UNIVERSITY OF TURKU

This document contains the following presentations (update Nov.9)

Chair's introduction to the session and subthemes: Sustainability and Technology related to food

Professor Pasi Kallio; Tampere University, Faculty of Medicine and Health Technology
Organ-on-chip technology for food research

Professor Tie Li; SIMIT, CAS, State Key Lab of Transducers Technology
High performance micro-nano sensor

Professor Wenguo Cui; Shanghai Jiaotong University, Ruijin Hospital
International Centre of Advanced Biomedical Materials

Professor Hongbo Zhang; Åbo Akademi University, Pharmaceutical Sciences Laboratory *Functional Materials for Healthcare*

Professor Xuetao Wei; Peking University, Department of toxicology
Food safety and functional ingredients

Professor Yiming Zhang; Zhejiang A&F University, FOOD and Health college
Paper microfluidic flow device for food safety analysis

Professor Baoqing Zhu; Beijing Forestry University, Department of Food Science
The Quality Formation Mechanism of Forest Fruit and its Processed products -- from the five-year cooperation between Beijing Forestry University and University of Turku, Finland

Professor Liwei Pan; Dalian University,College of Environmental and Chemical Engineering *The development of sustainable solutions in Dalian University*

Associate Professor Wei Yang; Jiangnan University, School of Food Science and Technology
Enzymatic Acylation of Anthocyanins from Multiple Sources

Professor Marina Heinonen; University of Helsinki, Department of Food and Nutrition
Food ingredients and technologies for sustainable food production

Associate Professor Yue Huang; China Agricultural University, College of Food Science and Nutritional Engineering; *Nondestructive assessment on food quality and safety*

.Assistant professor Maaria Kortesniemi, University of Turku, Food Chemistry and Food Development Unit
Applications of NMR metabolomics in food authentication and quality control

Senior researcher Silvia Gaiani; University of Helsinki, Ruralia
Assistant professor Jian An Huang; University of Oulu*: Optical Nanotechnologies for Single Cell, Single Particle and Single Molecule Point of Care Biosensors*

Professor Leiqing Pan; Nanjing Agricultural University: Application of optical technology and biosensor in rapid quality inspection of food products

Tampere University
Tampere University of Applied Sciences

Sub-Group 3: Food and Health Technologies

Finland – China Food and Health network

November 1st,2021

Prof. Pasi Kallio, Tampere University, Faculty of Medicine and Health Technology

Dr. Tuomas Valtonen, University of Turku

Research Aim

Develop and study technologies widely in relation to nutrition, food and health with the following focus areas:

- Food quality and composition analysis
- Food consumption / human nutrition monitoring
- Food production, processing and packaging
- Understanding and treatment of nutrition related diseases and responses to food

Examples of Research Topics

- Food quality and composition analysis
  - Technologies for improving food safety e.g. automated hygiene monitoring
  - Biosensors for food safety
  - Microfluidic chips with integrated sensors
  - Electronic nose technologies

- Food production, processing and packaging
  - Technologies for extracting valuable compounds from biomass, optimization of extraction processes from lab scale to pilot scale
  - Characterization of safety of compounds and ingredients using advanced in vitro and animal tests
  - Pilot scale production and analytical equipment (automation and robotics)
  - Digital twins and VR
  - Technological solutions that can increase food quality and extend the shelf life of food products

Examples of Research Topics

- Food consumption / human nutrition monitoring
  - Technologies for determining impacts of food and diet on human metabolism and health (Metabolomics)
  - Sensors for monitoring health / wearable health technology
  - Diagnostics of diet, nutritional and health status and technologies for determining personalized nutrition
  - Smart analysis technologies for monitoring consumer behaviour related to health and dietary data

- Understanding and treatment of nutrition related diseases and responses to food
  - Digital health interventions
  - Organ-on-chip technology for food-related diseases

Thank you!

Looking forward to collaboration with our Chinese colleagues

Finland – China
Food and Health Network

theme:
SUSTAINABILITY
OF FOOD, QUALITY AND SAFETY

Marina Heinonen

Professor (Food Safety)

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

SUSTAINABLE DEVELOPMENT GOALS

FAO SDGs

European Green Deal → climate neutral by 2050

RESEARCH GOALS & PRIORITIES

Mission 1

Healthy, safe, and sustainable diets are viable for all Finnish citizens by 2035

Combine research expertise in nutrition, food technology and behavioural sciences to understand the impact of healthy foods, healthy eating and support nutritionally high-quality food choices

Mission 2

Food system in Finland is based on sustainable, competitive, resilient food and feed production by 2035 – and beyond

To reach environmentally sustainable food and feed production with economic, social and cultural sustainability by inter- and transdisciplinary research

Mission 3

Resource efficient and zero waste are key determinants in the Finnish food system by 2035

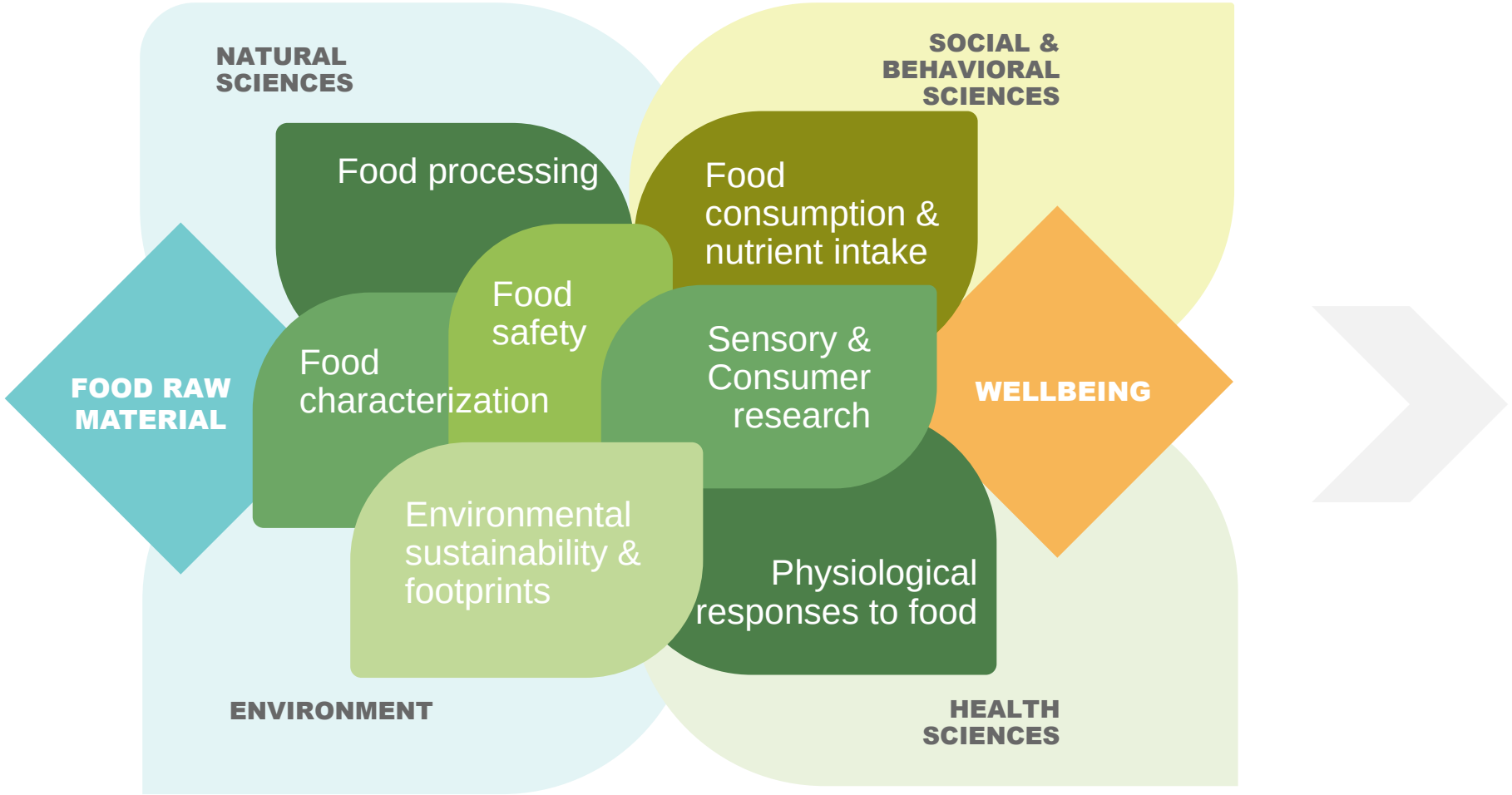
To identify and valorize side streams for high resource efficiency and zero waste agrofood system

Mission 4

Finland will be a forerunner and leading test-bed for sustainable food system research and innovations

Combining technology and natural sciences with human-social sciences to empower the food system related research in Finland

MULTIDISCIPLINARY COLLABORATION for SUSTAINABLE FOOD SYSTEM & HUMAN WELLBEING



LOOKING FORWARD TO COLLABORATION BETWEEN CHINESE AND FINNISH PARTNERS

research projects
research visits
workshops
education

Organ-on-chip technology for food research

Finland – China Food and Health network

1.11.2021

Prof. Pasi Kallio

Organ-on-chip?

- Cell cultures – more and more in 3D - that combine tissue engineering and microtechnologies to recapitulate the way a tissue or part of an organ work
- The goal is not to build a whole living organ but provide minimal functional units that have desired tissue- and organ-level functions
- Why?
  - To overcome limitations faced in traditional 2D in vitro cell culture models and animal models
- Where?
  - Drug development,
  - toxicity assesment,
  - understanding mechanisms of actions in diseases

Tampere University
Tampere University of Applied Sciences

Centre of Excellence in Body-on-Chip Research

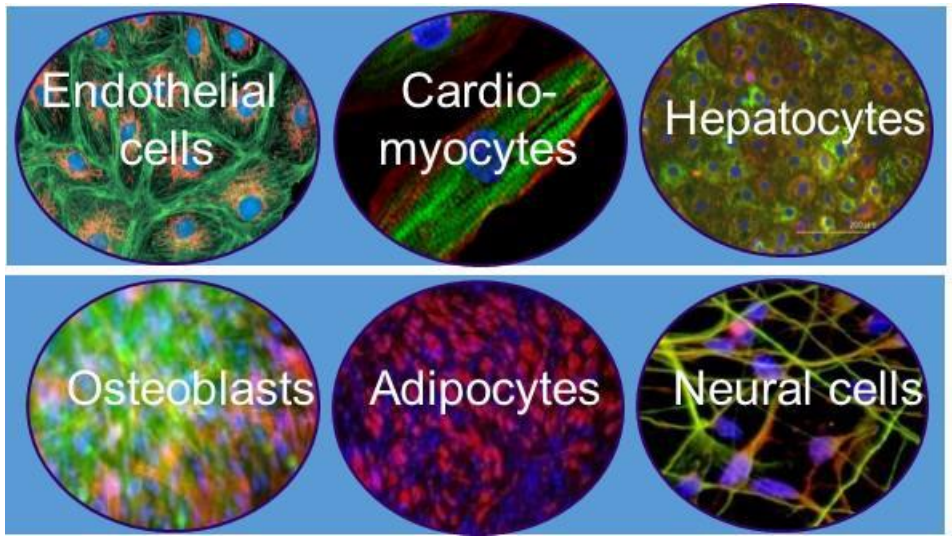
CoEBoC

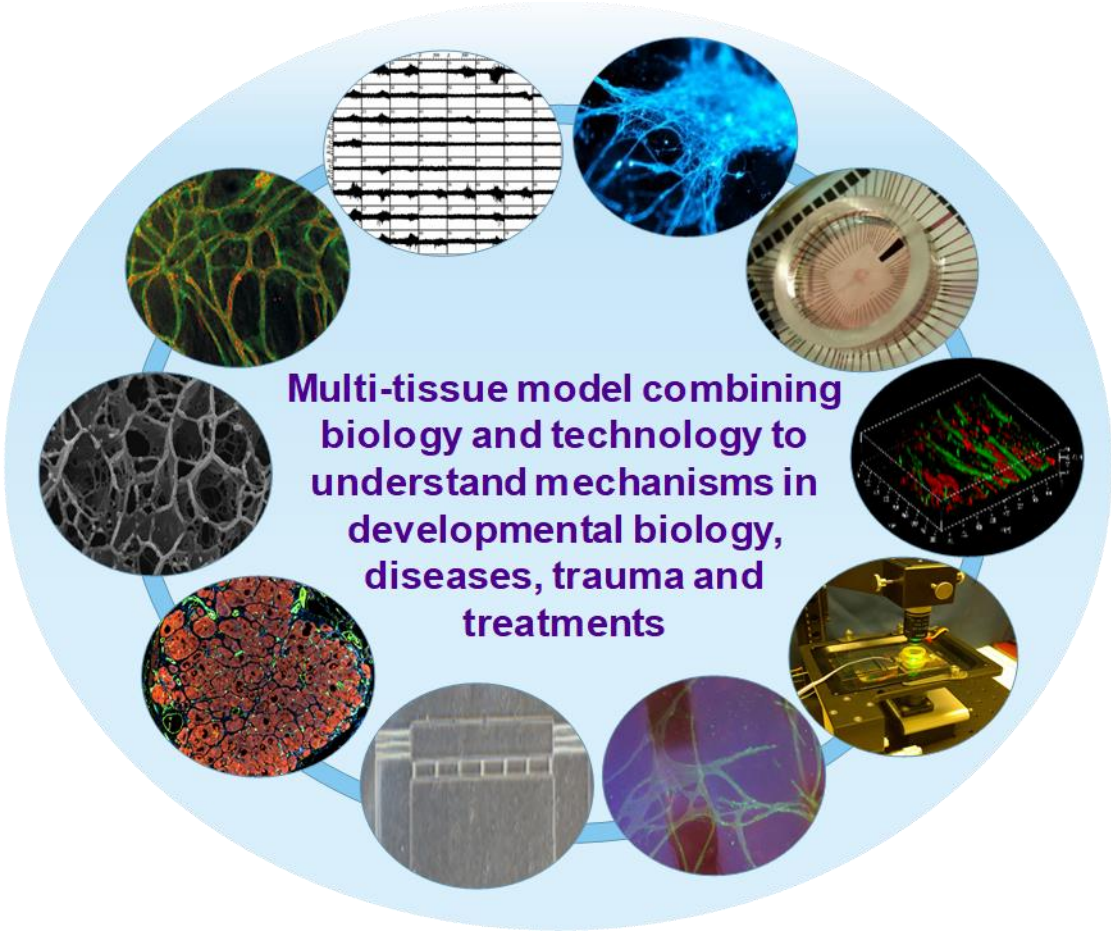
Tampere University

Centre of Excellence in **Body-on-Chip** Research

Multidisciplinary Research Consortium

- CoEBoC combines knowhow in **biological and engineering** sciences and aims to develop a new “body-on-chip” platform.





Tampere University
Tampere University of Applied Sciences

Expertise in CoEBoC

Engineering

Biomaterials and Tissue Engineering Group – Kellomäki

- **Biomaterials**
- **Hydrogels**

Computational Biophysics and Imaging Group – Hyttinen

- **3D- imaging**
- **Computer modelling**

Micro- and Nanosystems group – Kallio

- **Chip design and production**
- **Microfluidics**
- **Sensors**

Stem cell biology

Adult stem cells group – Miettinen

- **Mesenchymal stem cells**
- **Vascularization**
- **Adipose tissue and bone**

Heart group – Aalto-Setälä

- **Cardiomyocytes**
- **Hepatocytes**
- **Human iPS-cell lines**

Neuro group- Narkilahti

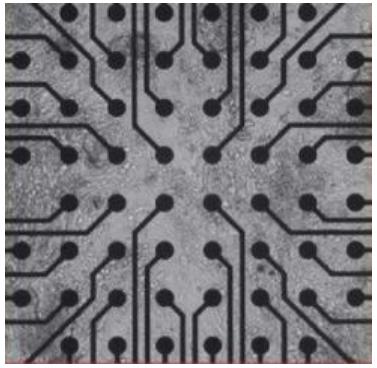
- **Neuronal cells**
- **Innervation**

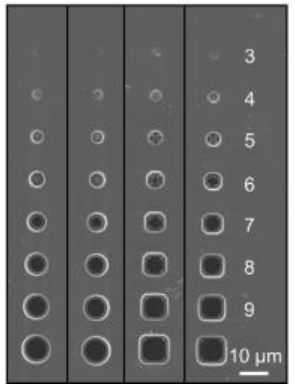
Gut-on-Chip

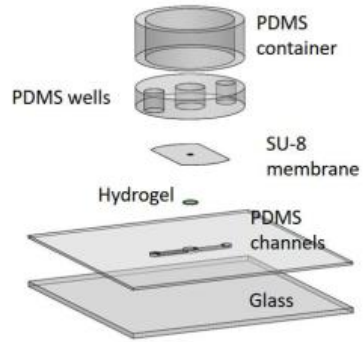
- 3D villi & crypt structure in the intestinal epithelial wall
  - Intestinal enterocytes, enteroendocrine cells, goblet cells, and Paneth cells
- Peristalsis and luminal flow
- Exposure to microbes (gut microbiome)
- Intestinal barrier formation

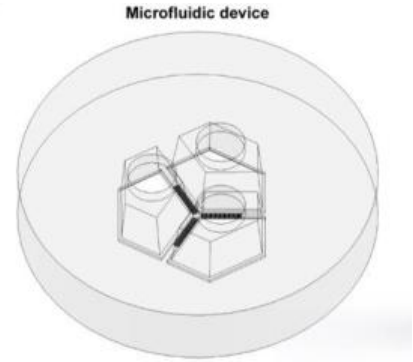
Technologies at Tampere University

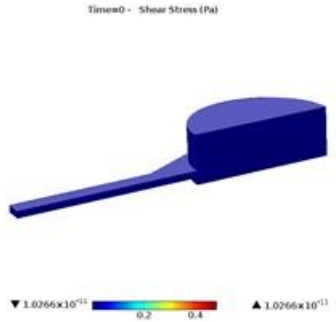
- Chip fabrication
- Membranes
- Hypoxic conditions
- Flow
- Stretching
- Impedance measurement
- hiPSC derived intestinal epithelial cells

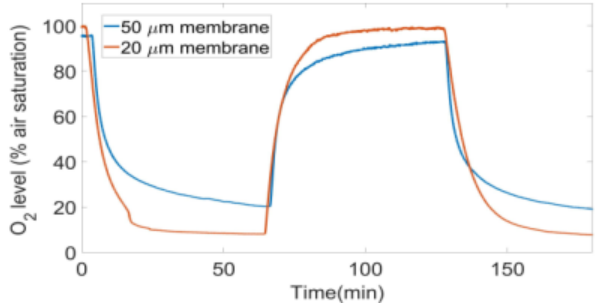


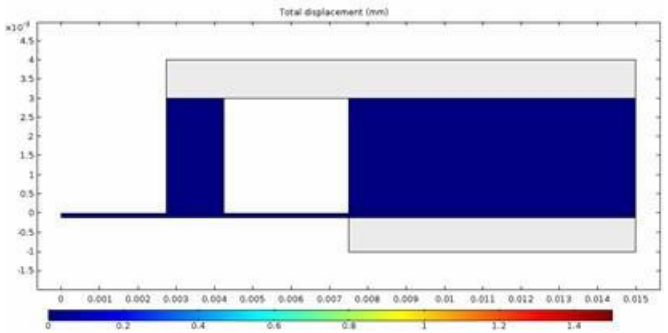


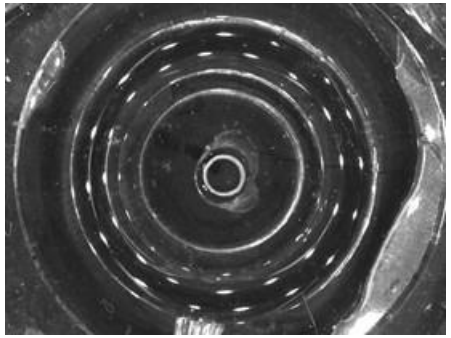












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THANK YOU!

Interested in collaboration?

Prof. Pasi Kallio
Pasi.kallio@tuni.fi

High Performance Micro-nano Sensor

— Biomimetic Olfactory Sensor

Tie Li

Shanghai Institute of Microsystem and Information Technology, CAS

Key Laboratory of Science and Technonlgy on Microsystem

State Key Laboratory of Transducer Technology

CMOS Camera

Vision

Microphone

Hearing

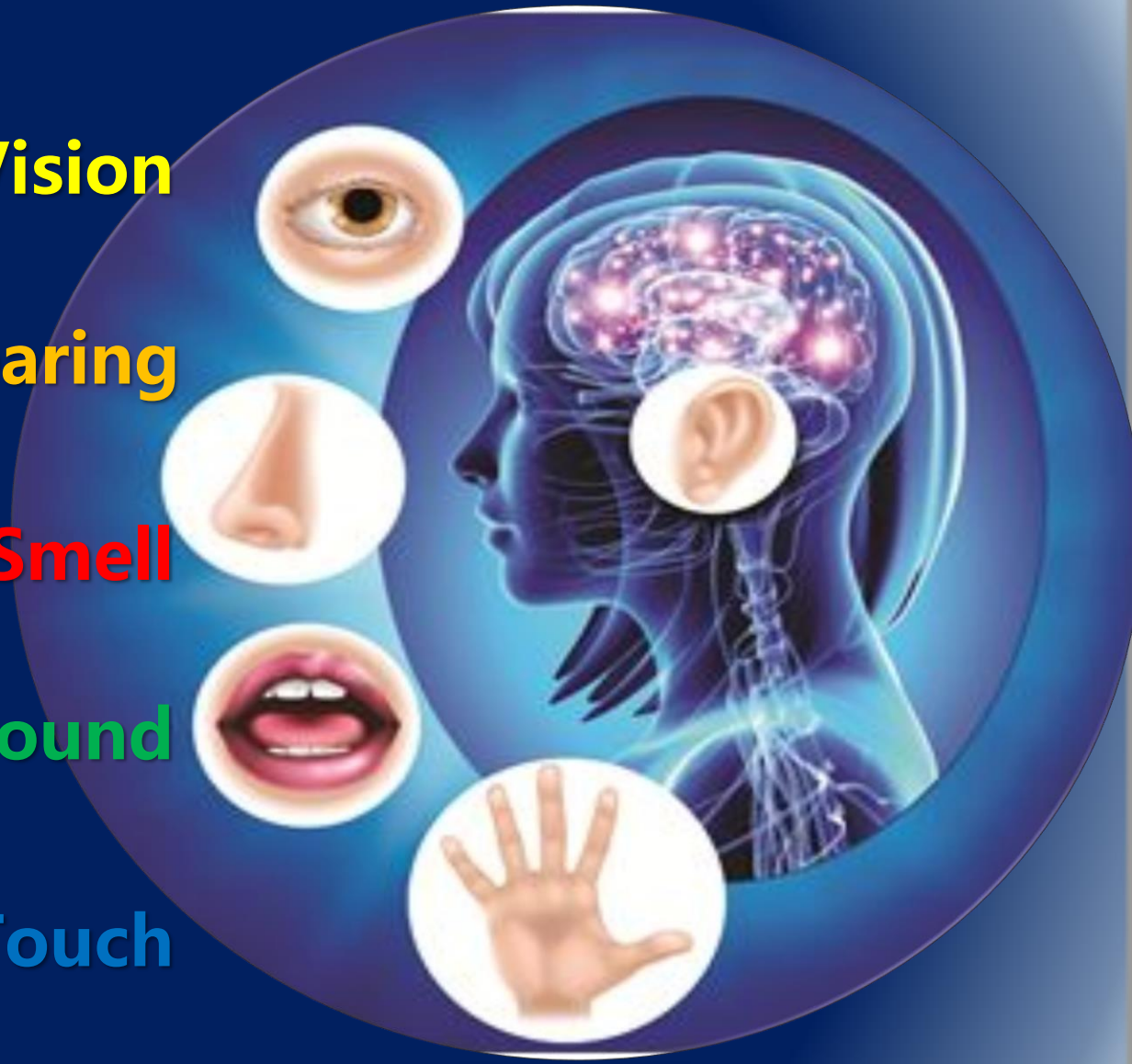
Smell

Speaker

Sound

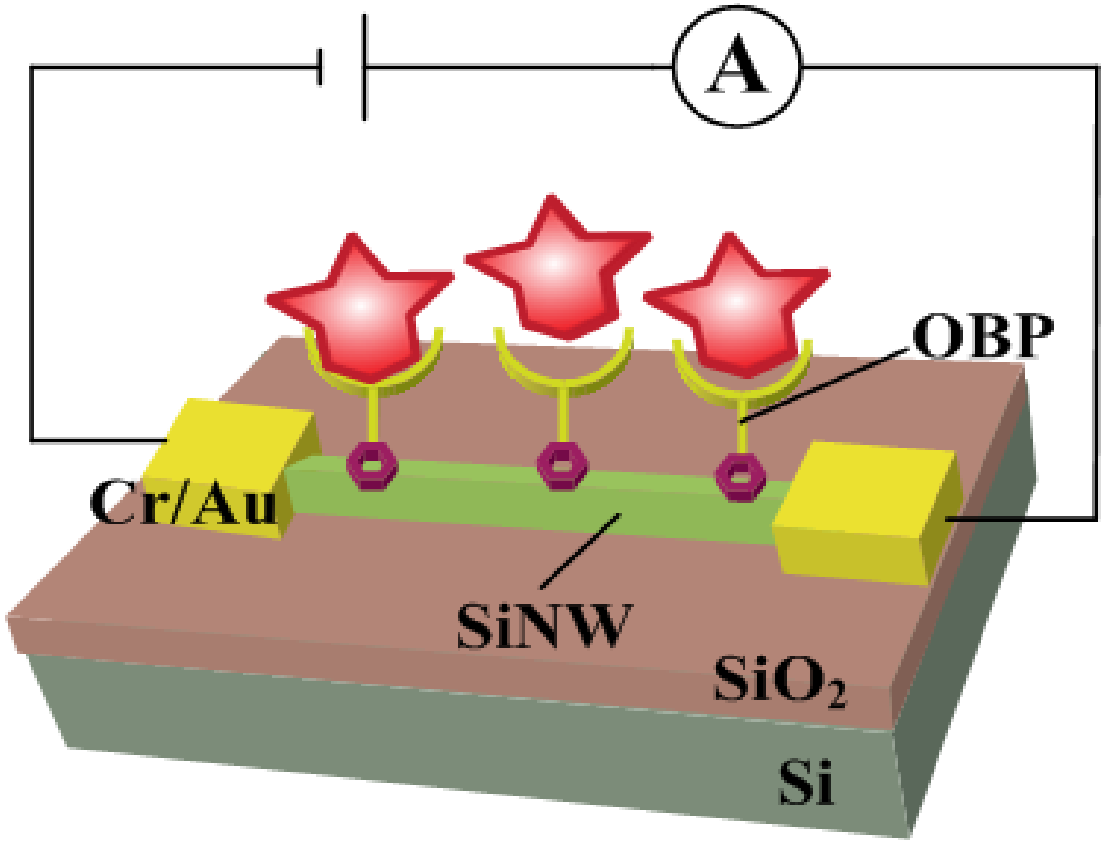
Touch Screen

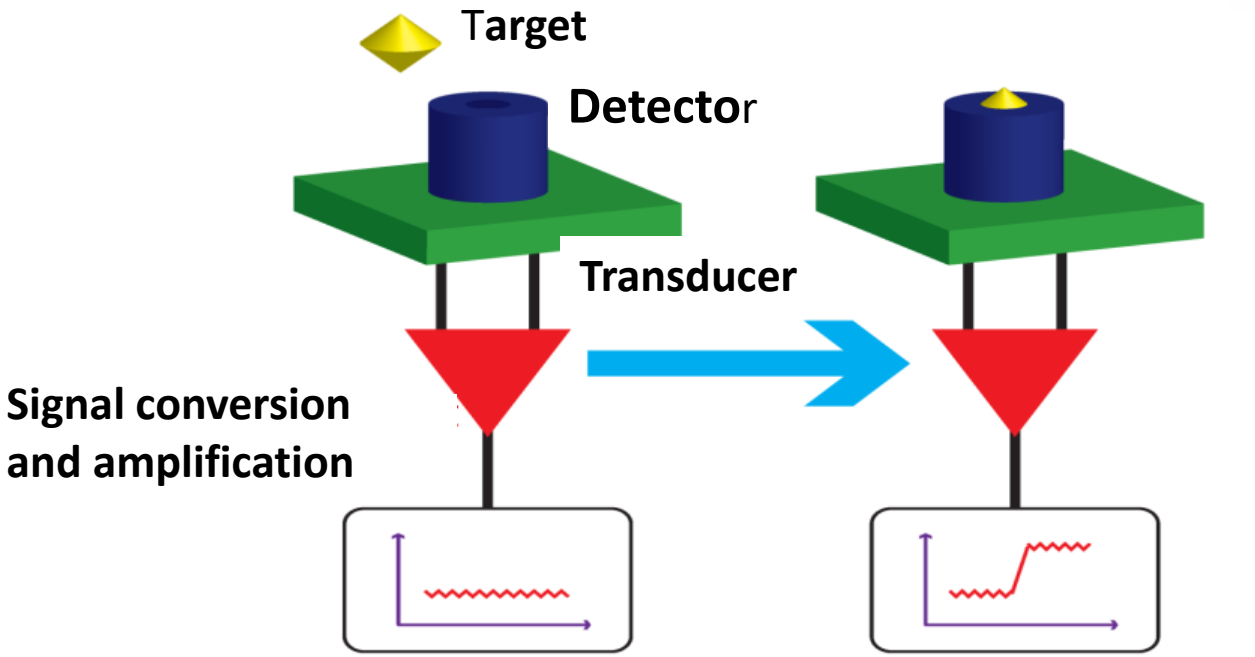
Touch



Biomimetic Olfactory Biosensor

Highly sensitive and reliable Biomimetic olfactory sensor：SiNWs and OBP molecules

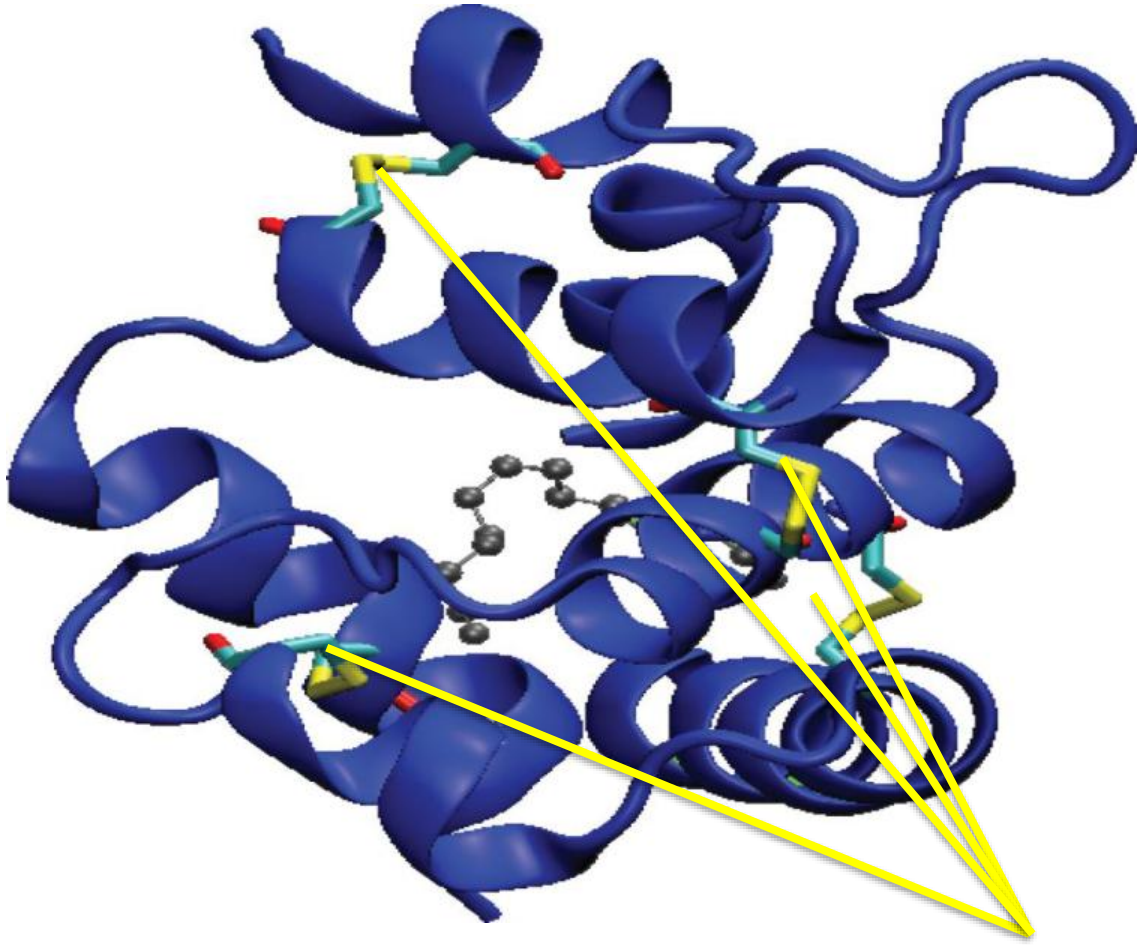




- **Senseing Principle**
  - The SiNWs sensor is modified with biomolecular to absorb odor molecules, resulting in the change of charge density on the SiNWs surface, and to recognize the odor molecules by sensor.

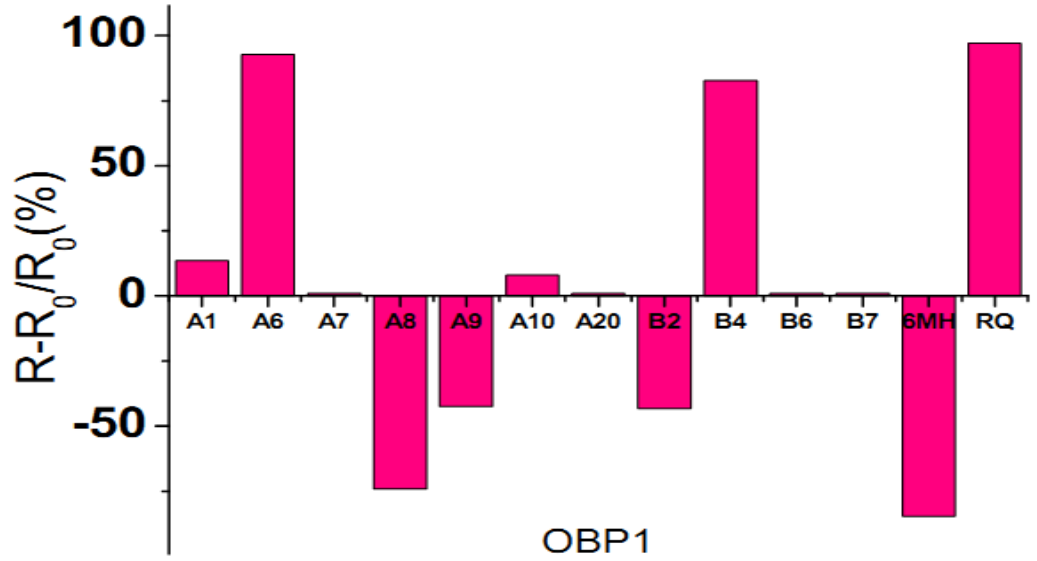
Anopheles mosquito Odor molecule Binding Protein(OBP)

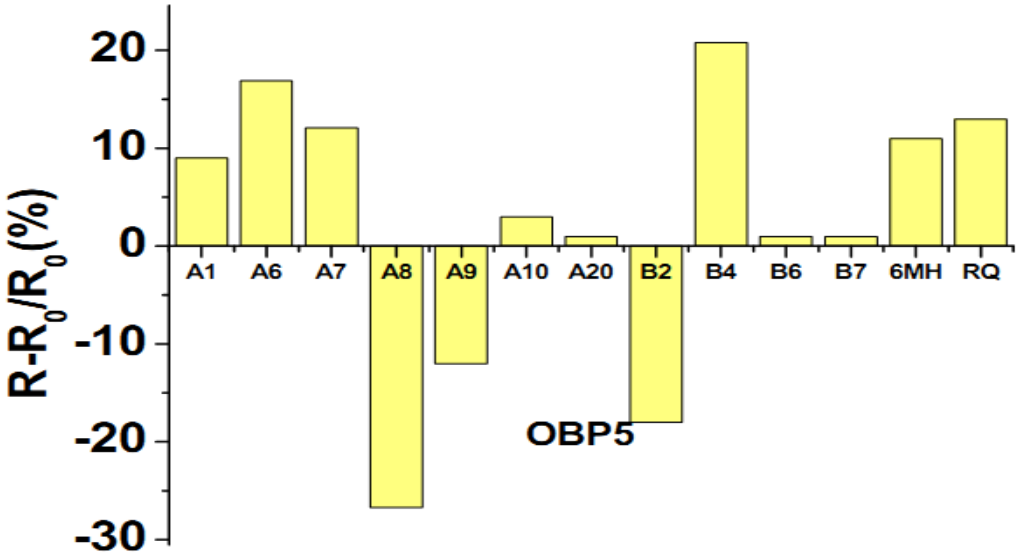
- Low molecular weight
- High structural stability
- Water solubility
- Temperature resistance

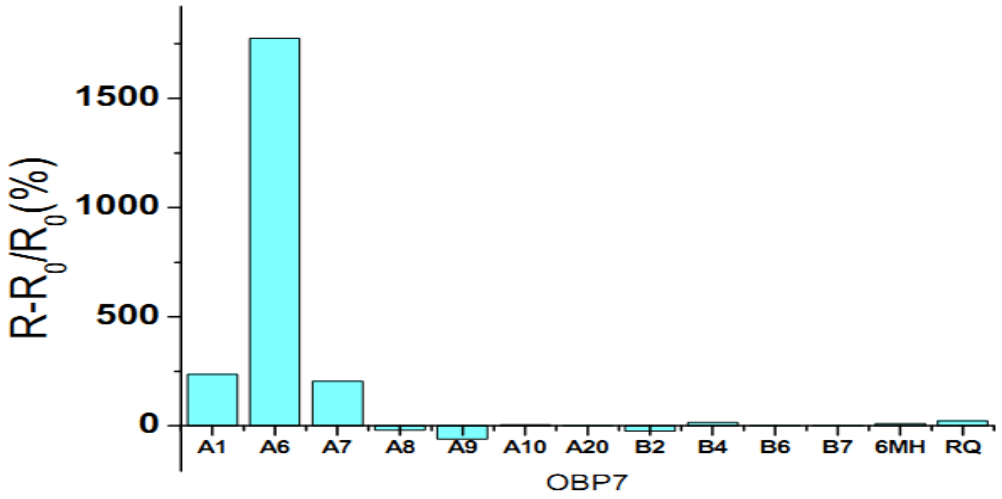


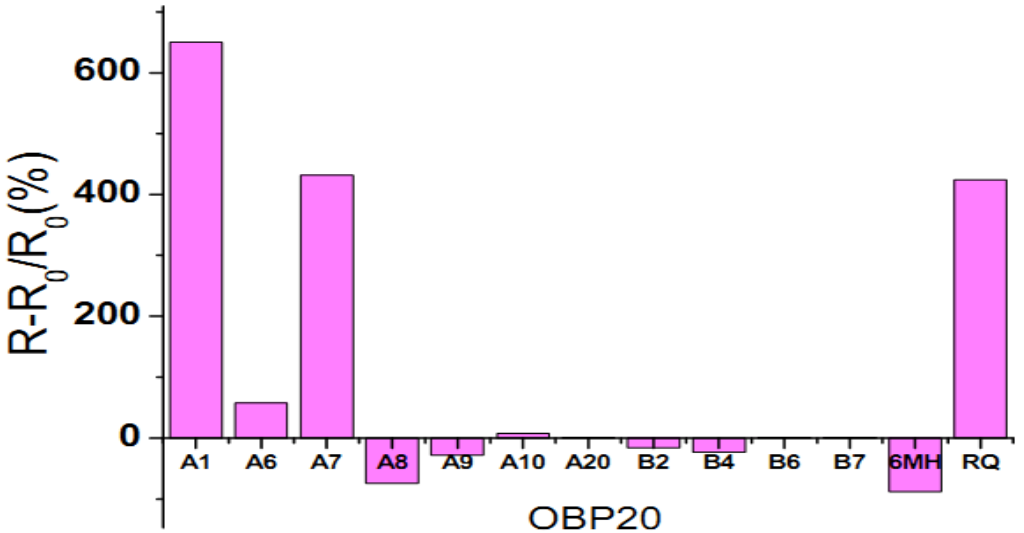
Disulfide bond

Test results of SiNWs Odor Biosensor









Conclusion

- Leaning from nature can get high-performance bionic sensors
- Bionic olfactory sensor can recognize different odor molecules and It is an important tool for human food safety and health protection in the future.

THANKS !

Tie Li
SIMIT,CAS
Tel. : +086-135019709598
Email : tli@mail.sim.ac.cn

Finland-China International Center for Advanced Biomedical Materials

Wenguo Cui

Ruijin Hospital, Shanghai Jiao Tong University
School of Medicine

上海交通大學
SHANGHAI JIAO TONG UNIVERSITY

目录

Opening ceremony

In April 2018, Director Lianfu Deng from Ruijin Hospital hosted the Prof. Niklas Sandler, vice Rector from Åbo Akademi University in Shanghai and established the "**International Center for Advanced Biomedical Materials**".

Nordic POP-China Forum on Clinical and Translational Medicine

Åbo Akademi

NORDIC POP

In August 2019, Director Lianfu Deng visited Finland and further discussed the arrangement of "International Center for Advanced Biomedical Materials" with Prof. Jessica Rosenholm.

Collaboration agreements

转化医用材料国际联合实验室

转化医用材料国际联合实验室合作协议

甲方：上海市奉贤区人民医院（上海交通大学附属第六人民医院南院）

乙方：上海交通大学医学院附属瑞金医院

丙方：埃博学术大学

二、合作内容

1、三方合作实现转化医用材料的国际联合，促进医用材料的临床转化及应用；

2、三方可以共同申请各类联合基金，在各自单位经费配套政策下，给予申请基金的配套支持；

3、鼓励三方联合招聘博士后科研人员，在本合同范围内，围绕三方感兴趣研究方向，甲方与乙方或丙方联合招生与培养高水平博士后，甲方将资助乙丙两方招聘的博士后人员的生活费（不低于 18 万 RMB/年/人），乙、丙方将负责匹配在该方进行的科研经费（不低于 2 万欧元/年/人）。博士后导师应该由甲乙方、甲丙方联合担任（博士后），博士后导师均为科研成果通讯单位。成果与知识产权归属合作方共同所有；

4、三方可互派科研人员进行互访，人员费用共同商议决定；

5、三方可定期开展学术交流，三方交流时间、地点等共同商议决定。

Party A（stamp and representative signature）: Shanghai Jiao Tong University Affiliated Sixth People's Hospital South Campus（Shanghai Fengxian District Central Hospital）

乙方（盖章及代表签名）：上海市伤骨科研究所

Party B（stamp and representative signature）: Shanghai Institute of Traumatology and Orthopaedics

丙方（盖章及代表签名）：埃博学术大学

Party C（stamp and representative signature）: Åbo Akademi University

ÅBO AKADEMIS SIGILL

二０一八年四月十七日

17th April, 2018

Main Cooperation Contents and Achievements (2018-2021)

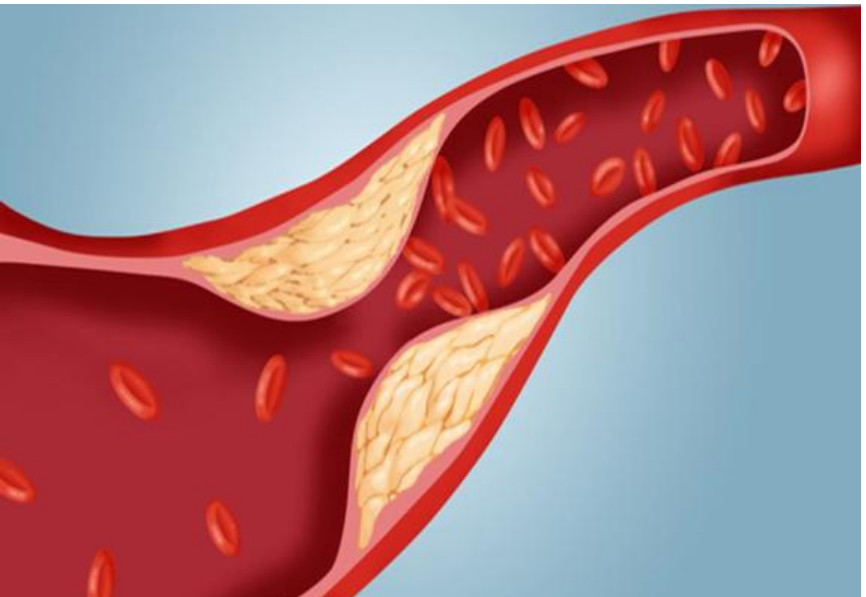
- **International cooperation:** Promting the medical material transformation and clinical transformation.
- **Personal exchange:** 6 visiting Professors visited Finland druing 2018-2021.
- **Postdoc requitement:** 2 Postdocs from Ruijin Hospital to carry out cooperative projects in Finland.
- **Joint PhD student requitement:** 8 PhD students have enrolled in the ÅAU PhD program.
- **Joint Project application:** 4 joint projects have been awarded by China (1 from China government and 3 from Shanghai).
- **Co-publications:** 23 co-publications have been published, including 17 papers with impact factor of 10+.
- **Infrastructure:** Ruijin hospital has received governmental funding from Jiaxing city in November 2020 to build a research center, which will provide lab spaces for hosting the visitors from ÅAU, especially on animal experiments.

Future Prospective

- **International mobility:** We welcome the international experts from Finland to visit us at any time and we will also send our researchers to Finland.
- **Joint PhD student requitement:** 10 PhD students/year will be enrolled in the ÅAU PhD program. Ruijin hosptial will provide partially funding support.
- **Joint Project application:** apply joint and frontier grants from Finland and China.
- **Co-publications:** 5-10 joint papers/year. We only focus on papers with high impact and clinical translational potential.
- **Collaboration with FCFH:** we hope to collaboration with FCFH and to promote the Finland-China collaboration in health.

Thanks !

Food Active Ingredients , Nutrition & Health



Prof. ZHANG, YUMEI(张玉梅)

School of Public Health, Peking University, Health Science Center

zhangyumeisphn@pku.edu.cn

Our team—A happy family !

"Dounai group"(豆奶一族： dou means soybean,nai **means milk)**

2 Professors, both Ph.D supervisor;
Dr. Peiyu Wang , Dr. Yumei Zhang

1 Associate Professor;
Dr. Jianghua

1 (Tsinghua) Assistant Professor; Dr. Ai Zhao

1 Biostatistics: Dr. Yingdong Zheng

1 Postdoc, Dr. Linwei Tao

5 Ph D Students,

4 Graduate Students for MS

Here comes the Team

In past 5 years we undertake projects over RMB 350 M

- **Projects Undertaking:**
- **11** NSFC(National Natural Science Foundation of China) projects, I am PI **5** of them;
- **1** National Scientific key projects of 13th five year plan
- **2** Beijing Major Science and Technology Project; **1** Hebei Major Science and Technology Project; **1** Key Project of NSFBJ
- Cooperate Universities: University of TURKU, UC DAVIS, University of Iceland;
- Cooperate with diary companies: Nestle, Arla, Fonterra, BASF, DSM , Chinese local companies such Yili, Mengniu, Sanyuan, Junlebao etc.
- Cooperated with 10 plus Chinese universities, 15 maternal and children's hospitals, 20 plus community hospitals

Plant active Ingredients

- ✓ Soy Isoflavones and soy active ingredients on Cardiovascular disease & mechanism;
- ✓ Sea buck thorn fruits juice on hyperlipidemia & prediabetes—cooperated with University of Turku);(2 RCT)
- ✓ Phytosterols esters added to bovine milk & hypercholestromia
- ✓ β-conglycinin of soybean; (1 RCT)
- ✓ Lactobacillus casei N1115; (2 RCT)
- ✓ Prebiotics(inulin) on lactose deficiency (1 RCT)
- ✓ Anthocyanins from purple potato, blue berries
- ✓ DHA at different position of triglycerides

RCT: randomized clinical trials

16 years of experience: from rural Hebei to national and international multi center breast milk research

2005
Hebei rural areas
50 samples

Laishui, Hebei Province

2011 Maternal Infant Nutrition & Growth
580 samples

MING Study
Beijing, Suzhou, Guangzhou

2016
80samples

Multicenter: China, Finland, Spain, South africa

Over 5000 samples
*13th 5 years Key projects

2018
Chinese North & South Cohort

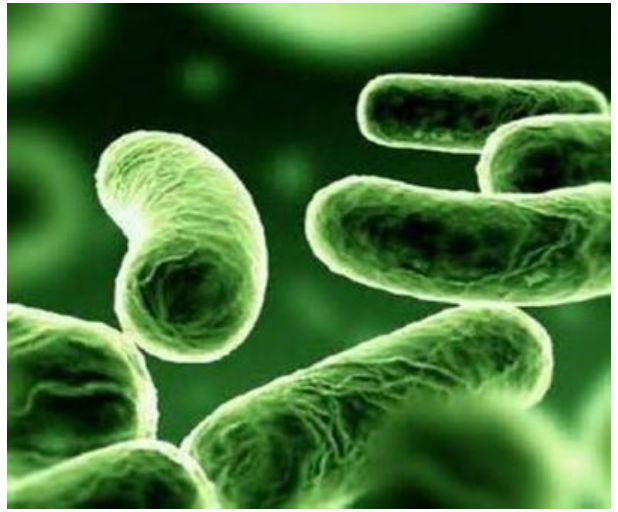
Breastfeeding cohort study

Milk active Ingredients

----Nutrients or active ingredients of foods

- ✓ Chinese breast milk fatty acids, milk microbiota, mycobiome & NMR metabolomics are different from Finland, Spain, South Africa; ---multicenter study
- ✓ The trend of bioactive protein such as α-lactoalbumin osteopontin， gangliosides, fatty cids, human milk oligosacchrides in human milk whey and casein);--- longitudinal study
- ✓ Probiotics on children and adult health:
  - ✓ Lactobacillus casei N1115 from Tibet traditional yogurt on Hyperlipidemia; the safety and improve immune fucnction on infants and toddlers（2 RCT）
  - ✓ *A strain of Bifidobacterium animalis* subsp. *lactis* on infants, safety and immune;(1RCT)
  - ✓ *A strain Bifidobacterium infantis on children health(1RCT)*

Chinese mother



Before and After in our Cooperation

Teaching & Training Programs between China- Finland

Research Cooperation :

Chen K, Wei X, Pariyani R, Kortesniemi M, Zhang YM, Yang BR. J Agric Food Chem. 2021 Apr 21;69(15):4423-4437.

Fabritius M, Linderborg KM, Tarvainen M, Kalpio M, Zhang YM, Yang B Food Chem. 2020 Oct 30;328:126991

Linderborg KM, Kulkarni A, Zhao A, Zhang J, Kallio H, Magnusson JD, Haraldsson GG, Zhang YM, Yang BR. Food Chem. 2019;283:381-389

Boix-Amorós A, Puente-Sánchez F, du Toit E, Linderborg KM, Zhang YM, Yang B, Salminen S, Isolauri E, Tamames J, MC. Appl Environ Microbiol. 2019 Apr 18;85(9). pii: e02994-18

Gómez-Gallego C, Morales JM, Monleón D, du Toit E, Kumar H, Linderborg KM, Zhang YM, Yang B,. Nutrients. 2018

Gómez-Gallego C, Kumar H ,García-Mantrana I., du Toit E, Suomela JP, Linderborg KM , **Zhang YM,** Isolauri E ,Yang Collado M.C. Breast Milk Polyamines and Microbiota Interactions: Impact of Mode of Delivery and Geographical Locat Metab 2017;70:184-19

Yong Xue, Qing Miao, Ai Zhao, Yingdong Zheng, **Yumei Zhang***, Peiyu Wang, Heikki Kallio, Baoru Yang*. Effects (Hippophaë rhamnoides) juice and L-quebrachitol on type 2 diabetes mellitus in db/db mice.Journal of Functiona 223-233（IF3.859）

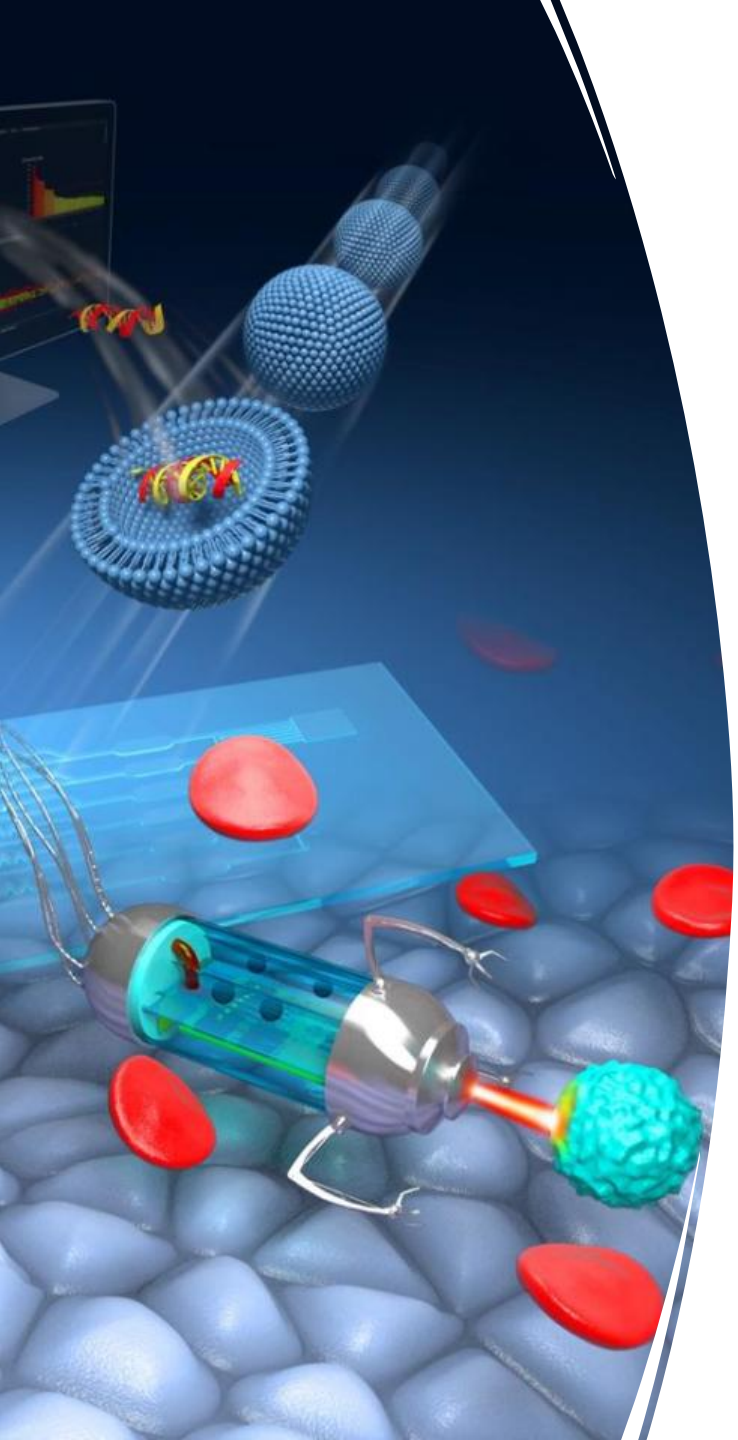
Xue Y, Lee E, Ning K, Zheng Y, Ma D, Gao H, Yang B, Bai Y, Wang P, **Zhang YM***. Prevalence of picky eating beha school-age children and associations with anthropometric parameters and intelligence quotient. A cross-sectional stud 1;91:248-55.（Q1 IF3.323）


Thanks !
Wonderful future cooperation!

Nanotechnology for Precision Medication

Associate Professor, Åbo Akademi University

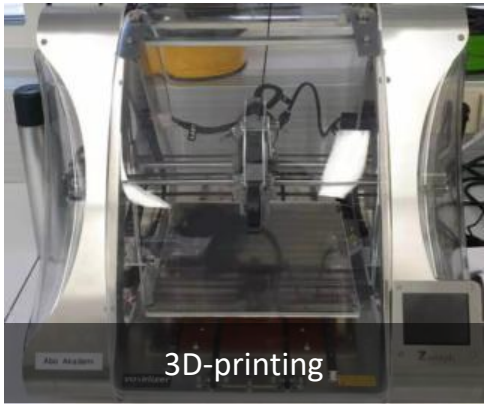
Guest Professor, Shanghai Jiaotong University

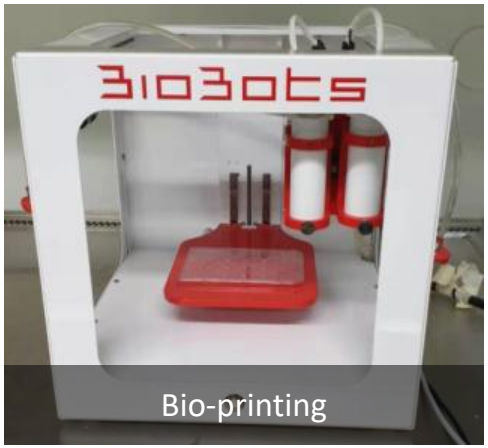


Contents :

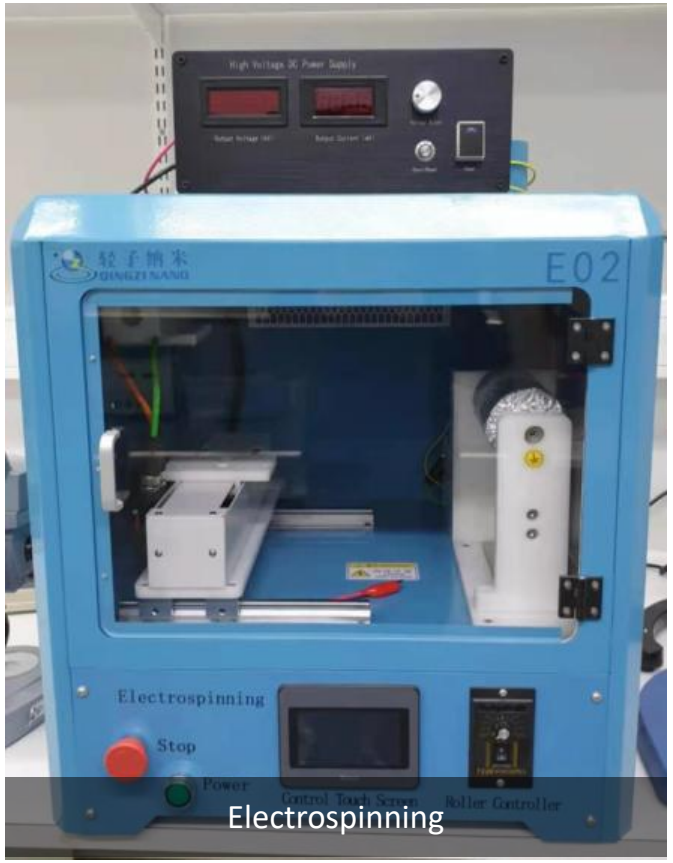
- Developed new materials and technologies based on real clinical problems.
- In our projects, the clinical doctors are involved in.
- We aim to have clinical translation.


Microfluidics


3D-printing

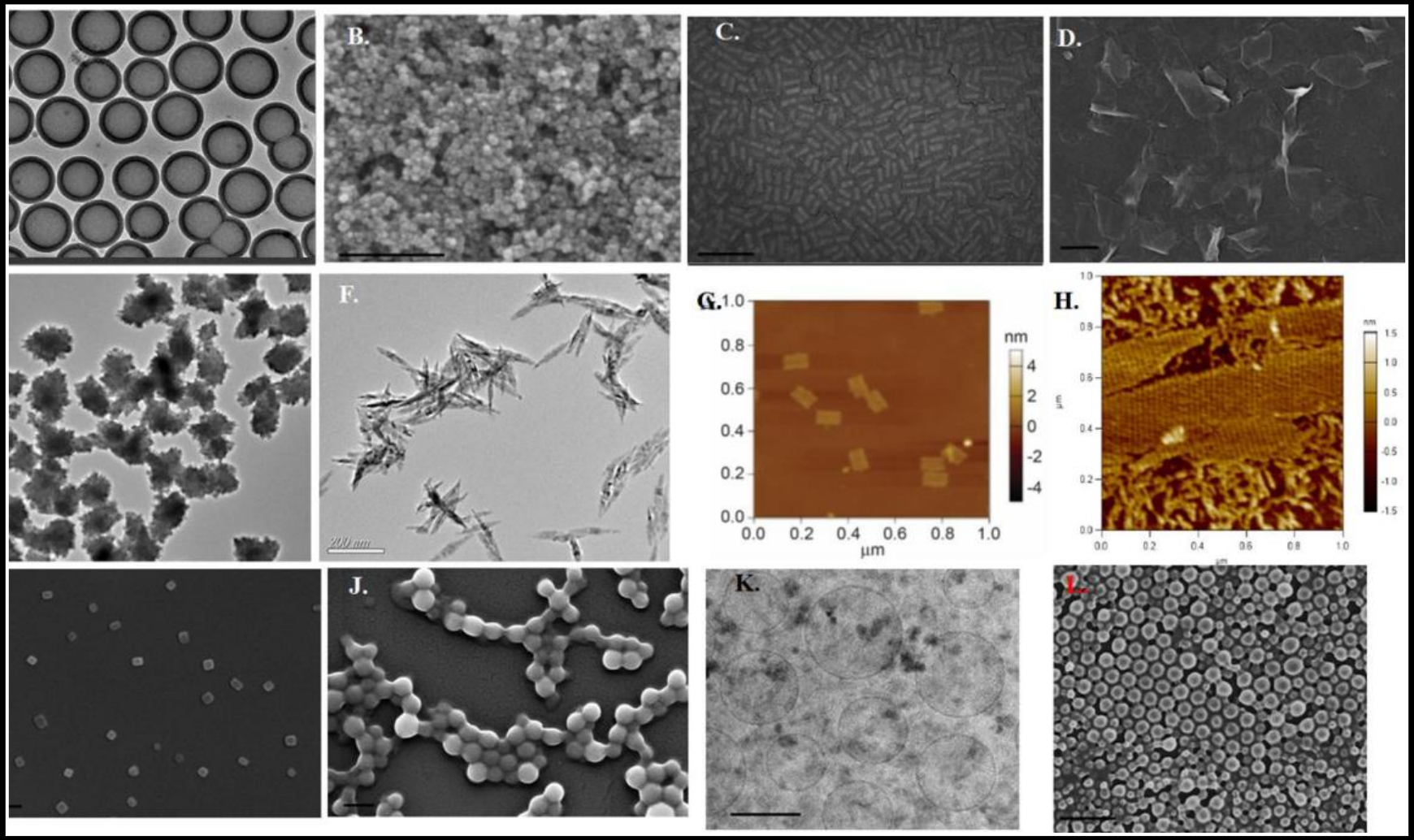


Bio-printing



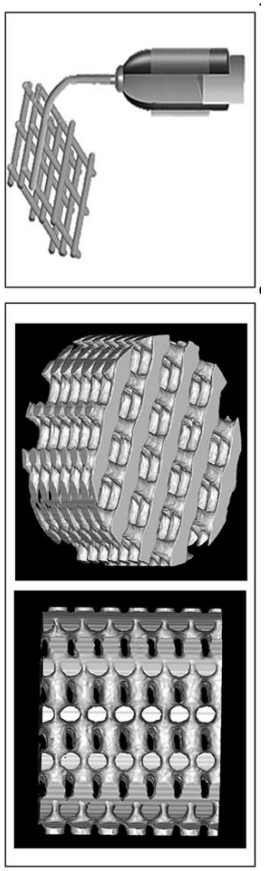
Electrospinning

Techonologies

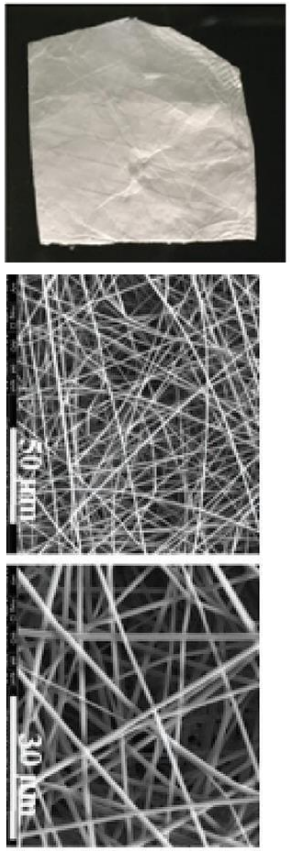


Nanoparticles produced by our group

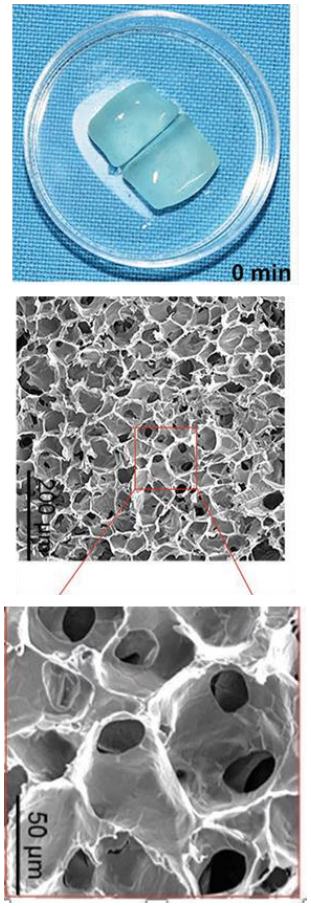
3D printing stent



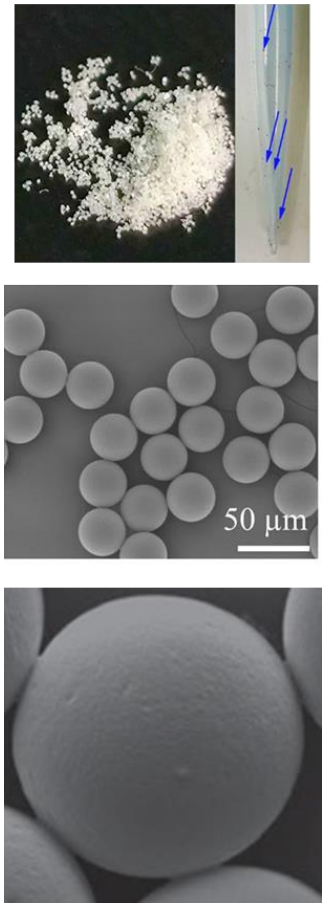
Electrospinning scaffold



Hydrogels

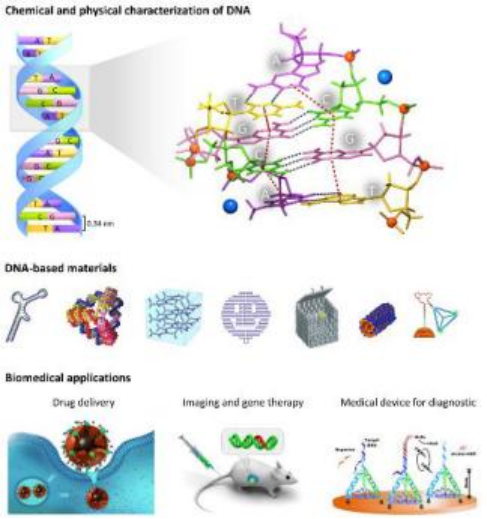


Microparticles



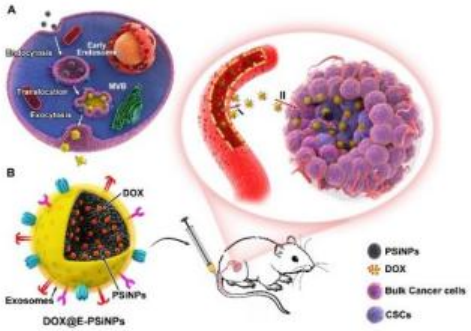
Technology 1: Nanomedicine

I have many years of research experience in nanomaterials (especially mesoporous materials and DNA nanomaterials), and I develop tools for drug delivery, targeted therapy, nanodiagnosis, imaging, and cancer treatment.



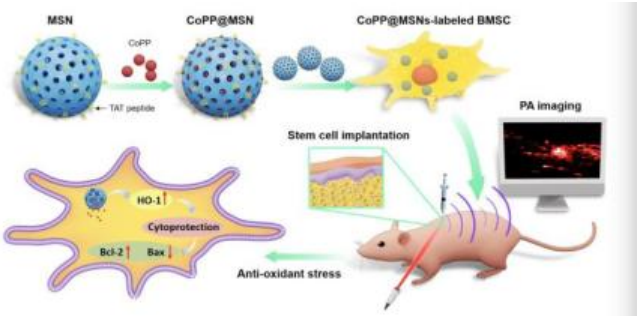
1: DNA nanomaterials: for biological responsive delivery and precision diagnostics

Adv. Sci. 2021. 8(9):2004793 **(IF 16.806)**
ADDR. 2021, 176, 113891 **(IF 15.47)**
Adv. Mater, 2018, 30, 1706887 **(IF 30.849)**
Adv. Mater, 2018, 30, 1703658 **(IF 30.849)**



2: Biomimetic nanomaterials: use cell member, exsome or other biological agents in nanoparticle design.

Nat. Com. 2019, 10, 1-16 **(IF 11.8)**
Adv. Funct. Mater. 2021 **(IF 18.808)**
Cell Rep. 2021, 35, 109131(**IF 9.423**)
Bioact. Mater, 2020, 6 (2), 433-446 (**IF 14.5**)
Adv. Func. Mater, 2018, 28, 1801738 (**IF 18.808**)
Adv. Func. Mater, 2019, 29, 1807559 (**IF 18.808**)
Nano Letters, 2018, 18, 1448-1453 (**IF 11.189**)

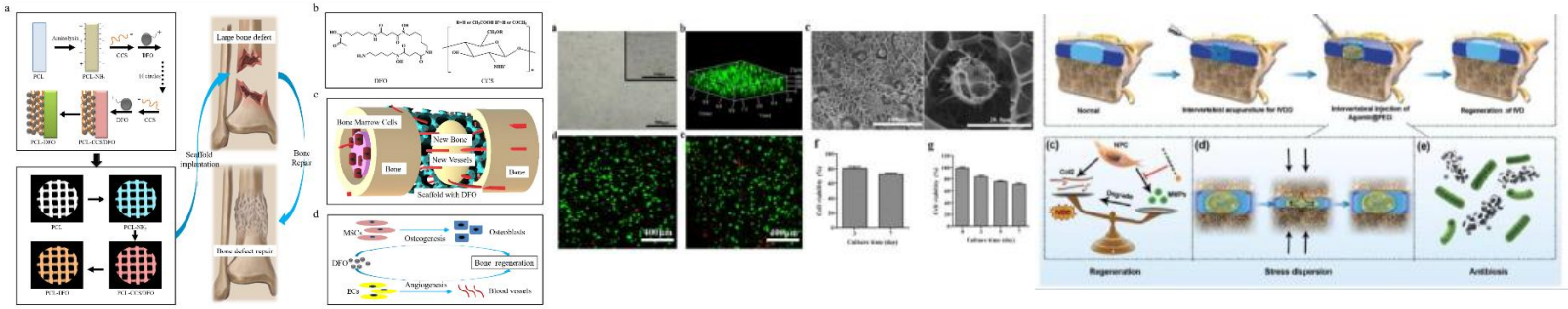


3: Nanoparticle for *in vivo* labelling and stem cell tracking *in vivo*

Adv. Mater. 2021, 33, e2005709 (**IF 30.8**)
Adv. Func. Mater, 2019, 1902652 **(IF 18.808)**
Small, 2019, 15, 1804332 **(IF 13.281)**
Biomaterials, 2019, 226, 119538 **(IF 12.479)**
ACS AMI, 2020, 12, 37885-37895 **(IF 9.229)**

Technology 2: Functional Materials for Regenerative Medicine

Using 3D printing technology, electrospinning technology to prepare a variety of biological functional scaffolds, to achieve bone and skin regeneration, and promote clinical transformation.



1. Bionic bone: simulate the natural structure of bone through 3D printing to promote bone regeneration.

ADDR. 2021, 174, 504-534 (**IF 15.47**)
Adv. Mater, 2019, 31, 1805452 **(IF 30.849)**
Adv. Func. Mater., 2017, 27, 1604617 **(IF 18.808)**
Biomaterials, 2019, 190, 97-110 **(IF 12.479)**

2. Stem cell therapy: prepare hydrogel to support the implant of stem cells, thereby promoting skin defect repair.

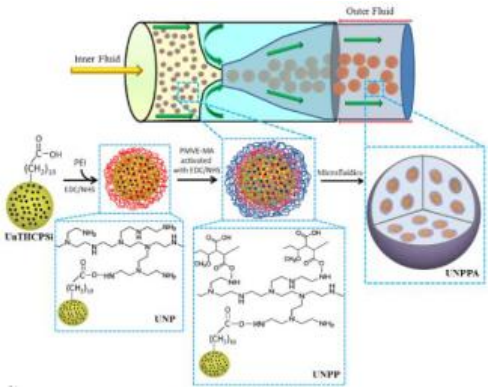
Adv Sci, 2019, 6, 1801555 **(IF 16.806)**
App Mater Today, 2018, 13, 54-63 **(IF 10.041)**

3. Adjust the microenvironment: delivery siRNA or other biomarkers through minimally invasive injectable hydrogel to adjust the microenvironment thus promote tissue regeneration.

Adv. Healthc Mater. 2020, 9, 1901239 (**IF 9.933**)
Adv Sci, 201902099 **(IF 16.806)**
Mater Horiz, 2019, 6, 385-393 **(IF 13.266)**
Mater Horiz, 2018, 5, 1082-1091 **(IF 13.266)**

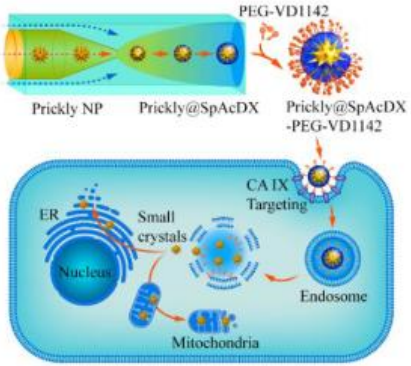
Technology 3: Microfluidics

My Postdoc supervisor Prof. David A. Weitz is one of the founder and most famous scientists in microfluidics in the world. I have been studying microfluidics and also built up the microfluidics platforms in ÅAU.



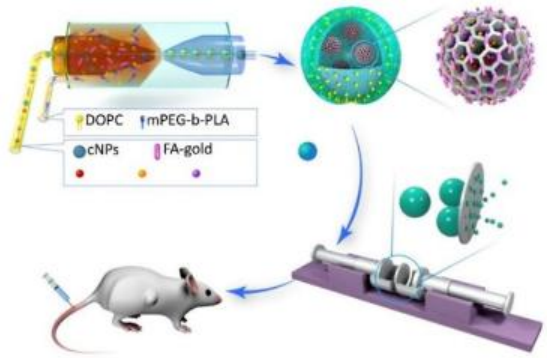
1. Single Emulsion: can produce all kinds of microparticles.

Small. 2021, 17, e2100479 (**IF 13.281**)
Adv. Mater, 2014. 26, 4497-4503 (**IF 30.849**)
Biomaterials, 2018, 185, 322-332 (**IF 12.479**)



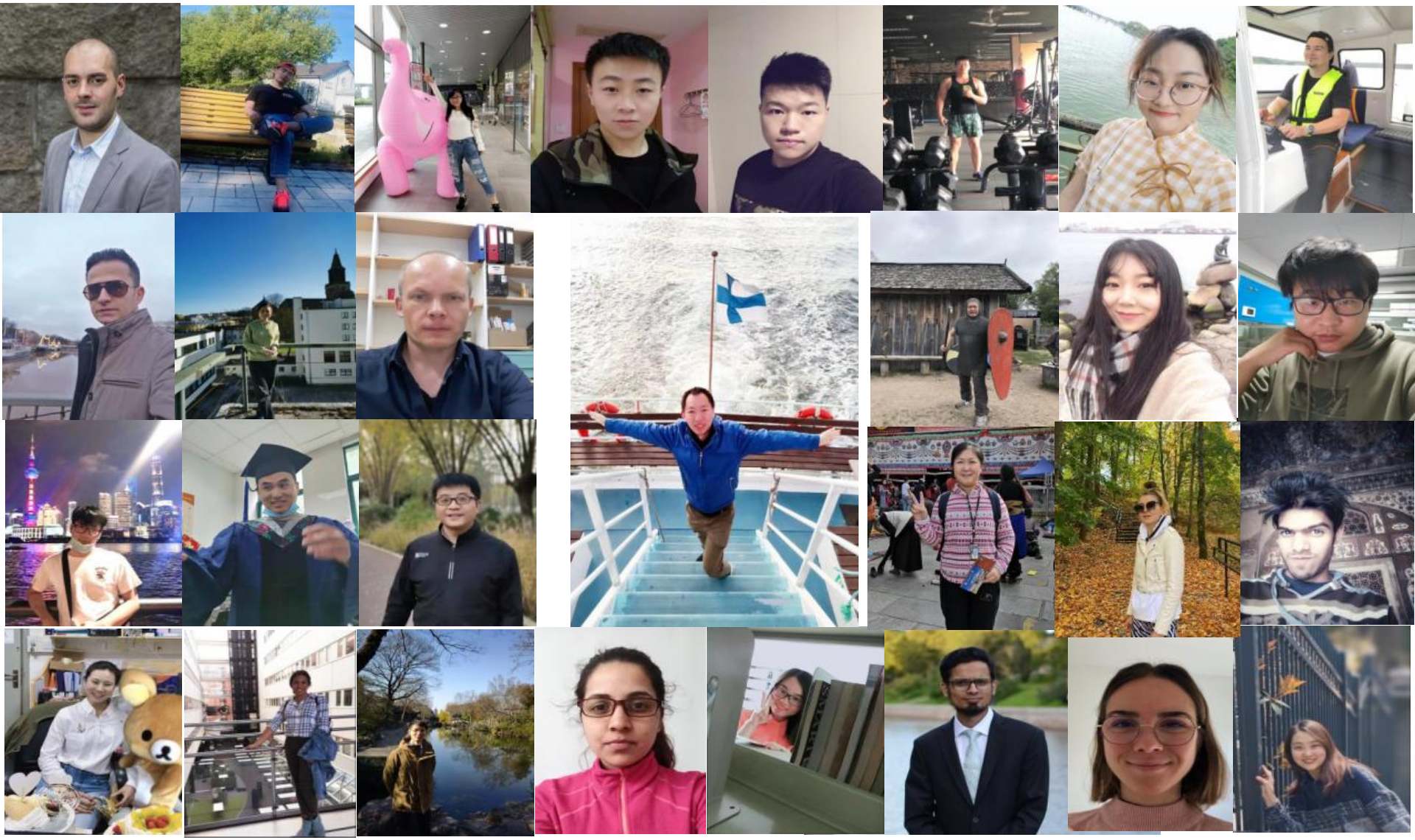
2. Nanoprecipitation: can produce all kinds of nanoparticles.

Adv. Mater. 2018, 30, 170339 (**IF 30.849**)
Adv. Mater. 2017, 29, 1603239 (**IF 30.849**)
Nano Letters, 2017, 17, 606-614 (**IF 11.189**)
ACS AMI, 2020, 12, 45838-45849. (**IF 9.229**)



3. Double Emulsion: can produce core-shell microparticles for more complicate applications..

PNAS 2019, 116 , 7744-7749 (**IF 11.205**)
ADDR, 2018, 128, 54-83 (**IF 15.47**)



Thank you! Contact: hongbo.zhang@abo.fi

北京林业大学
Beijing Forestry University

Quality Formation Mechanism of Forest Fruit and its Processed products

-- from five-years cooperation between BFU & UT

Baoqing Zhu Dr. zhubaoqing@bjfu.edu.cn

Bolin Zhang Prof. Dr. zhangbolin888@163.com

The Department of Food Science,
College of Biological Sciences and Biotechnology,
Beijing Forestry University

北京林业大学
Beijing Forestry University

Contents

1 Our Team in BFU

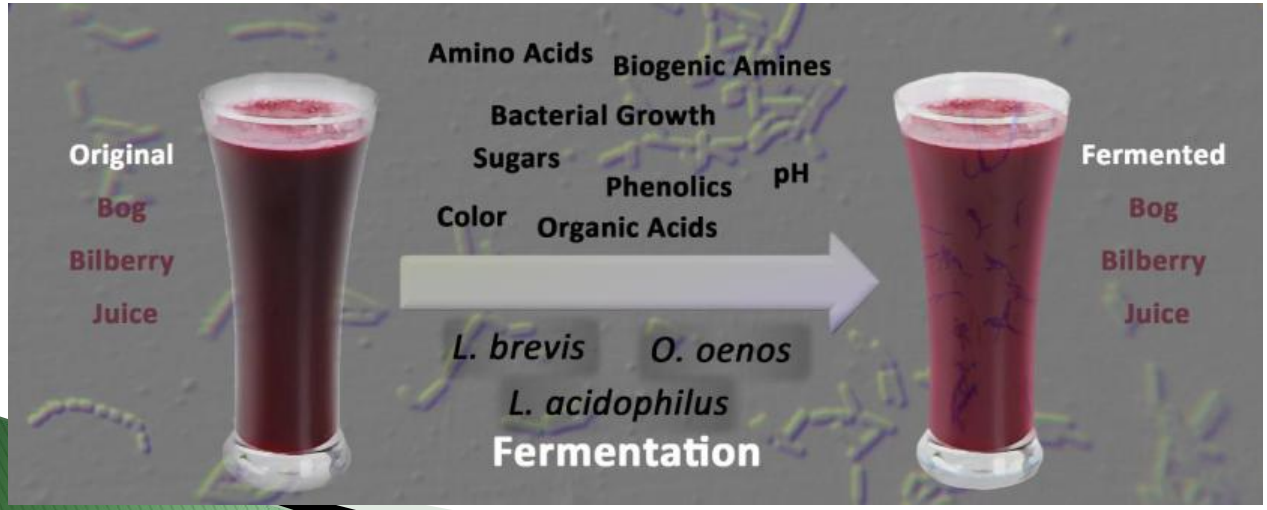
Research Interests:

(1) Quality of berries & their related fermented products

(2) Development of berries fermented products

Techniques: **Metabolomics; Systems Biology; Sensory Analysis;**

Members: **Prof. Zhang Bolin, Dr. Zhu Baoqing, Dr. Zhao Hongfei**



2 Our Cooperation with UT

(1) Scientific research

JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

pubs.acs.org/JAFC Article

Comparison of Volatile Composition between Alcoholic Bilberry Beverages Fermented with Non-*Saccharomyces* Yeasts and Dynamic Changes in Volatile Compounds during Fermentation

Shuxun Liu, Oskar Laaksonen, Alexis Marsol-Vall, Baoqing Zhu, and Baoru Yang*

Cite This: *J. Agric. Food Chem.* 2020, 68, 3626–3637 Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

JFCA, 2020,68, 3626

2 Our Cooperation with UT

(1) Scientific research

foods

MDPI

Article

Effect of *Lactobacillus acidophilus*, *Oenococcus oeni*, and *Lactobacillus brevis* on Composition of Bog Bilberry Juice

Yuqi Chen [1,†], Xiaoyu Ouyang [1,†], Oskar Laaksonen [2], Xiaoyu Liu [1], Yuan Shao [1], Hongfei Zhao [1], Bolin Zhang [1] and Baoqing Zhu [1,*]

1 Beijing Key Laboratory of Forestry Food Processing and Safety, Department of Food Science, College of Biological Sciences and Biotechnology, Beijing Forestry University, Beijing 100083, China; chenyuqi0226@163.com (Y.C.); oyxy1993@sina.com (X.O.); 15632102801@163.com (X.L.); 13261361300@163.com (Y.S.); zhaohf820603@163.com (H.Z.); zhangbolin888@163.com (B.Z.)

2 Food Chemistry and Food Development, Department of Biochemistry, University of Turku, FI-20014 Turku, Finland; Osanla@utu.fi

* Correspondence: zhubaoqing@bjfu.edu.cn; Tel./Fax: +86-10-6233-8221

† These authors equally contributed to this work.

Received: 26 August 2019; Accepted: 15 September 2019; Published: 21 September 2019

check for updates

Foods, 2019,8,430

2 Our Cooperation with UT

(1) Scientific research

Journal of Food Composition and Analysis 105 (2022) 104202

Contents lists available at ScienceDirect

Journal of Food Composition and Analysis

journal homepage: www.elsevier.com/locate/jfca

Original Research Article

Lactic acid bacteria incubation and aging drives flavor enhancement of goji berry juice

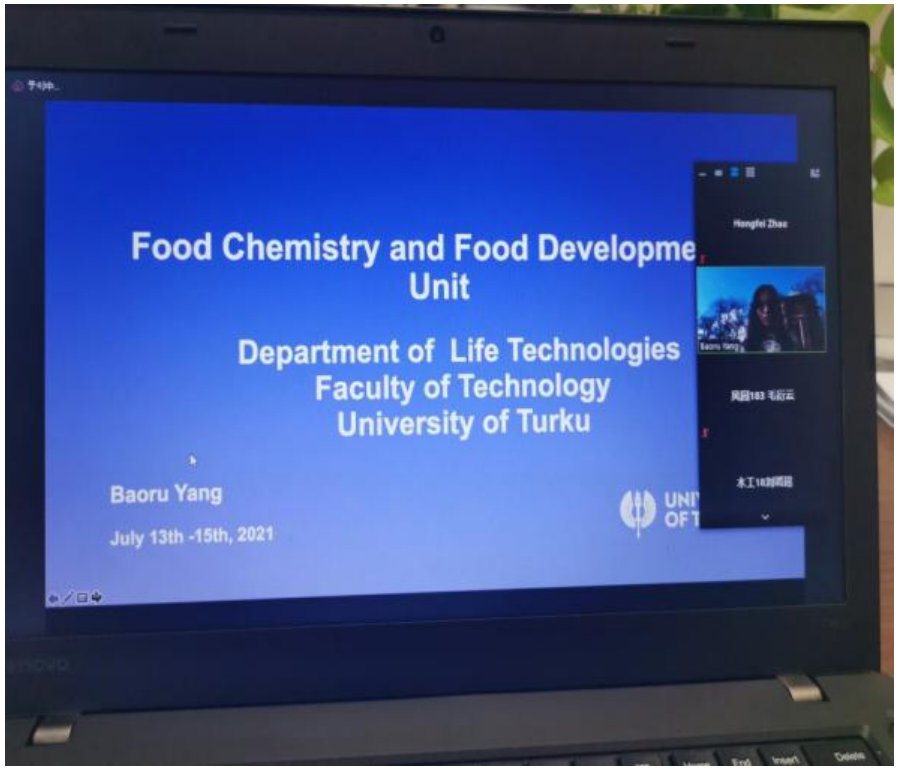
Yaran Liu [a,1], Pan Gu [a,c,1], Oskar Laaksonen [d], Bo Wei [a], Yuxuan Zhu [a], Bolin Zhang [a], Baoqing Zhu [a,*], Hehe Li [b,**]

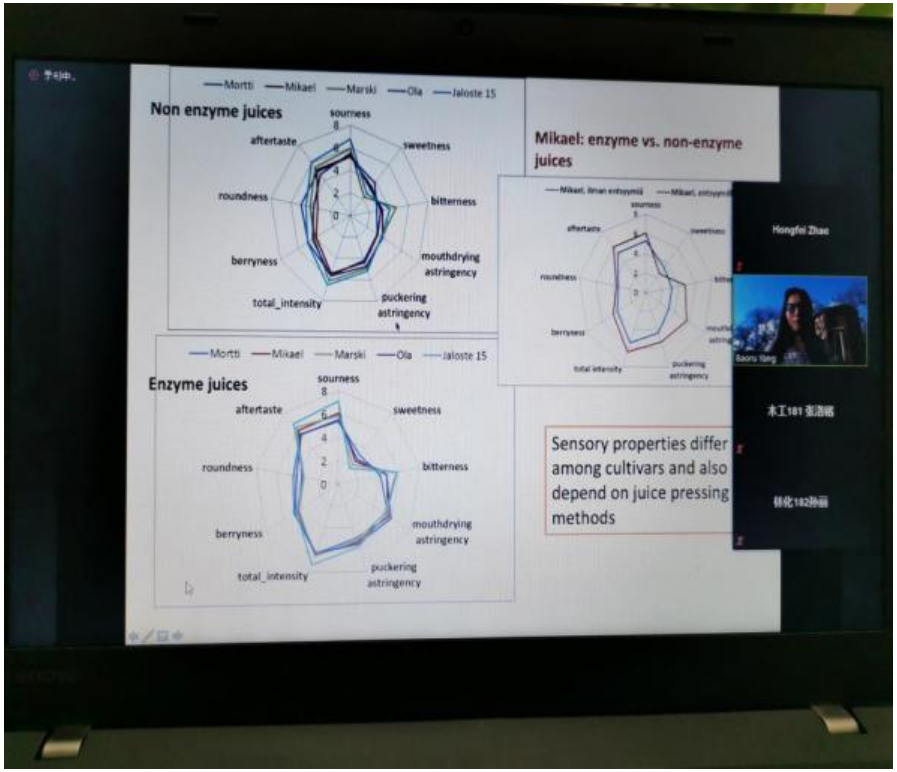
[a] Beijing Key Laboratory of Forestry Food Processing and Safety, Department of Food Science, College of Biological Sciences and Biotechnology, Beijing Forestry University, Beijing, 100083, China
[b] Key Laboratory of Brewing Molecular Engineering of China Light Industry, Beijing Technology and Business University, Beijing, 100048, China
[c] Beijing Academy of Food Sciences, Beijing, 100068, China
[d] Food Chemistry and Food Development, Department of Life Technologies, University of Turku, FI-20014, Turku, Finland

JFCA, 2022,105, 104202

2 Our Cooperation with UT

(2) Education and teaching





Summer school courses presented by Professor Dr. Baoru Yang in the July, 2021

2 Our Cooperation with UT

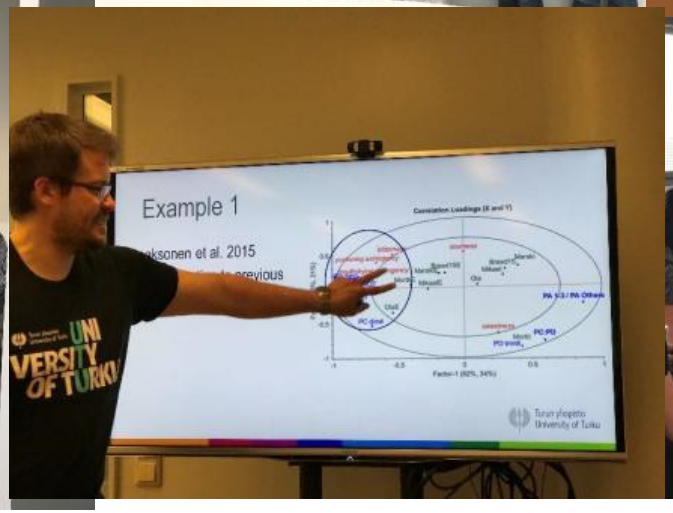
(2) Education and teaching

2018.11 Heilongjiang, China

2019.05 Beijing Forestry University

2 Our Cooperation with UT

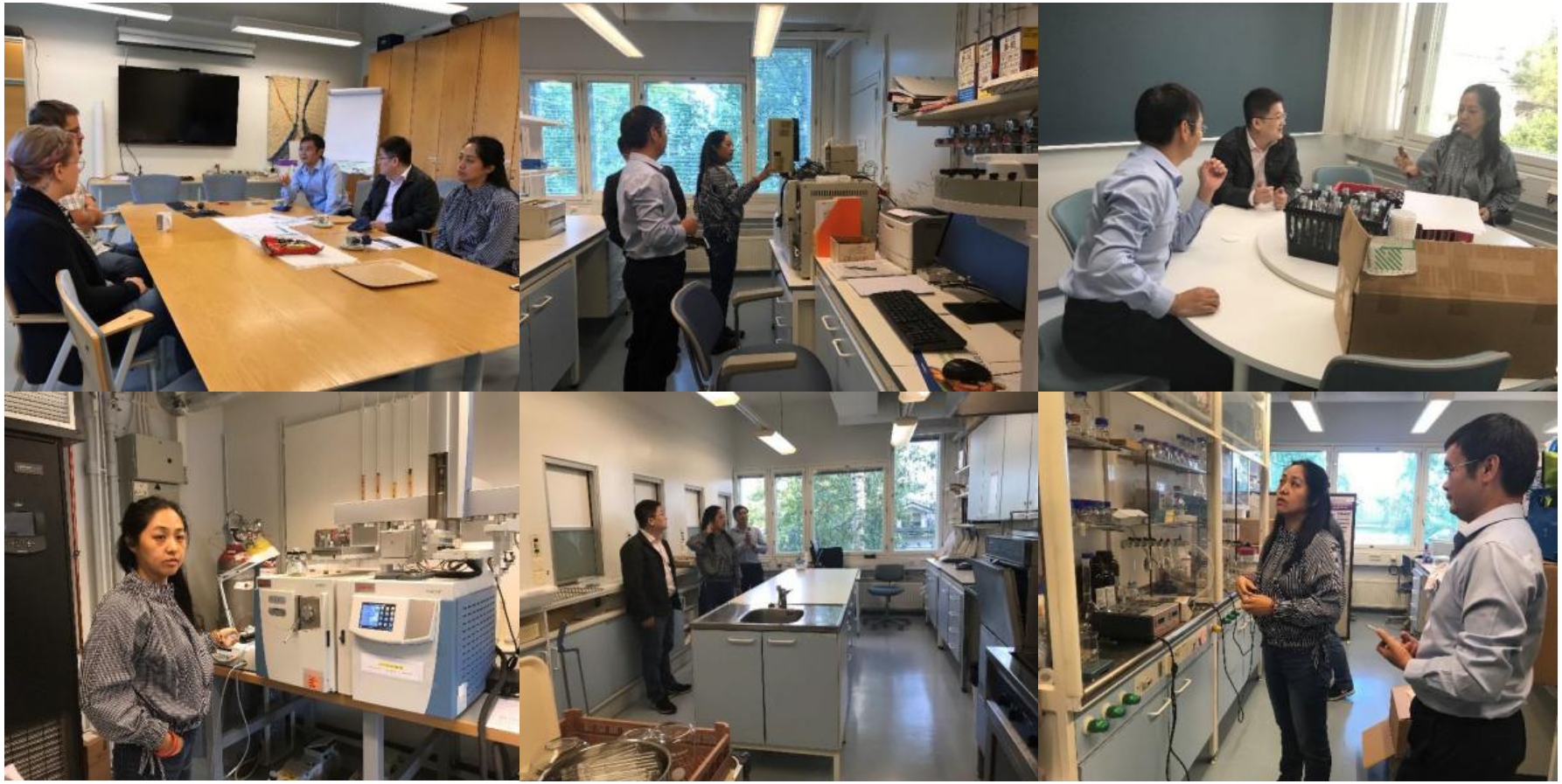
(3) Exchange visits



2017.09 University of Turku

2 Our Cooperation with UT

(3) Exchange visits



2017.09 University of Turku

3 Prospects for Future Cooperation

Berry Industrial problem

- Strong seasonal use
- Short harvest time
- difficult to preserve

Fermentation

Improve added value

Many thanks to Finland Partner

UNIVERSITY OF TURKU

industry Towards Nordic Industrial Scale Manufacturing of Non-Wood Forest Products NORDIC

Dr. Leena Faven

Pro. Baoru Yang

Dr. Oskar Laaksonen

Dr. Maaria Kortesniemi

Dr. Wei Yang

Dr. Xueying Ma

Dr. Shuxun Liu

UNIVERSITY OF OULU

Centria UNIVERSITY OF APPLIED SCIENCES

Pro. Hely Haggman

Pro. Pekka Oinas

Aalto University

Many thanks to our team in BFU

- **Baoqing Zhu PH.D** zhubaoqing@bjfu.edu.cn
- **Bolin Zhang Prof. PH.D** zhangbolin888@163.com

- **Thank you for listening.**
- **Welcome to visit and cooperate with us.**

- **The Department of Food Science,**
- **College of Biological Sciences and Biotechnology,**
- **Beijing Forestry University**

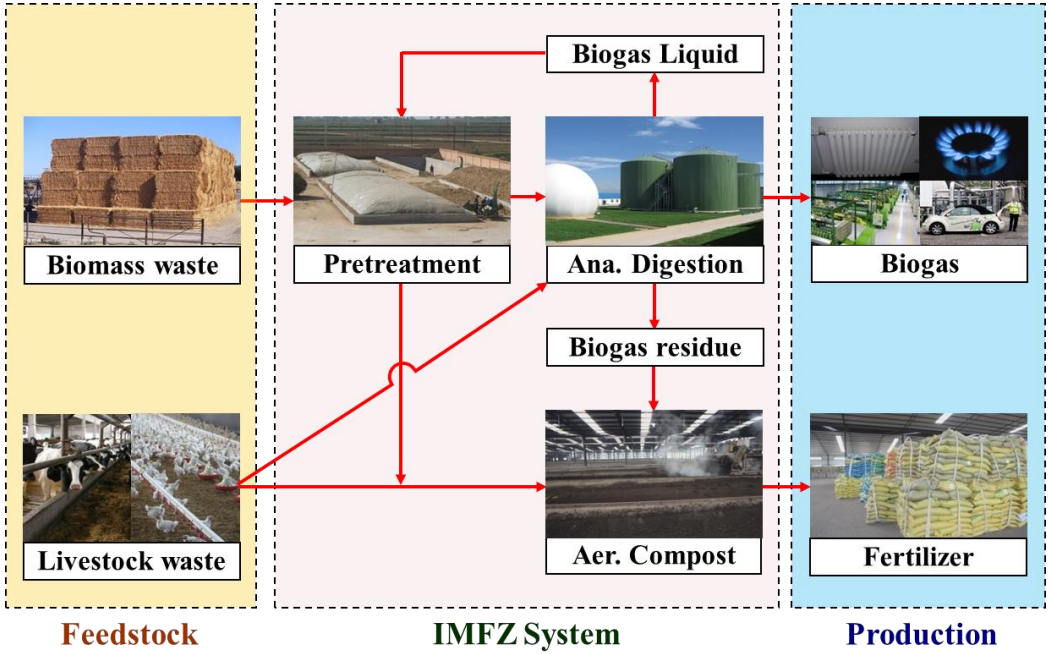
Development of Sustainable Solutions in Dalian University

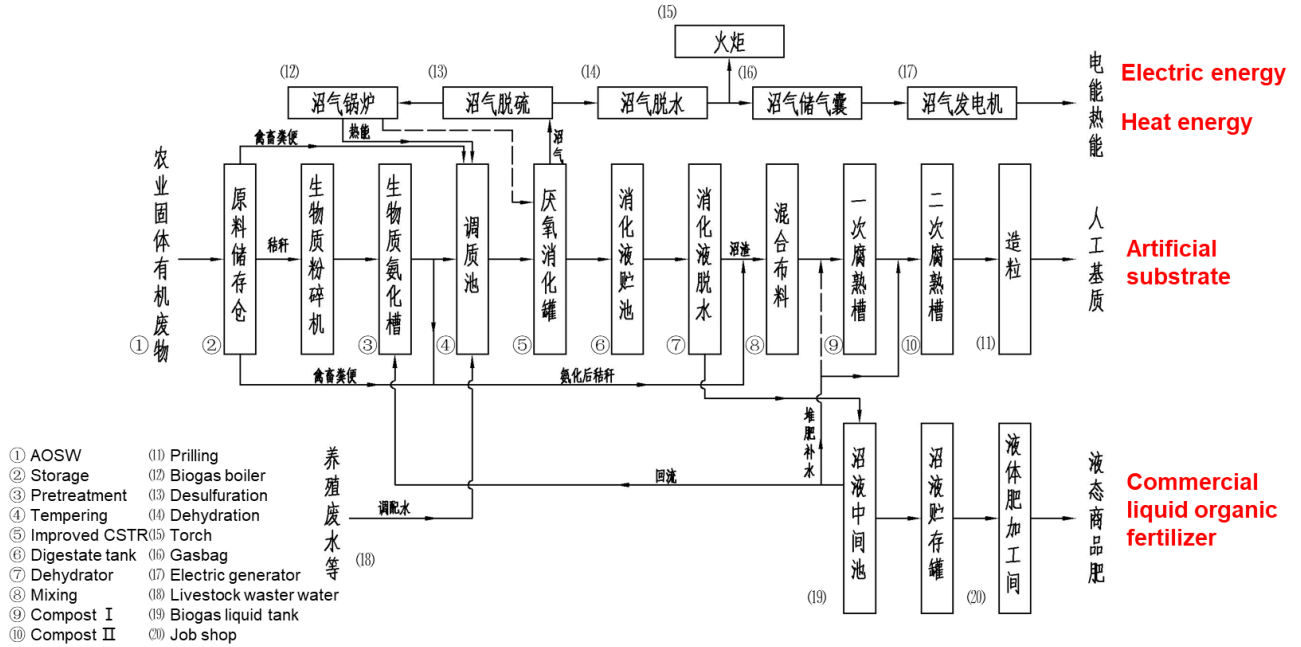
Dalian University

Pan Liwei

Technical introduction- IMFZ

IMFZ (Integrated Methanation, Fertilization and Zero emission technology) is defined as an organic wastes treatment method, which combines anaerobic co-digestion with aerobic composting for producing the clean energy of methane and green organic fertilizer.

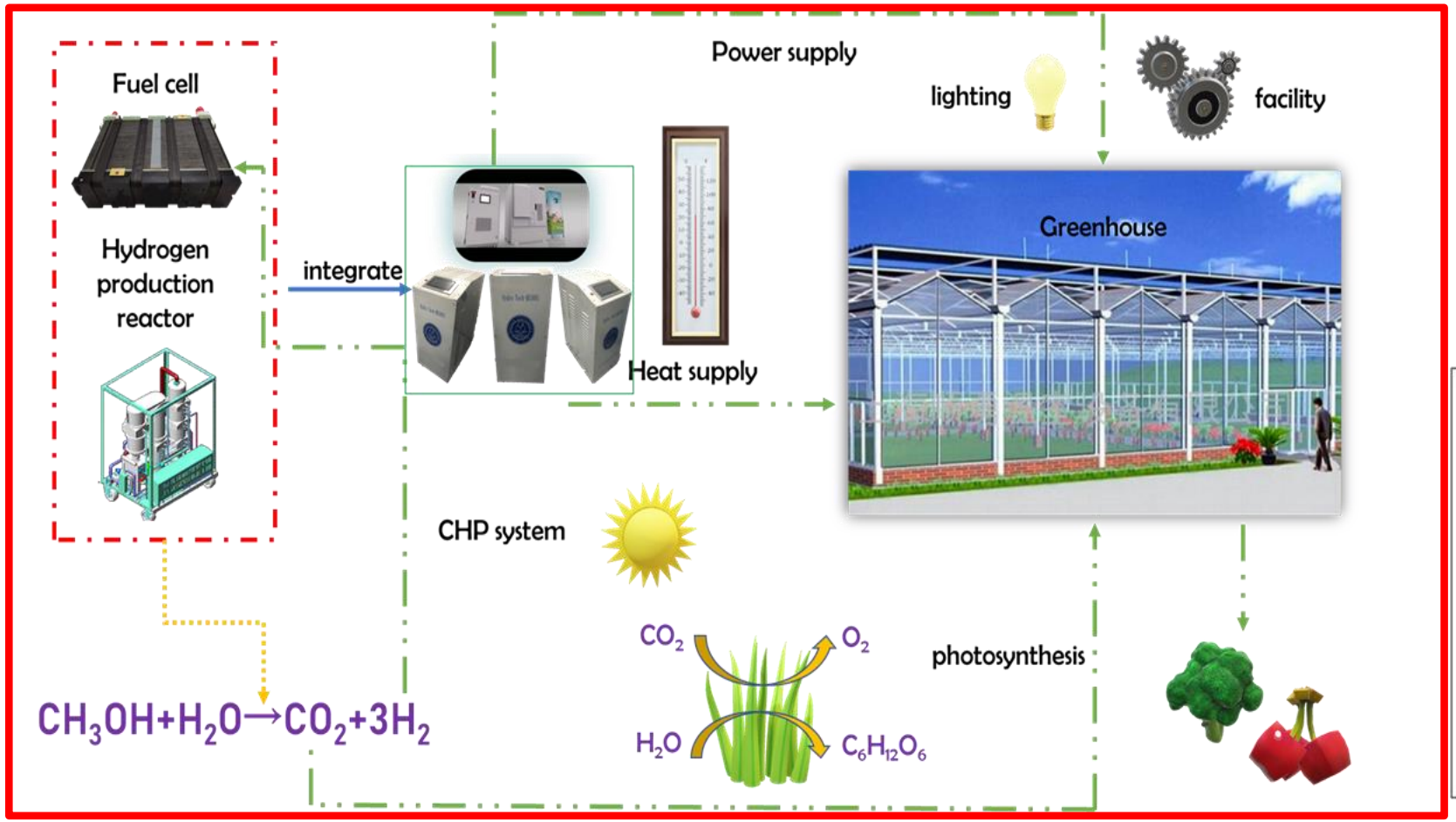


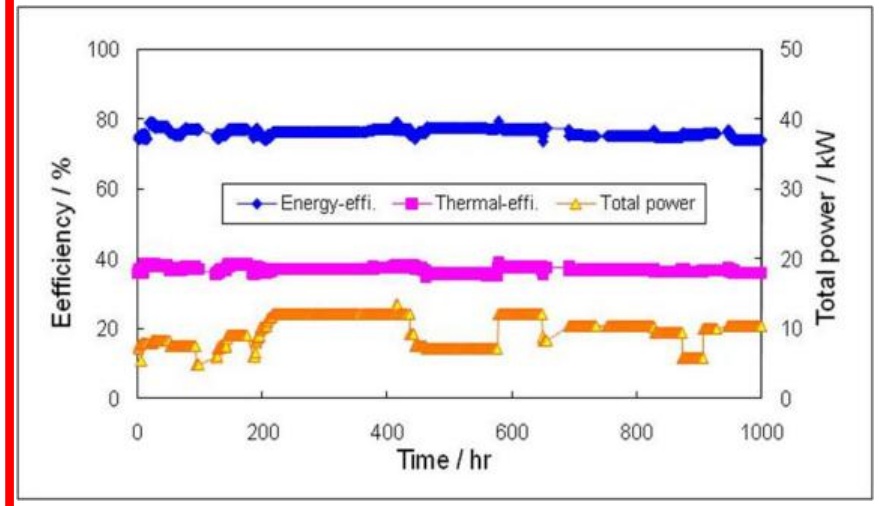


Feedstock	Biogas yield	Volumetric biogas yield	Degradation efficiency	Methane content
Lignocellulose Manure and other wastes	≥350 m^3/t TS	≥1.8 m^3/ m^3·d	≥75%	≥60%

Item	Organic matter	Humus	Total nutrients	Water content	pH
Index	≥60%	≥25%	≥10%	≤30%	6.5~8.5

Greenhouse used Combined heat and power system (CHP) based on PEM fuel cell





Thanks for your attention!

panliwei@dlu.edu.cn
+0086-13190166860

Enzymatic Acylation of Anthocyanins from Multiple Sources

Wei Yang

School of Food Science and Technology

Jiangnan University

1.11.2021

江南大学 JIANGNAN UNIVERSITY

Why?

Limitations in application

- Poor lipophilicity
- Thermal stability
- Unstable

  heat, light, pH changes

Natural acylated anthocyanins

- ca.50% known anthocyanins
- More stable

How?

Enzymatic Acylation of Anthocyanins

Anthocyanin source

- Alpine bearberry (*Arctostaphylos alpina*)

  Cyanidin-3-galactoside

- Blackcurrant (*Ribes nigrum*)

  Four anthocyanins

- Black goji berry (*Lycium ruthenicum*)

  Petunidin-*3*-*trans*-*p*-coumaroyl-rutinoside-5-glucoside

Photo by Slichter

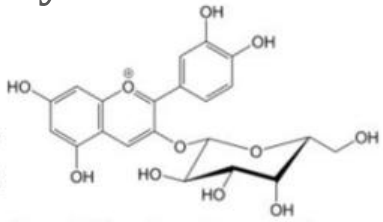
The anthocyanins were purified by column chromatography (Sephadex LH-20)

Turun yliopisto
University of Turku

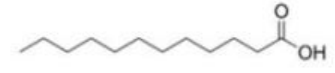
Current Results

Enzymatic acylation of single anthocyanin

purification

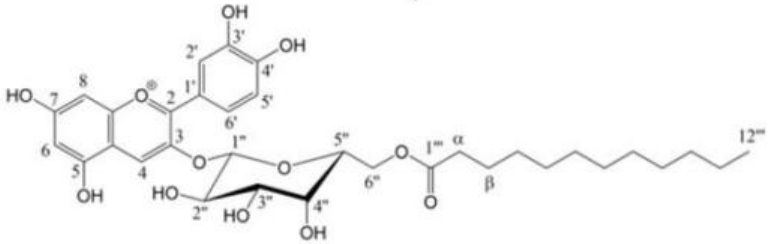


Cyanidin-3-galactoside



Lauric acid

enzymatic acylation



Cyanidin-3-*O*-(6″-dodecanoyl)galactoside

Acylated derivative

Caanidin-3-galactoside

Improved

Lipophilicity
Thermostability

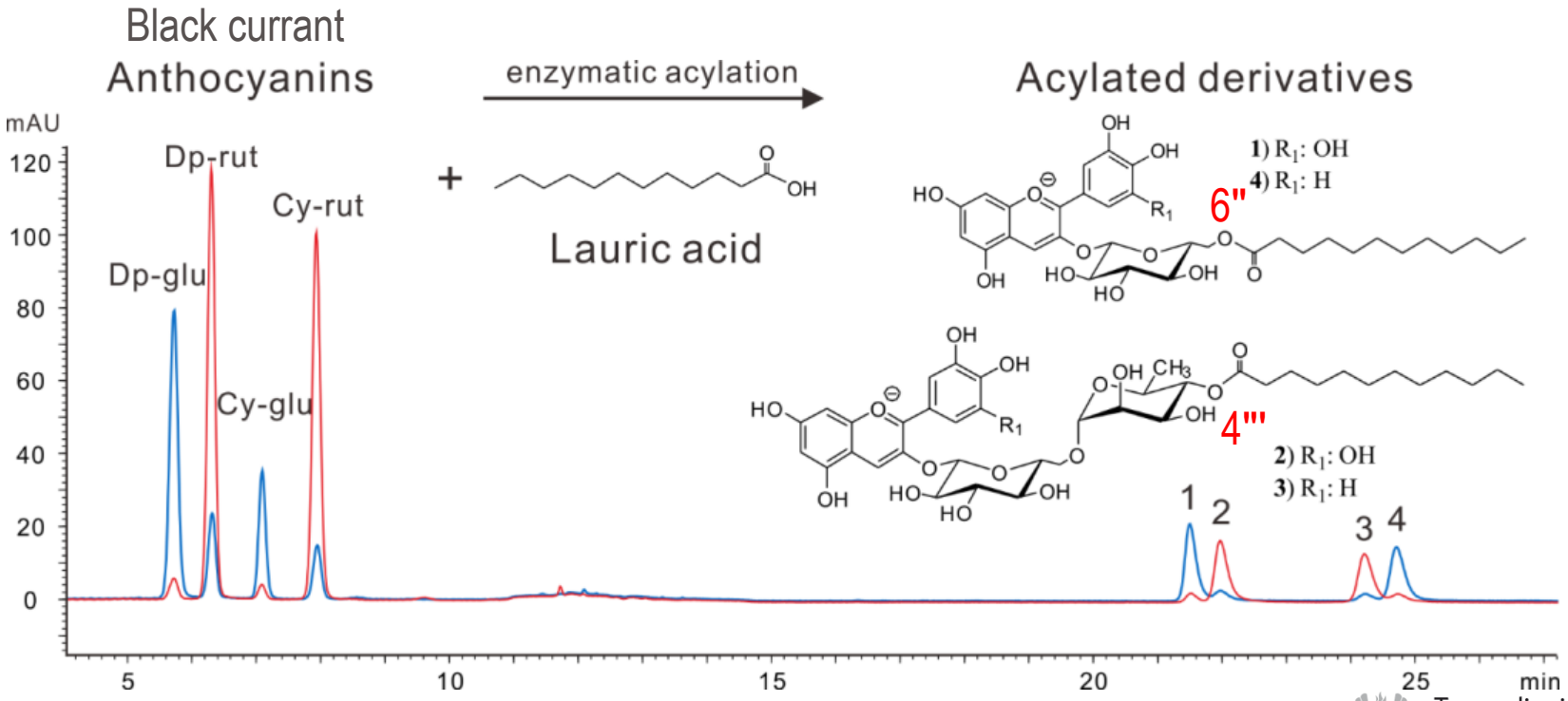
Retained

UV absorbance property
Antioxidant properties

Ref: W Yang et al. Journal of agricultural and food chemistry 66 (11), 2909-2916

run yliopisto
University of Turku

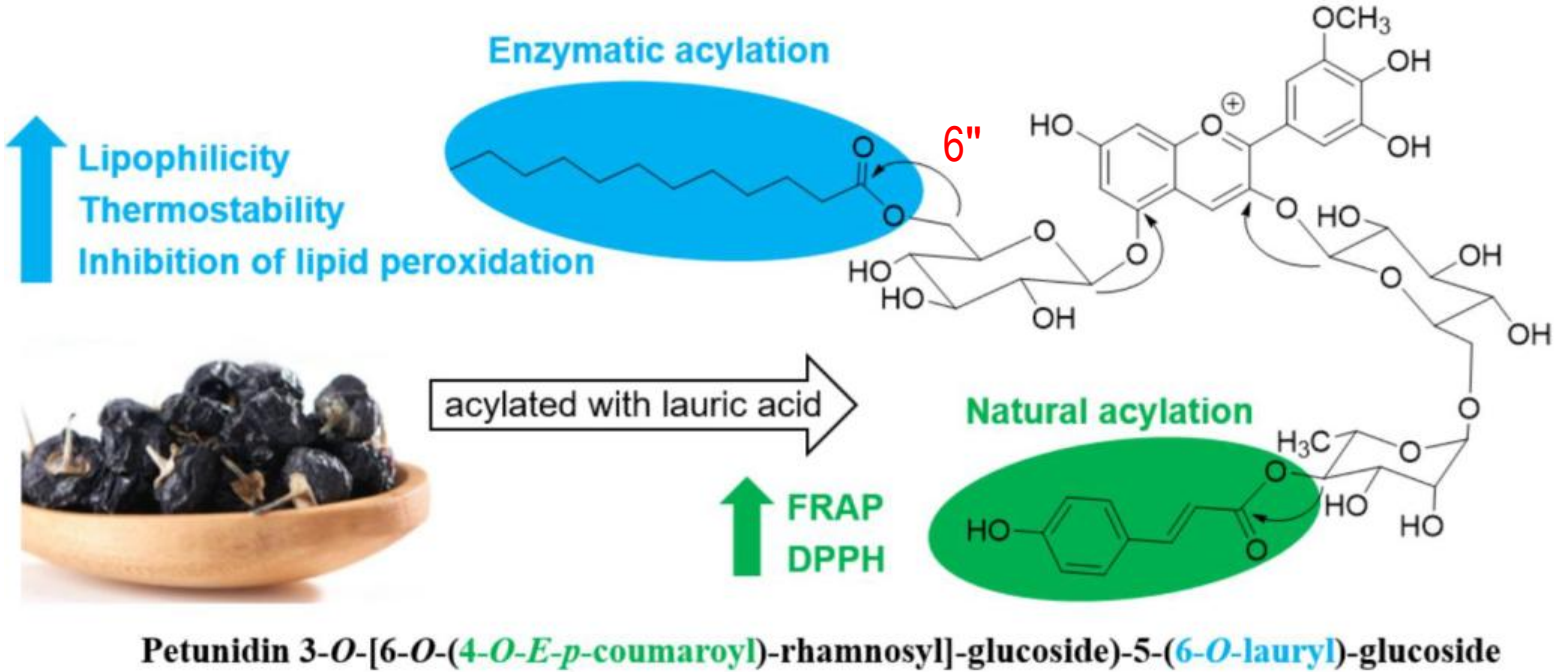
Enzymatic acylation of mixed anthocyanins



Ref: W Yang et al. Food chemistry 281, 189-196

Turun yliopisto
University of Turku

Enzymatic re-acylation of natural acylated anthocyanin



Ref: W Yang et al. Food chemistry, in press

Turun yliopisto
University of Turku

Results in progress

- Simulated *in vitro* digestion (mouth, stomach, small intestine)
- Thermal degradation pathway of acylated anthocyanins
- Cytotoxicity and *in vivo* toxicity tests
- Sensory evaluation
- Metabolomics of acylated anthocyanins

KEY ISSUES for the applications in the cosmetics and food industry

JIANGNAN UNIVERSITY

UNIVERSITY OF TURKU

UNIVERSITY OF VIENNA

Thanks for your attention!

INGREDIENTS & TECHNOLOGIES FOR SUSTAINABLE FOOD PRODUCTION

Marina Heinonen

Professor (Food Safety)

Head of the Department of Food and Nutrition

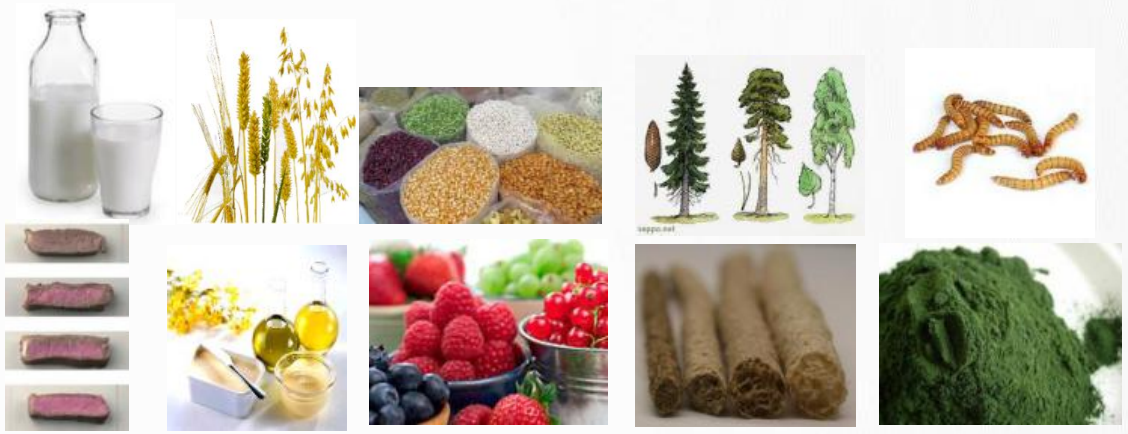
HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

www.helsinki.fi/yliopisto

SUSTAINABLE FOOD SYSTEM & HUMAN WELLBEING

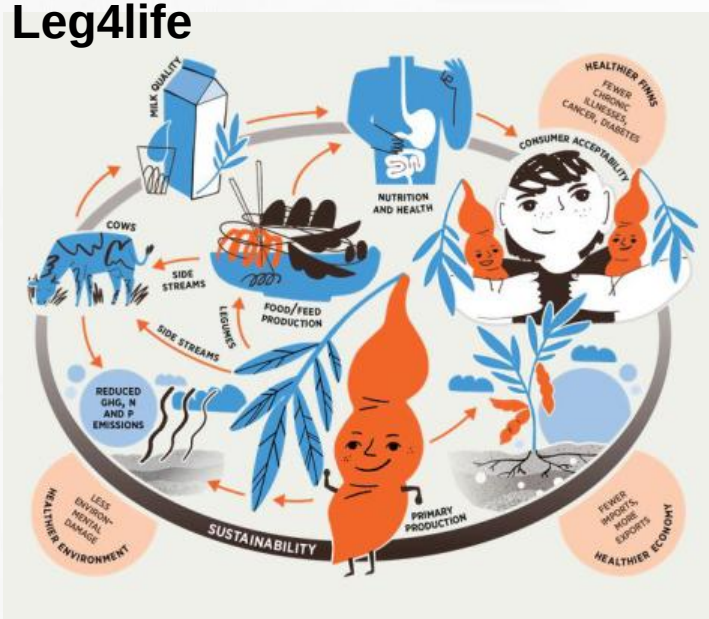
- NEW PLANT BASED PRODUCTS
- BIOACTIVE INGREDIENTS FROM CEREAL SOURCES
- BY-PRODUCTS AND MICROBIAL RESOURCES
- FOOD SAFETY
- NUTRITIONAL POLICY TARGETED ON CHILDREN AND ADOLESCENTS

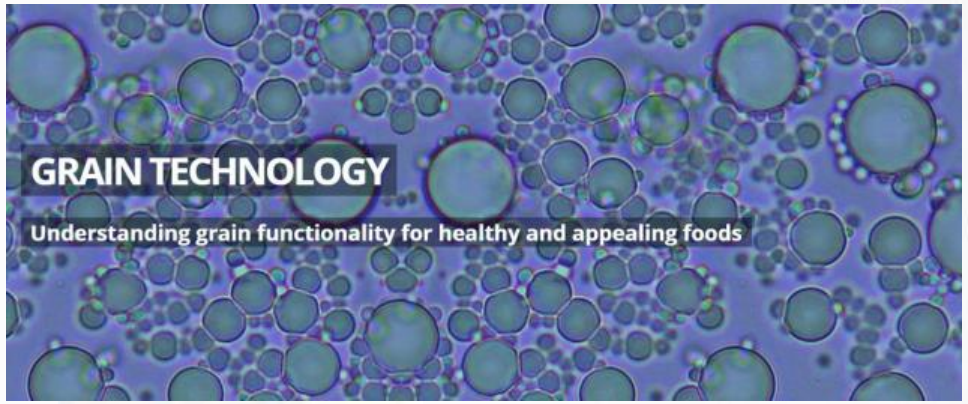
Vitamin B_{12}, folate, sterols, lipids, plant phenolics, xylans and mannans, beta-glucan, animal, insect & plant proteins



KEY RESEARCH PROJECTS

Leg4life





DA GIS

Healthy nutrition for children

B12 enrichment of plant food

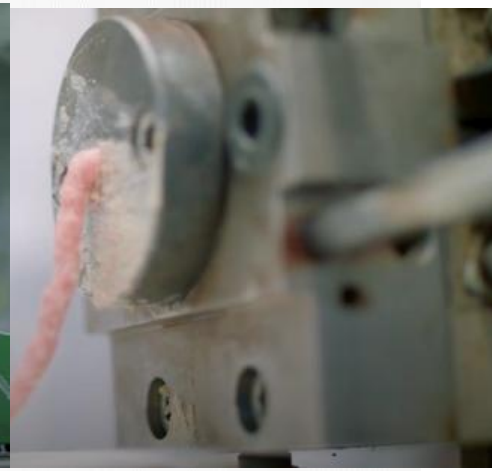
erc
European Research Council
Established by the European Commission

HELSINGIN YLIOPIS
HELSINGFORS UNI
UNIVERSITY OF HELSINKI

Maatalous-metsätieteellinen tiedekunta

PILOT PLANT PROCESSING

Microfludizator – emulsion preparation



Extrusion – making of snacks foods, meat analogues …

Bakery – conventional & novel ingredients

Pilot dairy – yoghurt, cheese, dairy analogues …

NEW INNOVATION PLATFORM

Viikki FOOD DESIGN FACTORY

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

Laura Forsman, Viikki Food Design Factory Manager

Nondestructive assessment on food quality and safety

Case of condiment

Yue Huang

China Agricultural University

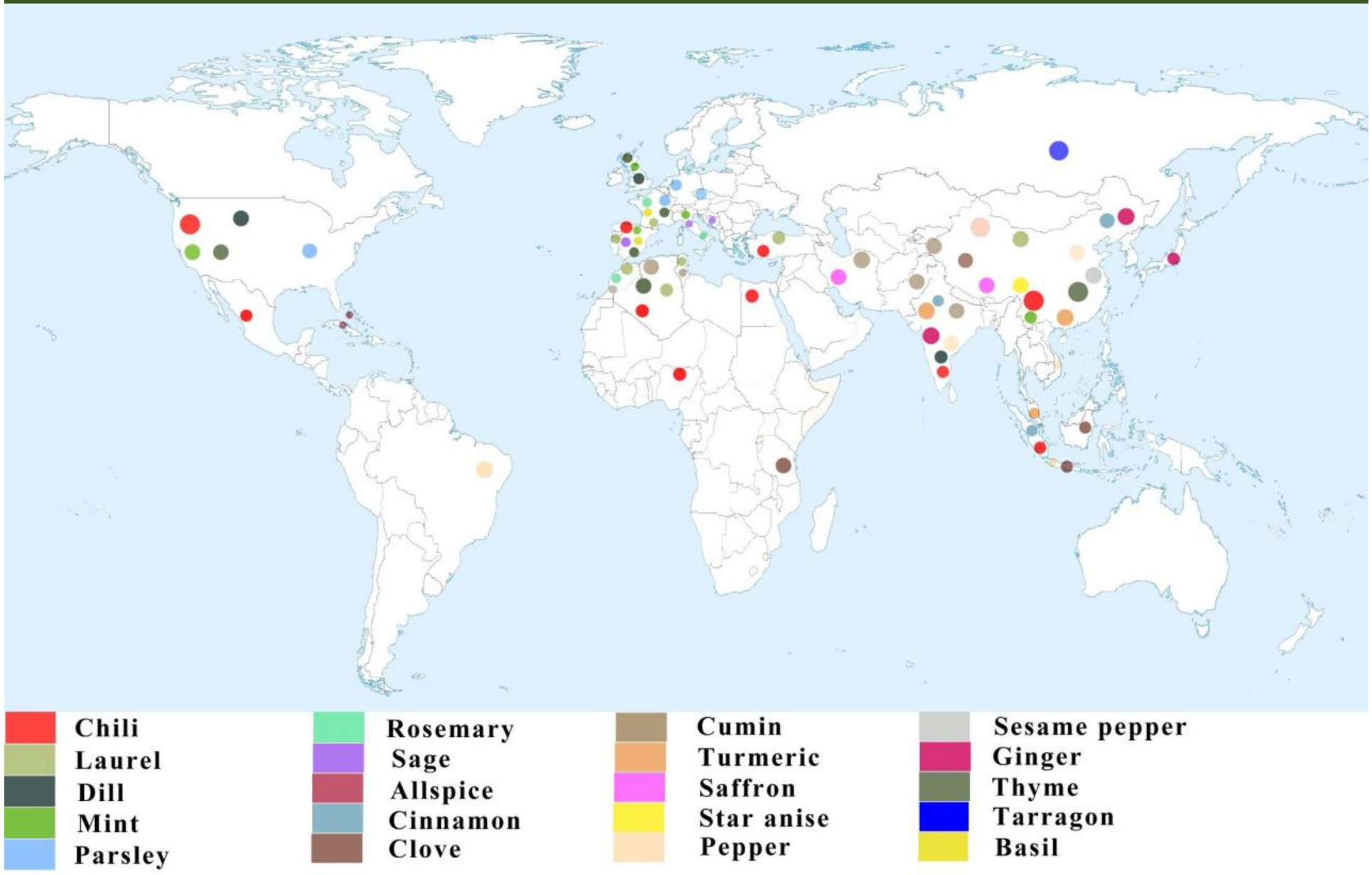
Email: huangyue@cau.edu.cn

Catering revenue € 630 billion

Condiment market € 54 billion

2020

Distribution of Spices in the World



Background

Piperine

Capsaicin

adulteration

Nitrosamines

Metals

Adulterations

Pepper

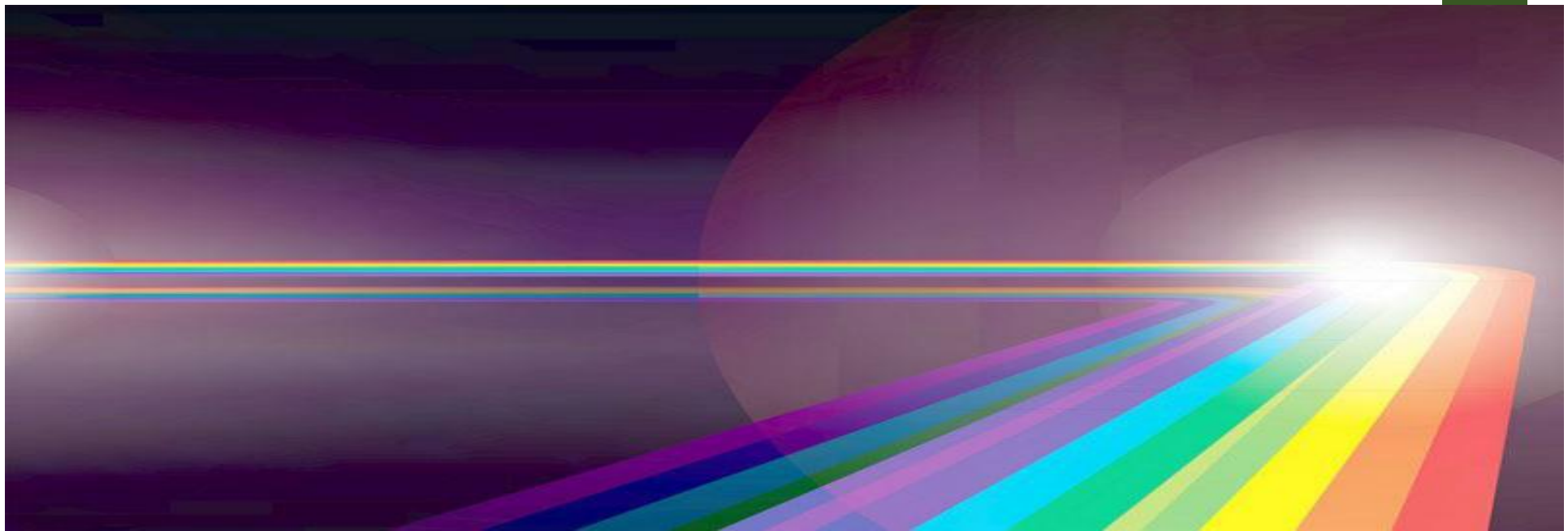
Most important condiments with the largest market share in the world

Spectroscopy

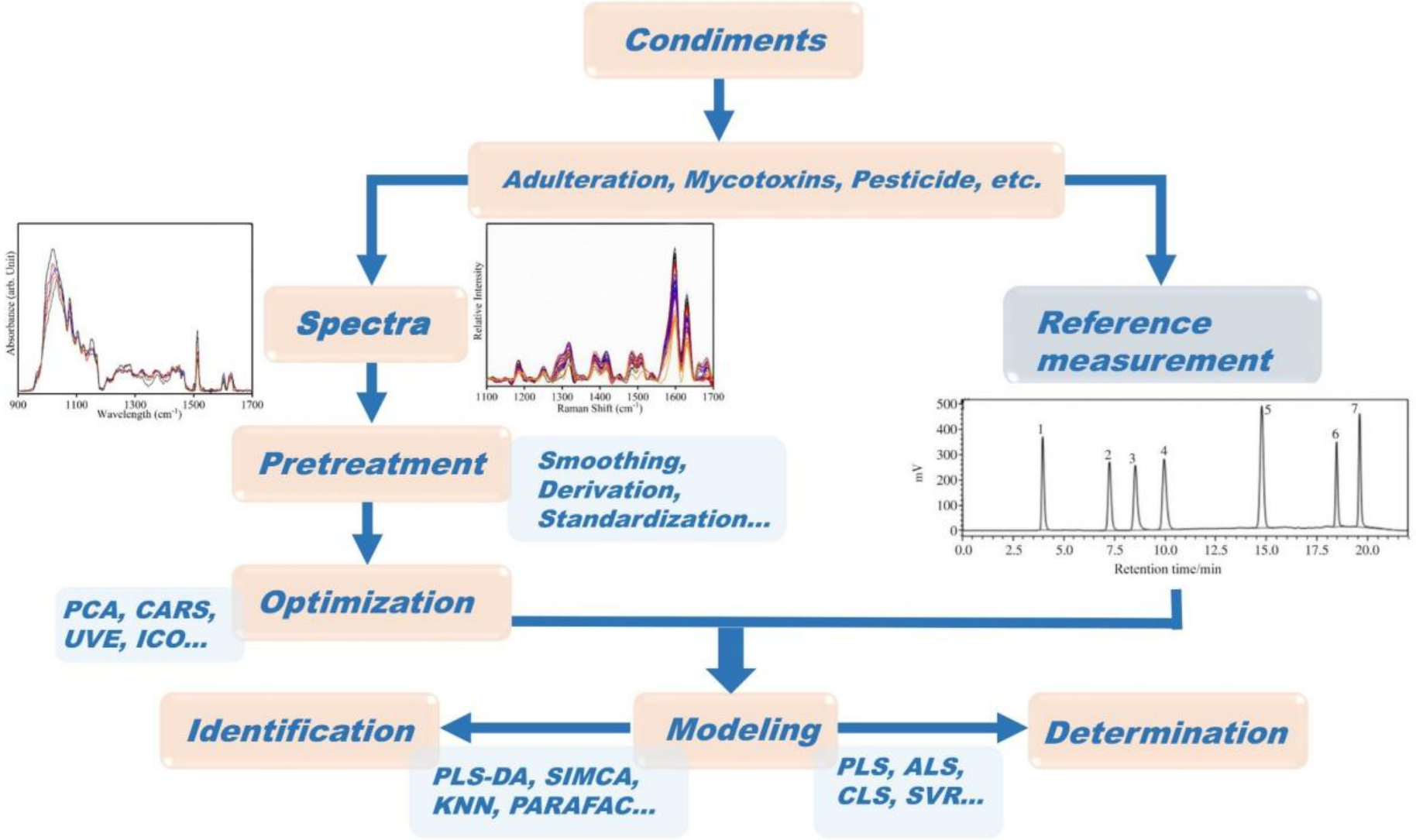
Convenience

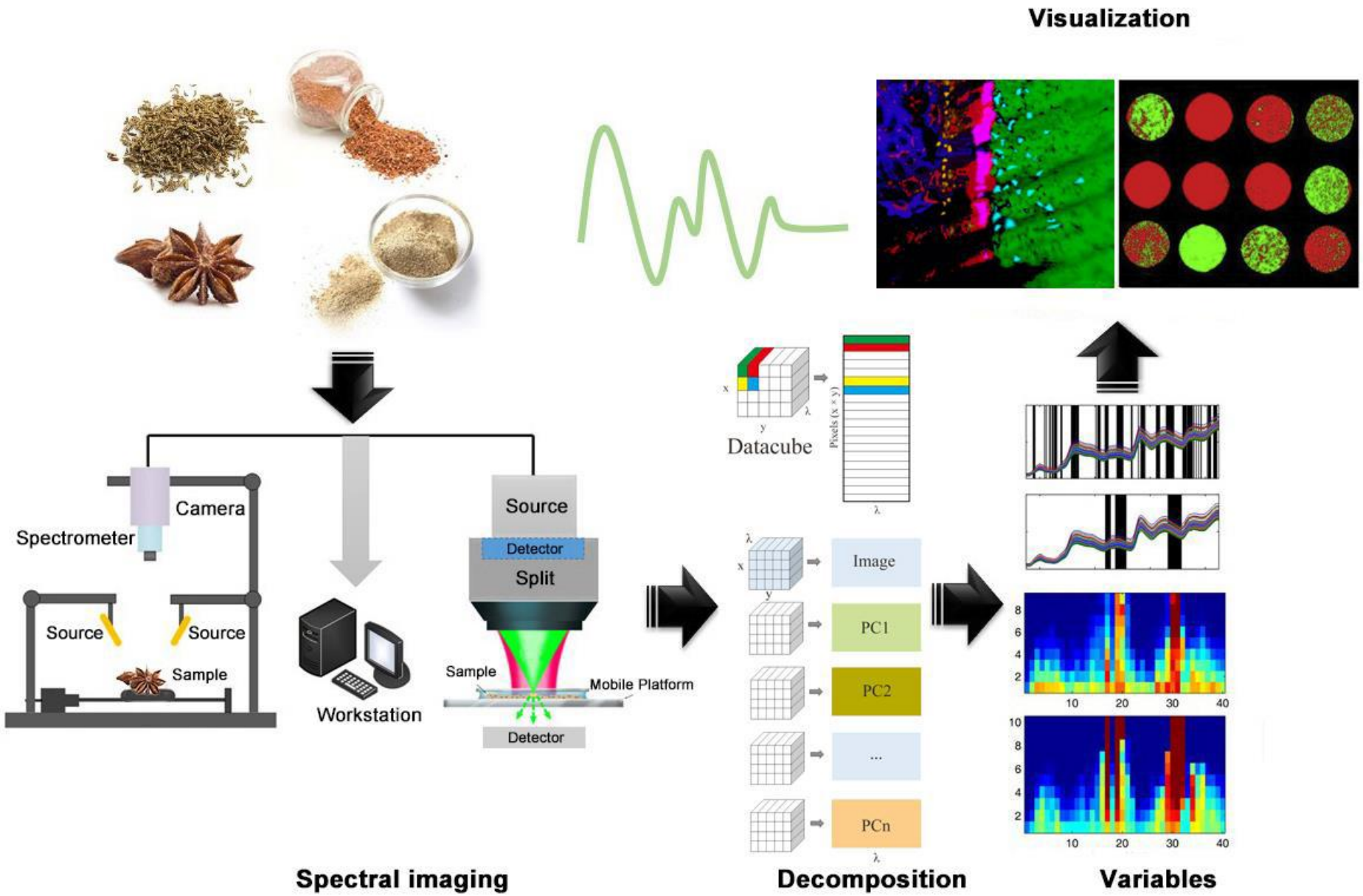
Economy

Environment



Analysis


Condiments
Adulteration, Mycotoxins, Pesticide, etc.
Spectra
Absorbance (arb. Unit)
900 1100 1300 1500 1700
Wavelength (cm⁻¹)
Relative Intensity
1100 1200 1300 1400 1500 1600 1700
Raman Shift (cm⁻¹)
Reference measurement
mV
500 400 300 200 100 0
1 2 3 4 5 6 7
0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0
Retention time/min
Pretreatment
Smoothing, Derivation, Standardization...
PCA, CARS, UVE, ICO...
Optimization
Identification
Modeling
Determination
PLS-DA, SIMCA, KNN, PARAFAC...
PLS, ALS, CLS, SVR...


Visualization
Camera
Spectrometer
Source
Source
Sample
Workstation
Source
Detector
Split
Sample
Mobile Platform
Detector
Datacube
Image
PC1
PC2
...
PCn
Spectral imaging
Decomposition
Variables

Analysis

Portable spectroscopy

Black and white peppers

Identification

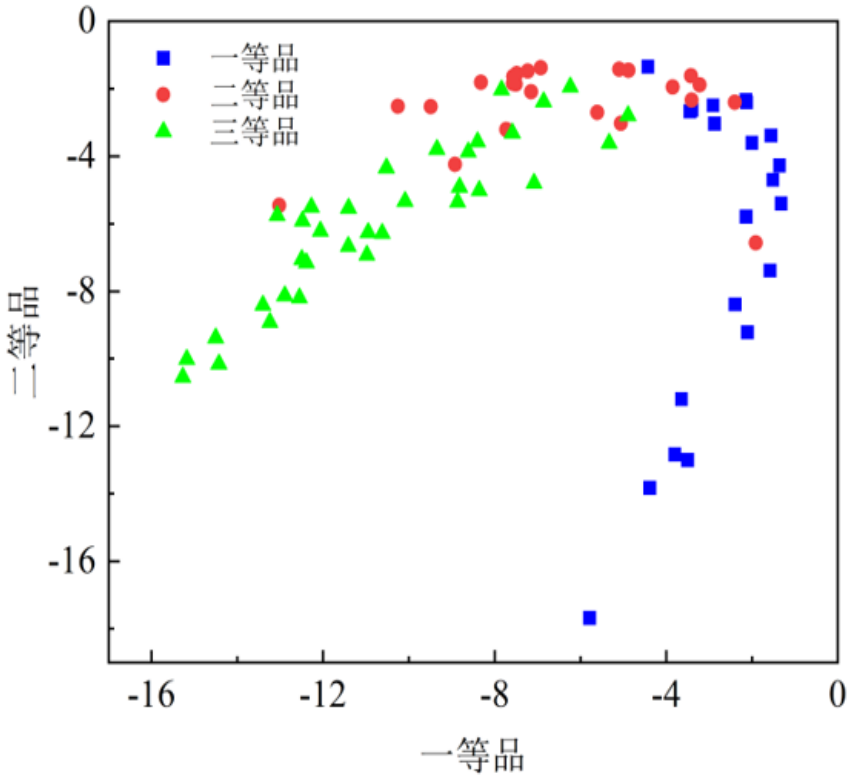
Fraud identification, Grading

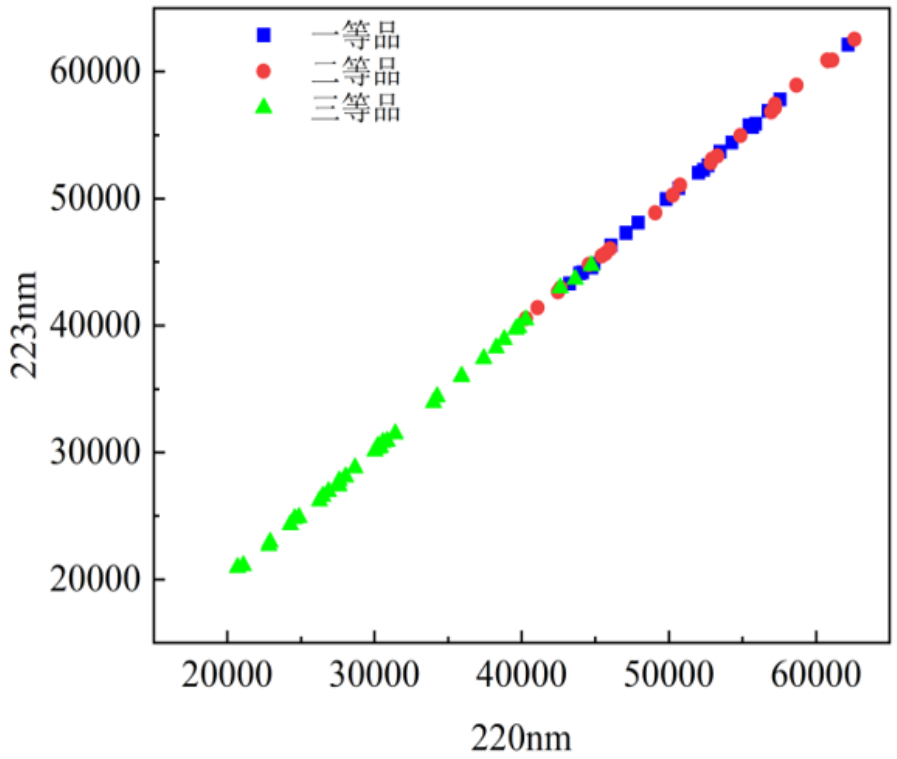
Quantification

Content of fraud and piperine

Analysis

Identification





LDA model

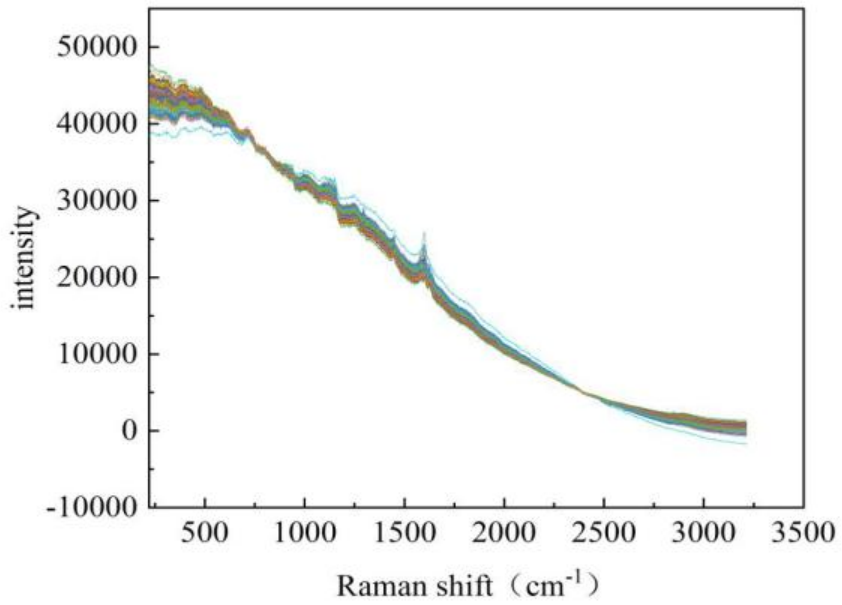
104 samples， At 86%， Ap 100%

SVM model

78 samples， At 100%， Ap 91%

Analysis

Quantification



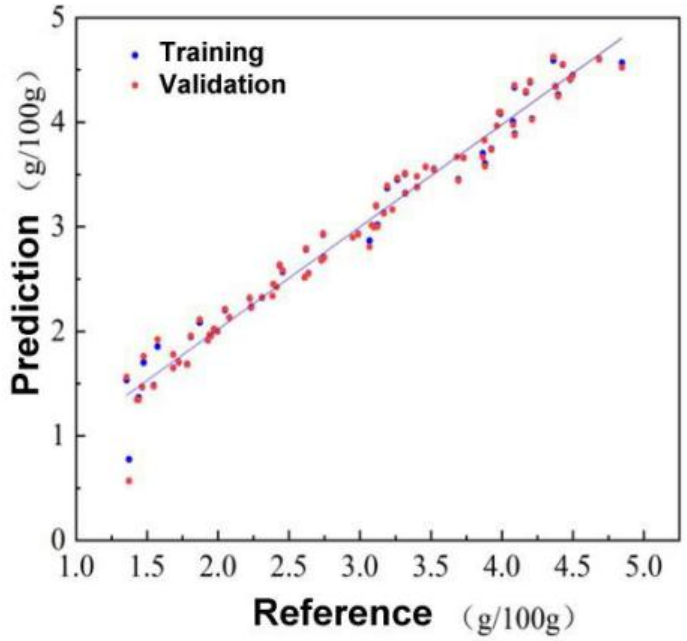
Fraud

Piperine

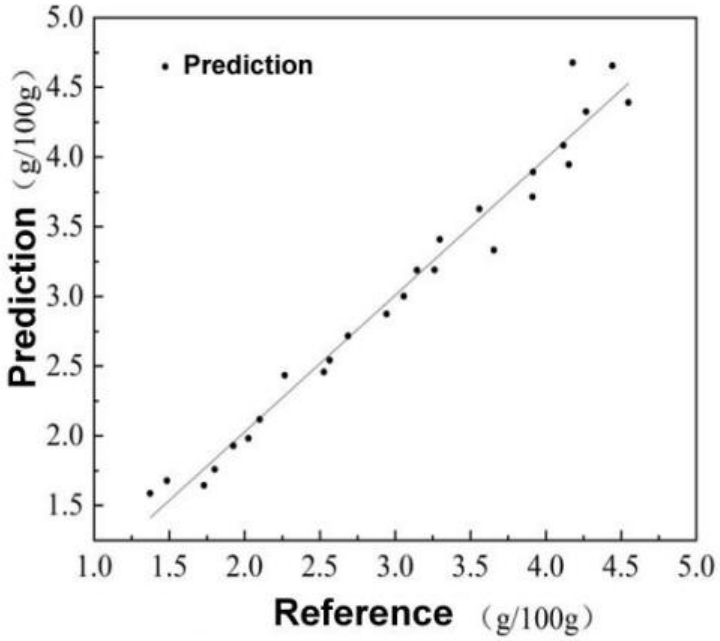
Portable NIRS & Raman

0.15 S

Portable NIRS-Content of piperine (PLS)



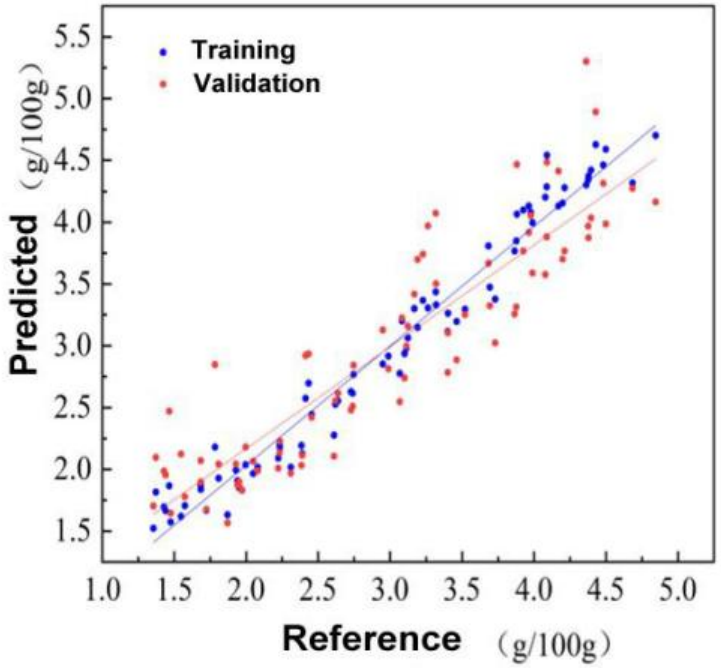
(a)



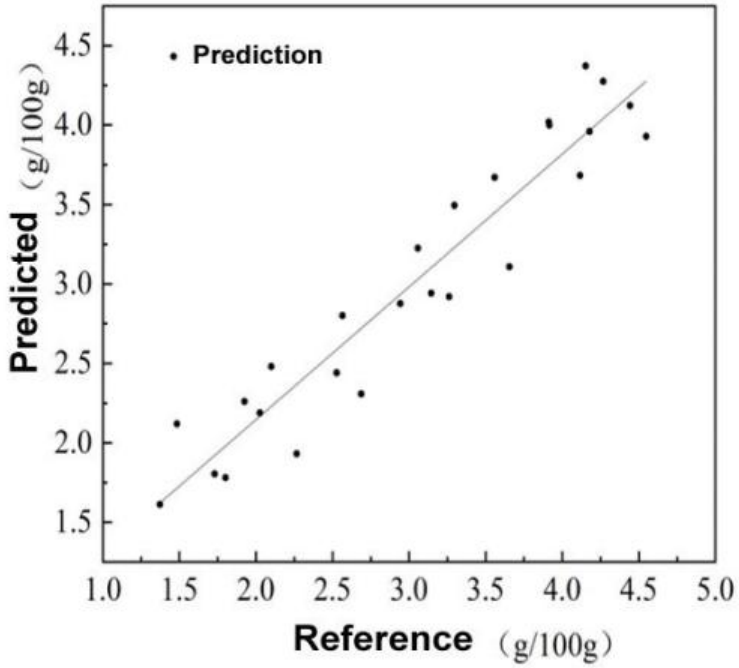
(b)

Factors：3
Rc：0.9794
RMSEC：0.1425
Rp：0.9728
RMSEP：0.1604
RPD：6.0474

Portable Raman-Content of piperine (PLS)



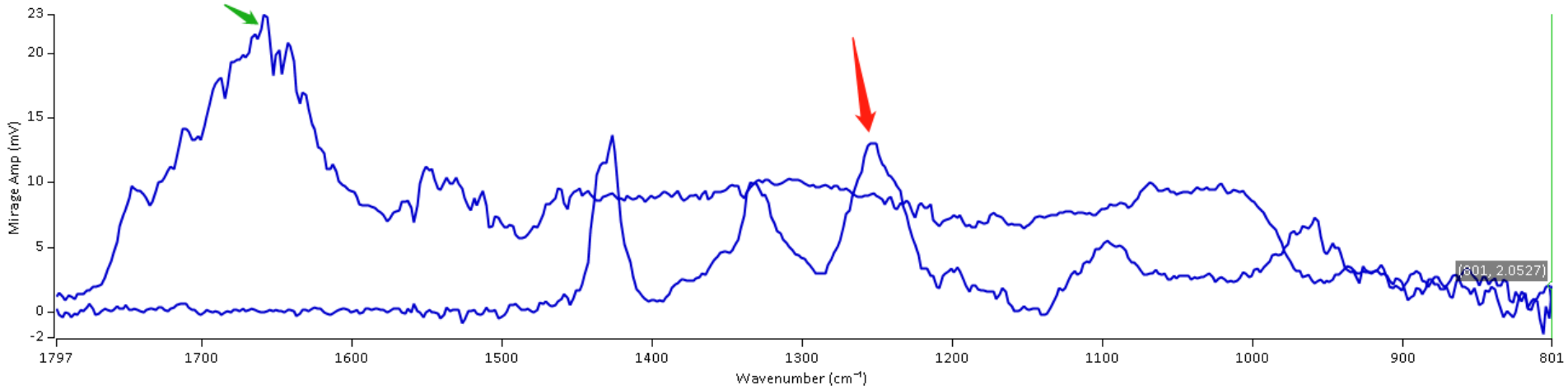
(a)

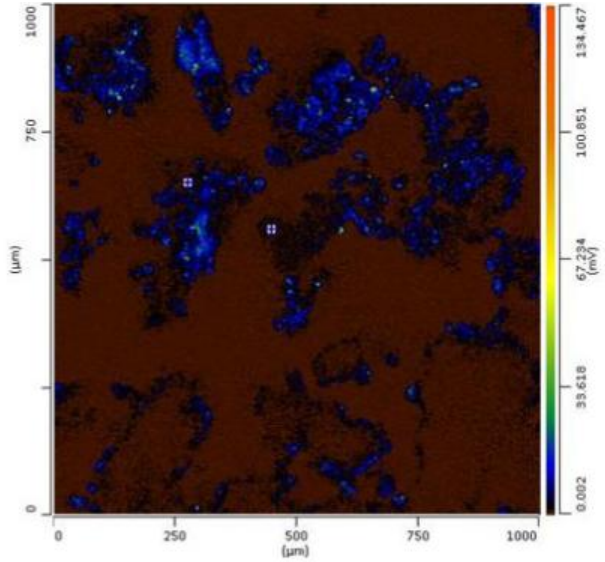


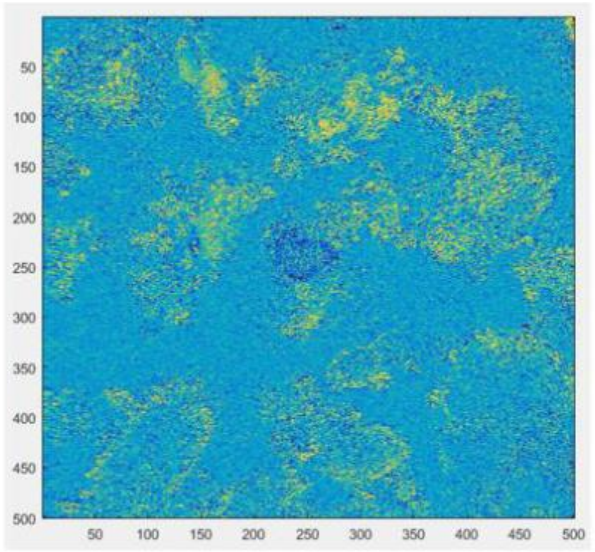
(b)

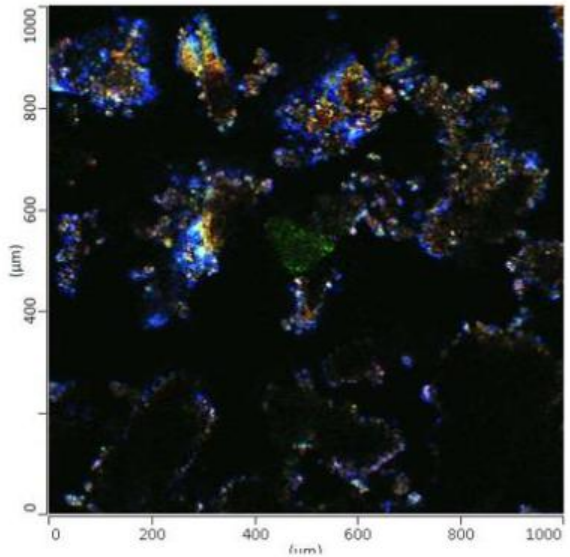
Factors：3
Rc：0.9668
RMSEC：0.1809
Rp：0.9023
RMSEP：0.3038
RPD：3.1929

Image Analysis





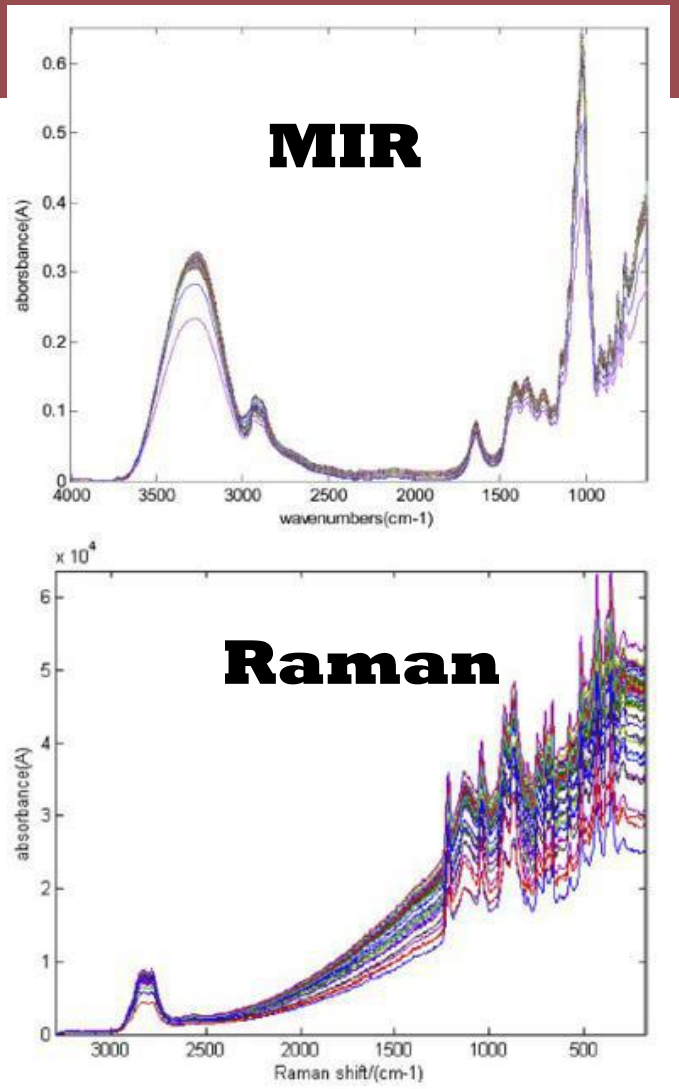




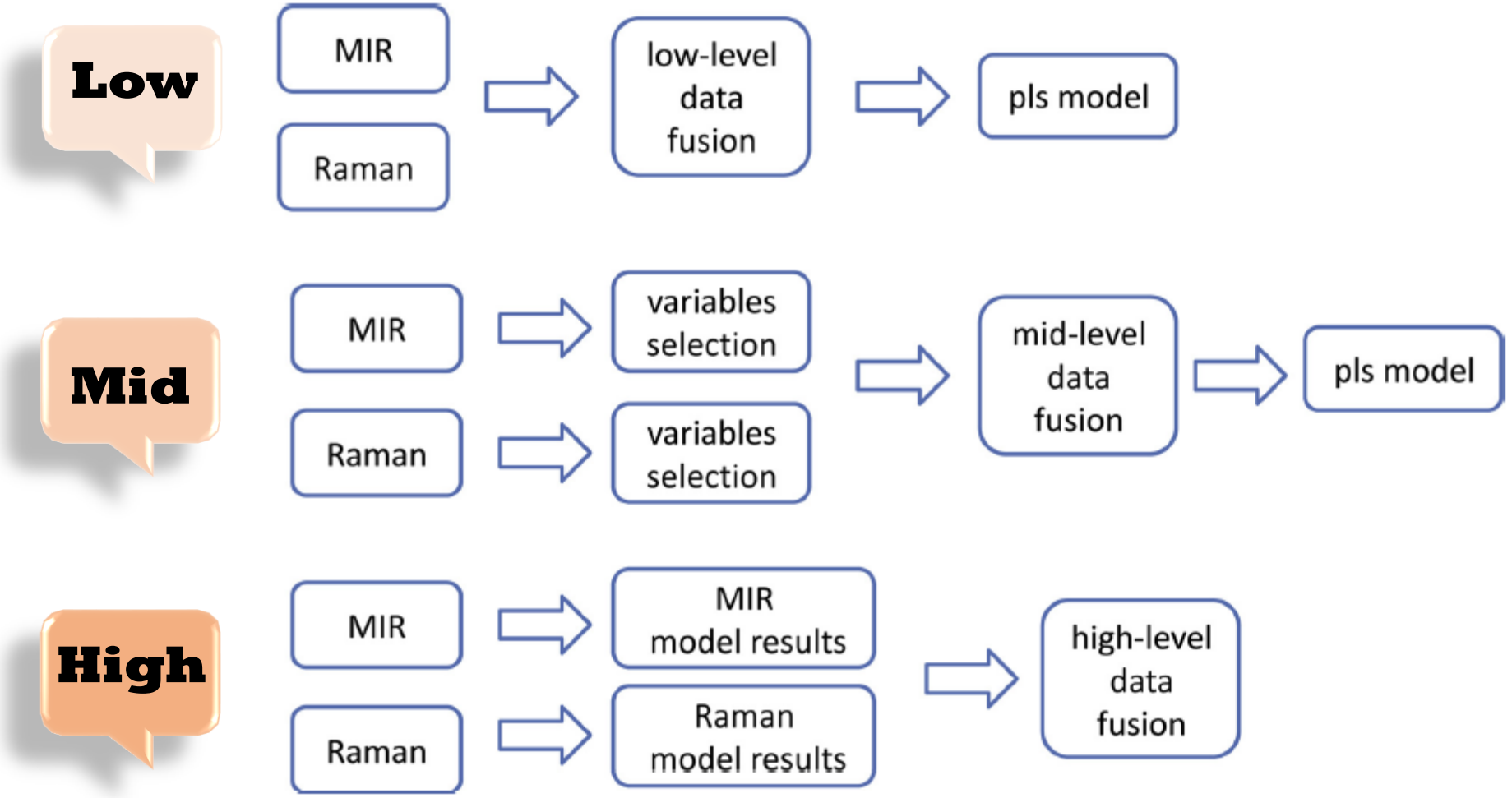
Analysis

Fraud honey

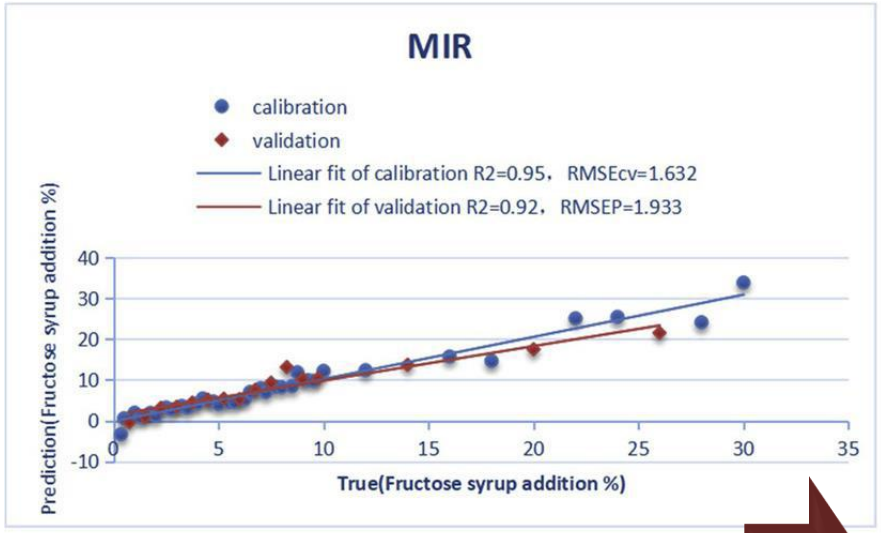
Spectral fusion

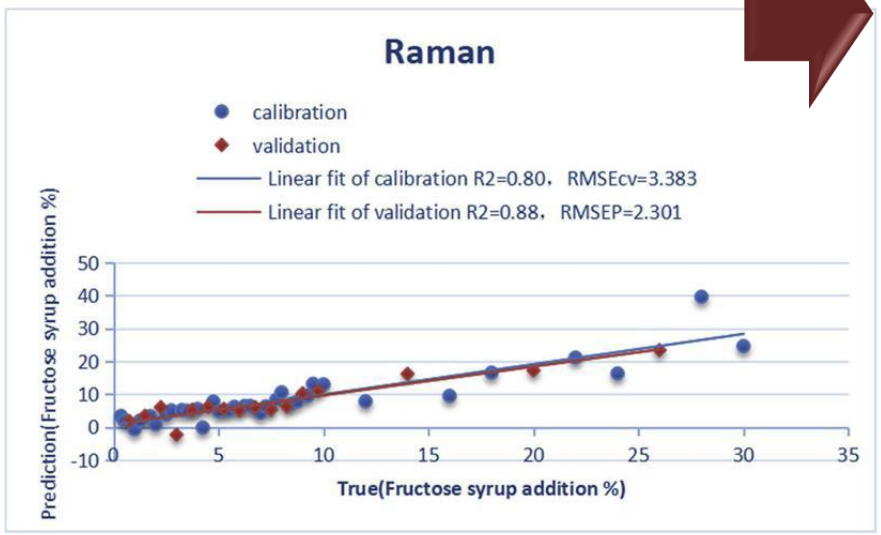


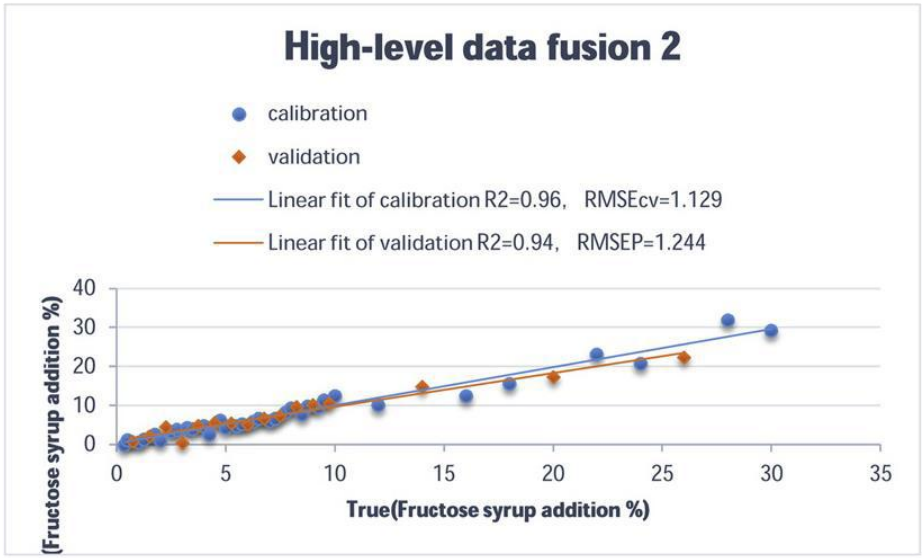
Spectral fusion



Spectral fusion

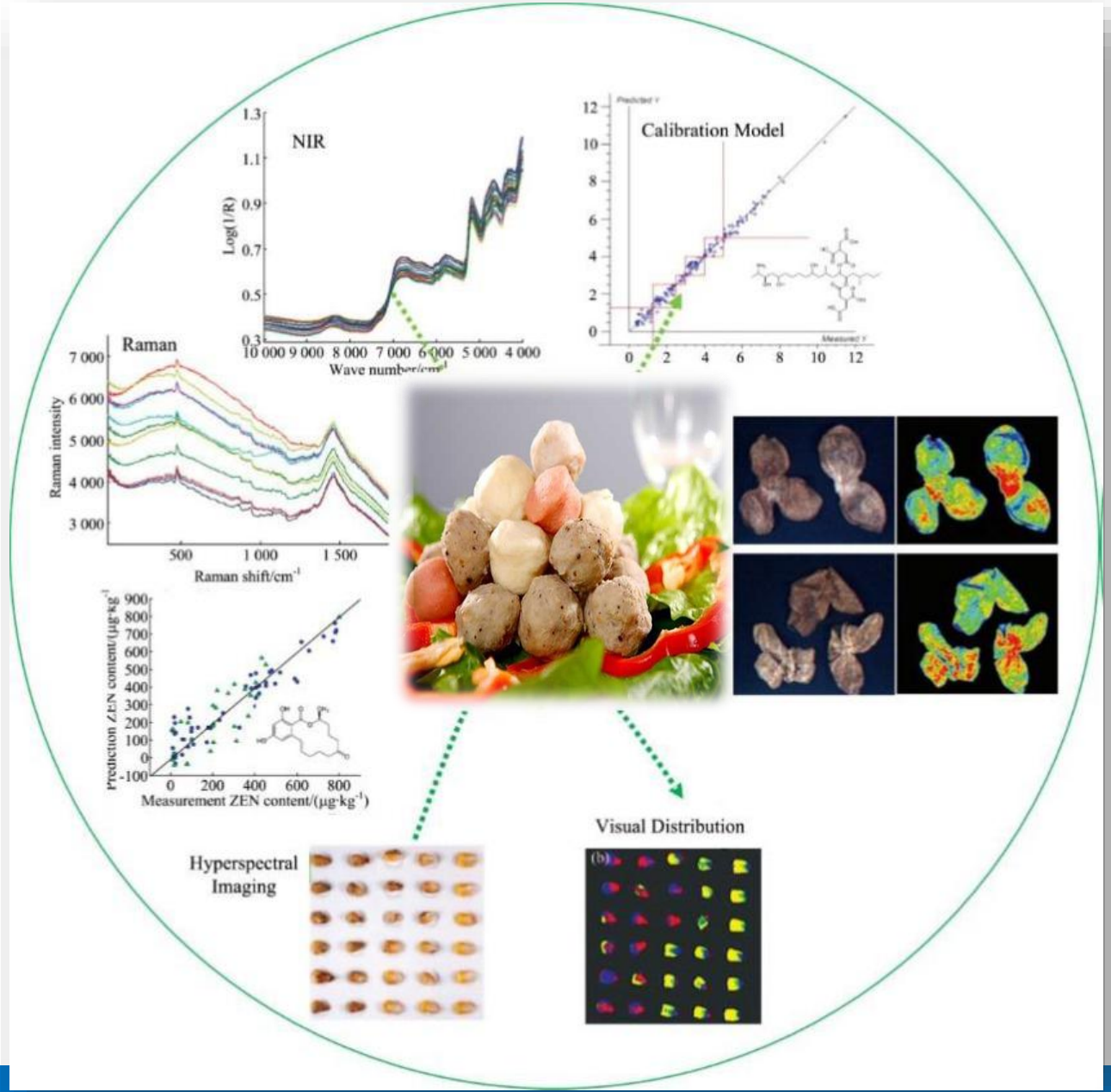






Further Application

Industrial application



Cooperation

- Extend the application range
- Online hyper imaging monitoring
- Chemometrics

Thanks for your attention

Email: huangyue@cau.edu.cn

Maaria Kortesniemi, Assistant Professor

Food Chemistry and Food Development,
Department of Life Technologies,
University of Turku

Applications of NMR metabolomics in food authentication and quality control

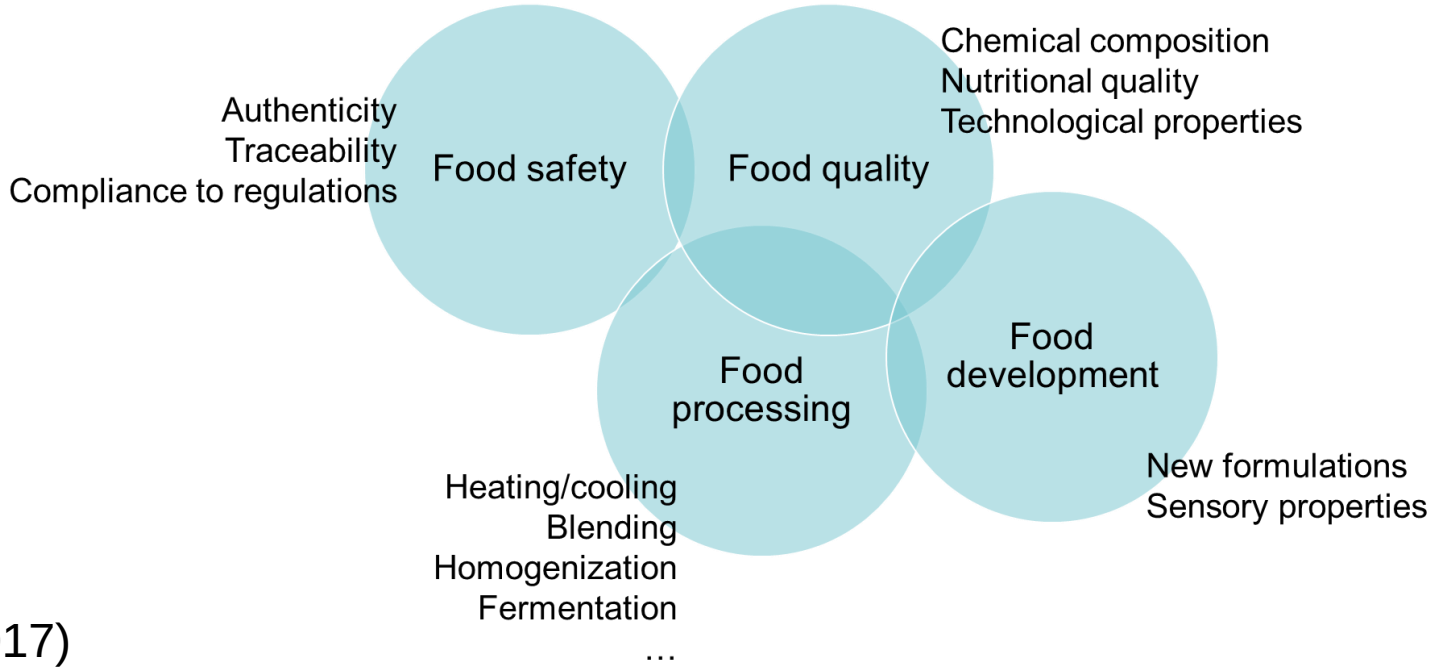
FCFH Kick-off event

Nov 1, 2021

UNIVERSITY OF TURKU

NMR metabolomics is an efficient tool for assessing food quality, processing and safety of raw materials and final products

- Little or no sample preparation (green method)
- Snapshot of sample's small-molecular-weight metabolites
- Fast and reliable screening method providing targeted and non-targeted multi-marker analysis



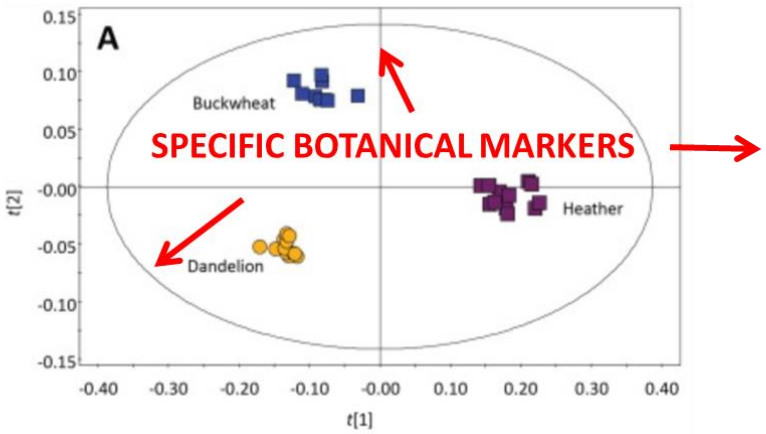
- Plant foods
  - Genotype (Kortesniemi et al. 2015, 2017)
  - Geographical origin (Kortesniemi et al. 2017; Paryani et al. 2020)
  - Abiotic/biotic stress (Kortesniemi et al. 2017)
  - Temporal variation (Kortesniemi et al. 2015; Paryani et al. 2020)
  - Agricultural practices

Instrumentation provided by the Turku Centre for Chemical and Molecular Analytics (CCMA)

UNIVERSITY OF TURKU

Honey

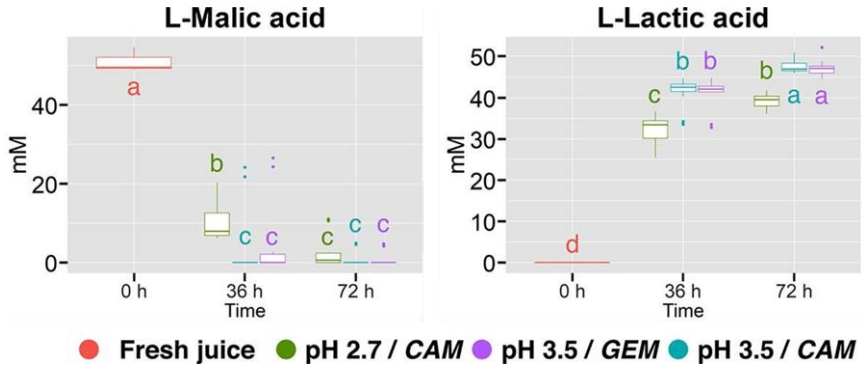
- Varietal (unifloral) / multifloral
- Botanical origin, authenticity
- Quality, commercial value
- Many benefits over traditional methods
- Reference databases for authentication



Kortesniemi et al. (2016) *Food Res Int*
Kortesniemi et al. (2018) *Food Chem*

Sea buckthorn juice

- Flavor modification of sea buckthorn (*Hippophaë rhamnoides*) juice
- Optimization of malolactic fermentation with *L. plantarum*
  - Strain, pH, medium, duration

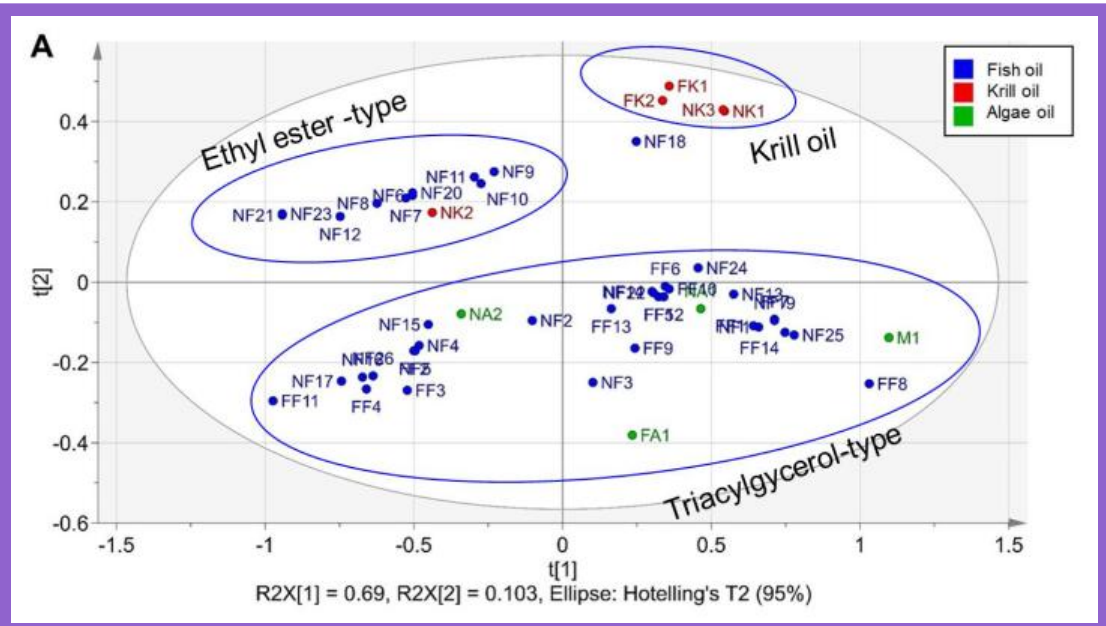


Markkinen et al. (2022)
Food Chem

Commercial omega-3 supplements

- Lipid class
- Nutritional quality
- Oxidation

Damerau et al. (2020) *Food Chem*



Thank you for your attention!
非常感谢

Contact:
Maaria Kortesniemi
mkkort@utu.fi

ENTREPRENEURSHIP AND INNOVATION IN FOOD SUSTAINABILITY TRANSITION

Dr Silvia Gaiani
Ruralia Institute, University of Helsinki
Finland-China Food and Health Network
1 st November 2021

My research in a nutshell

5 YEARS RESEARCH (2021-2025)

OBJECTIVE

To produce knowledge that can help support and shape the active role of food companies in South Ostrobothnia & Finland and promote an understanding of new business opportunities in the sustainable transformation of the food chain.
The research could potentially lead to the creation of an Innovation Hub/ Food Business Booster in the region.

SOME OF THE RESEARCH QUESTIONS

1. What is the current level of innovation in Finnish and South Ostrobothnian food companies?
2. How do new innovations and practices emerge? What is an innovation ecosystem in relation to food?
3. What is the role of food entrepreneurs in promoting innovations and sustainability transition?
4. What are the new emerging and promising trends in food innovation? (plant –based food/alternative proteins products/insects/3D printed food?)

?

Perfect timing for my research. WHY?

In terms of policies ….

Finland's Food Research Mission for 2035 (released in March 2021)

The Finnish food system is based on sustainable, flexible, and competitive food and runs pilots on research, innovations and new operating methods that aim for a sustainable food system

The Finnish Innovation Ecosystem Agreement (released In April 2021)

Seinäjoki: Sustainable regeneration of the food ecosystem and intelligent regeneration of industry

Southern Ostrobothnia Regional Program (2018-2021)

The Regional Program states that organic and local food will remain permanent phenomena, which means that small local food companies will bring new significance to the market.

In terms of facts…

- South Ostrobothnia is **the Food Province of Finland-** and there are a number of projects going on around food
- It has been nominated as the **best business environment** by the Federation of Finnish Enterprises
- Business investments are expected to be around **1 billion euro** in 2021
- **1000 hectars of new business area**
- **Seinäjoki has been nominated n.1 city of entrepreneurship and it is the capital of space**

Many institutions are working in the region to promote activities, projects and researches on food, innovation, digitalization, sustainability

Current activities

- Collecting data from food companies to understand their current level of innovation in food products, processing and technologies
- Developing strategies and tools to enhance resilience of the food companies and promote internationalization, networking activities and start ups
- Writing project proposals in the framework of Horizon Europe calls and other EU and Finnish funding opportunities
- Promote collaboration among academia and industry
- Happy to explore collaboration with Chinese universities!

THANK YOU!

Silvia Gaiani

silvia.gaiani@helsinki.fi

Check Ruralia website:

https://www2.helsinki.fi/en/ruralia-institute

Optical Nanotechnologies for Single-Cell, Single-Particle and Single-Molecule Point-of-Care Biosensors

Jian-An Huang
University of Oulu

Jian-An’s brief CV

February 2021 - now: Assistant Professor in Biosensors,
University of Oulu, Finland

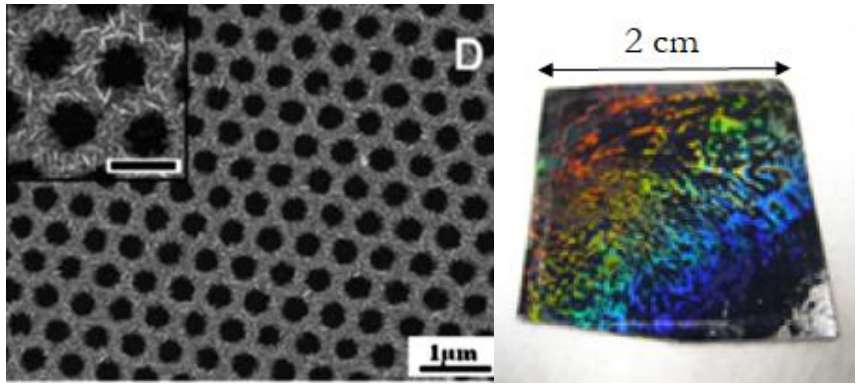
2nd-round postdoc: Nanophotonic Biosensing,
Italian Institute of Technology, Italy

1st-round postdoc: Scanning Near-field Optical Microscope,
University of Hong Kong, China

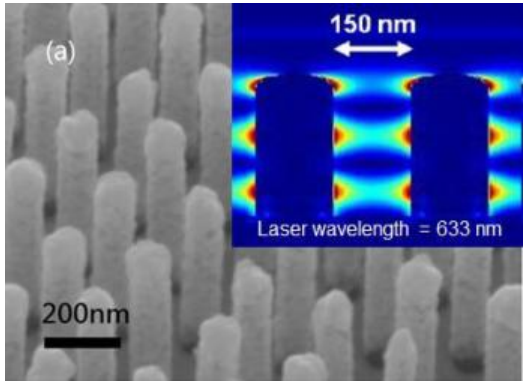
PhD.: Physics & Materials Science,
City University of Hong Kong, China

BSc.: Applied Chemistry,
University of Science & Technology of China, China

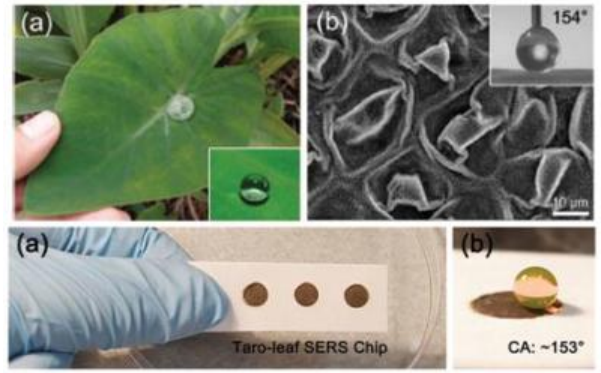
Optical Nanotechnologies for Point-of-Care Biosensors of Single Cell, Single Particle and Single Molecule



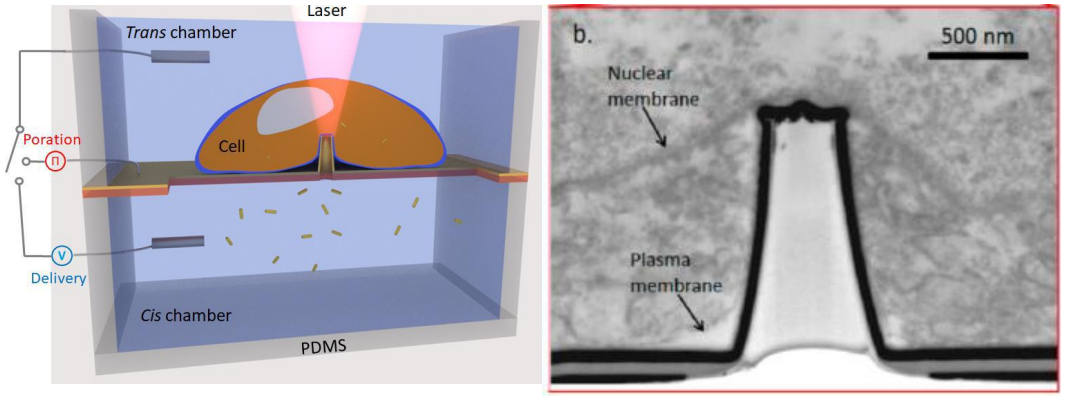
L. He, J.A. Huang et al., *Journal of Materials Chemistry* (2012)



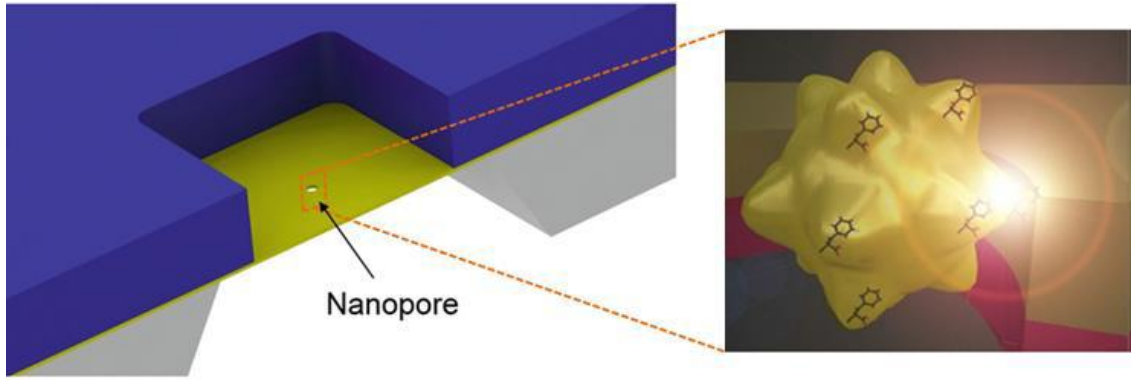
J.A. Huang et al., *Nano Letters* (2013)



J.A. Huang et al., *Nanoscale* (2016)

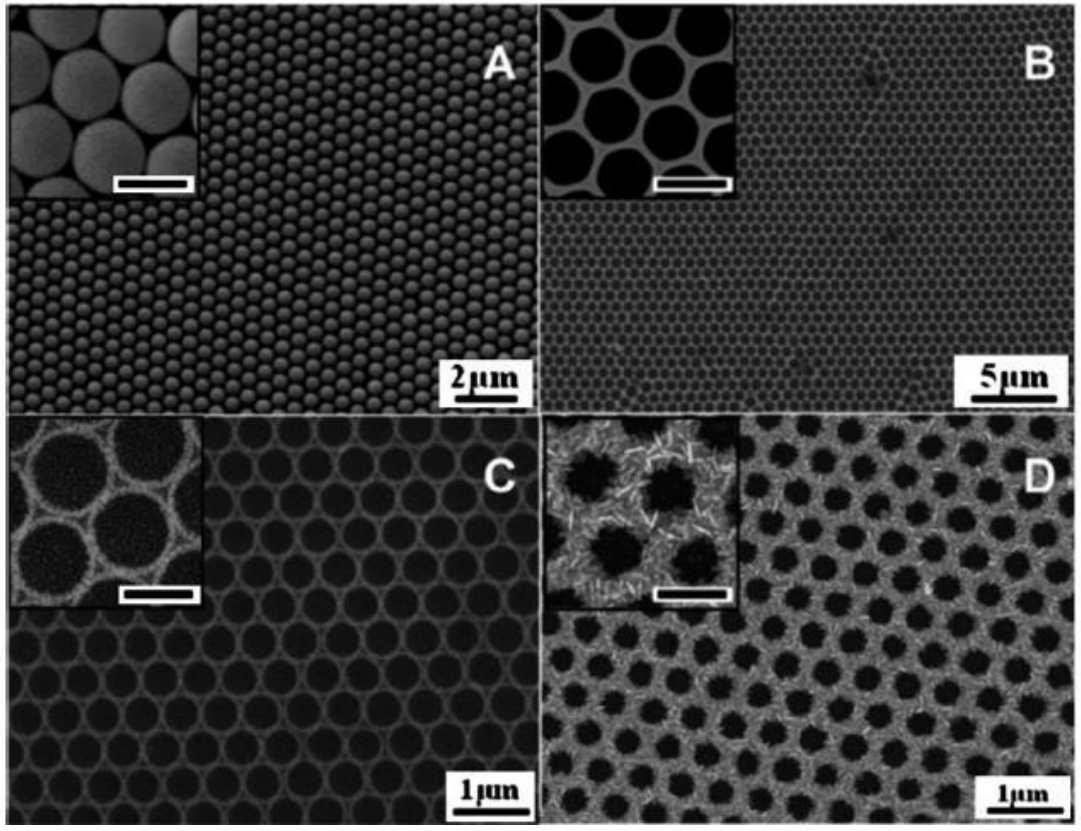


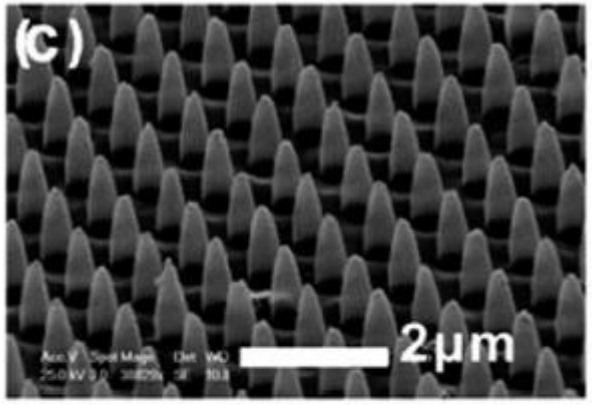
J.A. Huang *et al., Nano Letters* (2019)

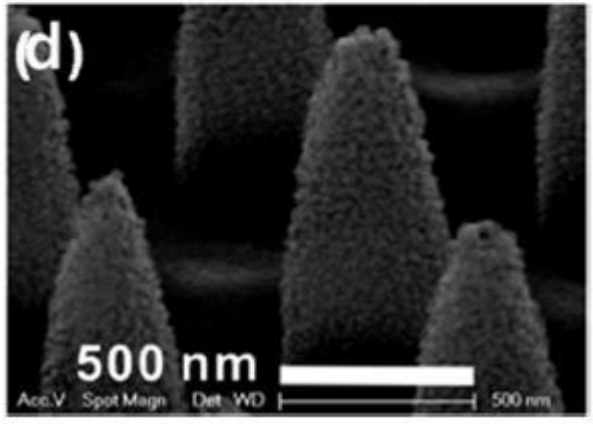


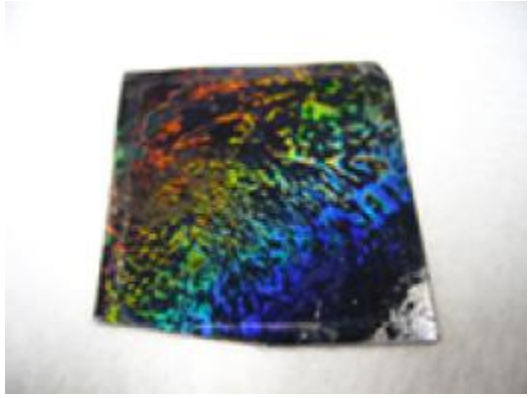
J.A. Huang *et al., Nature Communication* (2019)

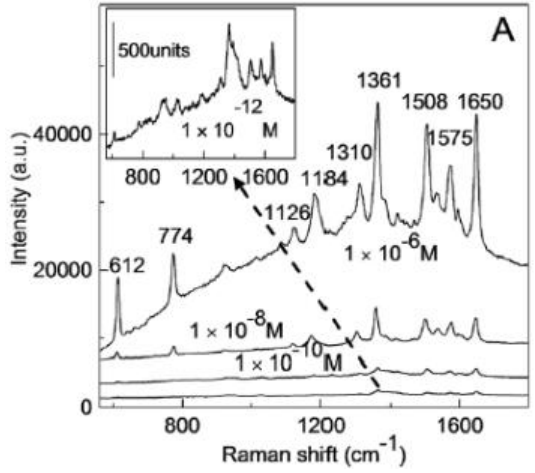
Wafer-scale plasmonic nanostructures fabricated by Nanosphere Lithography for Raman biosensing





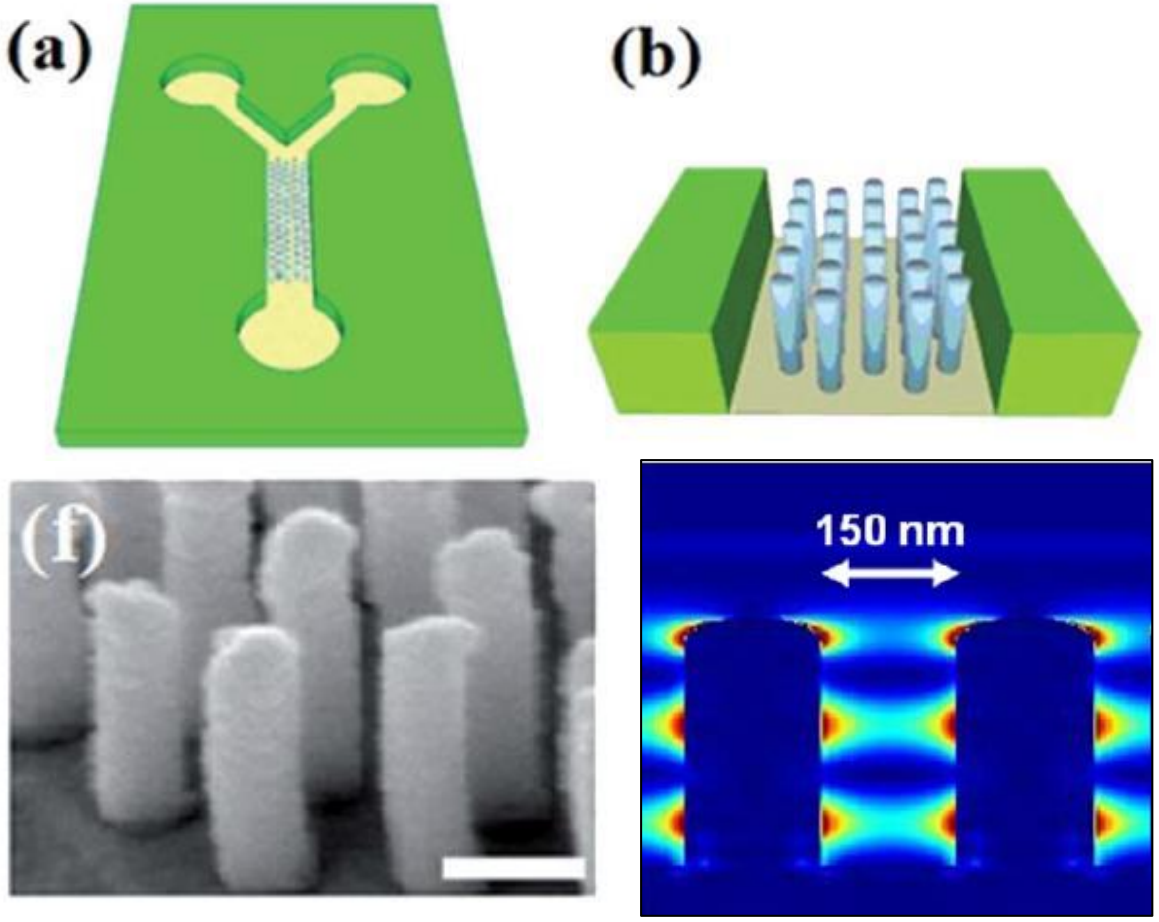




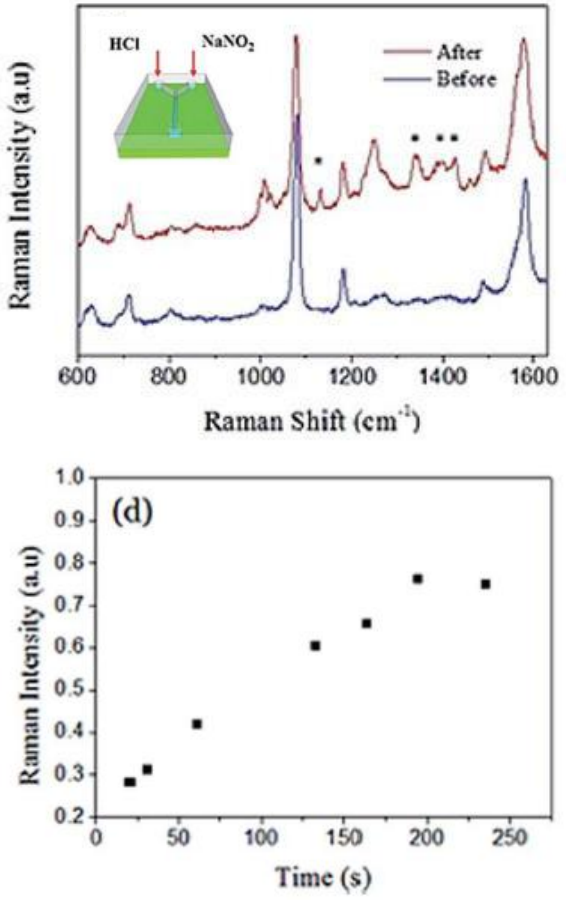


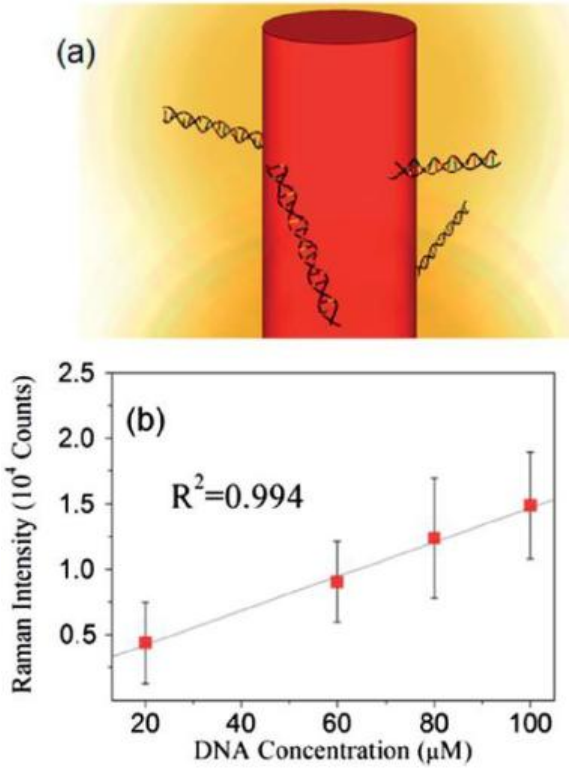
T. Xu et al., Appl. Phys. Lett., (2011)
L. He et al., J. Mater. Chem., (2012)

Plasmonic nanopillar in microfluidic chip for quantitative Raman detection of biomolecules



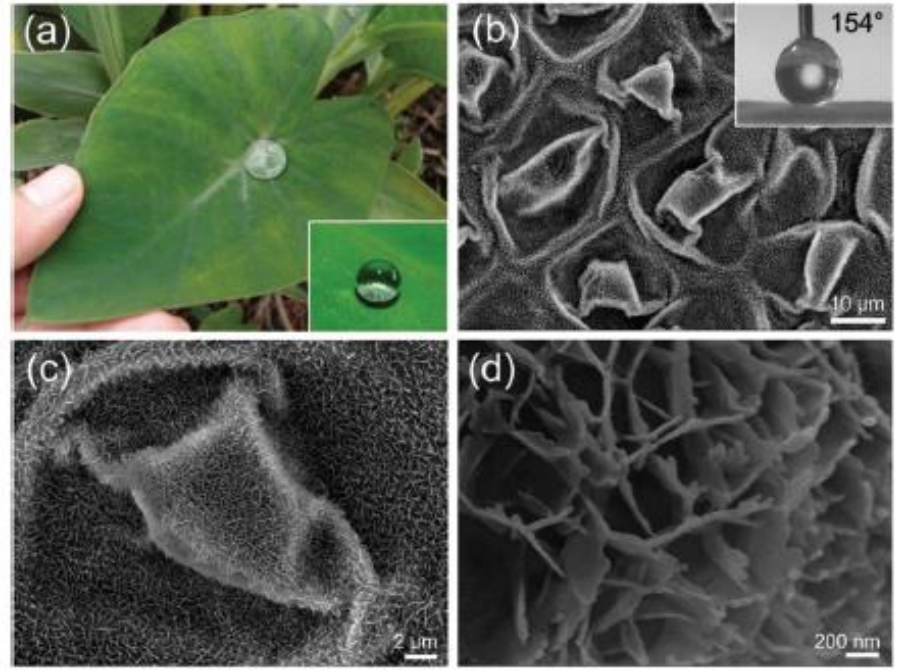
J.A. Huang et al., Nano Lett., (2013)

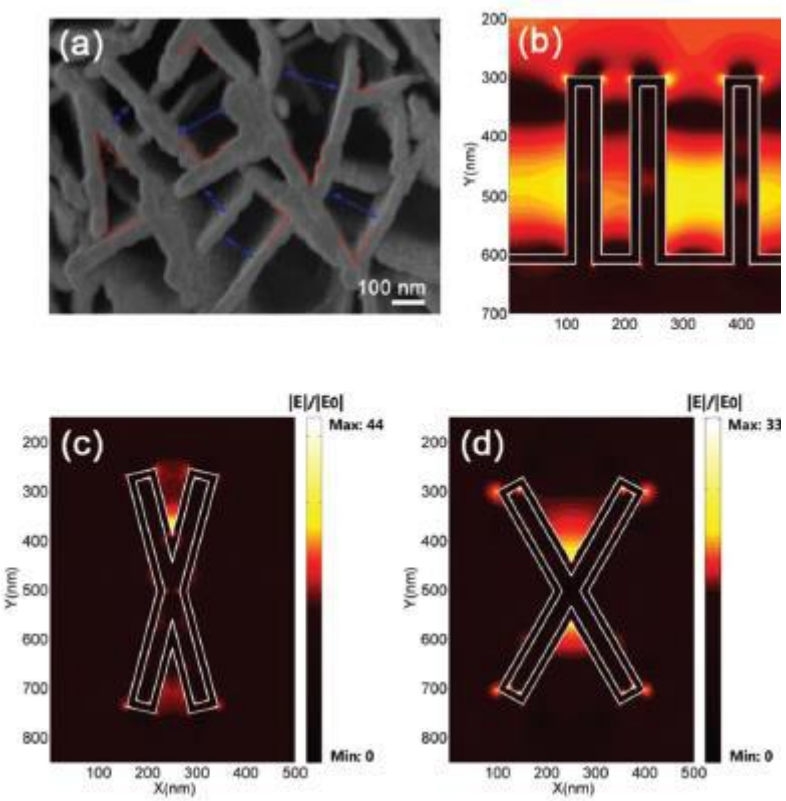


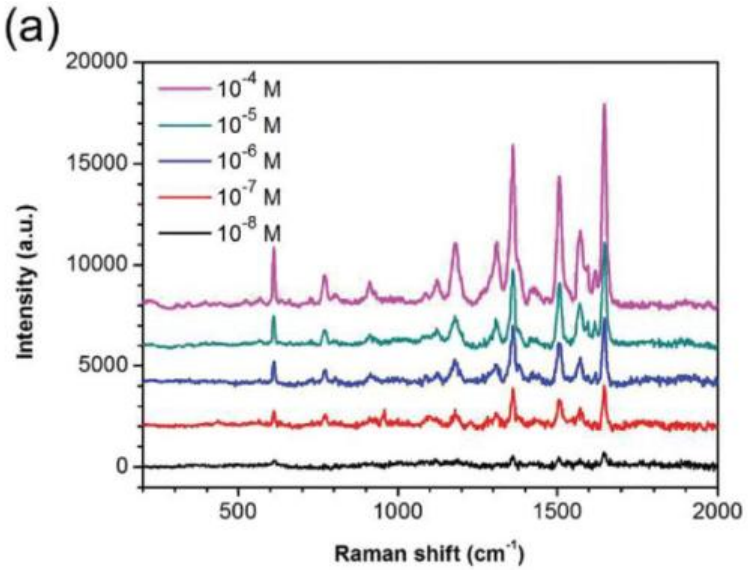


Y. Zhao et al., J. Mater. Chem. A, (2014)
Y. Zhao et al., J. Mater. Chem. A, (2015)

Low-cost Taro-leaf test chip for reproducible surface-enhanced Raman spectroscopy (SERS)

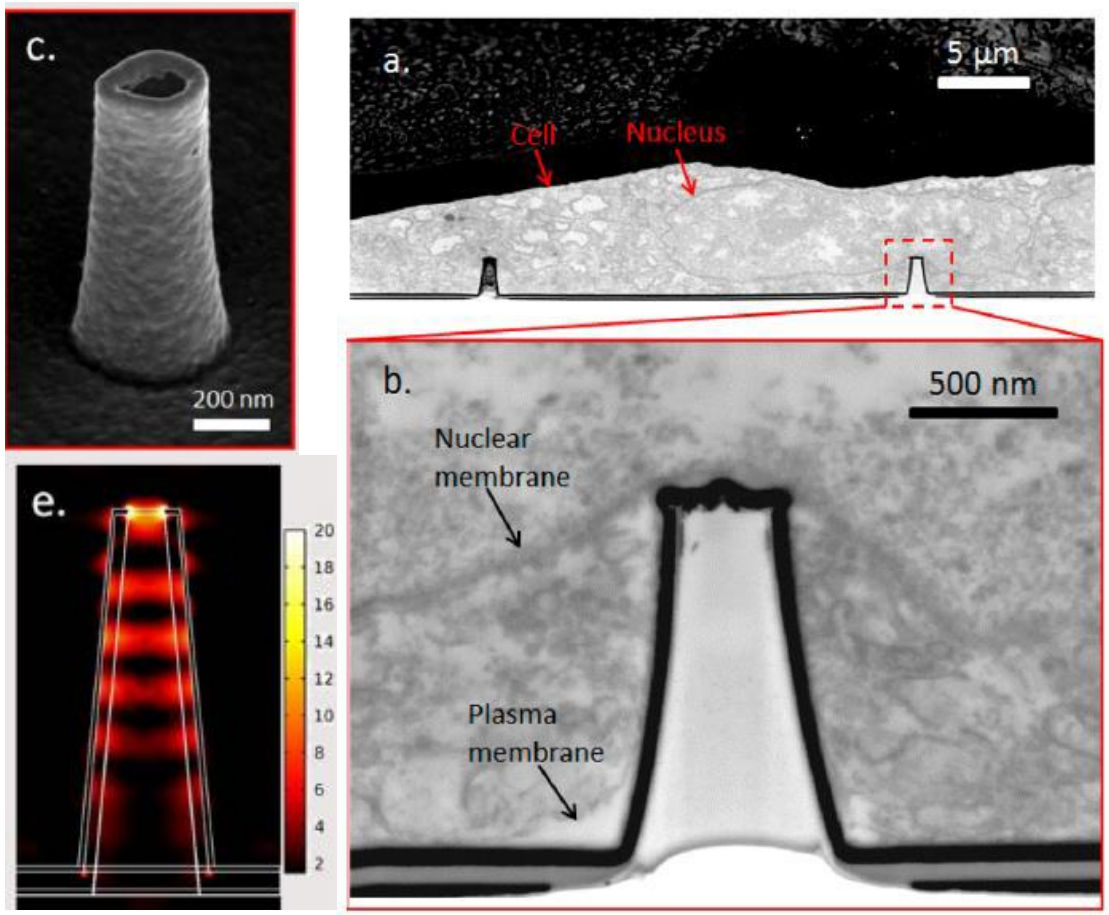


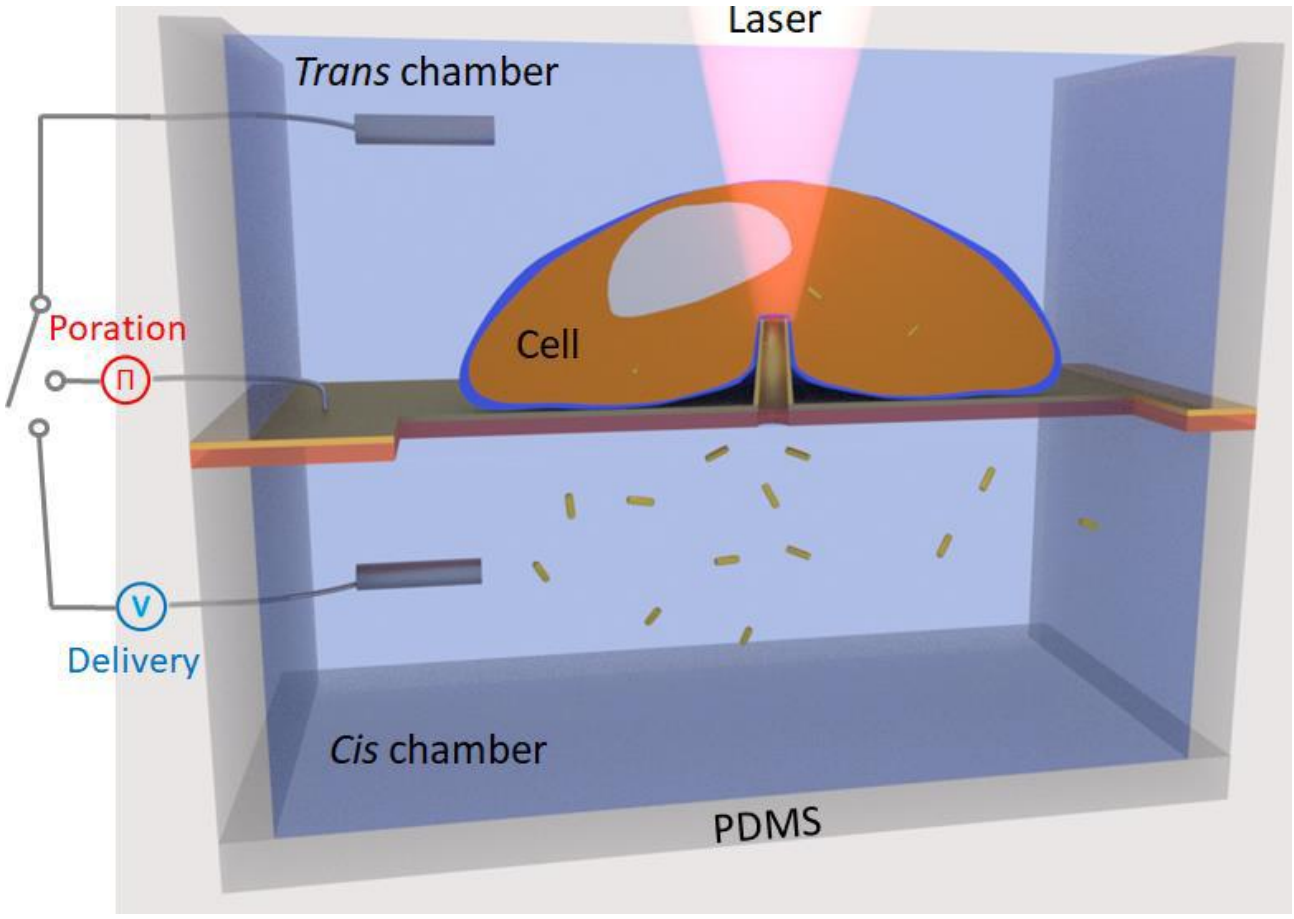




J.A. Huang et al., Nanoscale (2016)

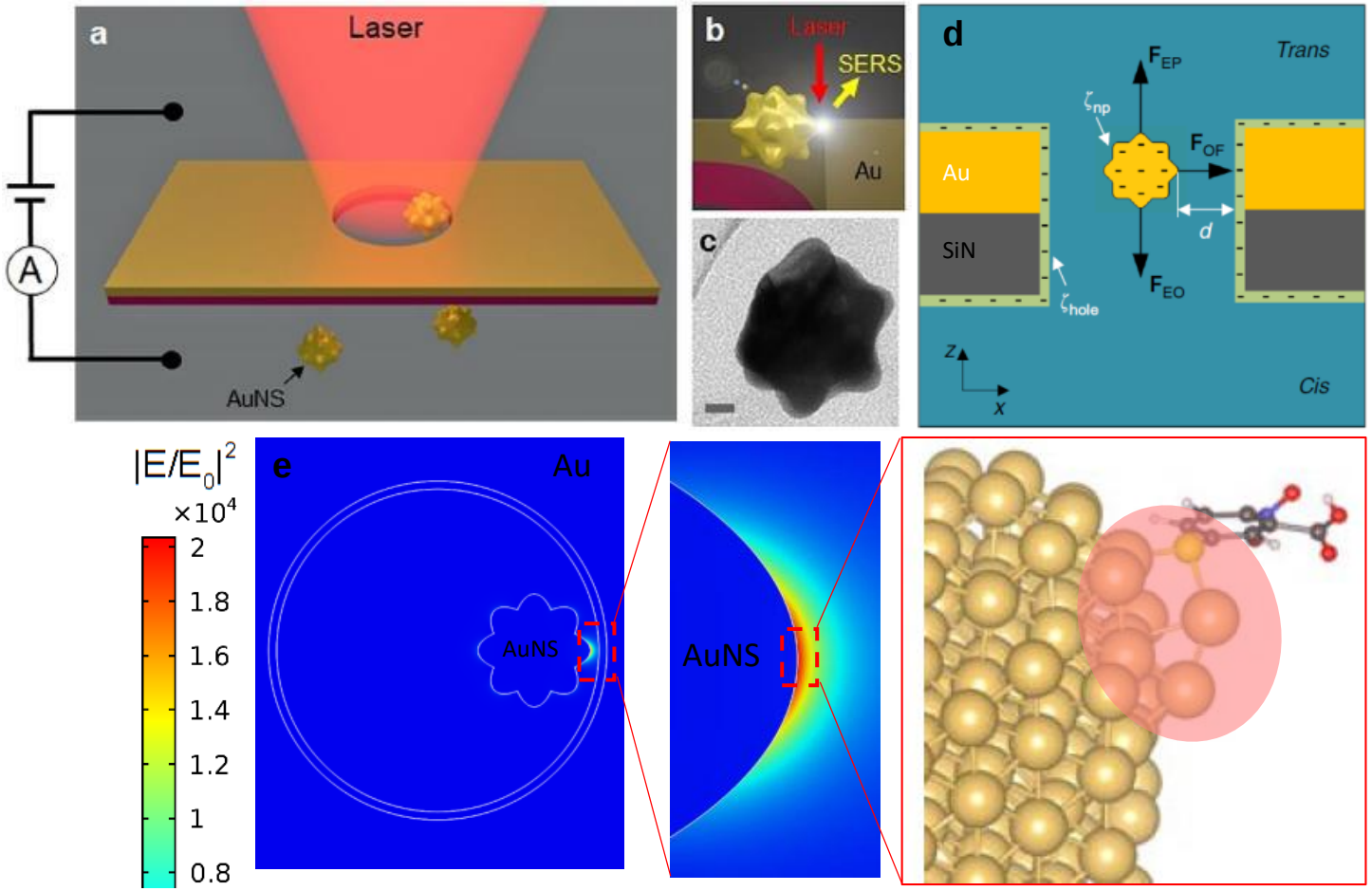
Single-cell study by a plasmonic gold nanotube for low-voltage electrophoration of cell membrane

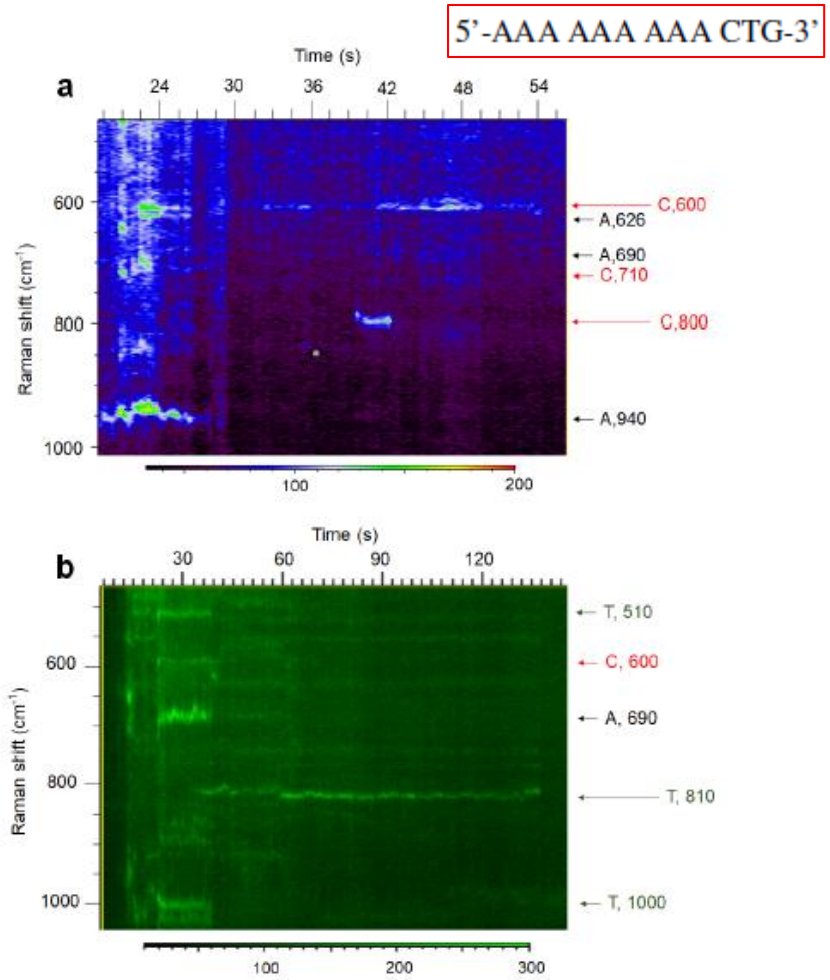




J.A. Huang et al., Nano Lett., (2019)

Single-molecule sequencing by Raman spectroscopy on a plasmonic nanopore





J.A. Huang et al., Nat. Commun. (2019)
J.A. Huang et al., Angew. Chem. Int. Ed. (2020)

Thank you for your attentions!

Jian-An Huang
Jianan.huang@oulu.fi

Application of optical technology and biosensor in rapid quality inspection of food products

Leiqing Pan, Professor

Nanjing Agricultural University

Email: pan_leiqing@njau.edu.cn

Optical technology: Integrating sphere

ELSEVIER

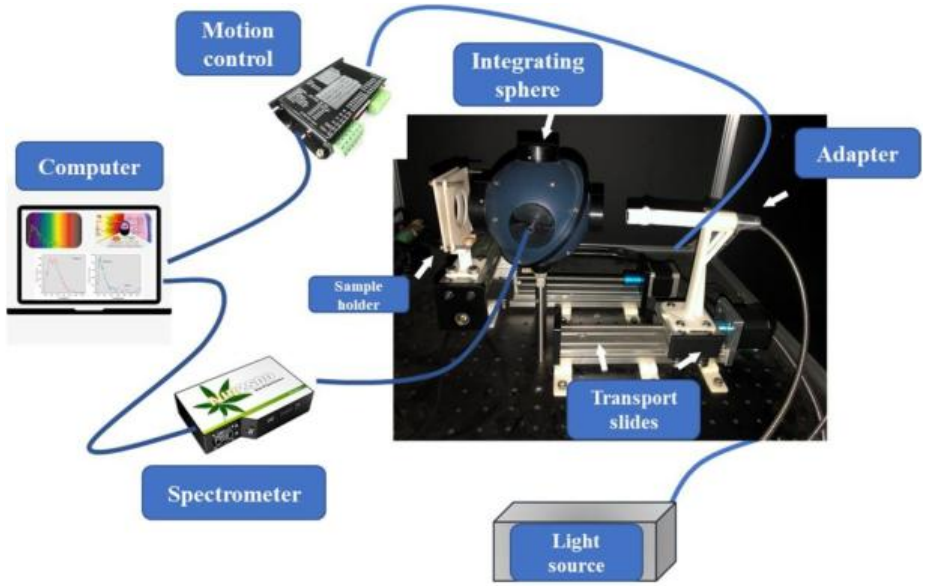
Journal of Food Composition and Analysis

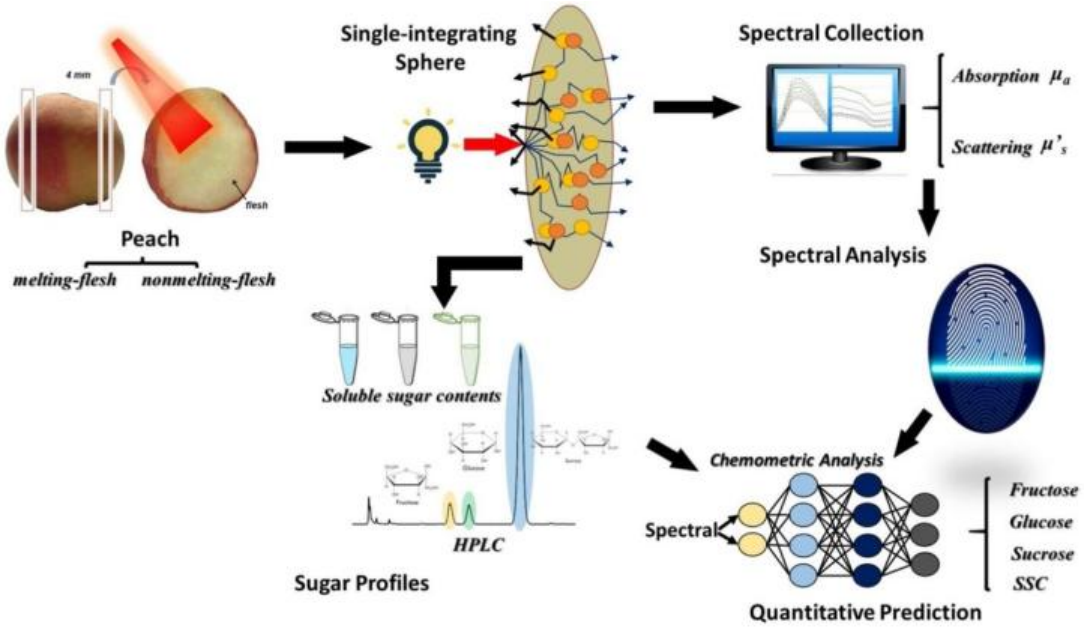
Volume 98, May 2021, 103843

Original Research Article

Quantitative determination of sugar profiles in peach fruit during storage by an integrating sphere system

Qiang Liu [a, b], Chen Ma [b], Kangli Wei [b], Kang Tu [b], Leiqing Pan [b]





Optical technology: Infrared spectroscopy

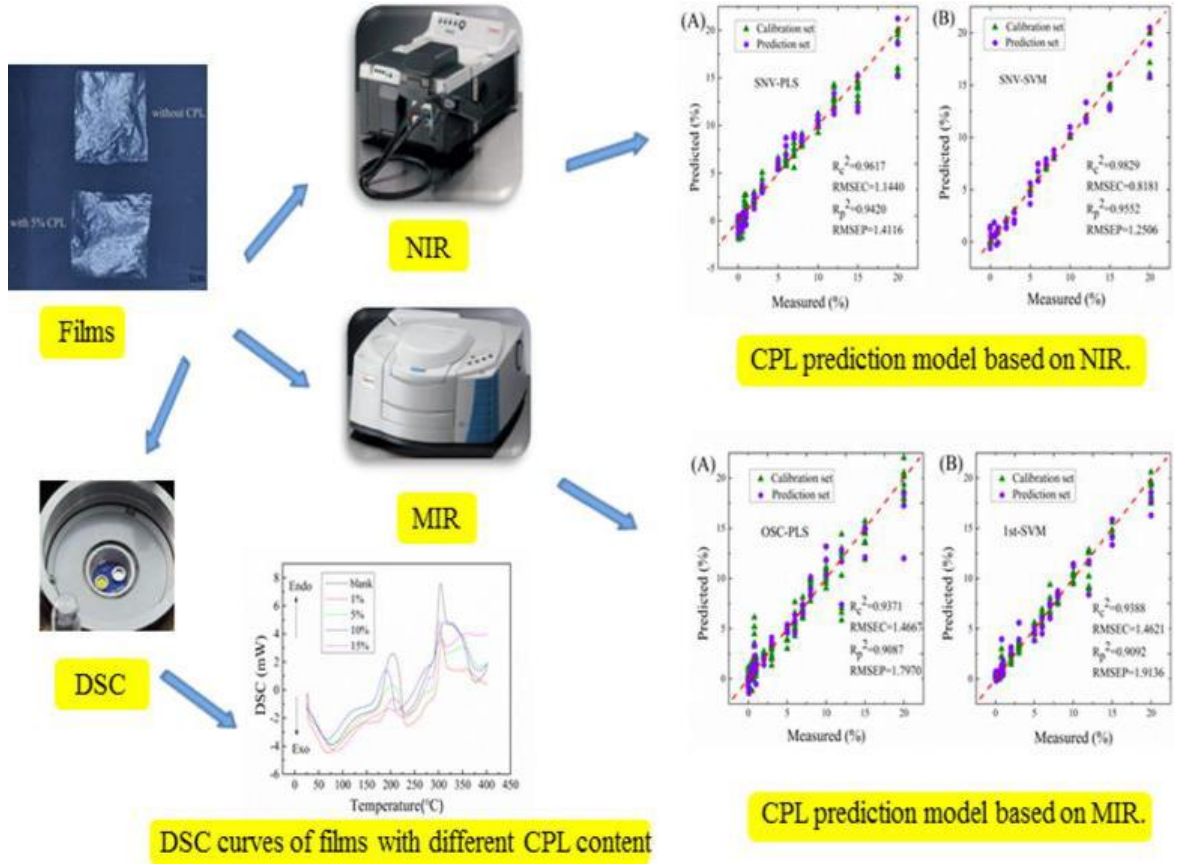
ELSEVIER

Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy

Volume 245, 15 January 2021, 118942

Effects of caprolactam content on curdlan-based food packaging film and detection by infrared spectroscopy

Jingyi Zhu [a], Qian Wang [a], Lu Han [a], Chong Zhang [a], Yuanyuan Wang [b], Kang Tu [a], Jing Peng [a], Jiahong Wang [c], Leiqing Pan [a]



Optical technology: Hyperspectral imaging

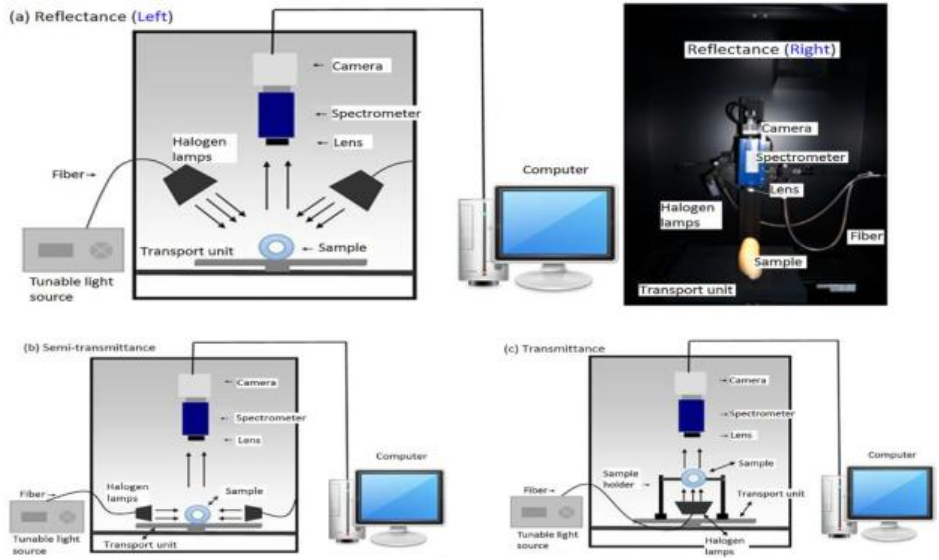
ELSEVIER

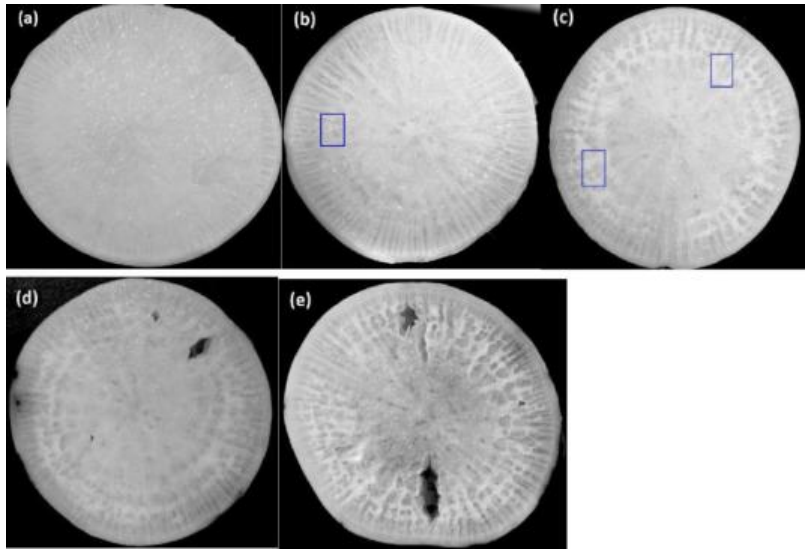
Postharvest Biology and Technology

Volume 126, April 2017, Pages 40-49

Hyperspectral imaging with different illumination patterns for the hollowness classification of white radish

Leiqing Pan, Ye Sun, Hui Xiao, Xinzhe Gu, Pengcheng Hu, Yingying Wei, Kang Tu



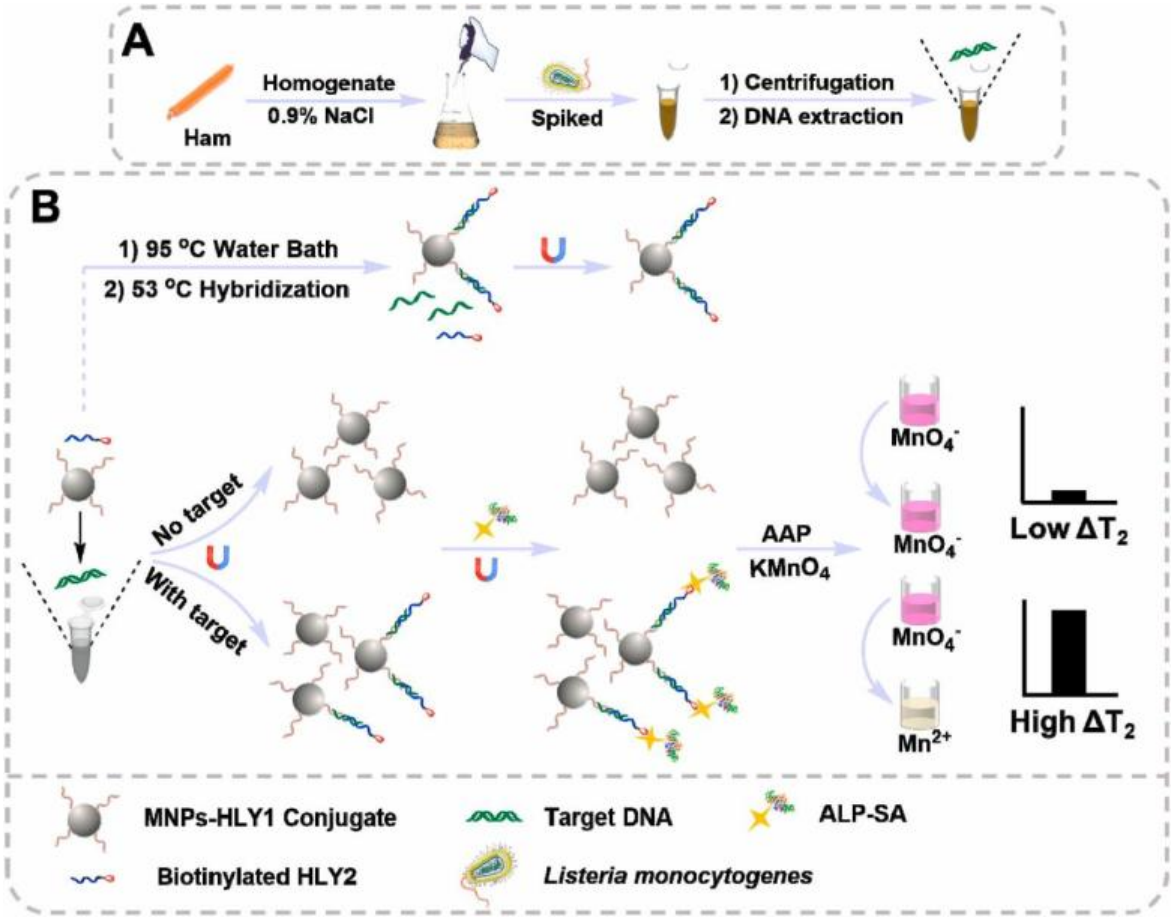


Biosensor

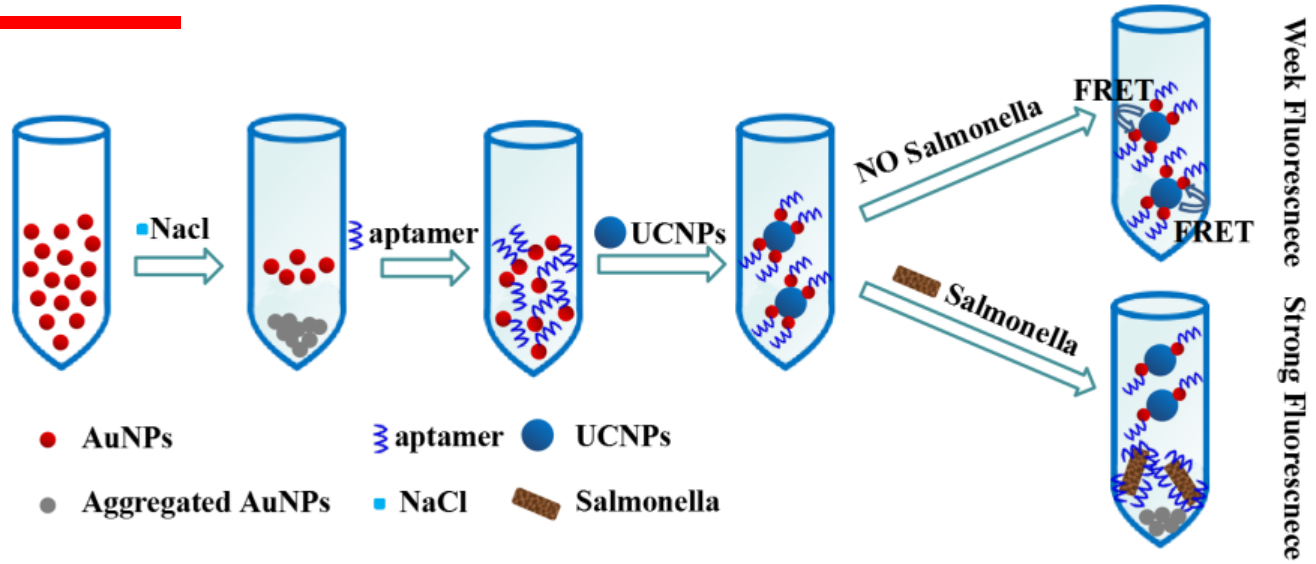
Food Control
Volume 125, July 2021, 107959

A magnetic relaxation DNA biosensor for rapid detection of *Listeria monocytogenes* using phosphatase-mediated Mn(VII)/Mn(II) conversion

Yue Li [a, 1], Long Wu [b, c, 1], Zhilong Wang [b], Kang Tu [a], Leiqing Pan [a] ✉, Yiping Chen [b] ✉



Biosensor



Analytical Methods

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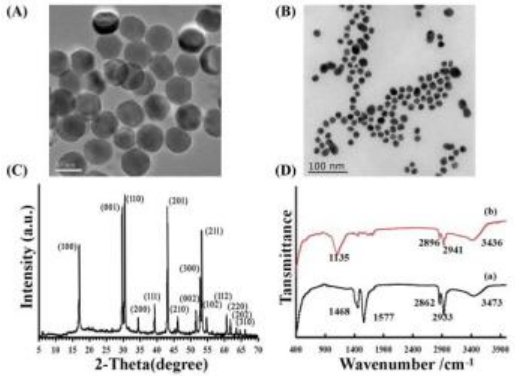
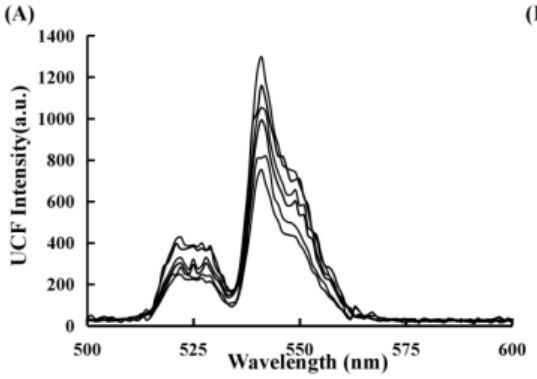
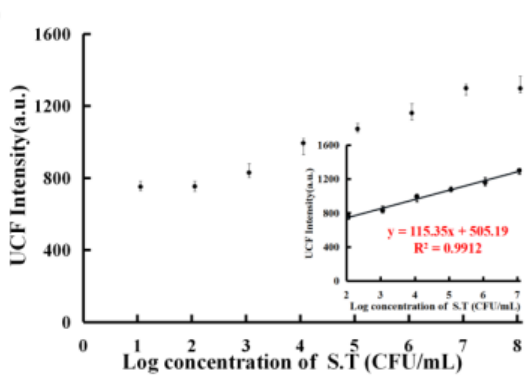
A fluorescence biosensor for *Salmonella typhimurium* detection in food based on the nano-self-assembly of alendronic acid modified upconversion and gold nanoparticles†

Min Chen, Leiqing Pan and Kang Tu *







Thanks for you attention!