

# 1121 Semester

## NMR Spectroscopy-based Metabolomics

Credit: 2

Coordinator: Dr. Der-Lii Tzou

Time: 10:00-12:00, Thursdays

Venue: A507, Institute of Chemistry, Academia Sinica

### Major Topics:

- Basics of NMR spectroscopy
- Detections and analyses of metabolites in urine and serum samples
- NMR spectroscopy-based metabolomics applications
- Hand-on practice

### Summary:

Metabolomics is well accepted as a truly translational tool for precision medicine nowadays. Among other techniques, NMR spectroscopy has become a promising and reliable approach that is able to analyze disease related metabolism for a decade. In this new elective course, we proposed to deliver lectures covering a few topics, including basics of NMR spectroscopy (4 hr), detection and analyses of low molecular weight metabolites in human urine and serum samples (8 hr), application to various disease diagnoses (cancer, diabetes, cardiovascular and neurodegenerative diseases) (8 hr), as well as hand-on practice (4 hr) in Biopark NMR lab, see course syllabus. Lecturers include: Prof. M-S Hsiao (previous National Yang Ming Chiao Tung University faculty), Prof. D-L Tzou (IoC, AS), Dr. C-K Chang (Taiwan Biobank) and Dr. Y-C Lou (BioTReC, AS).

### The aims are

- Familiar with basics of NMR spectroscopy
- How to assign the NMR signals for urine and serum samples
- What are the information can be extracted from the NMR signals
- Introduction to in vitro diagnosis report (IVDr)
- How to analyze the information for profiling and diagnosis
- Applications NMR spectroscopy-based metabolomics to various diseases, including cancers, diabetes, cardiovascular and neurodegenerative diseases
- Hand-on practice experience

At the end of the course, students will take NMR measurement of urine sample by themselves and conduct an official IVDr, while using their urine samples for example.

Course Syllabus:

Week	Date	Topic	Professor
1	9/7	Introduction	Der-Lii Tzou
2	9/14	NMR Spectroscopy-Fundamental and Principle	Der-Lii Tzou
3	9/20	NMR Spectroscopy-Fundamental and Principle	Der-Lii Tzou
4	9/27	Detection and analysis of metabolites I	Chung-Ke Chang
5	10/05	Detection and analysis of metabolites II	Chung-Ke Chang
6	10/12	Detection and analysis of metabolites III	Chung-Ke Chang
7	10/19	Detection and analysis of metabolites IV	Chung-Ke Chang
8	10/26	Applications of NMR-based metabolomics I - Preface	M-S Hsiao
9	11/02	Applications of NMR-based metabolomics II - Cancers	M-S Hsiao
10	11/09	Applications of NMR-based metabolomics III- Diabetes	M-S Hsiao
11	11/16	Applications of NMR-based metabolomics IV - Cardiovascular and neurodegenerative diseases	M-S Hsiao
12	11/23	Midterm	
13	11/30	<i>In vitro</i> diagnosis report	Yuan-Chao Lou
14	12/07	Hand-on practice (NMR lab in Biopark)	Yuan-Chao Lou
15	12/14	Hand-on practice (NMR lab in Biopark)	Yuan-Chao Lou
16	12/21	Final Presentation and Report	Der-Lii Tzou
17	12/28	Final Presentation and Report	Der-Lii Tzou

Grading: Midterm Exam: 50%      Final Presentation: 40%      Attendance: 10%

\*\*TIGP-CBMB students have priority to take the course. Other students can take it if there is capacity.