

### **April 2nd, 2024 (Tuesday): Metabolomics as a tool to investigate natural products**

**10:00 – 11:00** Introduction to metabolomics (Robert Verpoorte)

**11:15 – 12:45** Application of metabolomics to medicinal plant research (Alvaro Viljoen)

**14:00 – 15:00** Revisiting Traditional Chinese Medicine by Metabolomics (Mei Wang)

### **April 3rd, 2024 (Wednesday): How to prepare samples, extract,**

**10:00 – 11:00** Sample preparation (Hye Kyong Kim)

**11:00 – 12:00** Sample Preparation and Extraction (Ria & Kim)

Divide into 2 groups (A & B)

- 11:00-11:30 Group A: Watch video: sample preparation (Kim, 1.5.03), Group B: Demonstration in the Lab (Ria, NPL lab)
- 11:30 - 12:00 Group A: Demonstration in the Lab (Ria, NPL lab)

Group B: Watch video: sample preparation (Kim, 1.5.03)]

**12:00 – 12:30** Q & A for sample preparation and extraction (Kim & Ria, 1.5.03, If necessary)

### **April 4th, 2024 (Thursday): How to separate metabolites**

**10:00 – 12:00** Basic chromatography theory for liquid chromatography (Erica G. Wilson)

**14:00 – 16:00** Basic of multivariate data analysis (Harald van Mil)

### **April 5th, 2024 (Friday): How to process analytical data for statistical and multivariate data analysis**

**10:00 – 12:00** TLC application to medicinal plant metabolic fingerprinting (Tien Do)

**12:15 – 13:00** Chromatography and spectroscopy data processing for metabolomics (Jeroen Jansen)

### **April 8th, 2024 (Monday): Practice of NMR and NMR measurements**

**10:00 – 11:30** Identification of Metabolites by MS spectrometry (Rob van der Heijden)

**13:00 – 14:00** LC-MS demonstration (Ozlem, 4<sup>th</sup> floor LC room)

### **April 9th, 2024 (Tuesday): Practice of MS data processing**

**10:00 – 12:00** Gas Chromatography-based metabolomics: theory and applications (Joachim Kopka)

**14:00 – 15:00** GC-MS and LC-MS data processing (Hocelayne Paulino Fernandes, and Özlem Erol, room 1.5.03)

**15:15 – 15:45** Q & A for LC-MS data processing (if necessary)

### **April 10th, 2024 (Wednesday): How to analyse metabolites by NMR**

**10:00 – 12:00** NMR based metabolomics: Theory and Applications (Jan Schripsema)

**14:00 – 15:00** NMR facility demonstration (Young Hae Choi)

### **April 11th, 2024 (Thursday): How to apply metabolomics to plant sciences**

**10:00 – 12:00** Integrating metabolomic data from multiple analytical platforms for a comprehensive characterization of lemon essential oil (Serge Rudaz)

**14:00 – 16:00** Strategies for unambiguous identification of biomarkers (Jean-Luc Wolfender)

### **April 12th, 2024 (Friday): Structure elucidation of amino acids I and II**

**10:00 – 12:00** Structural elucidation of amino acids I (Young Hae Choi)

**14:00 – 16:00** Structural elucidation of amino acids II (Young Hae Choi)

### **April 15th, 2024 (Monday): Structure elucidation of amino acids III**

**10:00 – 12:00** Structural elucidation of amino acids III (Young Hae Choi)

### **April 16th, 2024 (Tuesday): Structure elucidation of sugars I and II**

**10:00 – 12:00** Structural elucidation of sugars (Young Hae Choi)

**14:00 – 16:00** Structural elucidation of sugars (Young Hae Choi)

### **April 17th, 2024 (Wednesday): Additional MS-based techniques for metabolomics**

**10:00 – 12:00** DART mass as a tool of metabolic profiling technique (Young Pyo Jang)

**14:00 – 16:00** Ambient mass spectrometry a useful tool for metabolomics (Teris van Beek)

### **April 18th, 2024 (Thursday): How to apply metabolomics to clinical studies**

**10:00 – 11:30** Metabolomics in human health and disease (Martin Giera)

**14:00 – 16:00** NMR-based profiling of intra – and extracellular metabolome (Sarantos Kostidis)

### **April 19th, 2024 (Friday): How to apply metabolomics to medicinal plants studies and concluding remarks**

**10:00 – 11:00** Metabolomics in Industry (Doris Jacobs)

**11:15 – 12:00** Concluding remarks (Robert Verpoorte and Young Hae Choi)

**12:15 – 13:00** Course evaluation