells are regarded to have great potentials for application in regenerative medicine. The adipose-derived stem cells (ASCs) have been shown to share similar characteristics of mesenchymal stem cells isolated from bone marrow. Previous reports suggested that culture as 3D spheroids can increase therapeutic potentials of mesenchymal stem cells. Therefore, we aimed to manipulate the spheroid formation of human ASCs by culturing them on chitosan films. Then we investigated the cell behavior of ASCs in the spheroids.

[Materials and Methods]

Chitosan-coated tissue culture plates (CMs) were prepared for human ASC culture. The ASCs were passaged 3 times and plated onto CMs or tissue-culture polystyrene (TCPS) with the culture medium consisting of DMEM-high glucose, 10% FBS, 1% penicillin-streptomycin (all from Gibco). Human ASCs were seeded at different densities onto CMs, and the number and diameter of spheroids per well in each group were measured. Culture media was refreshed every 2–3 days. In some experiments, after spheroids were formed on CMs 7 days after cell seeding, these spheroids were transferred from CMs to a TCPS or a new CM and then cultured for 7 more days. Cell viability was assessed by the alamar blue assay and the live/dead analysis. Cell apoptosis was analyzed by flow cytometry measuring propidium iodide uptake and annexin V labeling. Expression of “stemness” genes were analyzed by real-time PCR. Histology and immunohistochemistry of the ASC spheroids were also obtained.

[Results]

With the increasing seeding density of ASCs on CMs, the ASC spheroid formed faster and exhibited a bigger diameter at day 7. Live/dead assay showed that ASCs within the spheroid are largely viable, though the proliferation of ASCs was inhibited. Upon translocation of ASC spheroids from CM to TCPS, ASCs started to proliferate again. The ratio of apoptotic cell in ASC spheroid was comparable to those cultured on TCPS. Significant upregulation of Sox-2, Oct-4 and Nanog genes was noted in cells within ASC spheroids. The finding was further supported by the immunohistostaining of Sox-2, Oct-4 and Nanog in ASC spheroids.

[Discussion]

We found that ASC spheroid formation on chitosan films enhanced the “stemness” of ASCs by upregulation of stemness-related genes, such as Sox-2, Oct-4 and Nanog.

Different cell behaviors of ASCs derived from spheroid and monolayer cell culture were demonstrated. Cells in spheroids are in close association with each other and probably signal cues to each other much easier than in monolayer cultures. The changes in the ASCs as they form spheroids are probably the result of the nonadherent culture conditions provided by the chitosan films.

[Conclusions]

Our results indicated that human ASCs could form spheroids on chitosan films. Although the spheroids do not proliferate, ASCs within the spheroid remained viable. Since spheroid-derived ASCs appeared to have more “stemness” characteristics, they should be of value for future application in regenerative medicine.

09:50-10:00

S-6

Knockdown of p21Cip1/Waf1 enhances proliferation, the expression of stemness markers and osteogenic potential in human mesenchymal stem cells

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Cell-based therapies using bone marrow-derived mesenchymal stem cells (MSCs) demonstrate great potential in bone regenerative therapies. Ex vivo expansion of MSCs is often required to generate adequate cell numbers in clinical applications. Senescence of MSCs occurs along with ex vivo passages and results in lower proliferation rate, loss of stemness and compromised therapeutic potential. However, currently no effective and safe method is available to solve the senescence problem. Previous studies indicated that a cell cycle regulator, p21, may be associated with cell senescence. We hypothesized that p21 may play an important role in the senescence of bone marrow-derived MSCs. The purpose of this research was to determine the role of p21 expression in the senescence of human bone marrow-derived MSCs. The results indicated that MSCs increased in p21 expression and became senescent along with ex vivo expansion. Lentiviral transduction of senescent MSCs with p21 shRNAs was able to increase their proliferation capacity, expression of stemness markers, and osteogenic potential in vitro. More importantly, the reduction of p21 expression enhanced the bone repair capacity of senescent MSCs in a mouse calvarial defect model. The p21-knockdowned MSCs showed increased telomerase activity and telomere length but maintained normal chromosome integrity and did not acquire tumorigenic potential. In conclusion, p21 plays an important role in senescence of human bone marrow-derived MSCs. The knockdown of p21 may become an effective and safe strategy to prevent or reduce the senescence of MSCs during ex vivo expansion.

Keywords: mesenchymal stem cells, senescence, p21, osteogenesis

10:00-10:10

S-7

長效表現型桿狀病毒改質脂肪幹細胞修復大範圍骨缺陷
Adipose-derived Stem cells engineered with the persistently expressing hybrid baculovirus augment the healing of massive bone defects

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長庚紀念醫院分子影像中心[3] 長庚紀念醫院骨科部關節重建骨科[4]

[Introduction]

Massive segmental defects arising from trauma or tumor resection remain a challenging clinical problem. To heal massive, segmental bone defects using adipose-derived stem cells (ASCs), which alone cannot heal large defects, we hypothesized that sustained expression of factors promoting bone regeneration (BMP2) and angiogenesis (VEGF) provides continuous stimuli to augment the healing.

[Materials and Methods]

We developed a dual baculovirus (BV) system whereby one BV expressed FLP recombinase (BacFLP) while the other hybrid BV harbored an Frt-flanking transgene cassette. The New Zealand White (NZW) rabbit ASCs were transduced with the BMP2-expressing BV or VEGF-expressing BV, co-seeded to scaffolds and co-implanted into critical-sized (10 mm) femoral segmental defects in NZW rabbits. The bone regeneration was assessed by radiography, Positron Emission Tomography / Computer Tomography (PET/CT) at 2, 4, 8 and 12 weeks post-transplantation (wpt), and μCT, histological staining, biomechanical torsional testing at 12 wpt, respectively.

[Results]

FLP/Frt-mediated recombination occurred in up to 46% of ASCs transduced with BacFLP and the hybrid BV, leading to cassette excision off the BV genome, enabling transgene persistence in episomal form and prolonging expression to >28 days. ASCs engineered by conventional BV transiently expressing BMP2/VEGF (S group) only healed the critical-size (10 mm) segmental femoral bone defects in 4 out of 10 NZW rabbits at 12 wpt, but ASCs engineered by the hybrid vectors persistently expressing BMP2/VEGF (L group) healed the critical-size defects in 12 out of 12 animals in 8 weeks. Compared with the S group, the L group not only accelerated the healing, but also ameliorated the bone metabolism, bone volume, bone density, angiogenesis and mechanical properties

[Discussion]

These data confirmed our hypothesis that persistent BMP2/VEGF expression is essential.

[Conclusions]

Use of the hybrid BV vector for ASCs engineering represents a novel therapy to treat massive segmental defects necessitating sustained stimuli.

第四屆第二次會員大會

理事長的話

各位親愛的會員 您好,

感謝各位會員的支持與愛戴，讓弟 勝茂繼續擔任第四屆的理事長，並使學會會務均順利的進行。

學會在 99 年與中華民國骨科醫學會聯合舉辦”2010年骨科材料科學研討會”，邀請到國外學者 Case Western Reserve University, Clare M. Rimnac, Ph.D.，國內則有張至宏醫師、侯君翰醫師、陳江山醫師、詹益聖醫師、林瑞模教授等於會中發表淵博的演說及寶貴的研究成果，期盼能對會員有所幫助及鼓勵。

而理監事會也努力希望能讓更多年輕優秀的研究生有更多機會參與學會所舉辦之活動，故在第四屆第一次會員大會提議修訂章程，訂定準會員之資格，並於會員大會中投票通過。

再生醫學研究目前仍是各先進國家競相投注研發，大力推動之科技重點，尤其隨著老化、癌症、心血管病變等慢性病及中樞神經受損的人口逐漸上升，再生醫學所扮演的角色也將越發顯得重要，所以學會希望各位會員能更專注的投入這門學問，對再生醫學、組織工程等有更多的瞭解，將其更加延伸。

期盼所有會員們能持續支持學會，並不吝隨時提出建言。

理事長 侯勝茂 敬啟

2011 年 02 月 26 日

台灣再生醫學學會第四屆理、監事名單
(照筆劃順序排列)

理 事 長：侯勝茂

常務理事：江清泉、徐善慧、陳耀昌、蔡清霖

理　　事：林峰輝、侯連圍、洪士杰、張至宏、張恒雄、
陳文哲、黃玲惠、楊俊佑、楊榮森、嚴孟祿

候補理事：林高田、陳志華、陳英和、蘇正堯

常務監事：黃義侑

監　　事：林文澧、林泰元、孫瑞昇、蔡文基

候補監事：譚傳明

第四屆第二次會員大會議程

時間：民國100年2月26日(星期六) 12:00

地點：臺大醫學院103講堂(台北市仁愛路一段一號)

主席：侯勝茂 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. 通過年度工作計劃
2. 通過年度經費收支、決算表

五、臨時動議

六、散會

九十九年度工作報告

理事會報告

一、召開理監事會議計四次。

二、會員人數增加至一百八十人。

三、九十九年十一月六日星期六假台大醫學院102講堂舉行”2010年骨科材料科學研討會”

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。

一百年工作計劃

一、招收會員

二、舉行四次理監事會議。

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 99 年 1 月 1 日至 99 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**	**657,666**	**770,000**			
	1		會費收入	135,000	140,000		5,000	含入會費常年會費
	2		捐款收入	310,000	600,000		290,000	廣告攤位收入及贊助會員捐款等
	3		利息收入	21,541	30,000		8,459	郵局, 銀行利息
			補助收入	191,125	0	191,125		國科會補助開會
			本會支出	**933,588**	**1,131,000**			
2	1		人事費	141,000	150,000		9,000	員工及加班費
	2	1	文具	4,058	22,500		18,442	
		2	印刷費	74,610	40,000	34,610		
		3	郵電費	3,484	20,000		16,516	
		4	雜項	14,192	60,000		45,808	
	3	1	業務費	78,579	100,000		21,421	召開理監事會及辦理相關研討會所需之費用
		2	會議費	271,380	300,000		28,620	
		3	交通費	10,500	100,000		89,500	
			其他業務費	239,785	300,000		2,715	召開2月份年會及10月份研討會
			提撥基金	96,000	38,500			
			本期餘絀	275,922				

理事長：侯勝茂　秘書長：楊台源　常務監事：黃義侑印　會計：孟昭雲　製表：孟昭雲

台灣再生醫學學會
收支預算表
中華民國 100 年 1 月 1 日至 100 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**	**700,000**	**750,000**			
	1		會費收入	170,000	130,000	40,000		含入會、費常年會費
	2		捐款收入	500,000	600,000		100,000	廣告攤位收入及贊助會員捐款等
	3		利息收入	30,000	20,000	10,000		郵局銀行利息(隨利率變動)
			本會支出	**1,150,000**	**1,150,000**			
2	1		人事費	150,000	150,000			員工薪資及加班費
	2	1	文具	30,000	22,500	7,500		
		2	印刷費	40,000	40,000			
		3	郵電費	20,000	20,000			
		4	雜項	60,000	60,000			
	3	1	業務費	100,000	100,000			召開理監事會及辦理相關研討會所需之費用
		2	會議費	200,000	300,000	100,000		
		3	交通費	100,000	100,000			
			其他業務費	300,000	300,000			
			提撥基金	35,000	57,500			依收入總額提列5%作為準備基金

理事長：侯勝茂　秘書長：楊台鴻　常務監事：黃侑義印　會計：孟昭雲　製表：孟昭雲

台灣再生醫學學會

工作人員待遇表

職稱	姓名	性別	出生年月日	出生地	到職日年月日	月支薪餉	備註
秘書	楊惠晶	女	59年2月20日	台北	97.12.01	NT$10,000	現任

理事長： 侯勝茂　秘書長： 楊台鴻　常務監事： 黃侑義　會計： 孟昭雲　製表： 孟昭雲

台灣再生醫學學會

現金出納表

中華民國 99 年 1 月 1 日至 99 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	$2,356,042	本期支出	$933,588
本期收入	657,666	本期結餘	$2,080,120
合計	$3,013,708	合計	$3,013,708

理事長： 侯勝茂　秘書長： 楊台鴻　常務監事： 黃侑義　會計： 孟昭雲　製表： 孟昭雲

台灣再生醫學學會
資產負債表
中華民國 99 年 1 月 1 日至 99 年 12 月 31 日止

資　產		負　債	
科　　目	金額	科　　目	金　　額
定期存款	$2,000,000	提撥基金	$96,000
庫存現金	$80,120	本期結餘	$1,984,120
合計	$2,080,120	合計	$$2,080,120

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	026	陳文哲	052	溫哲昇	076	鄧文炳
002	侯勝茂	027	周正義	053	梁文雄	077	鄭耀山
003	陳耀昌	028	陳英和	054	楊治雄	078	陳伯毅
004	楊台鴻	029	林瑞模	055	蔡文基	079	簡松雄
005	楊榮森	030	徐郭堯	056	林高田	080	郭繼陽
006	楊俊佑	032	吳輝傑	057	古鳴洲	081	王世杰
007	林峰輝	033	蕭逸民	058	宋信文	082	蔡友士
008	林文澧	034	李建和	059	姚俊旭	083	王至弘
009	王清貞	035	譚傳明	060	呂紹睿	084	張志豪
010	黃義侑	036	黃振勳	061	鍾瑞嶂	085	趙建銘
011	王兆麟	037	施庭芳	062	范揚峰	086	謝智新
012	江清泉	038	侯連圍	063	戴浩志	087	曾鵬文
013	石朝康	039	陳志華	064	洪士杰	088	徐明洸
014	蔡清霖	040	李炫昇	065	王世南	089	詹益聖
015	張恆雄	041	張瑞根	066	劉有漢	090	吳錫銘
017	蘇芳慶	043	何慶安	067	許致榮	091	李宣書
018	陳瑞明	044	李敏旭	068	黃國淵	092	楊長彬
019	陳全木	045	江鴻生	069	李裕滄	093	王貞棣
020	童瑞年	046	陳昭宇	070	陳沛裕	094	蘇志堅
021	殷金儉	047	張宗訓	071	李協興	095	楊曙華
022	何始生	048	釋高上	072	林頌然	096	邱錦輝
023	孫瑞昇	049	劉永隆	073	游敬倫	097	郭兆瑩
024	賴禎添	050	張至宏	074	曾繁文	098	陳學明
025	蕭天源	051	蔡慶豐	075	陳吳坤	099	林柳池

編號	姓　名	編號	姓　名	編號	姓　名	編號	姓　名
100	潘如瑜	125	史　中	150	林毅誠	175	鄭有仁
101	楊維宏	126	鄭乃禎	151	顏君哲	176	侯添財
102	劉明偉	127	謝式洲	152	陳江山	177	賴文福
103	王文志	128	蘇鴻麟	153	侯君翰	178	施子弼
104	方旭偉	129	曾清秀	154	吳俊昇	179	黃鼎鈞
105	陳敏慧	130	劉百栓	155	廖振焜	180	陳宣佑
106	張明熙	131	唐逸文	156	傅再生		
107	陳興源	132	王清正	157	蔡宗廷		
108	蔡文龍	133	王盈錦	158	羅文政		
109	郭宗甫	134	吳信志	159	王德原		
110	王禎麒	135	簡雄飛	160	賴志毅		
111	湯月碧	136	高國慶	161	吳佳慶		
112	黃玲惠	137	徐新生	162	沈延盛		
113	王佩華	138	許文明	163	李一麟		
114	郭源松	139	黃鶴翔	164	何美泠		
115	翁文能	140	陳偉勵	165	楊宗霖		
116	徐善慧	141	劉席瑋	166	吳坤佶		
117	蘇正堯	142	李冠瑢	167	趙本秀		
118	楊世偉	143	胡育誠	168	鄭明德		
119	林偉彭	144	黃維超	169	李源芳		
120	謝豐舟	145	陳安泰	170	嚴孟祿		
121	方紀宇	146	謝清河	171	顏伶汝		
122	蘇慶華	147	彭慶安	172	林泰元		
123	曾育弘	148	劉滄梧	173	陳尹愷		
124	林佐文	149	薛敬和	174	許元銘		

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：

2011年度台灣再生醫學學會學術研討會暨會員大會

特此感謝

互裕股份有限公司

台灣捷邁醫療器材股份有限公司

吉興藥品股份有限公司

順華藥品工業股份有限公司

裕強生技股份有限公司

輝瑞大藥廠股份有限公司

默沙東藥廠股份有限公司

以上依筆劃順序排列