# 馬偕醫學院 生物醫學研究所 2017醣科學研習會

**活動名稱：**

微型醣科學研習會

Mini-symposium on Glycobiology in basic and clinical sciences

活動日期：2017 年 6 月 14 日

活動地點：本校第二教研大樓 G 區 5 樓 525 教室

**研討會議程：**

| 場次 | 講題 | 講者 |
|---|---|---|
| **9:30-9:50** | **報到** | |
| **9:50-10:00** | **致詞** | |
| **第一場** | **引言人:卓文隆教務長** | |
| **10:00-12:00** | **Carbohydrates in our life- not only for sweetness (全英文演講) 及綜合討論** | **李遠川院士** |
| **12:00-13:00** | **午餐** | |
| **第二場** | **引言人:賴宗聖所長** | |
| **13:10-15:00** | **Functions and therapeutic targets of Siglec-mediated infections, inflammations and cancers 及綜合討論** | **楊崑德教授** |
| **15:00-15:10** | **茶敘** | |
| **第三場** | **引言人:莊育裡副教授** | |
| **15:10-17:10** | **Tissue stem cell niche: elements, architect and action 及綜合討論** | **李小玲副研究員** |
| **17:10** | **結束** | |

# 前言

醣(Carbohydrates；碳水化合物)長久以來一直被視為細胞能量的主要來源，目前的研究顯示，"醣"對於人類生理上也扮演著相當重要的角色。蛋白質表面有被醣所附著，這些醣蛋白 (glycoprotein or proteoglycan)多半位於細胞的表面與細胞之間，是細胞與細胞之間辨識彼此與互相溝通的媒介。缺少醣，即使有蛋白質，細胞之間還是無法傳遞訊息。

相較於蛋白質學，醣科學為較新穎的研究學門，其研究領域涵蓋各生物醫學之研究，尤其是多醣與多醣結合蛋白(glycoptrotein or proteoglycan)，在感染性與免疫疾病、癌症、神經性疾病與心血管疾病等疾病中扮演著重要的角色。細胞外的基質(Extracellular Matrix, ECM)中亦含有很多醣類 (e.g. GlycosoAminoGlycans, GAG)及醣蛋白，於幹細胞分化中扮演著微環境(Niche)的角色，我們非常榮幸於此次研習會中，能夠邀請到李遠川院士、楊崑德教授及李小玲副研究員蒞臨，交流分享此方面的知識及研究，目的是提升本所師生的國際視野。

馬偕醫學院生物醫學研究所

所長 賴宗聖 敬上

2017 年 6 月 14 日

## 李遠川教授（Yuan-Chuan Lee, Ph.D.）

- 國立臺灣大學農化系學士〔1955 年〕
- 國立臺灣大學農化系碩士〔1957 年〕
- 美國愛荷華大學生化博士〔1962 年〕
- 1994 年當選中央研究院院士 〔生命科學組〕
- John-Hopkins University., Assistant Professor (1965 — 1970)
- John-Hopkins University, Associate Professor (1970 — 1974)
- John-Hopkins University, Professor (1974 — 2011)
- Research Professor (2011 — )

李遠川教授畢生鑽研醣類化學，以其在「醣類結構分析」的傑出貢獻，榮獲美國化學學會2001年「哈德森獎」（Claude Hudson Award）。

**ABSTRACT**

Carbohydrates are ubiquitous in our life --- food, clothes, houses, furnitures, diseases and medicine. We are most familiar with glucose, fructose, sucrose, and lactose which are important for our energy supplies. However, do you know stones of the Great Walls of China were glued with carbohydrates such as glutinous rice? The Zealander Castle in Tainan was also glued with glutinous rice paste. Many human diseases such as AIDS, TB, influenza, cancers etc. are based on interactions involving carbohydrates. Blood groups such as types A, B, AB, and O are determined by different carbohydrate groups. Interestingly, native Americans and some South Pacific islanders contain only 1~2% of blood group B but Asians and Europeans contain 20~40% of type B group.

There are also other blood groups, but also based on the carbohydrates structures. For example, Lewis-type blood groups can affect infectious and inflammatory diseases. Biological interactions involving carbohydrates often requires more than single sugars. Biologically important carbohydrates are often expressed as branches. Recognition of carbohydrates must deal with intricate branched structures of carbohydrates. Carbohydrate-binding proteins (lectins) typically prefer clustered carbohydrate structures. For instance, our study found that intravenous infusion of radio-labeled hexa-valent lactosides to animals resulted in nearly exclusive accumulation of radioactivity in the liver, which may be used to target liver cancer and/or inflammatory diseases. HIV and influenza infections heavily depend on recognition of cell surface carbohydrates terminated with sialic acid in different linkages. Delineating the carbohydrate-lectin interactions could drastically improve diagnoses and therapies of many diseases.

# 楊崑德教授（Kuender D. Yang, MD, Ph.D.）

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|---|---|---|---|
| • National Defense Medical Center, Taiwan | 1983 | MD | Medicine |
| • National Defense Medical Center, Taiwan | 1989 | Ph.D. | Immunology |
| • University of Utah School of Medicine | 1987-1989 | Post-doc. | Immunology |
| • Harvard Medical School | 1991-1992 | Post-doc | Pharmacology |
| • Johns Hopkins University, Asthma Center | 2007-2008 | Visit Prof. | Glycobiology |

- 1997-2011 Chairman, Dept. Medical Research, Chang Gung Memorial Hospital at Kaohsiung, Taiwan
- 2011-2015 Professor and Director, Dept. Research & Development, Show Chwan Memorial Hospital, Changhua, Taiwan
- 2012- Professor, Institute of Medical Sciences, National Yang Ming University
- 2015- Professor, Mackay Children's Hospital & Mackay Medical College


**ABSTRACT**

Siglecs, sialic acid-binding immunoglobulin-like lectins, belong to a family of immunoglobulin (Ig)-like lectins, which contain two or three unique domains. All Siglecs have at least 2 domains including an extracellular domain with variable (V) and constant (C)-set immunoglobulin (Ig) regions, and a transmembrane domain. Most of the Siglecs (Siglec 2~12, 17, E, F and G) with three domains including intracellular tyrosine-based inhibitory motif (ITIM) associated with Src homology 2 (SH2) tyrosine phosphatases (SHP1/2) usually deliver an inhibitory signal. Certain Siglecs (Siglec 14, 16 and H) containing no intracellular domain carry certain basic amino acids in transmembrane domain coupled with intracellular tyrosine-based activating motif (ITAM) for cell activation.

A dramatically diverse expression of Siglecs is found among mammals. The number of Siglec-encoding genes has been correlated to lifespan of mammals, indicating its evolutional advantage on acquisition of Siglecs in humans. Certain polymorphisms of Siglecs have been associated with premature delivery, infection, schizophrenia, allergy, dementia or chronic obstructive pulmonary disease. Siglecs mainly expressing on leukocytes could interact with cis- or trans-sialic acid (SA) ligands for cell-cell and host-organism interactions on infections, inflammations (acute injury or autoimmunity) and oncogenesis (antigen presentation or immunosuppression).

Amplifying or eliminating the SA–Siglec interactions is a promising strategy to treat cancers, infections and inflammations, based on SA modifications in side chains or nanoparticle decoration, and on the designs of Siglec antibodies in conjugation of drugs or toxins, or in bispecific modalities. This article depicts functions and therapeutic targets of each individual Siglec and provides a summary to target dynamic cascades of the SA-Siglec interaction in 5 different levels.

# 李小玲副研究員（Sheau-Ling Lee, Ph.D.）

Associate Investigator
Institute of Cellular and System Medicine, National Health Research Institutes
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Associate Professor (Joint Appointment)
Biotechnology Center, National Chung Hsing University, Taichung, Taiwan


**RESEARCH OF INTERESTS:**

Molecular and cellular identification of stem cell niche.
Function and regulatory mechanism of stem cell-niche interaction/communication.
Molecular and cellular events governing neurogenesis: neural stem/progenitor cell proliferation, differentiation and migration, and their effects during neurodegenerative process.
The role and function of membrane-associated proteases in stem/progenitor cells mobility and stress responses.
Neuroprotective and neurogenerative applications in neurodegeneration disorders.


**ABSTRACT**

Adult tissues harbor stem or progenitor cells that are responsible for tissue regeneration during injury. These tissue stem/progenitor cells reside in specialized microenvironment termed “niche”. Stem cell niches are created by a subset of differentiated cells and a rich milieu of extracellular matrix which protects and supports stem cells allowing stem cells to manifest their unique intrinsic properties. Changes of tissue stem cell niche have been seen to associate with diseases and aging. Signaling by secreted factors and cell-cell contact communication have all been shown to be crucial regulatory factors for stem cell. Many of the stem cell niche effectors are glycoproteins. This talk will review some of the current knowledge on stem cell niche and discuss the role of a transmembrane protease in brain neural stem cell and neurovascular niche.