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This document contains the following presentations (update Dec 10)

Chair's introduction to the session and subtheme Nutrition and Food

Senior Advisor Helli Kitinoja; Seinäjoki University of Applied Science
Research activities in the fields of Nutrition and health and Food safety

Researcher Ying Gao; Zhejiang University, Department of Sports Science
Physical activity and health in Chinese children

Assistant Professor Ying Zheng; Zhejiang A&F University, Food and Health College *Research Progress of Food and Herbal Medicine in Zhejiang A&F University*

Researcher Qinxue Ni; Zhejiang A&F University, Food and Health College
Intensive Processing and Industrialization Application of Gardenia jasminoides Ellis- A Traditional Chinese Medicinal Food

PHD Hongzhen Wang; Zhejiang A&F University, School of Food and Health
Secondary metabolites engineering of medicinal plant

Associate professor Kirsi Laitinen, University of Turku, Institute of Biomedicine, Faculty of Medicine; *Early Nutrition and Health - research group*

University teacher Marika Kalpio; University of Turku, Department of Life Technologies / Food Chemistry and Food Development
Method for analyzing chiral triacylglycerols (TAGs) in nutritionally important lipids

Professor Baoru Yang; University of Turku, Food Chemistry and Food Development Unit
Lipids in Infant Nutrition

Professor Qing Gu; Zhejiang Gongshang University, Food Microbiology
Probiotics and Human Health

Researcher Zhan Ye; Jiangnan University, School of Food Science and Technology
Dietary lipid gastrointestinal digestion and enteral health

Research fellow, Associated Professor Lina Zhang; Jiangnan University
Digestibility and allergenicity of milk proteins

Researcher Jie Zheng; Jinan University, Department of Food Science and Engineering: *Interactions between amino acids and polyphenols with reactive aldehydes in foods*

Project Researcher Kaile Kubota University of Turku, Department of Nursing Science
AI-driven Gamified Intervention and Intelligent Intervention Support Module to Foster the Health Equity of Children - Nutrition Project (HEAL-nutrition)

Professor Yumei Zhang; Peking University, School of Public Health; Food active ingredients, Nutrition & Health

Finland-China Food and Health Network (2021-2024)

9.12.2021

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Finland – China Food and Health Network

Long term goals:

- To enhance cooperation between Finnish and Chinese HEIs
- To build up a unique platform for multidisciplinary research and academia-industrial collaboration
- To generate top level science and innovation with strong impact
- To support business partnerships between Finland and China
- To enhance awareness and branding of Finland and China to enhance mobility of experts between the two countries

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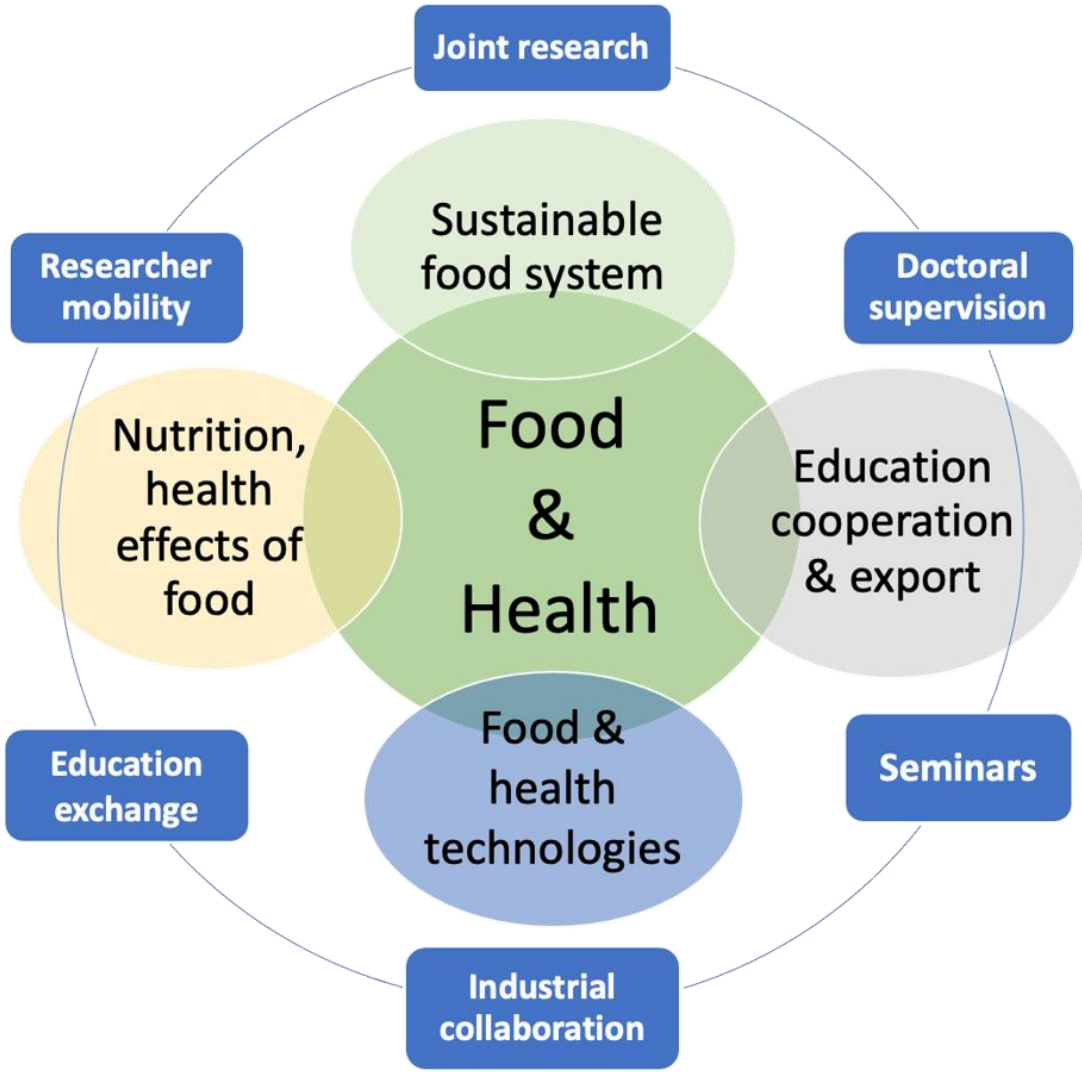
Finland – China Food and Health Network



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Participating Finnish Institutions

- University of Turku (coordinator)
- University of Helsinki
- University of Eastern Finland
- University of Oulu
- Tampere University
- University of Vaasa
- Åbo Akademi University

Universities of Applied Sciences:

- Seinäjoki
- Centria
- Laurea
- Häme
- Savonia
- Jyväskylä
- LAB
- Satakunta
- Tampere
- Lapland
- Vaasa
- Kajaani
- Karelia

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Action plan for 2021 - 2022

2021

- Support from the Ministry of Education and Culture, Finland
- Establishment of the network in 2021 with Finnish institutes
- Building on active research contacts with Chinese collaborators

Kick-off Event

- Kick-off event (Nov.1, 2021) with almost 40 Chinese and Finnish researchers presenting, over 130 registered participants
- Focus on building more research co-operation in cooperation and together with Chinese partners; universities and companies

2022

- Network co-operation develops with joint actions like seminars, project planning, supervision, exchange and identifying industrial co-operators, for example.
- Creating dialogue between Chinese and Finnish researchers and companies
- Mapping educational co-operation possibilities

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Contact persons

Professor Baoru Yang (academic responsible)

International Liaison Officer Kirsi Korpela (coordinator)

fcfh-coordinator@utu.fi

https://fcfh.utu.fi/

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FCFH - Finland - China Food and Health network: Subgroup Nutrition, health effects and food

Kick-off 1.11.2021

Aim

- To create **multidiciplinary actions** among Finnish and Chinese Universities and Research Institutes
  - To maintain and support existing collaborations
  - To facilitate new, potential collaborations
- Main focus in research collaboration, but educational activities are supported

- Interested institutes have discussed and presented the main focus areas, but they are open for discussion

Suggested topics for the common interests

1. Child and maternal health and wellbeing
   - Infant health
   - School children nutrition
   - Interested institutes/Finland: UTU, UTA, UH, SeAMK, UO
2. Metabolic diseases
   - Diet, food and physical activity, lifestyle modifications
   - Novel bioactive molecules
   - Gut microbiota related metabolism
   - Obesity related metabolic disorders, such as fibrosis, inflammation
   - Traditional fermented foods, also from the view point of microbes used in the processing
   - Functional Materials for bioactive molecules delivery and metabolic disease related tissue engineering
   - Interested Institutes/Finland: UEF, UO, UH, UJ, ÅAU, UTU, SeAMK

Potential Institutes noted in the discussions

FINLAND:

- University of Turku
- University of Eastern Finland
- University of Oulu
- University of Helsinki
- University of Jyväskylä
- University of Tampere
- Åbo Akademi
- Seinäjoki University of Applied Sciences

CHINA

- Peking University
- Sun Yat Sen
- University of Hong Kong
- Shenzhen University
- China Medical University
- Shenyang University
- Shanghai Jiao Tong University
- Shenzhen Polytechnic
- Beijing Sport University
- Zhejiang University

Research and Educational collaboration in the fields of Nutrition, Health and Food Safety

Helli Kitinoja

Senior Advisor
Seinäjoki University of Applied Sciences

November 1, 2021

SeAMK

Seinäjoki University of Applied Sciences (SeAMK)

International – Entrepreneurial - Best for the Student

Faculties: Business and Culture, Food and Agriculture, Health Care and Social Work, Technology

official member EDUCATION FINLAND www.educationfinland.fi

Rated as the best UAS 2020 in Finland by the graduates

Bachelor Degree Programmes in English:

- *Agri-Food Engineering*
- *Automation Engineering*
- *International Business*
- *Nursing*

Master Degree in International Business Management

Profile Areas: ***Sustainable Food Solutions, Smart and Energy Efficient Systems, Welfare and Creativity, Entrepreneurship and Growth***

- 5,000 full-time students - 10 % international
- 21 Bachelor and 13 Master Programmes
- 21 Double Degree and Joint Programmes in nine countries
- 210 partner universities in 52 countries (China since 1996)
- 80 enterprises in the same Campus (triple-helix)
- South Ostrobothnia is the Food Province of Finland, (e.g. Atria plc.)

FINNISH EDUCATION EVALUATION CENTRE

GOLD Award 2013 International Student Satisfaction

www.seamk.fi

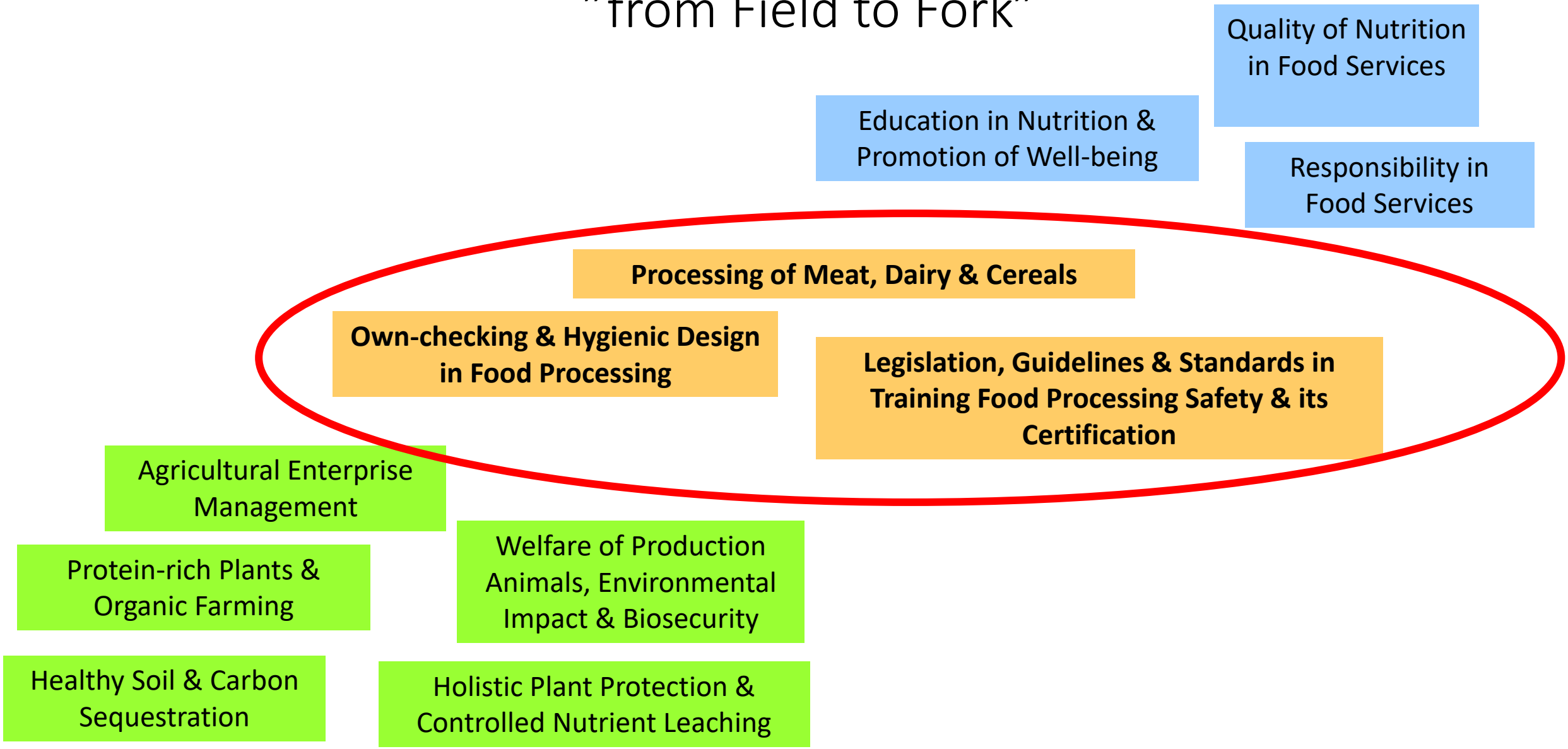
SeAMK

SeAMK

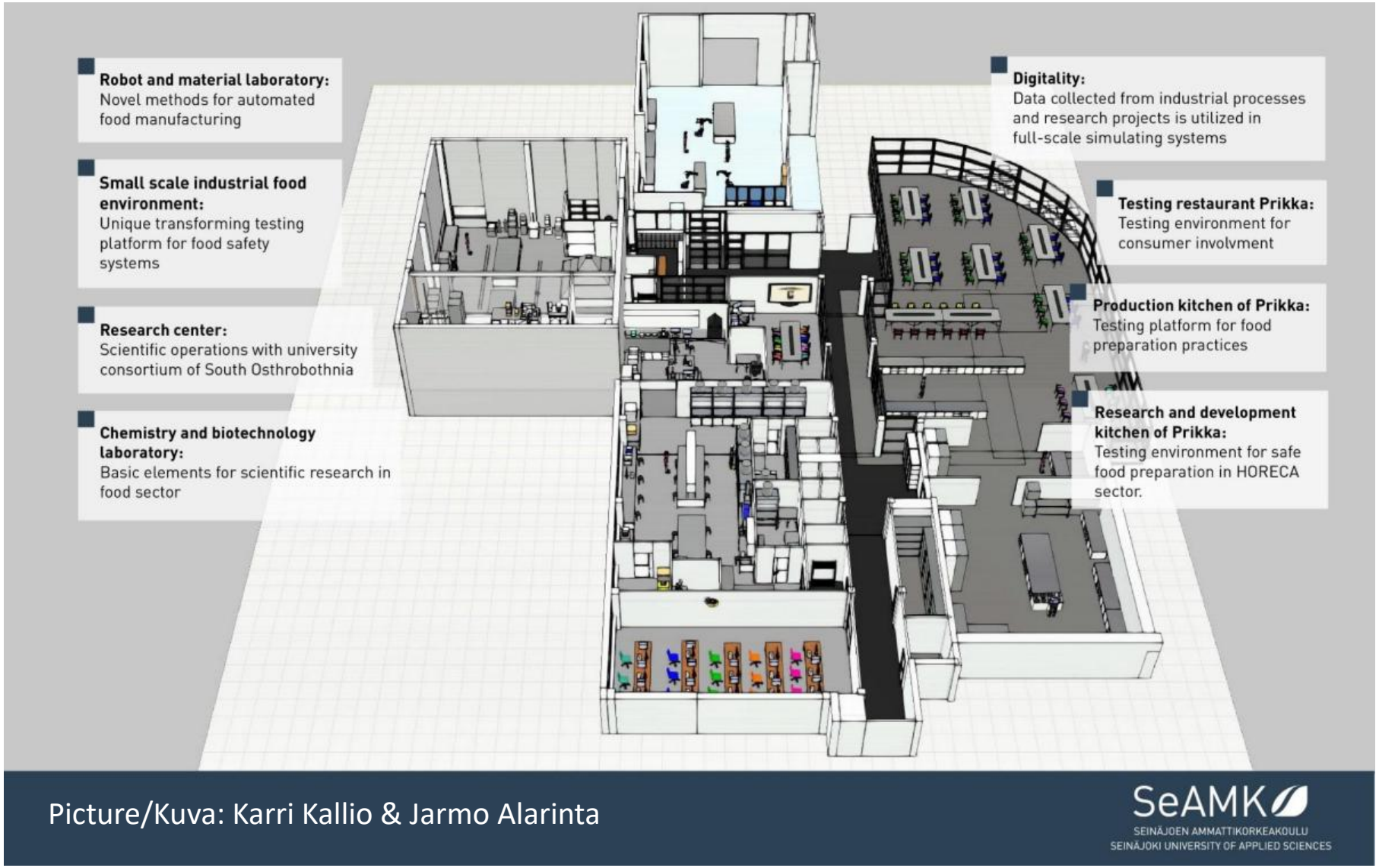
Sustainable agri-food solutions

in agriculture, food processing & hospitality management

Highlights within the Research and Education Themes ”from Field to Fork”



SeAMK



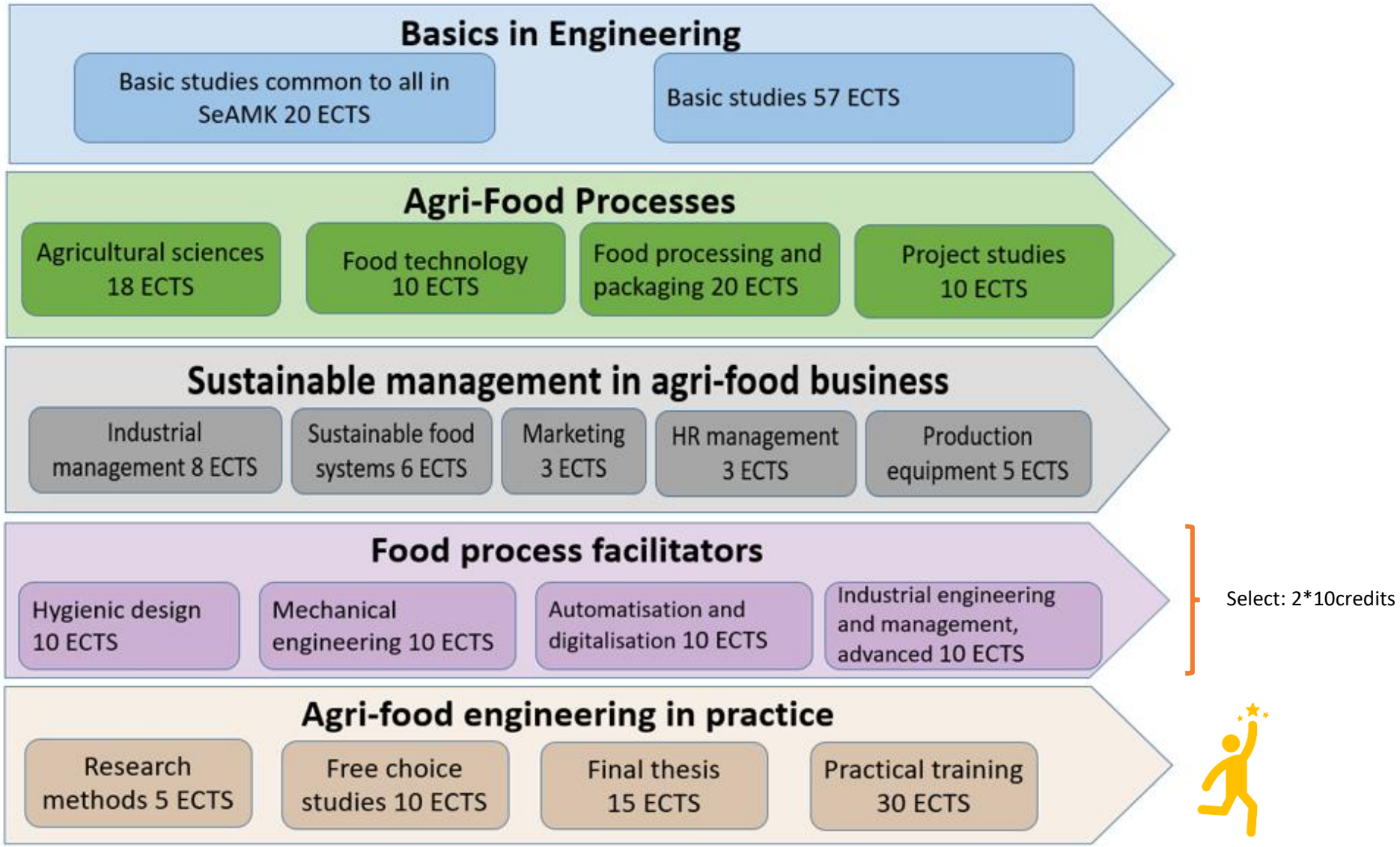
Picture/Kuva: Karri Kallio & Jarmo Alarinta

RDI - Sustainable Agri-Food Solutions

- We have an experienced and **multidisciplinary group** of experts, **totally 45 persons**
- The **annual volume** of projects is about **1.2 M€**
- **150 publications/annually**
- The **main funding** comes from the European Agricultural Fund for Rural Development (**EAFRD**), European Regional Development Fund (**ERDF**), **Interreg Europe, Horizon 2020** and **Erasmus+**
- More information on sustainable food chain studies and **RDI activities can be found on the website** **www.seamk.fi**

Agri-Food Engineering (AFE) Bachelor Degree Programme

4 years / 240 ECTS credits, starting in September 2022



https://www.seamk.fi/en/all-studies/bachelor-degree-programme-in-engineering-agri-food-engineering/

Healthy Kids of Seinäjoki® Platform

SeAMK

Healthy Kids of Seinäjoki

Aim: Supporting overall Health and Wellbeing of Children, Adolescents and their Families
Roots on obesity and overweight prevention of children and prevention of long-term illnesses

Research interests in supporting health and wellbeing of children:

- *Health and Wellbeing Management*
- *City and Living Environment Development and Management*
- ***Guidance supporting Healthy Choices based on the needs of the Family***
- ***Healthy Nutrition, Food Safety, School Meals***
- *Physical Activity and Exercise supporting Health*
- *Multiprofessional and Multidimensional Cooperation*
- ***Child Obesity and overweight prevention***
- ***New Product Innovations with the companies and industry***
- ***Effectiveness of the interventions and methods***

Kallio, Karri; Kyntäjä, Merja; Ventelä, Sarita; Ojala, Markus; Wirtanen, Gun (2020). New food premises for training and research purposes. https://urn.fi/URN:NBN:fi-fe202101081366

Healthy Kids of Seinäjoki.
http://www.healthykidsofseinajoki.fi/en/

Kasanen, M., Kitinoja, H. & Nissinen, K. 2021. Healthy Kids of Seinäjoki (HKS) – ”Lisää informaatiota tarvittaisiin”. HKS-kehitysalustahankkeessa toteutettu nykytila-analyysi Seinäjoen kaupunkiorganisaation lasten, nuorten ja lapsiperheiden hyvinvoinnin ja terveyden edistämisestä. Seinäjoen ammattikorkeakoulu: Seinäjoen ammattikorkeakoulun julkaisusarja A. Tutkimuksia. http://urn.fi/URN:NBN:fi-fe2021051730052
(Analysing the current situation of the promotion of health and wellbeing of children in the City of Seinäjoki. Publication of Seinäjoki University of Applied Sciences, Researches.)

Kasanen, M., Kitinoja, H. & Nissinen, K. 2021. Healthy Kids of Seinäjoki (HKS) –toiminta ja kehitysalusta: Tutkimus- ja kehittämistoiminnan toimenpidesuunnitelma. Seinäjoen ammattikorkeakoulu: Seinäjoen ammattikorkeakoulun Raportit. http://urn.fi/URN:NBN:fi-fe2021061637807
(Healthy Kids of Seinäjoki model as a Development Platform. Action Plan for the research and development.)

Kasanen, M., Kitinoja, H. & Nissinen, K. 2021. Healthy Kids of Seinäjoki (HKS) -toiminnan vaikuttavuuden osoittaminen : Ehdotus lasten ja nuorten hyvinvoinnin ja terveyden ilmiöpohjaisesta määrittelystä ja seurantaindikaattoreista. Seinäjoen ammattikorkeakoulu. Raportti. https://urn.fi/URN:NBN:fi-fe2021060935986
(Proposal for the indicators to be used in measuring the effectiveness of the HKS interventions.)

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Healthy Kids of Seinäjoki

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Seinäjoki University of Applied Sciences

SeAMK

Physical activity and health in Chinese children

Ying Gao

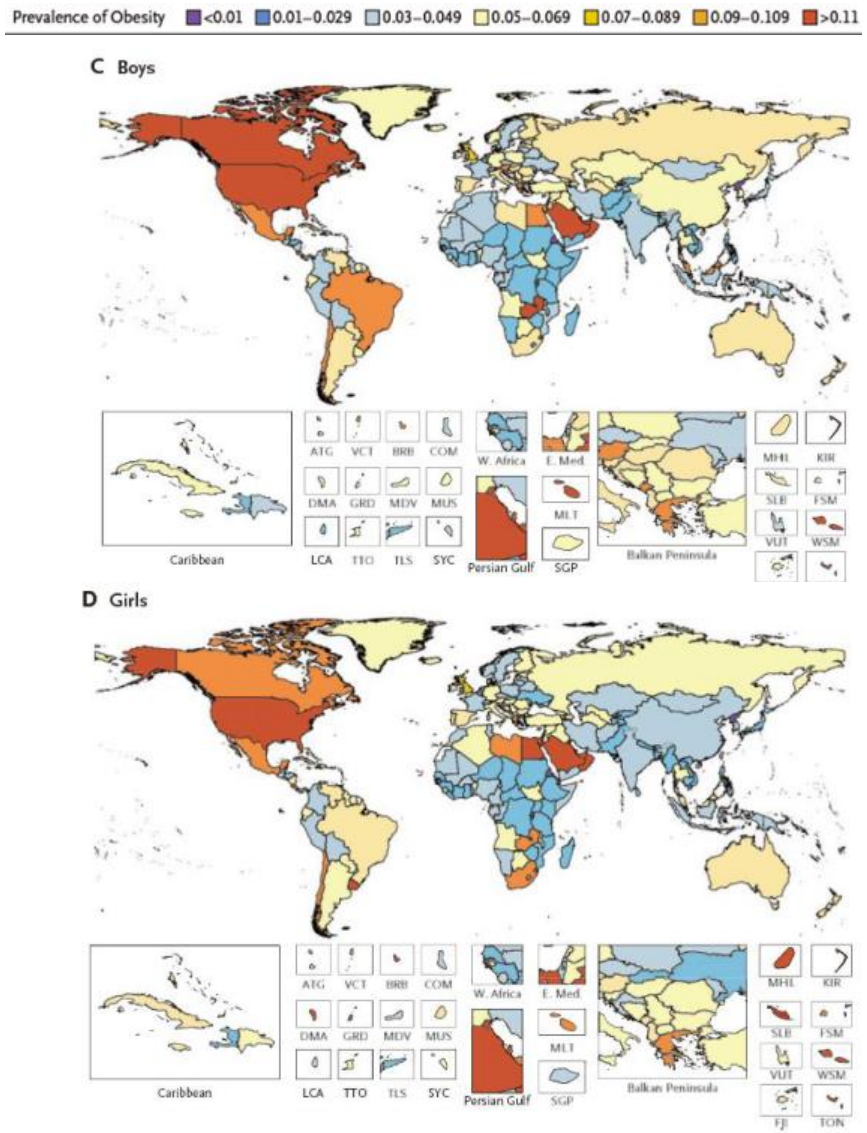
Tenure-track researcher, Zhejiang University

Hangzhou, China

1.11.2021

yigao@zju.edu.cn

Chinese Obese Children



Prevalence of Obesity at the Global Level (Reilly et al., 2017)

表 3-2 我国 7-18 岁学龄儿童超重肥胖检出率及预测率(%)

		1985	1995	2000	2005	2010	2014	2020	2030
超重	小计	2.1(497)	4.1(1014)	7.4(1761)	8.7(2001)	9.6(1880)	12.2(2198)	13.8(2439)	17.3(3057)
	城市男	1.2	5.1	11.8	13.3	14.6	17.1	21.0	26.8
	乡村男	3.2	3.8	6.5	8.2	9.3	12.6	13.2	16.4
	城市女	2.9	5.5	8.0	8.7	8.6	10.6	12.1	14.7
	乡村女	1.3	2.2	3.4	4.6	6.0	8.3	8.6	10.9
肥胖	小计	0.5(118)	2.5(619)	4.6(1095)	6(1380)	5.0(979)	7.3(1315)	8.5(1502)	10.7(1891)
	城市男	0.2	5.1	8.7	11.4	8.6	11.1	14.3	18.1
	乡村男	0.9	1.5	3.4	5.1	4.5	7.7	7.9	10.2
	城市女	0.5	2.6	4.1	5.0	4.1	5.8	6.8	8.5
	乡村女	0.3	1.1	2.3	2.6	2.5	4.5	4.6	5.9
合计	小计	2.6(615)	6.7(1658)	12(2855)	14.7(3380)	14.6(2859)	19.4(3496)	22.3(3941)	28.0(4948)
	城市男	1.4	10.2	20.5	24.6	23.2	28.2	35.3	44.9
	乡村男	4.1	5.3	9.9	13.3	13.8	20.3	21.1	26.5
	城市女	3.4	8.0	12.1	13.7	12.7	16.4	18.9	23.2
	乡村女	1.6	3.3	5.7	7.2	8.6	12.8	13.2	16.8

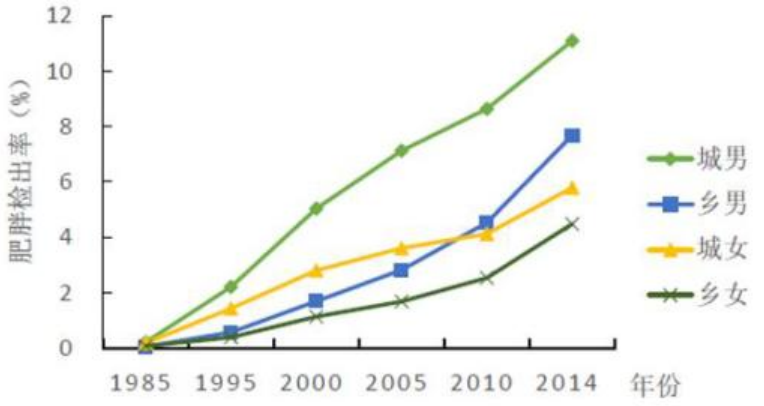


图 1-7 我国城乡学生肥胖检出率及变化（%）（1985-2014 年）

It was predicted in the official report that there will be **MORE THAN 49 MILLION** overweight/obese children in China in 2030.

(Zhang L, et al., 2021)

Diet and PA Related to Obesity

- Overall, about 55.2% of the adolescents consumed fast food at least 1 d/w, and 10.3% did so 4–7 d/w. **BMI, physical activity and sedentary behavior** were correlated with fast food consumption (Li et al., 2020)
- Time spent in **MVPA** was positively associated with achieving the healthy zones for **BMI, upper body strength and flexibility** (Marques et al., 2015)
- **Being sedentary and inactive** would increase the risk of overweight/obesity (Crowe et al., 2020)

Table 3. Association risk factors for fast-food consumption in five regions and total.

	Africa Region	Americas Region	Eastern Mediterranean Region	Southeast Asia Region	Western Pacific Region	Total
Age	1.061 (1.008–1.116)	0.917 (0.880–0.954)	1.004 (0.959–1.052)	1.113 (1.069–1.159)	0.856 (0.824–0.888)	0.937 (0.920–0.954)
Sex	0.712 (0.641–0.792)	1.121 (1.041–1.207)	1.076 (0.986–1.174)	1.220 (1.123–1.326)	1.064 (0.993–1.140)	1.081 (1.043–1.120)
BMI	0.975 (0.961–0.989)	0.983 (0.974–0.992)	1.019 (1.010–1.029)	1.002 (0.991–1.013)	1.028 (1.021–1.035)	0.994 (0.990–0.999)
Food insecurity	1.252 (0.971–1.614)	2.438 (1.972–3.014)	1.218 (0.939–1.581)	0.921 (0.700–1.211)	1.602 (1.317–1.948)	1.535 (1.385–1.702)
Fruits consumption	1.599 (1.432–1.786)	1.154 (1.069–1.245)	1.222 (1.115–1.339)	1.585 (1.454–1.728)	1.007 (0.937–1.081)	1.208 (1.164–1.253)
Vegetables consumption	1.299 (1.160–1.455)	1.431 (1.305–1.569)	1.233 (1.113–1.367)	1.454 (1.332–1.588)	1.303 (1.209–1.404)	1.517 (1.458–1.578)
Soft Drinking consumption	2.066 (1.837–2.322)	2.655 (2.420–2.913)	3.354 (3.064–3.670)	2.355 (2.169–2.559)	2.377 (2.218–2.547)	2.254 (2.173–2.338)
Smoking	1.667 (1.301–2.135)	1.429 (1.192–1.714)	1.664 (1.346–2.056)	0.943 (0.725–1.226)	1.762 (1.488–2.087)	1.491 (1.362–1.632)
Physical active	1.151 (1.022–1.298)	1.065 (0.982–1.154)	1.283 (1.156–1.424)	1.493 (1.361–1.638)	1.484 (1.374–1.602)	1.258 (1.209–1.308)
Sedentary behavior	1.580 (1.421–1.757)	1.284 (1.193–1.382)	2.178 (1.994–2.378)	2.096 (1.926–2.282)	1.432 (1.336–1.534)	1.491 (1.439–1.545)

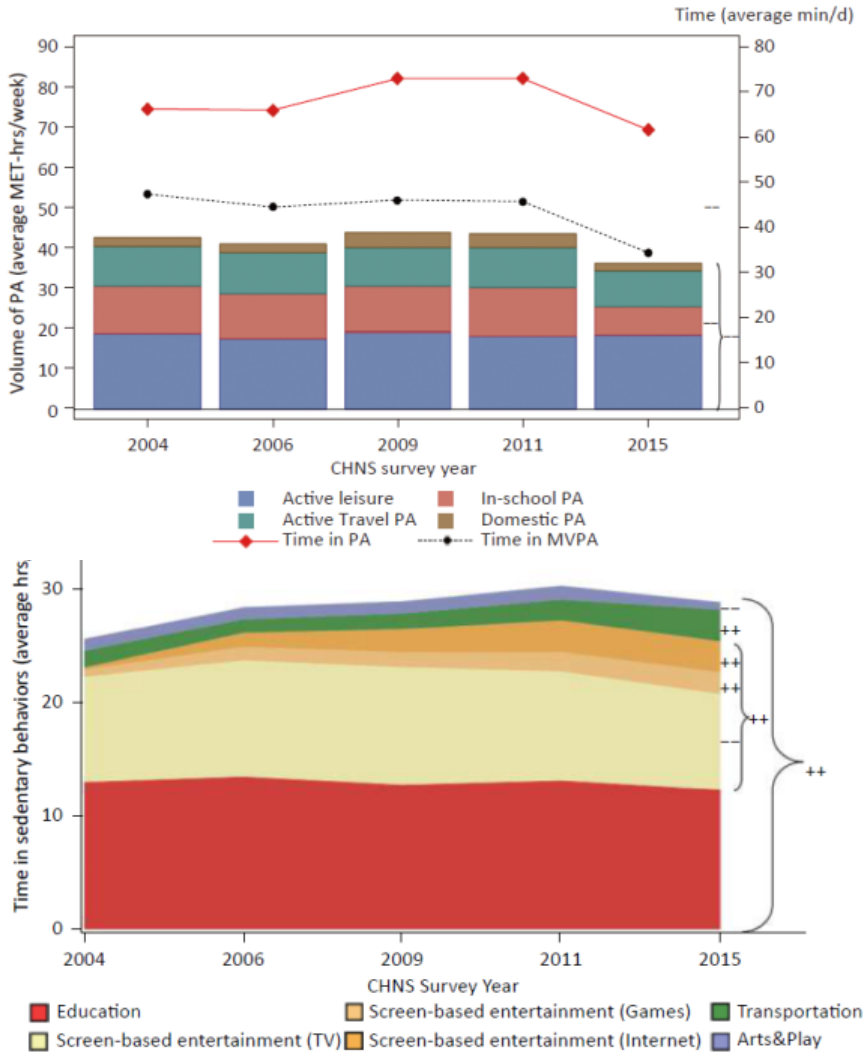
TABLE 2. Associations between MVPA and sedentary time with being categorized as being in the HFZ.

Achieve HFZ	MVPA	MVPA[a]	Sedentary Time	Sedentary Time[a]
BMI[b]				
Unhealthy zone	1.000 (reference)	1.000 (reference)	1.000 (reference)	1.000 (reference)
Healthy zone	1.004 (1.000–1.008)*	1.004 (1.000–1.008)*	1.000 (0.999–1.001)	1.000 (0.999–1.001)
Push-ups[b]				
Unhealthy zone	1.000 (reference)	1.000 (reference)	1.000 (reference)	1.000 (reference)
Healthy zone	1.005 (1.002–1.009)**	1.006 (1.003–1.010)**	1.000 (0.999–1.001)	1.000 (1.000–1.002)
Curl-ups[b]				
Unhealthy zone	1.000 (reference)	1.000 (reference)	1.000 (reference)	1.000 (reference)
Healthy zone	0.997 (0.992–1.003)	0.995 (0.989–1.001)	0.998 (0.997–1.000)*	0.998 (0.997–0.999)**
Sit and reach[b]				
Unhealthy zone	1.000 (reference)	1.000 (reference)	1.000 (reference)	1.000 (reference)
Healthy zone	1.020 (1.016–1.023)***	1.018 (1.014–1.022)***	0.998 (0.997–0.998)***	0.999 (0.998–1.000)**
Fitness composite score[c]	0.002 (0.001–0.003)***	0.003 (0.002–0.004)***	0.000 (0.000–0.000)	0.000 (0.000–0.000)

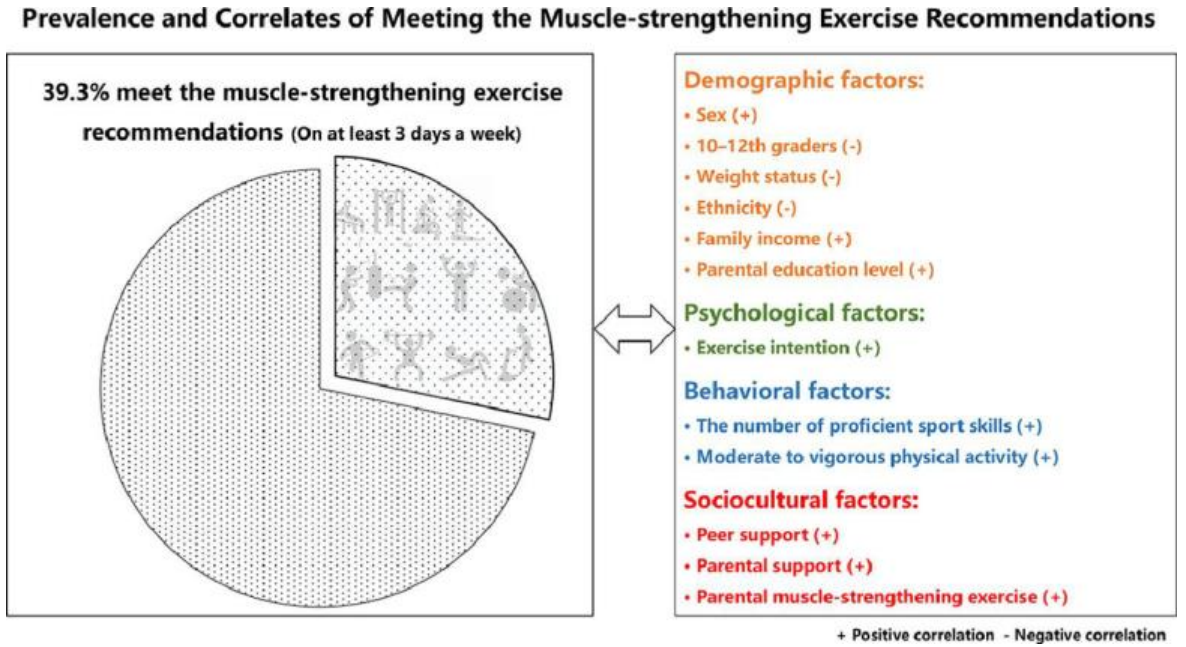
Table 2 Associations between combinations of physical activity and screen time recommendations with excess weight

	Overweight or obesity ($n = 9913$)	
	OR (95% CI)	p value
Model 1		
Active and not sedentary	Reference	
Active and sedentary	1.38 (0.95–1.99)	0.088
Inactive and not sedentary	1.49 (1.17–1.91)	0.002
Inactive and sedentary	1.83 (1.38–2.43)	<0.001

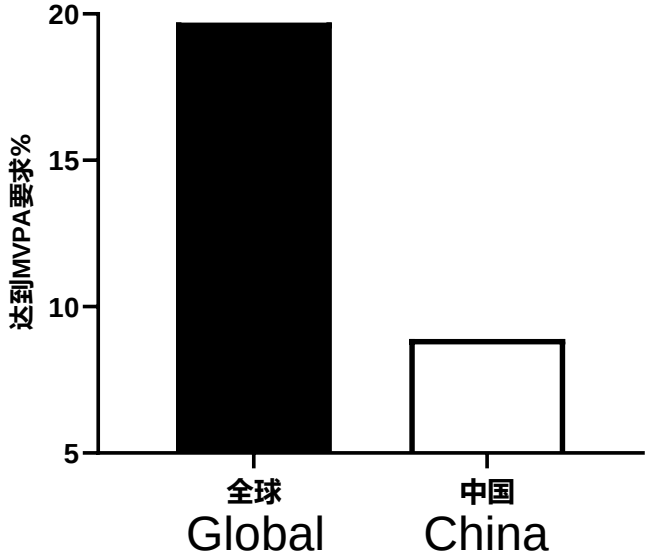
Physical Activity and Sedentary Behaviour



A declining PA and a increasing SB trend among Chinese children was observed from 2004 to 2015 (Yang et al., 2021).



Xin et al., 2021



The proportion of 13–15-year-olds doing more than 60 min of MVPA per day is **19.7%** (Hallen et al., 2012), while only **8.9% Chinese children** reached the goal (李培红 等，2016)

NSFC-AF

- Physical activity and sedentary patterns of Finnish and Chinese children (2019-2021)
- Sedentary behavior and physical activity in school-aged children: objectively measured sedentary time and associations with muscle inactivity and activity level (2021-2023)

Thank you !

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https://person.zju.edu.cn/en/gaoying

Research Progress of Food and Herbal Medicine in Zhejiang A&F University

Ying ZHENG (zhengying@zafu.edu.cn)

College of Food and Health, ZAFU

Nov. 1, 2021

About Us

The College of Food and Health originated from the subject of Food Science and Engineering established in 2001. And the Traditional Chinese Medicine (TCM) was created in 2003, which was the only professional subject with traditional Chinese medicine resources in Zhejiang Province.

Faculty and Students

The college consists of a diverse group of individuals, including 63 faculty and staff, more than 1120 undergraduate students and 163 graduate students.

Complete student training system

Programs

Subjects

Undergraduate

Food Science and Engineering
Food Quality and Safety
Traditional Chinese Medicine (TCM)
Biopharmaceutics

Master

Academic master program

Food Science and Engineering
Chemical Biology

Professional master program

Food Processing and Safety
Traditional Chinese Medicine

Doctor

Wildlife Protection and Utilization

Developing History

Traditional Chinese Medicine major was officially approved.

2003

2009

Zhejiang A&F University school-level key construction major.

2014

Approved as an emerging characteristic specialty construction point in Zhejiang Province.

2018

Approved as master of Chinese medicine, trinity enrollment.

2019

Approved as a first-class professional construction point in Zhejiang Province.

Research Interests of TCM

3 main fields

Protection and Sustainable Utilization of TCM

Functional Screening and Evaluation of TCM

Bioengineering of TCM and Developing New Health Supplements

① Protection and Sustainable Utilization of TCM

Main contents

- ◆Germplasm investigation and preservation of TCM
- ◆Reproductive ecology and evolution
- ◆Introduction, domestication, and breeding of TCM

Objective

- ➢**Disentangle** Temporal and spatial distribution and evolution pattern of genetic variation of TCM
- ➢**Reveal** Evolution and adaptive mechanism of TCM
- ➢**Formulate** Strategy for TCM protection

② Functional Screening and Evaluation of TCM

Main contents

By using patch clamp, protein coupled affinity chromatography and other technologies, an efficient screening platform to identify functional ingredients of TCM was constructed, and compounds in active components were also fished by cell models containing related target molecules.

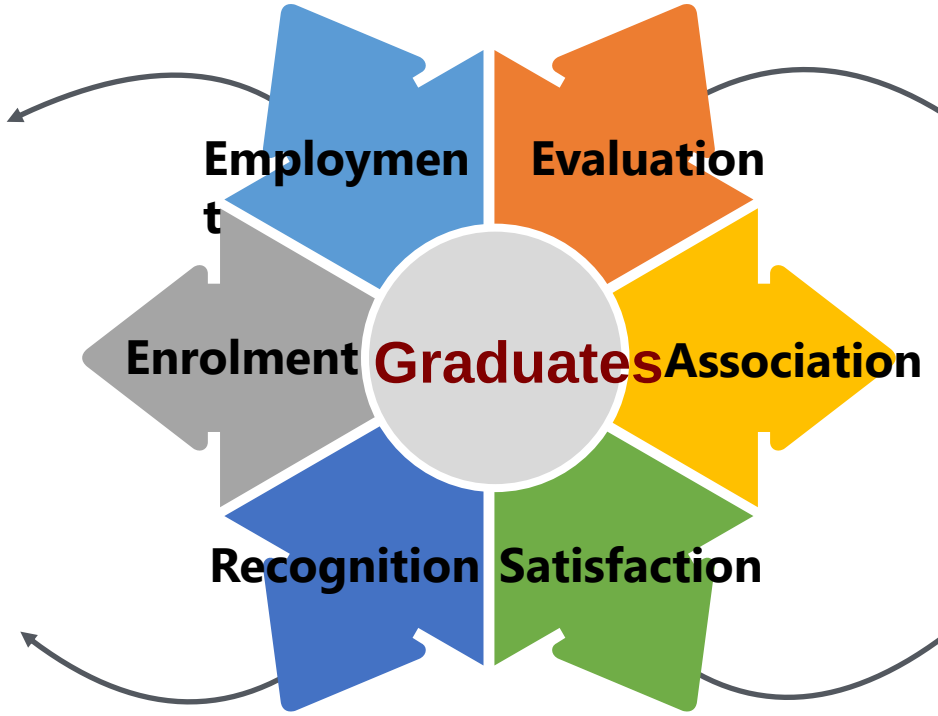
③ Bioengineering of TCM and Developing New Health Supplements

Main contents

The fermentation culture system was constructed by the in vitro culture of medicinal fungi, endophytes, and tissue cells on purpose to introduce functional ingredients into yeast and other microbes. As a result, it enriches and generates large-scale products of functional ingredients by microbial fermentation.

Graduate Quality

- High employment competitiveness and enrollment rate
- High evaluation from employers and long-term cooperation
- High recognition of employment and better follow-up development
- Supporting the development of ethnic medicine



Thank you!

College of Food and Health, ZAFU

Early Nutrition and Health -research group

Kirsi Laitinen, Associate Professor

Institute of Biomedicine, Research Centre for Integrative Physiology and Pharmacology

Faculty of Medicine

Early Nutrition & Health

Research Group

University of Turku

Finland

OVERWEIGHT/OBESE

GESTATIONAL DIABETES

UNIVERSITY OF TURKU

Our **vision** is to uncover interactions between diet, metabolism and microbiome, as well as behavioral factors, and their contribution to maternal and child health.

→ means for advancing better health in these susceptible populations.

British Journal of Nutrition (2017), **118**, 343–352
doi:10.1017/S0007114517002100

Dietary intake of fat and fibre according to reference values relates to higher gut microbiota richness in overweight pregnant women

Henna Röytiö[1], Kati Mokkala[1], Tero Vahlberg[2] and Kirsi Laitinen[1]*

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Review

Interactions of dietary fat with the gut microbiota: Evaluation of mechanisms and metabolic consequences

Kati Mokkala [a], Noora Houttu [a], Tuğçe Cansev [a, 1], Kirsi Laitinen [a, b, *]

Original resear. *Gut* 2021;**70**:309–318. doi:10.1136/gutjnl-2020-321643

Metagenomics analysis of gut microbiota in response to diet intervention and gestational diabetes in overweight and obese women: a randomised, double-blind, placebo-controlled clinical trial

Kati Mokkala [1], Niklas Paulin [2], Noora Houttu [1], Ella Koivuniemi [1], Outi Pellonperä [3], Sofia Khan [2], Sami Pietilä [2], Kristiina Tertti [3], Laura L Elo [2,4], Kirsi Laitinen [1]

UNIVERSITY OF TURKU

The Journal of Nutrition
Genomics, Proteomics, and Metabolomics

Distinct Metabolic Profile in Early Pregnancy of Overweight and Obese Women Developing Gestational Diabetes

Kati Mokkala,[1] Tero Vahlberg,[2] Outi Pellonperä,[3] Noora Houttu,[1] Ella Koivuniemi,[1] and Kirsi Laitinen[1]

Original Article
CLINICAL TRIALS AND INVESTIGATIONS

Obesity

Distinct Metabolomic Profile Because of Gestational Diabetes and its Treatment Mode in Women with Overweight and Obesity

Kati Mokkala [1], Tero Vahlberg [2], Noora Houttu [1], Ella Koivuniemi [1], and Kirsi Laitinen [1,3]

EBioMedicine 2021;73: 103655

ELSEVIER
Contents lists available at ScienceDirect
Clinical Nutrition
journal homepage: http://www.elsevier.com/locate/clnu

Impact of combined consumption of fish oil and probiotics on the serum metabolome in pregnant women with overweight or obesity

Kati Mokkala,[a] Tero Vahlberg,[b] Noora Houttu,[a] Ella Koivuniemi,[a] Leo Lahti,[c] and Kirsi Laitinen,[a,d]*

Original article

Overweight and obesity status in pregnant women are related to intestinal microbiota and serum metabolic and inflammatory profiles

Noora Houttu [a, b, *], Kati Mokkala [a, b], Kirsi Laitinen [a, b]

UNIVERSITY OF TURKU

Public Health Nutrition: page 1 of 9 doi:10.1017/S1368980014002535

Development and evaluation of a stand-alone index for the assessment of small children's diet quality

Henna Röytiö[1,2], Johanna Jaakkola[2,3], Ulla Hoppu[2], Tuija Poussa[4] and Kirsi Laitinen[1,2,*]

Public Health Nutrition: page 1 of 12 doi:10.1017/S1368980021003657

Development of a stand-alone index for the assessment of diet quality in elementary school-aged children

Ella Koivuniemi[1,*], Outi Nuutinen[2], Markus Riskumäki[3], Tero Vahlberg[3] and Kirsi Laitinen[4]

JOURNAL OF THE ACADEMY OF NUTRITION AND DIETETICS

Parental and Child Factors Associated With 2- to 6-Year-Old Children's Diet Quality in Finland

Ella Koivuniemi, MSc; Johanna Gustafsson, PhD; Irene Mäkelä, MD; Viivi J. Koivisto, MD; Tero Vahlberg, MSc; Ursula Schwab, PhD, RD; Harri Niinikoski, MD, PhD; Kirsi Laitinen, PhD, RD

International Journal of *Molecular Sciences*

Article

Overall Dietary Quality Relates to Gut Microbiota Diversity and Abundance

Kirsi Laitinen * and Kati Mokkala

UNIVERSITY OF TURKU

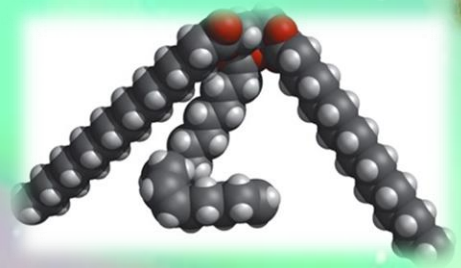
THANK YOU!

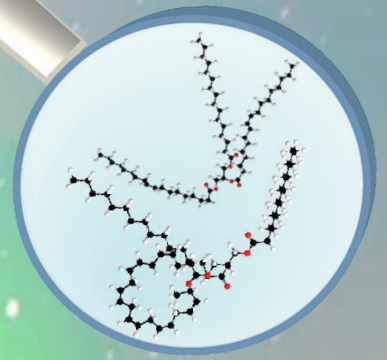
UNIVERSITY OF TURKU

https://sites.utu.fi/nutritionresearch/en/

kirsi.laitinen@utu.fi

Method for analyzing chiral triacylglycerols (TAGs) in nutritionally important lipids



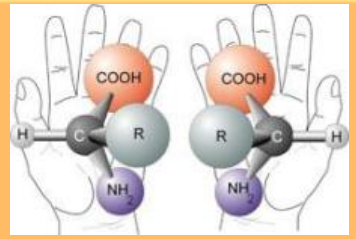


Marika Kalpio
PhD, University Teacher
Food Chemistry and Food Development
Department of Life Technologies

AIM

To understand

- the role of chirality in fats and oils



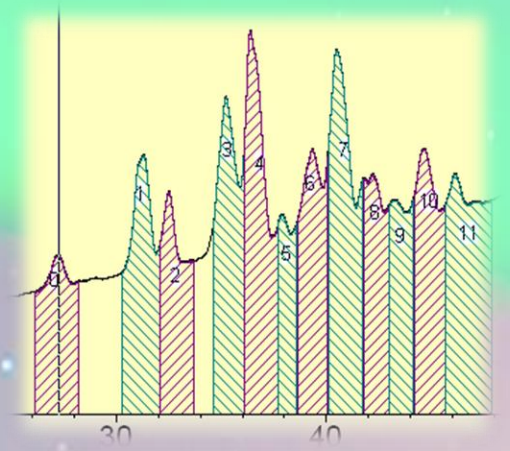
- the impact of the TAG regioisomers and enantiomers on metabolism, bioavailability, digestion, absorption, transport, and common health as well as on physicochemical properties

Food Chem
University of Turku

UNIVERSITY OF TURKU

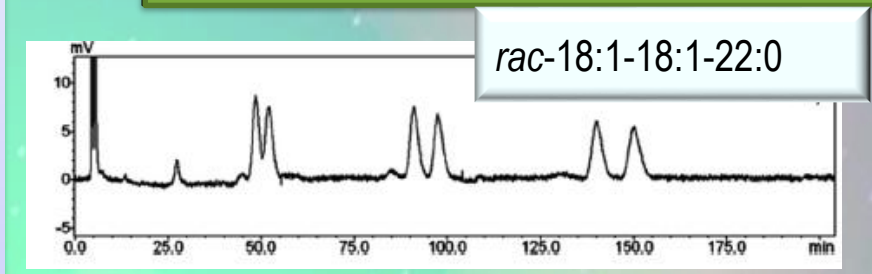
Chiral chromatography connected with sample recycling system and MS detection

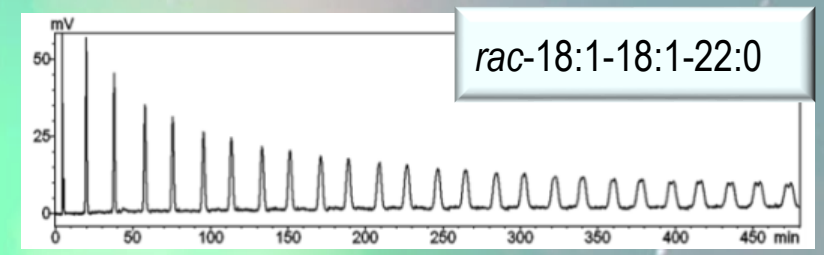
Lipid extraction, TAG fractionation, FA composition, ECN distribution, Semipreparative RP-HPLC



Kalpio et al. 2015

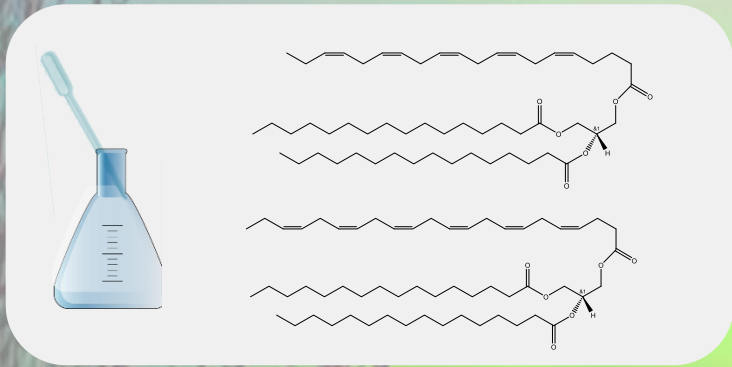
Chiral chromatography + sample recycling





Kalpio et al. 2015

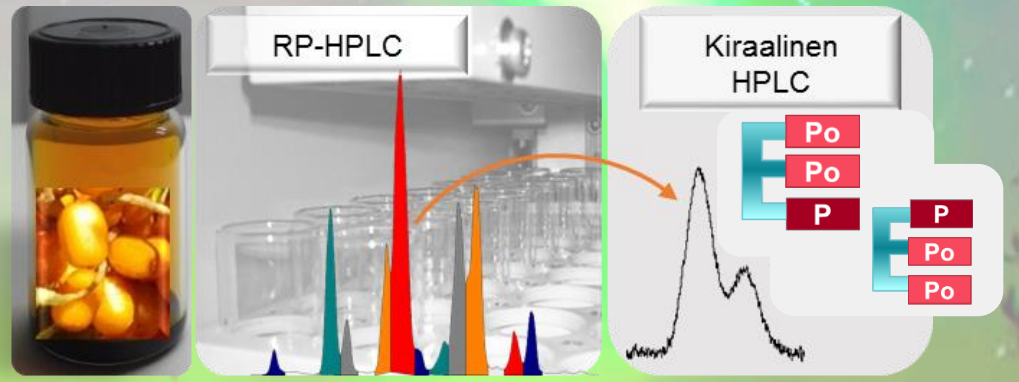
Chemoenzymatic synthesis, University of Iceland



21 synthesized, 17 enantio-separated

Kalpio et al. 2020

MS detection (HPLC-ESI/APCI-MS, direct inlet MS)



70.5 / 29.5

Kalpio et al. 2021

UNIVERSITY OF TURKU

Thank you for attention – Kiitos mielenkiinnosta

marika.kalpio@utu.fi

Method for analyzing chiral TAGs
in nutritionally important lipids

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UNIVERSITY OF TURKU

Lipids in Infant Nutrition

Baoru Yang
Food Chemistry and Food Development
Department of Life Technologies
University of Turku
November 1st, 2021

UNIVERSITY OF TURKU

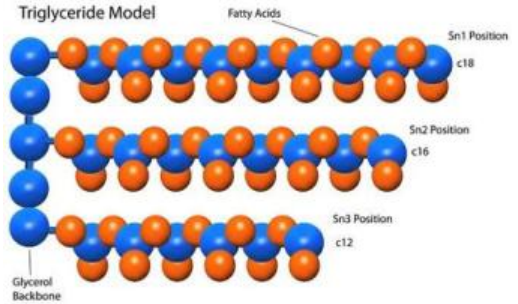
Lipids in Infant Nutrition

Large variety of fatty acids

Specific positional distribution of fatty acids in fat molecules

Diversified lipid classes in fat droplet and membranes

Complexity of large number of molecular species

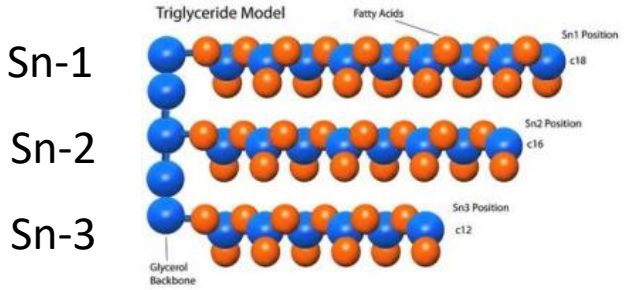


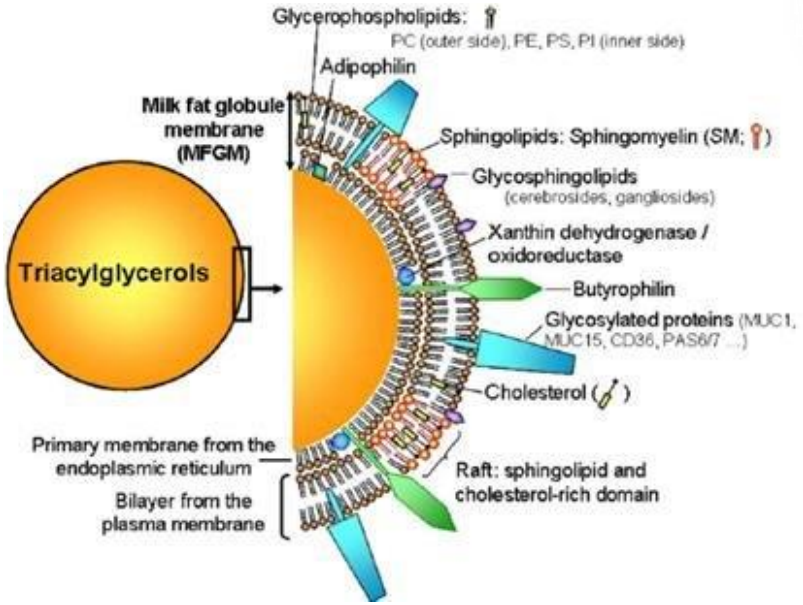
Influenced by multiple factors, e.g. maternal diet and lactating stage

Our interest and approach

Triacylglyerols

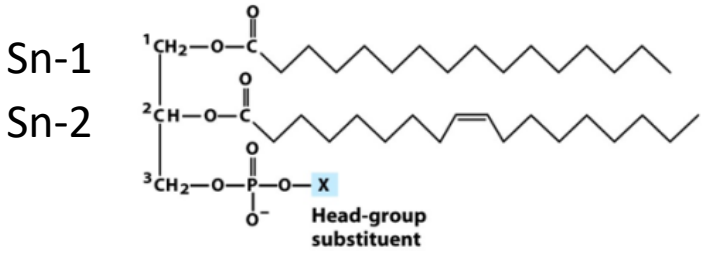
- Analysis of regio- and stereoisomers (MS/MS)





Glycerophospholipids

- Regioisomeric analysis using MS/MS



- Human milk, infant formula, other natural fats and oils
- Understanding the significance of regio/stereoisomeric structure for fat digestion and nutrition in infants

Received: 24 March 2021 | Revised: 21 June 2021 | Accepted: 21 June 2021

DOI: 10.1002/rcm.9151

RESEARCH ARTICLE

Rapid Communications in Mass Spectrometry WILEY

Direct infusion and ultra-high-performance liquid chromatography/electrospray ionization tandem mass spectrometry analysis of phospholipid regioisomers

Mikael Fabritius | Baoru Yang

Food Chemistry and Food Development, Department of Biochemistry, University of Turku, Turku, Finland

Correspondence
B. Yang, Food Chemistry and Food Development, Department of Life Technologies, University of Turku, FI-20014 Turku, Finland.
Email: baoru.yang@utu.fi

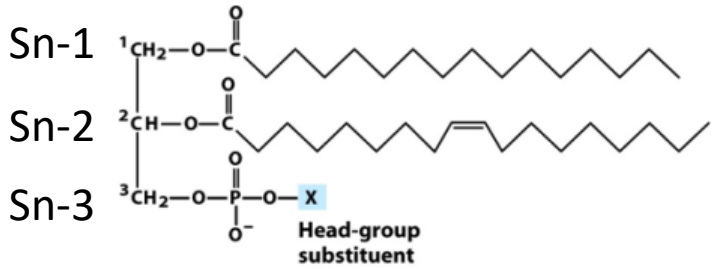
Funding information
Academy of Finland, Grant/Award Number: 310982; University of Turku Graduate School

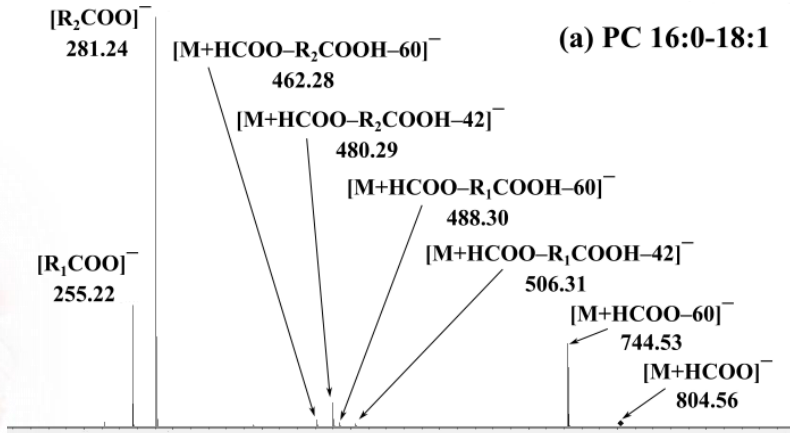
Rationale: Phospholipids are important components of cell membranes that are linked to several beneficial health effects such as increasing plasma HDL cholesterol levels, improving cognitive abilities and inhibiting growth of colon cancer. The role of phospholipid (PL) regioisomers in all these health effects is, however, largely not studied due to lack of analytical methods.

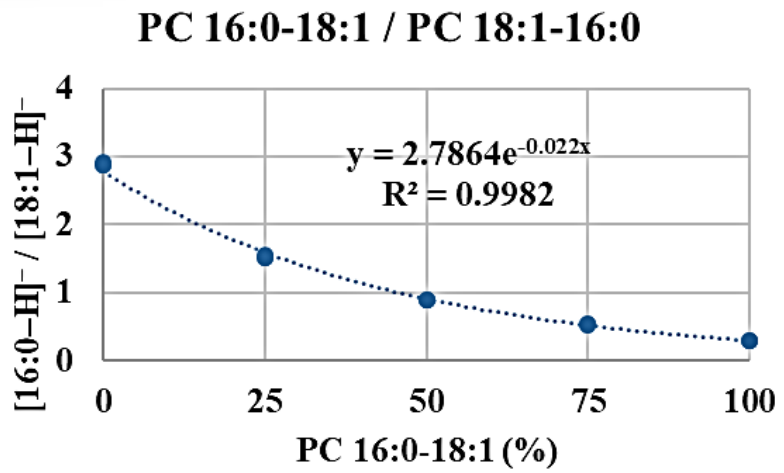
Methods: Electrospray ionization mass spectrometry in negative mode produces structurally informative fragment ions resulting from differential dissociation of fatty acids (FAs) from the sn-1 and sn-2 positions, primarily high-abundance $[RCOO]^-$ ions. The fragment ion ratios obtained with different ratios of regiopure phospholipid reference compounds were used to construct calibration curves, which allow determination of regioisomeric ratios of an unknown sample. The method was developed using both direct infusion mass spectrometry (MS) and ultra-high-performance liquid chromatography and hydrophilic interaction liquid chromatography mass spectrometry (UHPLC-HILIC-MS).

Results: The produced calibration curves have high coefficients of determination (R^2 >0.98) and the fragment ion ratios in replicate analyses were very consistent. A test mixture containing 60/40% ratios of all available regioisomer pairs was analyzed to test and validate the functionality of the calibration curves. The results were accurate and reproducible. However, regioisomeric quantification of certain chromatographically overlapping compounds is restricted by the relatively wide window in precursor ion selection of the MS instrument used.

Conclusions: This method establishes a framework for analysis of phospholipid regioisomers. Specific regioisomers can be quantified using the existing data, and method development will continue with improving chromatographic separation and exploring the fragmentation patterns and efficiencies of different PL classes and FA combinations, ultimately to refine this method for routine analysis of natural fats and oils.







analytical chemistry

Article

Cite This: *Anal. Chem.* 2019, 91, 13695−13702

pubs.acs.org/ac

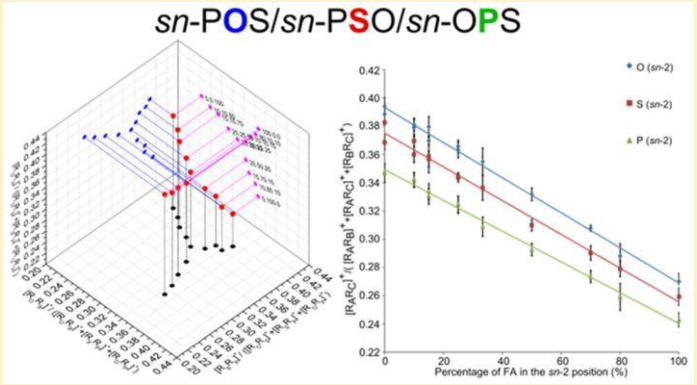
Regiospecific Analysis of Triacylglycerols by Ultrahigh-Performance-Liquid Chromatography−Electrospray Ionization−Tandem Mass Spectrometry

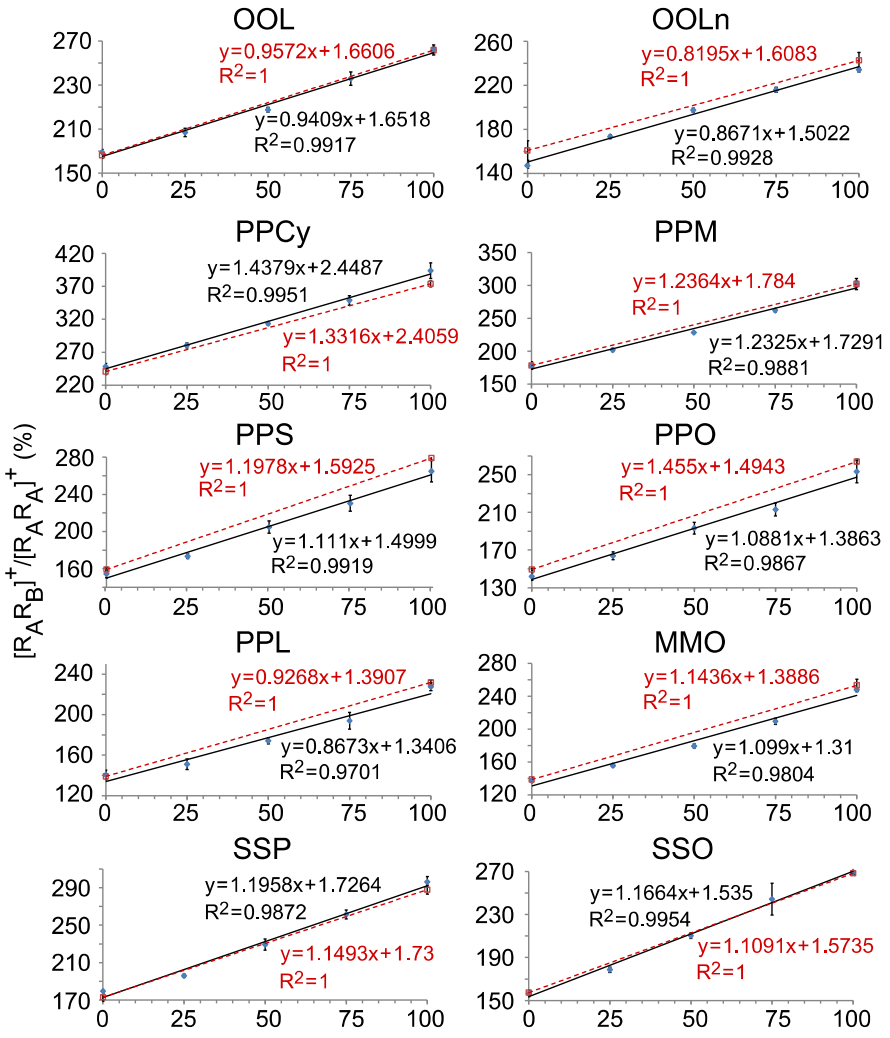
Marko Tarvainen, Heikki Kallio, and Baoru Yang*

Food Chemistry and Food Development, Department of Biochemistry, Faculty of Science and Engineering, University of Turku Turun yliopisto FI-20014 Finland

Supporting Information

ABSTRACT: An ultrahigh-performance-liquid chromatography−electrospray ionization−tandem mass spectrometry (UHPLC−ESI−MS/MS) method was developed for the analysis of AAB and ABC type triacylglycerol (TG) regioisomers. Excellent linear regressions were established between the ratio of $[RR]^+$ product ions and the proportion of regioisomers of TGs. The method was further optimized by analysis of 18 regiospecific pairs of AAB type TGs and five triplets of regioisomers of ABC type TGs with acyl carbon number (ACN) ranging from 36 to 54 and the number of double bonds (DB) from 0 to 7. Reverse linear relationships were recognized between the slope of the calibration curve and the number of double bonds of the *sn*-2 fatty acids. Negative linear regressions were found between the intercepts of the calibration curves and the sum of ACN + DB of *sn*-2 fatty acids. The method was highly repeatable as shown by the low deviation and high stability of the calibration curves at different concentrations and between different periods of analysis. This is the first time that calibration curves for the ABC type TGs are reported. The results provide crucial and novel information for reliable and quantitative determination of regioisomeric TGs in natural fats and oils.





Probiotics and Human Health

Prof. Dr. Qing Gu

01/11/2021

Probiotics

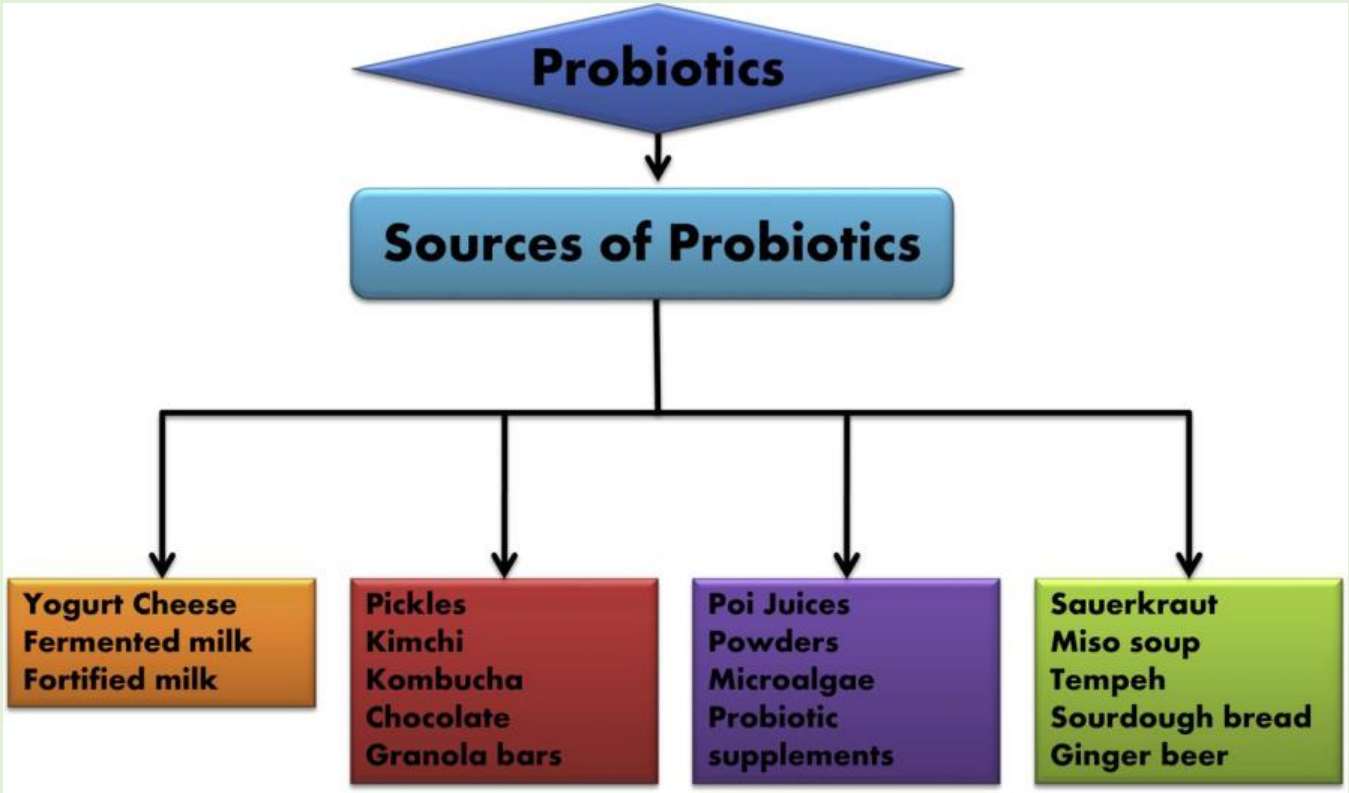
Definition of probiotics from WHO & FAO

“live microorganisms which when administered in adequate amounts confer a health benefit to the host”

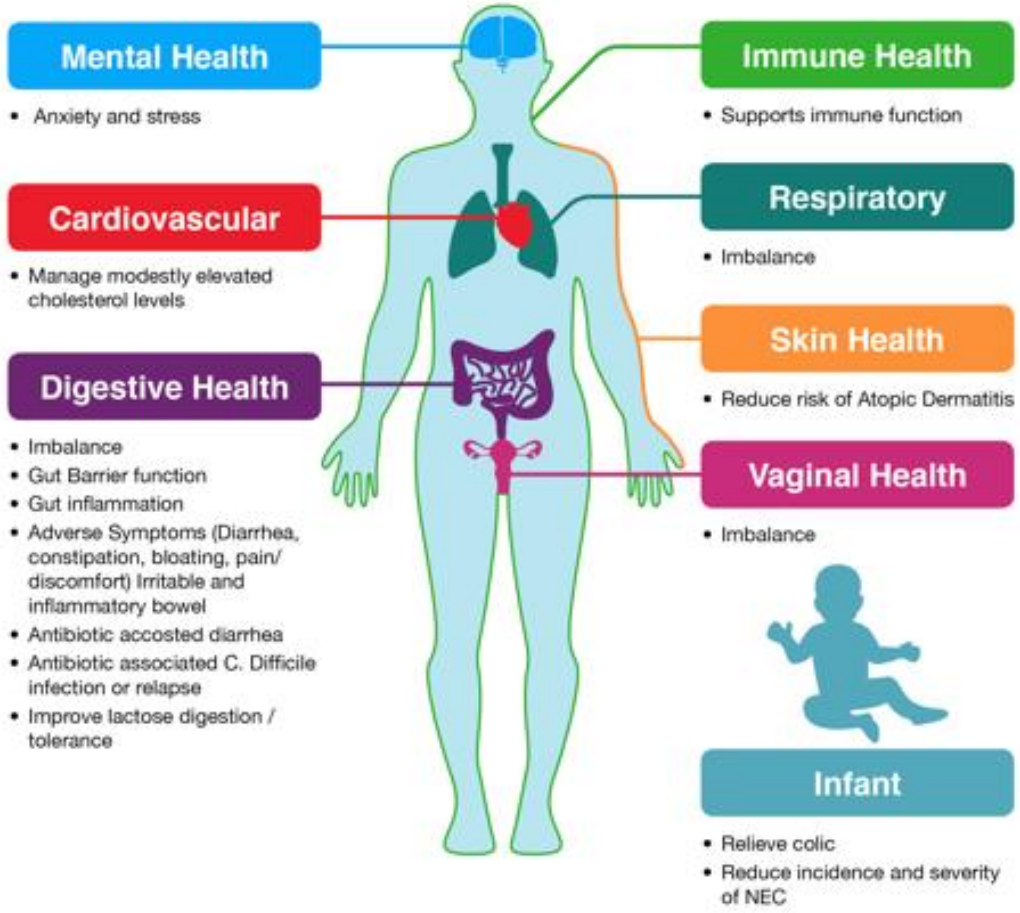
Types of Probiotics

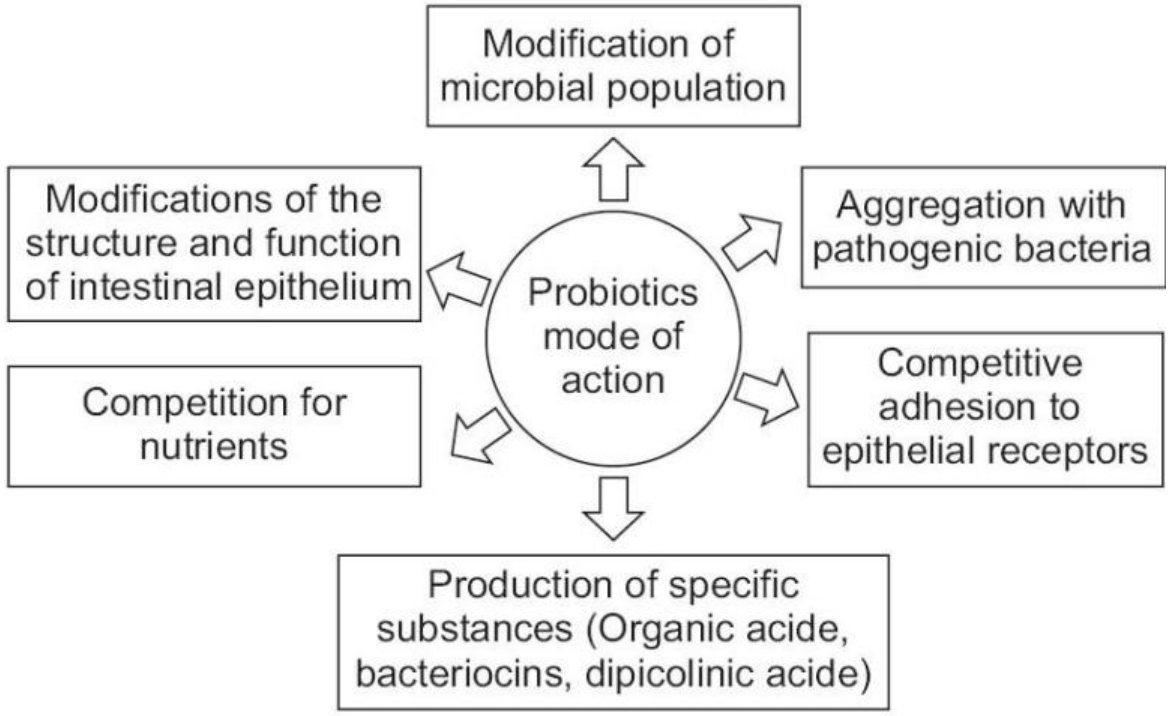
1. **Bacteria**
   - *Lactobacillus*
   - *Bifidobacterium*
2. **Yeast**
   - *Saccharomyces boulardii*

Different sources of probiotics



Beneficial Effects of Probiotics





Mode of Action

Main Research Interests

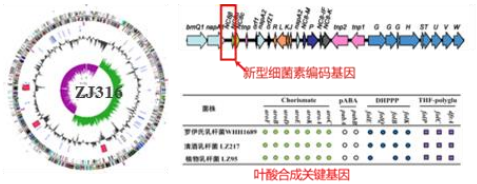
Probiotics and gut health

Probiotic genome and function; key technologies for preparation and industrialization of probiotics

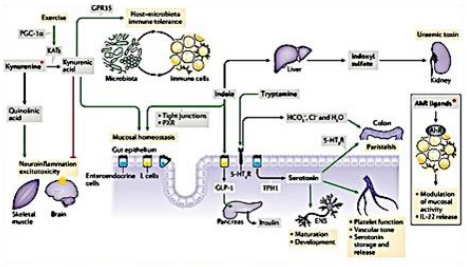
Strain bank construction

Function revelation

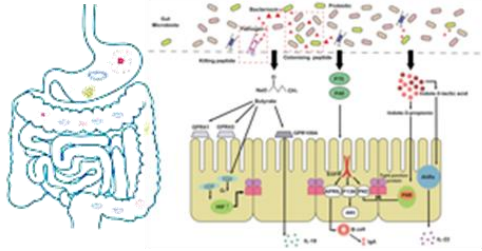
gene level



metabolic level



gastrointestinal regulation



Industrial application

probiotic powder

beverages

fermented dairy

fermented fruit & vegetable

fermented meat

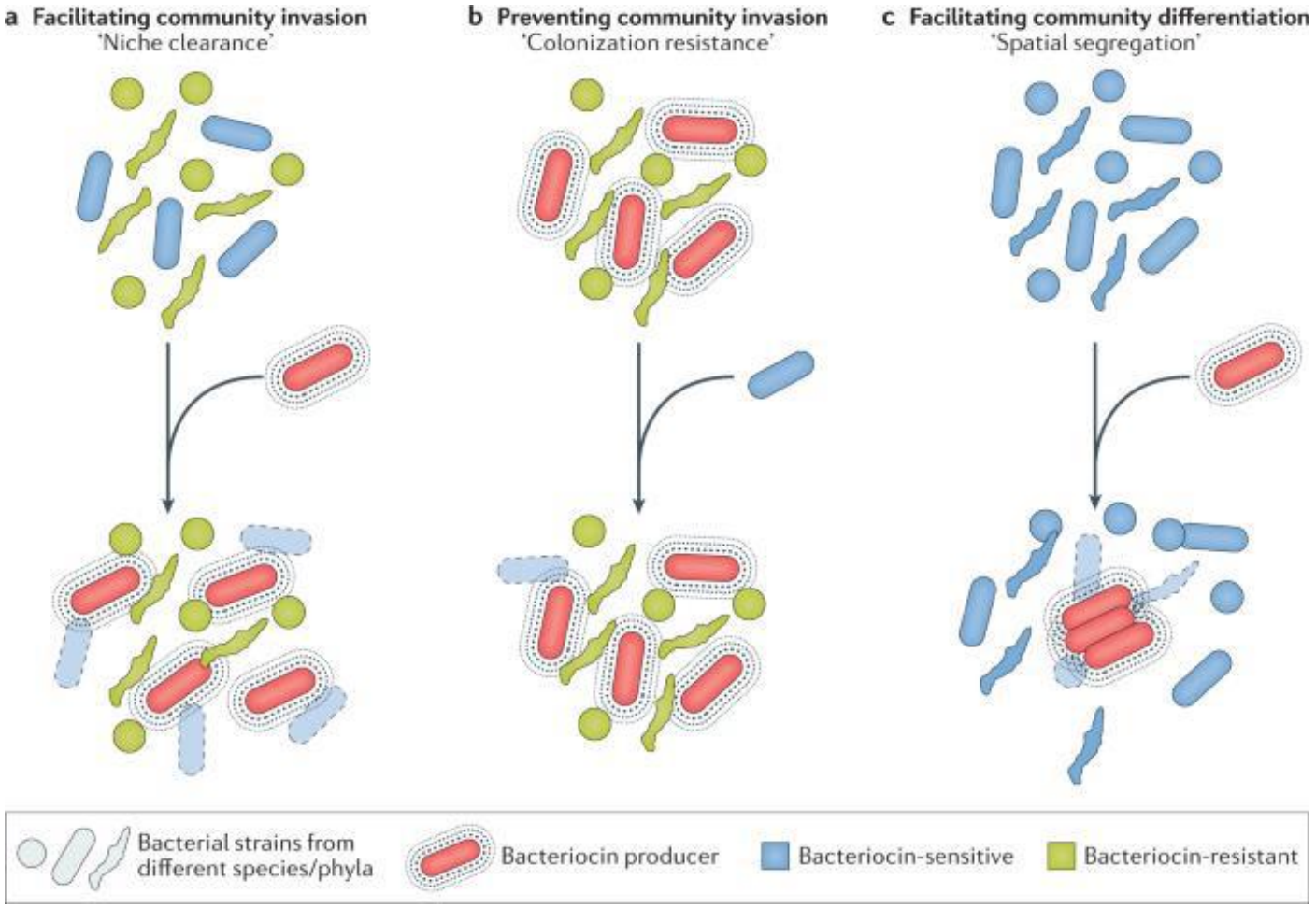
fermented beans

fermented cereal

Main Research Interests

Nutritional functions of probiotics derived compounds

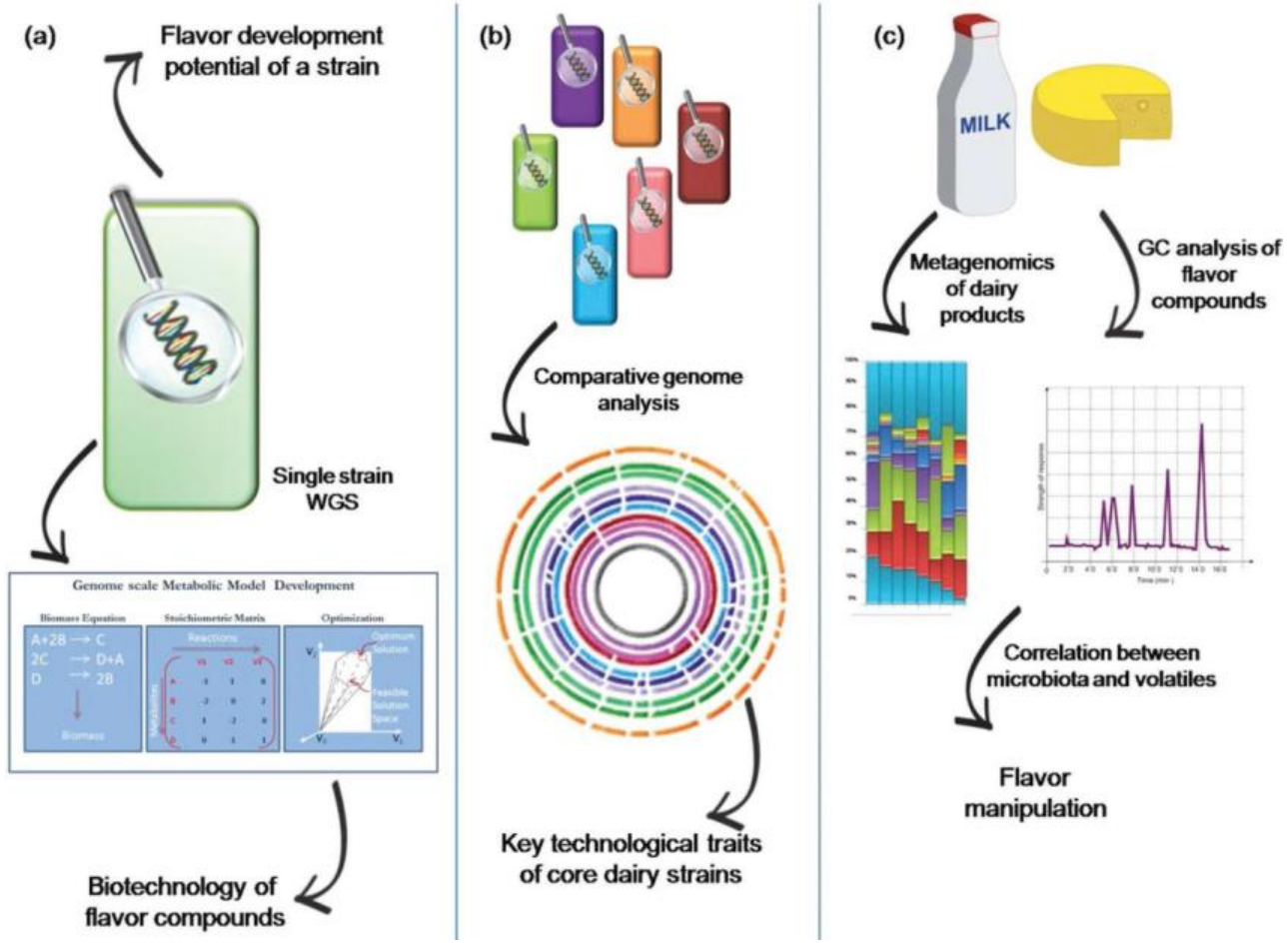
Research on the regulation mechanism of intestinal microecology by functional active substance released by lactic acid bacteria, including **bacteriocins, polyphenols, vitamins, exopolysaccharides**



Main Research Interests

Flavor and microbial metabolism regulation of microflora in natural fermented foods

Collection of new microbial resources in different fermented products, such as fruit wines, cheese, milk, pickle, fermented fish product; flavor and metabolic regulation of these fermented food products



Academic Achievements

National funding

>20

National research awards

= 4

Peer-reviewed papers

>120

Patent

> 20

Team introduction

Prof. Qing Gu

Dean of the School of Food and Biological Engineering, Zhejiang Gongshang University

guqing2002@hotmail.com

Prof. Ping Li

Associate prof. Dafeng Song

Lecturers

Shiying Wu

Jiarun Han

Shuxun Liu

Cheng Qian

Researchers & Doctor candidates

Qingqing Zhou

Xiaodan Zhao

Jianxing Yu

Guoqiang Li

Tingting Yan

Ziqi Chen

Chenlan Xia

Thank you for your attention!

Dietary lipid gastrointestinal digestion and absorption, and the enteral health

Zhan Ye *Post Doc.*

School of Food Science and Technology

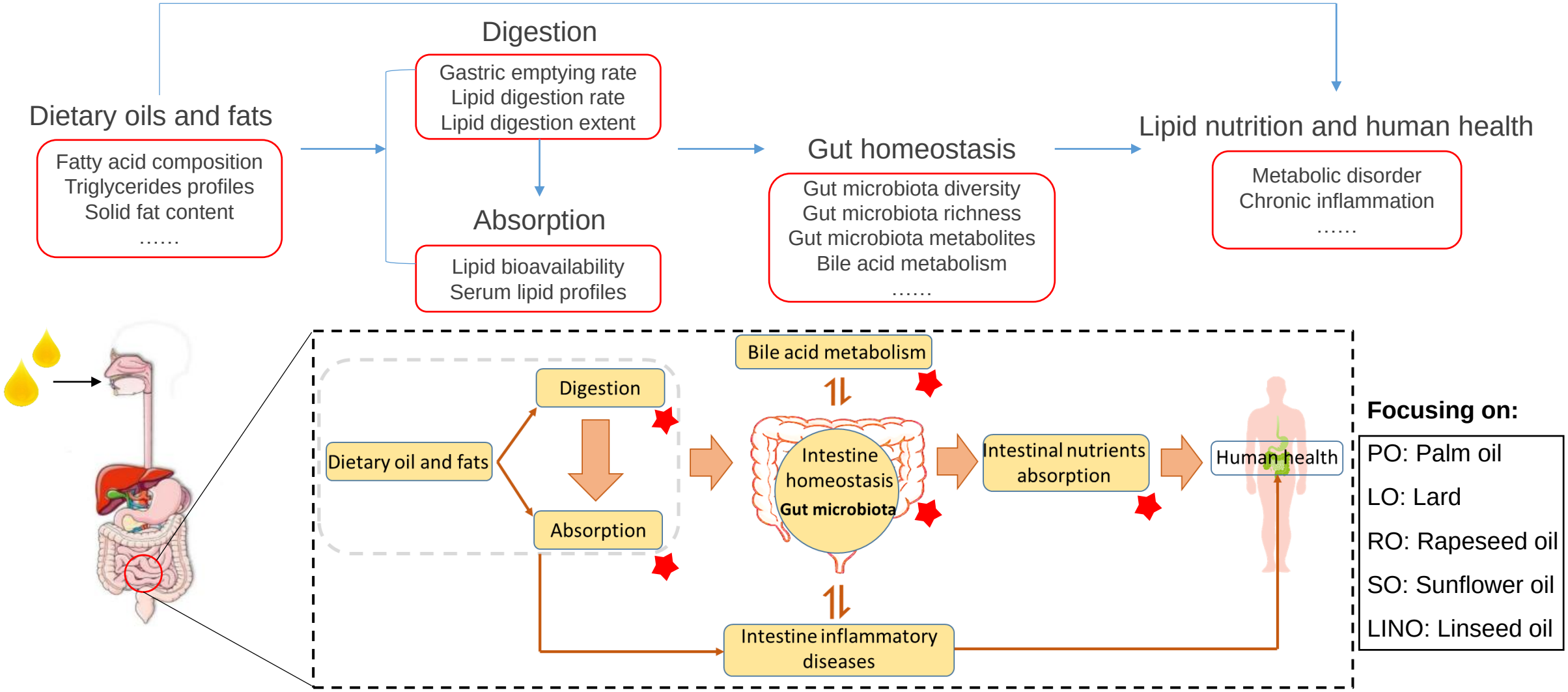
Jiangnan University

Email: yezhan@Jiangnan.edu.cn

OUTLINE

1. Backgrounds
2. Main work
3. Future efforts

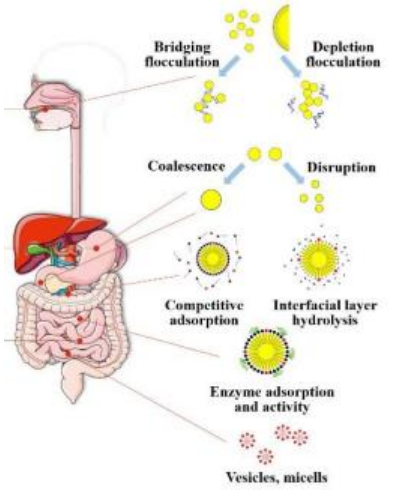
1. Backgrounds

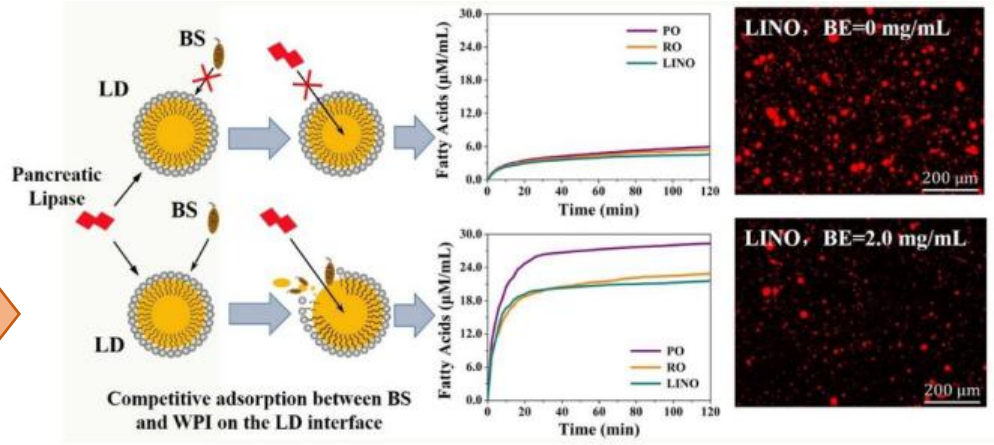


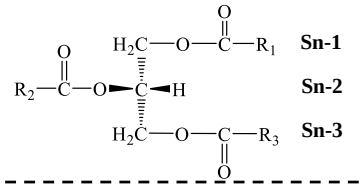
- Dietary lipid composition affects their gastrointestinal digestion and absorption fates;
- Long-term unbalanced dietary lipid intake may affect the human health by influencing the gut homeostasis and the nutrients absorption

2. Main work

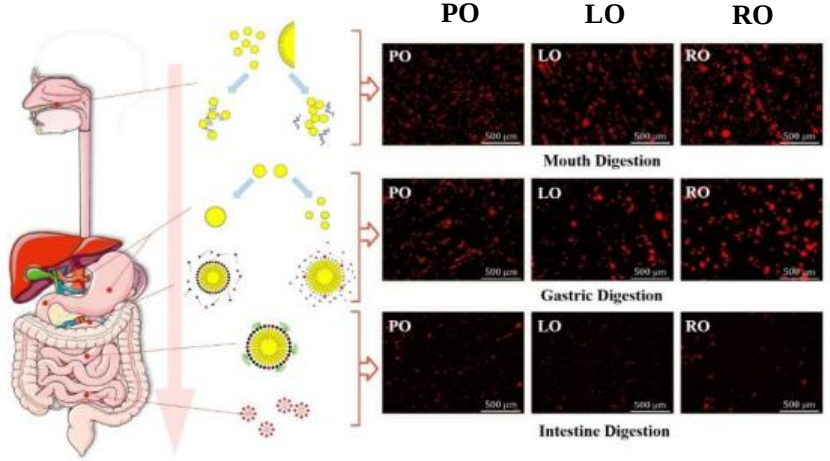
In-Vitro digestion model







1. Digestion rate: PO > RO> LINO
2. Bile salt affinity: PO > RO ≈ LINO
3. Dietary oil rich in short chain fatty acids showed higher digestion efficiency.



TG structure;

Unsaturation degree

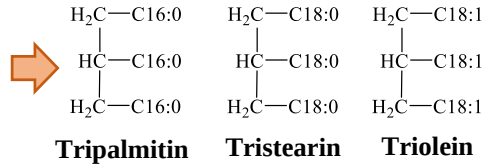
Emulsion behavior

Bile acid affinity

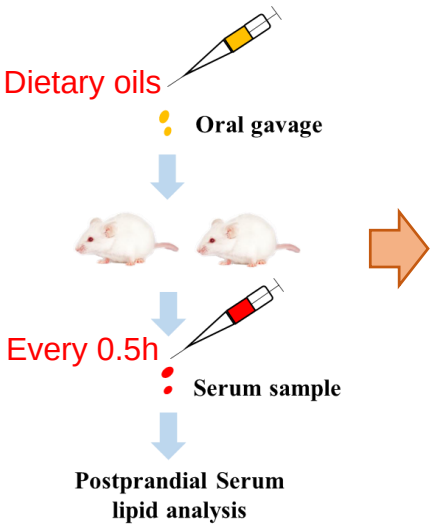
Fatty acid release

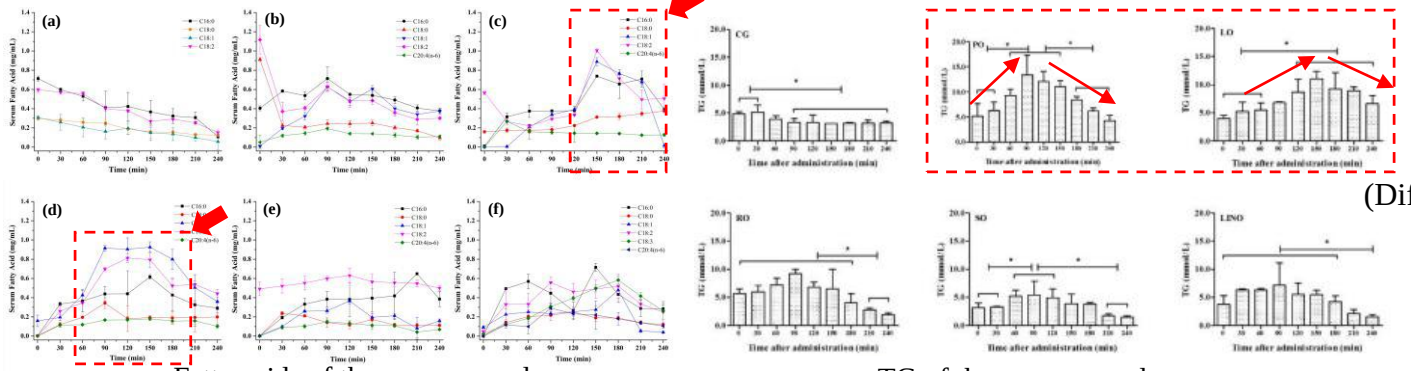
Digestion kinetics

TGs with different chain length and degree of unsaturation



SD rats oral gavage administration





Fatty acids of the serum samples

TG of the serum samples

Correlation analysis

Serum lipid profile	Fatty acid composition of the five dietary oils									
	C16:0	C18:0	C18:1	C18:2	C18:3n3	SFA	MUFA	PUFA	UFA/SFA	ω6/ω3
TG	0.555*	0.169	0.234	-0.528*	-0.146	0.519*	0.233	-0.494	-0.391	-0.443
TC	0.347	-0.034	-0.263	0.558*	-0.534*	0.303	-0.277	0.018	-0.416	0.718**
LDL-C	0.805**	0.354	-0.024	-0.011	-0.630*	0.787**	-0.025	-0.467	-0.793**	0.196
HDL-C	-0.241	-0.754**	-0.05	0.032	0.369	-0.393	-0.082	0.279	0.475	-0.007
LDL-C/HDL-C	0.587*	0.861**	0.032	-0.102	-0.560*	0.717**	0.062	-0.471	-0.778**	0.015

Dietary oils → Digestion and absorption

(Different in composition)

Systematic circulation

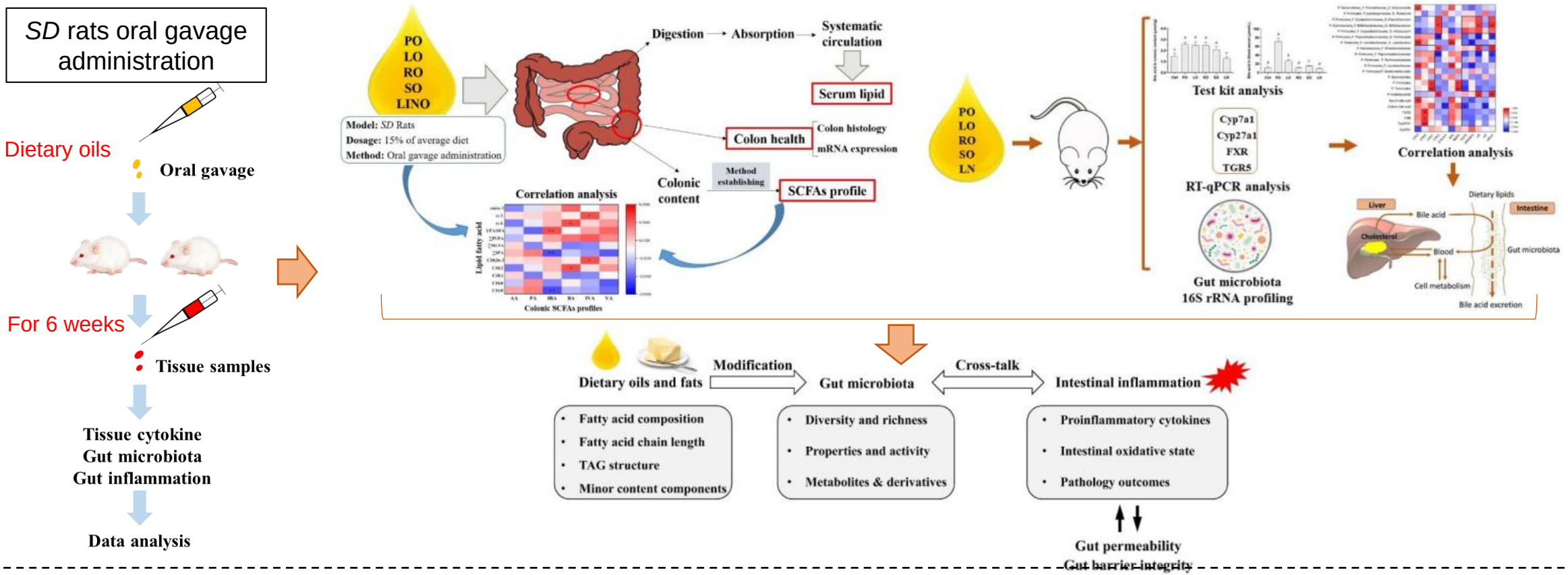
Correlationships

Serum lipid profiles

Serum fatty acid composition

In postprandial (0～240 min)

2. Main work



Representative publications:

(1) Z. Ye, et al. Trends Food Sci. Tech., 2021, 113, 255-276; (2) Z. Ye, et al. J. Sci. Food Agr., 2021 (in press); (3) Z. Ye, et al. J. Food Biochem., 2021, 2021, 45(4), e13695; (4) Z. Ye, et al. Food Res Int., 2020, 132C, 109117; (5) Z. Ye, et al. Food Funct., 2019, 10, 1490-1503; (6) Z. Ye, et al. J. Agr. Food Chem., 2018, 66 (24): 6227-6238.

3. Future efforts

1. The individual fatty acid within the TAGs molecules on the dietary lipid intestinal absorption should be illustrated.
2. The molecular nutrition of different fatty acids with regard to the gut microbiota homeostasis are deserve to be explored.
3. Underlying mechanisms of the individual fatty acids on the gut health and human nutrition still need to be uncovered.

Thank you!

Zhan Ye *Post Doc.*

School of Food Science and Technology

Jiangnan University

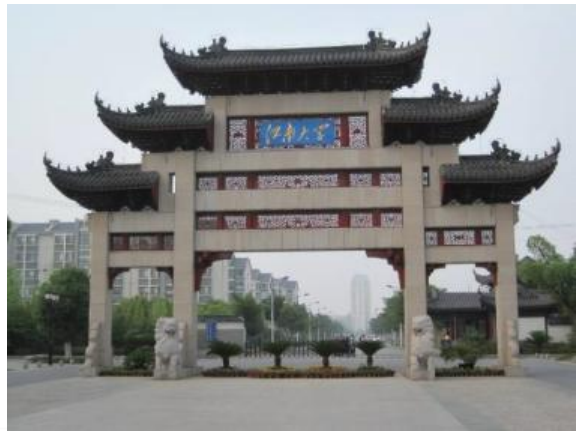
Email: yezhan@Jiangnan.edu.cn

江南大学食品学院
School of Food Science and Technology
Jiangnan University

Finland – China Food and Health Network kick-off Meeting

Lina Zhang

Jiangnan University



1 Background

江南大学食品学院
School of Food Science and Technology
Jiangnan University

2011.09-2015.9

WAGENINGEN UR
For quality of life

PhD. Wageningen University

- Dynamics of milk proteome in human and animal milk

2015.11-2017.9

THE UNIVERSITY of NORTH CAROLINA GREENSBORO

Post-doc, Biomedical Research Center, University of North Carolina at Greensboro

- Glycated proteins in T1D human plasma with high glucose and low glucose level
- Proteome study of human islets

2017.9-Now

江南大学 JIANGNAN UNIVERSITY

Associate Professor, School of Food Science and Technology, Jiangnan University

- Proteomics and glycomics study in human and dairy farm animals

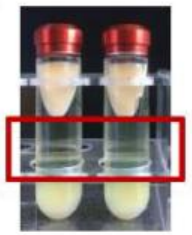
2 Research area

江南大学食品学院
School of Food Science and Technology
Jiangnan University

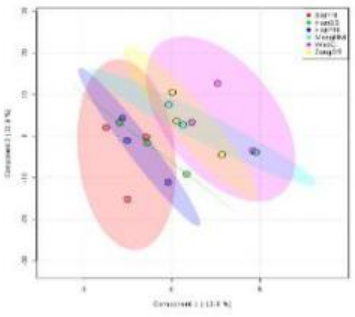
Human and animal milk (bovine, caprine, sheep, and camel) composition analysis

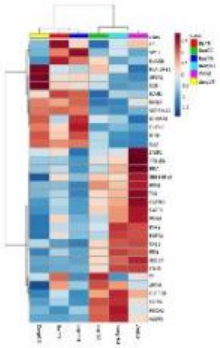
- Comparison in milk proteome related to species, geography and healthy status
- Post-translational modification analysis of milk proteins： glycosylation and phosphorylation
- Qualitative and quantitative analysis of oligosaccharides

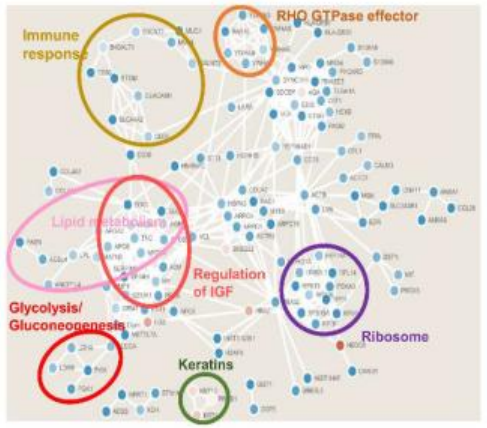
Human milk collection

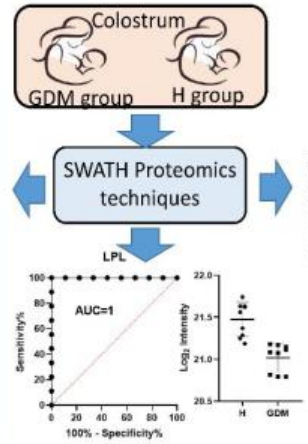

Human milk serum

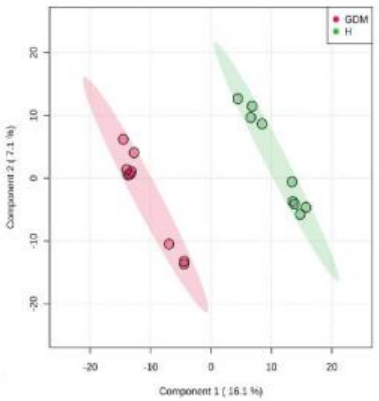
Proteomics techniques


Similarity


Differences





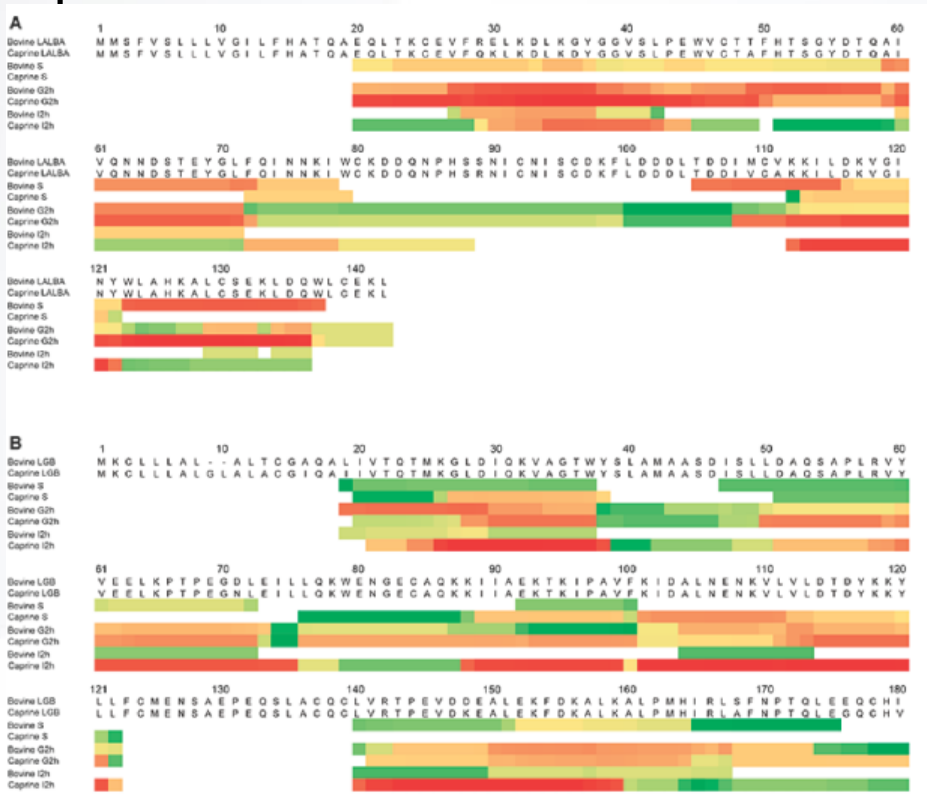


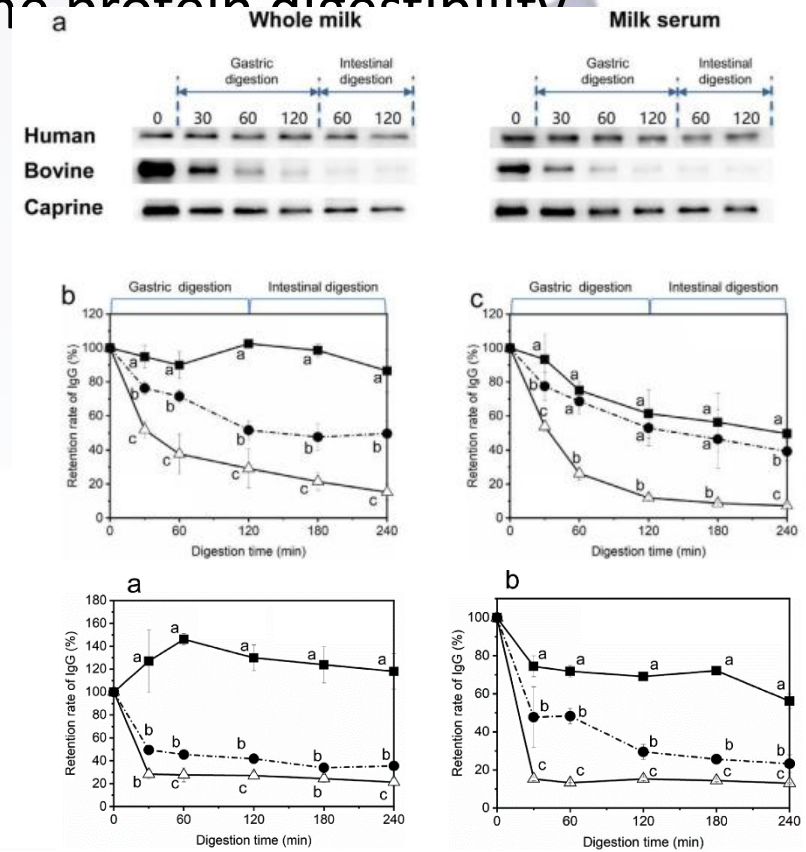
2 Research area

江南大学食品学院
School of Food Science and Technology
Jiangnan University

Human and animal milk protein digestibility

- Milk digestibility analysis： species and processing
- Milk protein absorption： cell and animal model
- Influence of post-translational modification on the protein digestibility



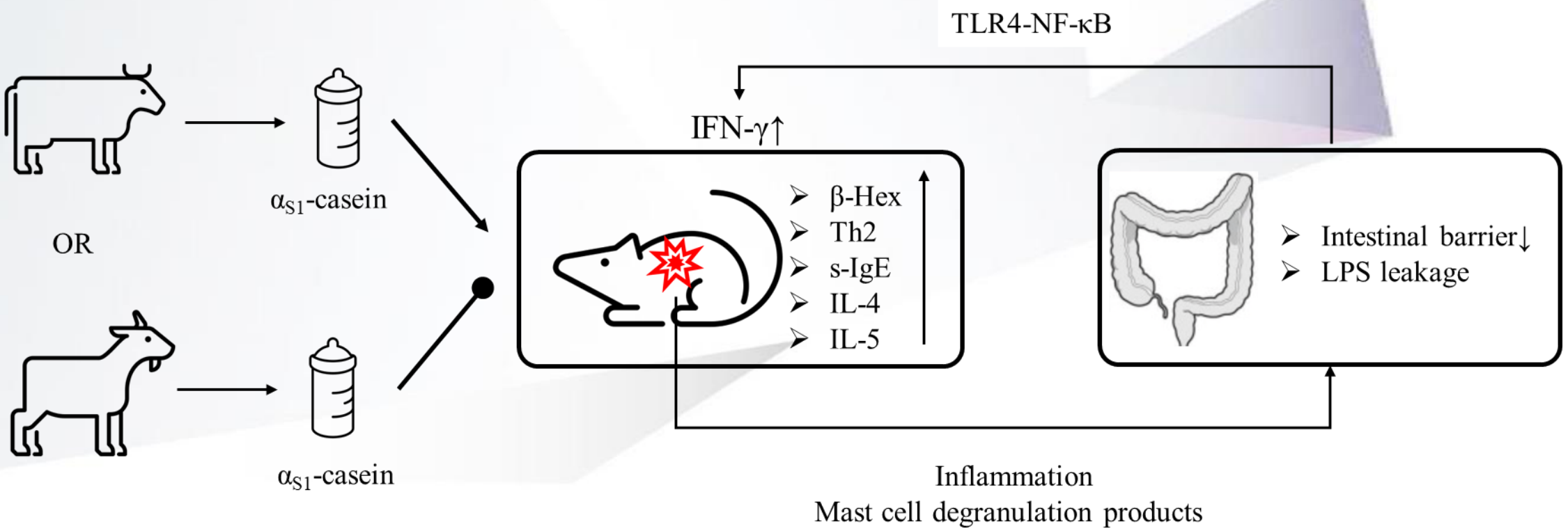


2 Research area

江南大学食品学院 School of Food Science and Technology Jiangnan University

Milk allergenicity and its influence on neurodevelopment

- Animal model compare the sensitization of as1-casein between bovine and caprine milk and the mechanism
- Influence of allergy on neurodevelopment

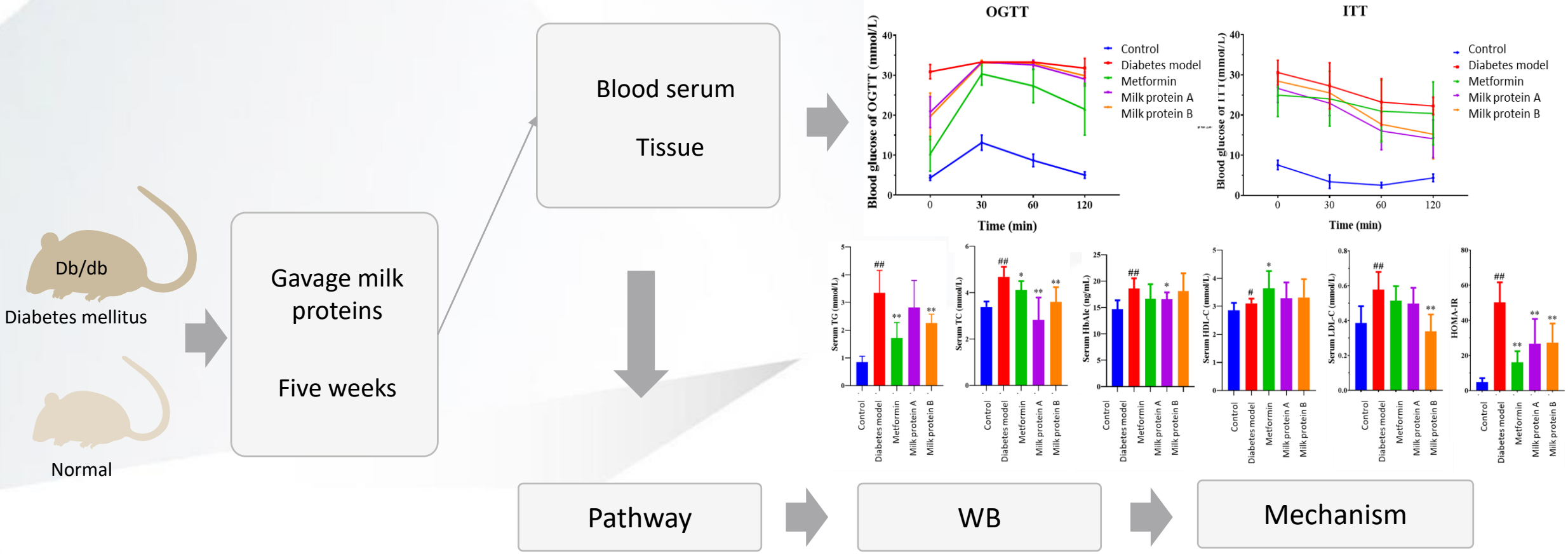


2 Research area

江南大学食品学院
School of Food Science and Technology
Jiangnan University

Milk protein functionality

- The effect of milk protein on regulation of blood glucose of T2D
- The effect of milk protein on anti-inflammation effect



江南大学食品学院
School of Food Science and Technology
Jiangnan University

Thanks for your attention!

THE SCHOOL OF FOOD SCIENCE AND TECHNOLOGY
JIANGNAN UNIVERSITY

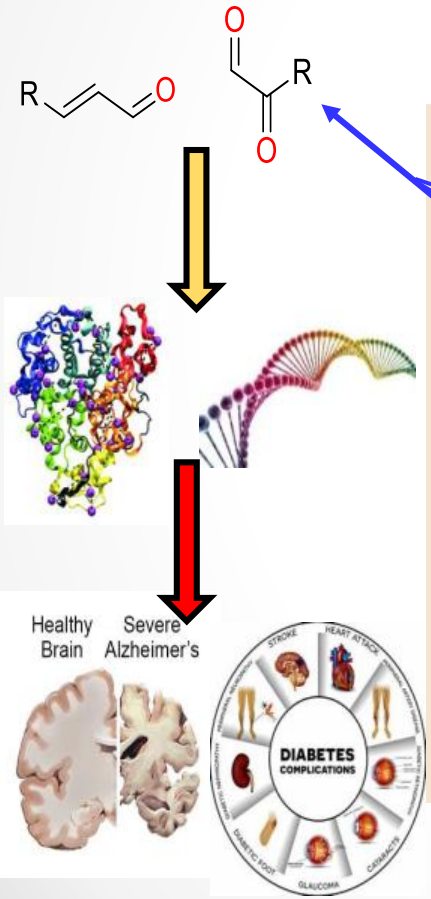
Interaction between Reactive Carbonyl Compounds and Amino Acids/Phenolic compounds and their safety evaluation

Jie Zheng, PhD, Associate Professor

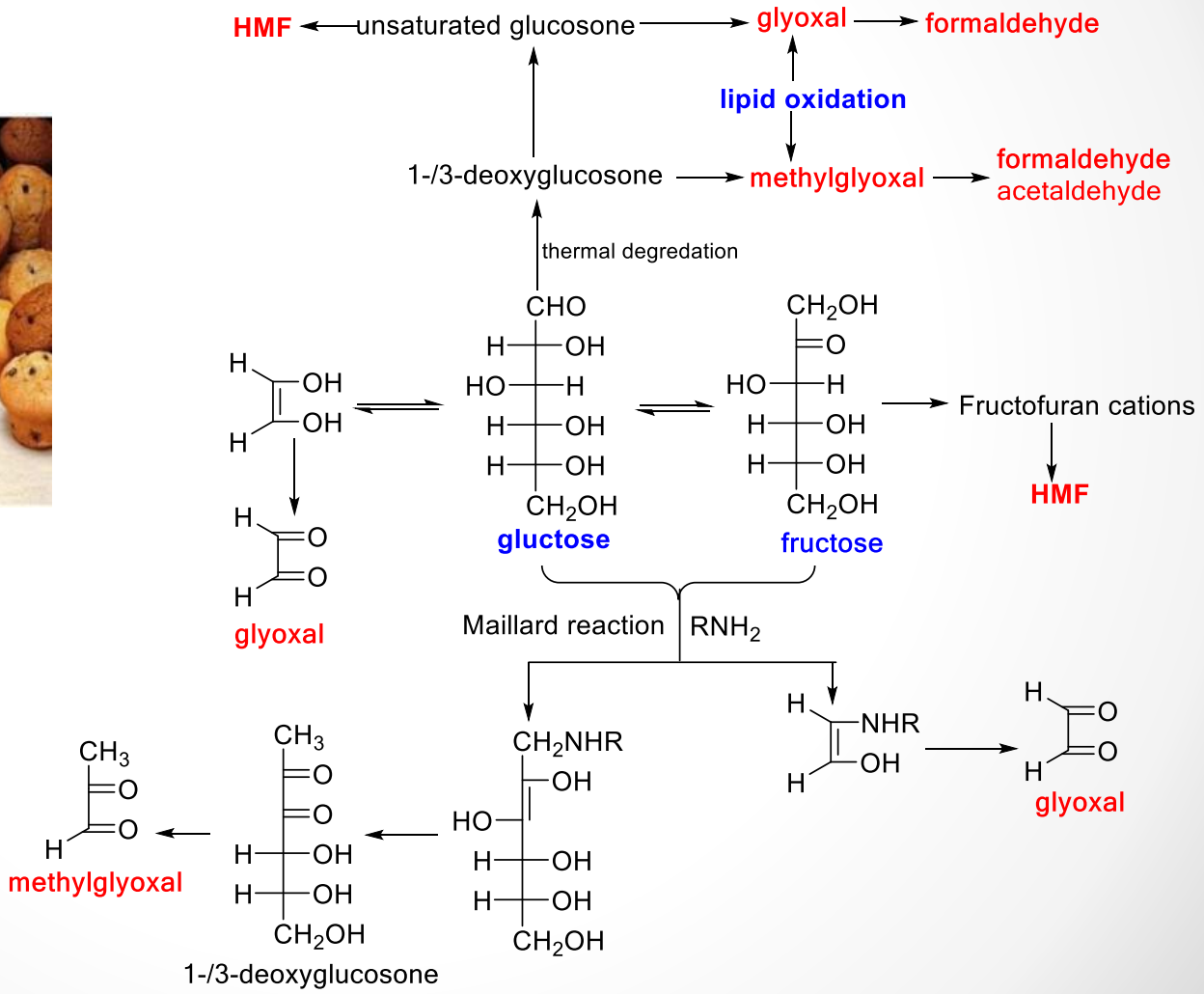
暨南大學
JINAN UNIVERSITY

Department of Food Science and Engineering

Reactive carbonyl compounds



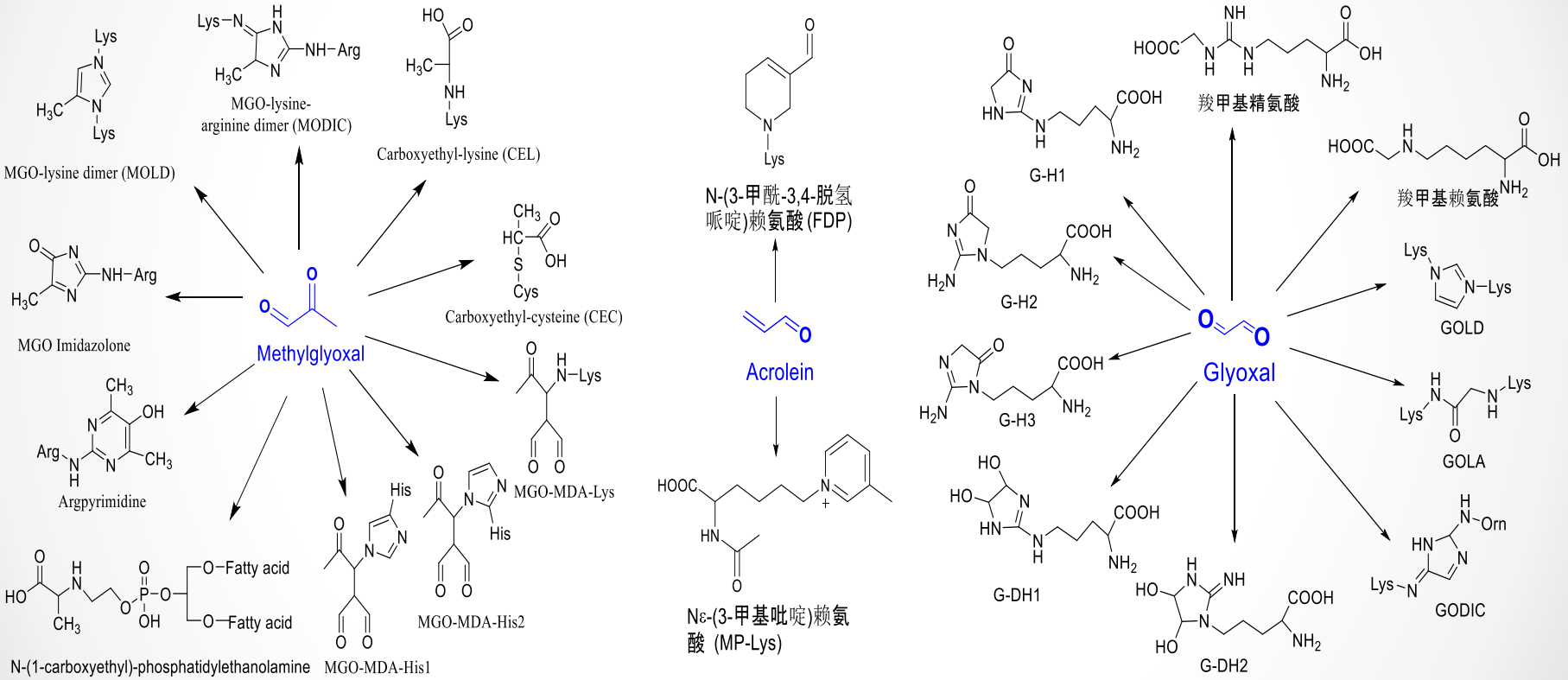
Reactive carbonyl compounds are generated in thermally processed foods



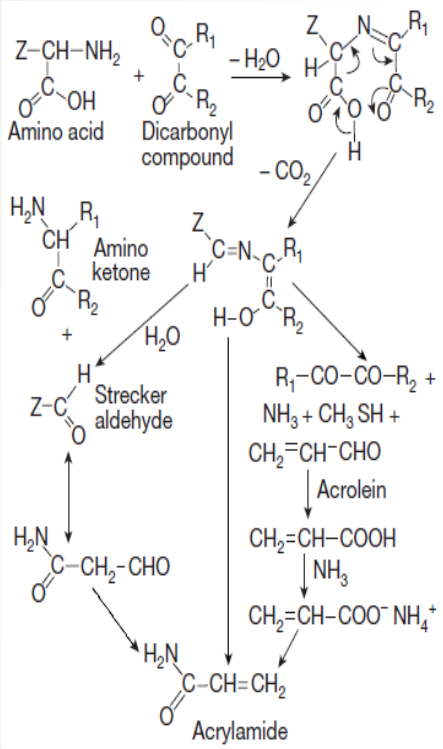
Reactive carbonyl compounds in foods

Food	GO	MGO	2,3-BD	3-DG	1-DG	3-DGal
Honey	0.2–7.0	nd-761	0–4.3	79–1641 143–1099[a]		14–46
Candies		nd-1.1		141–1011		nd-36
Bread		nd-28		13–619		nd-47
Cheese	nd	nd		nd-tr		nd-tr
Alkali-treated pretzel		2.5–16		4.5–34		tr-6.4
Cookies	4.8–26.0	1.8–81.4		8.5–385		tr-88
Pasta (cooked)		nd		nd-8.8		nd
Potatoes (cooked/fried)		nd-tr		nd-18		nd
Oils (raw)	< 1.2	nd-0.8				
Oils (cooked)	0.8–4.0	0.2–1.3				

Precursors of AGEs



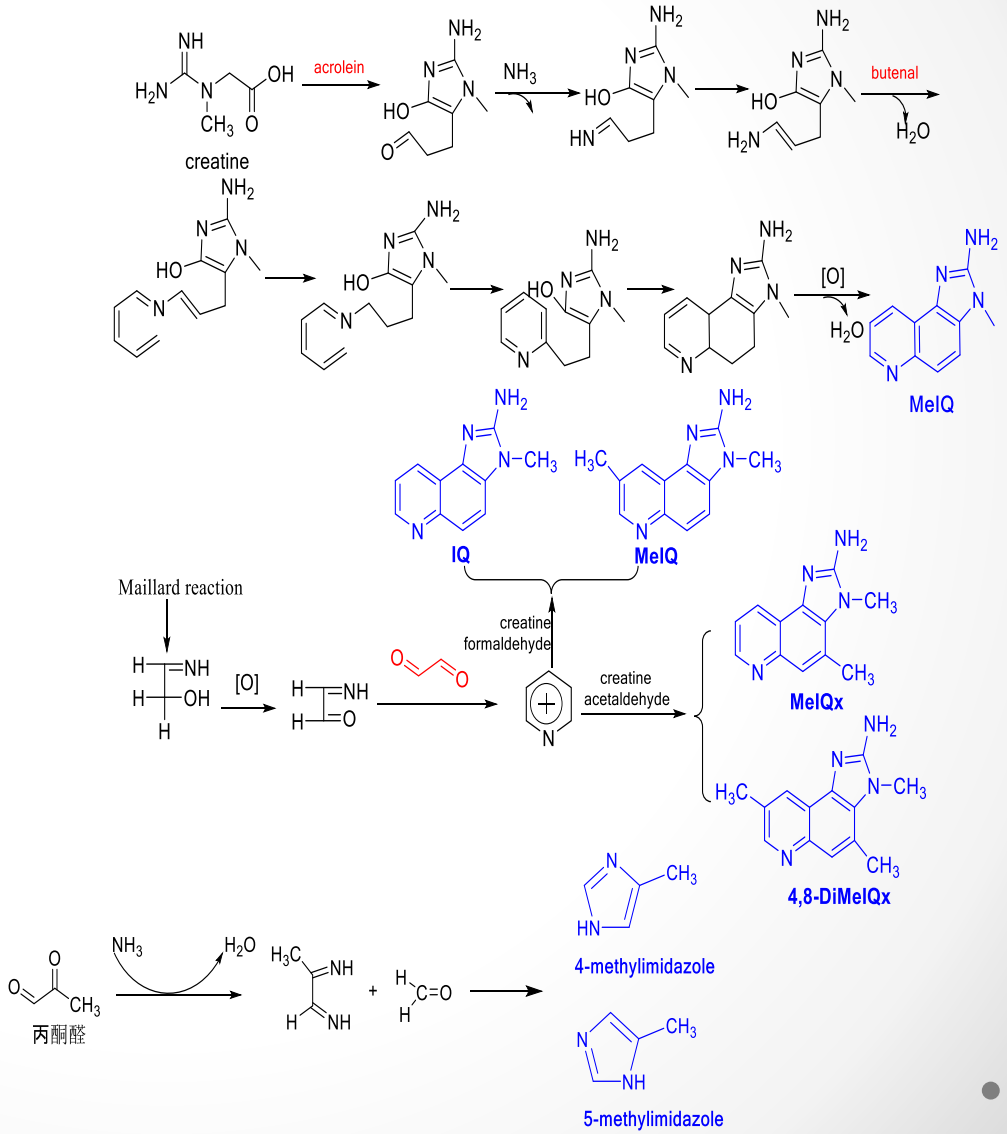
Precursors of Acrylamide



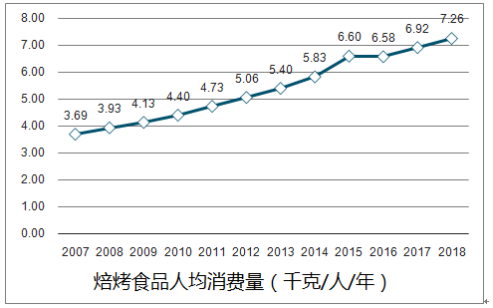
reactants	acrylamide [μg/g Asn]
glucose + asparagines	5.5
fructose + asparagines	7.8
glyoxal + asparagine	2001
methylglyoxal + asparagine	19
diacetyl + asparagine	10
glyceraldehyde + asparagine	100

Ref：*J. Agric. Food Chem.* *54*(26), 10253-10261.

Precursors of heterocyclic amines



Reactive carbonyl compounds in thermally processed foods



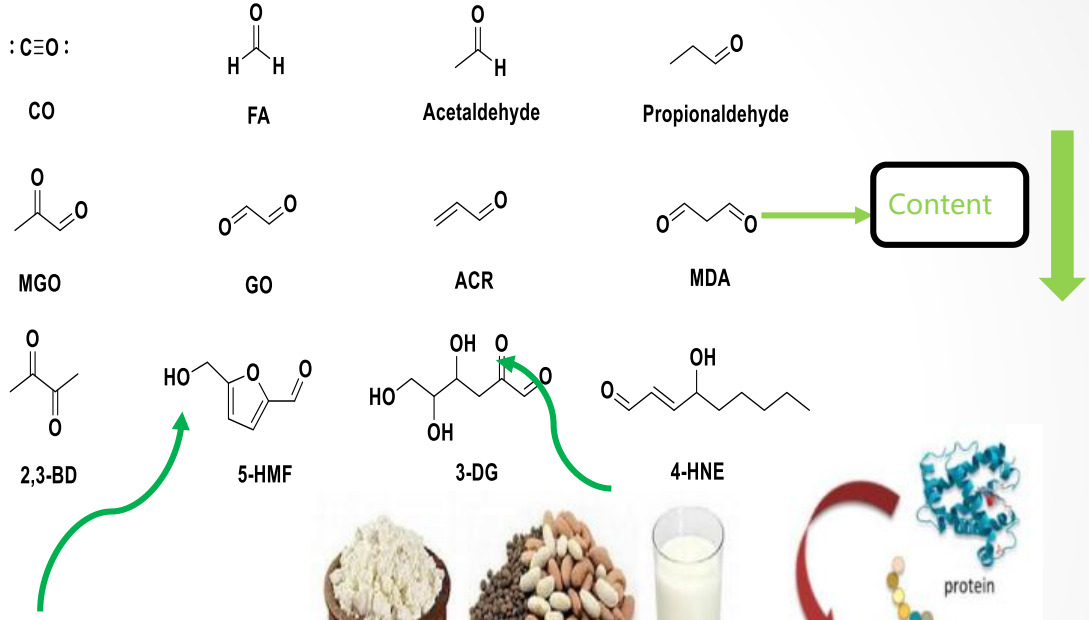
乙二醛 丙酮醛 1-脱氧奥苏糖 3-脱氧奥苏糖
葡萄糖醛酮 丁二酮 丙烯醛 羟甲基糠醛

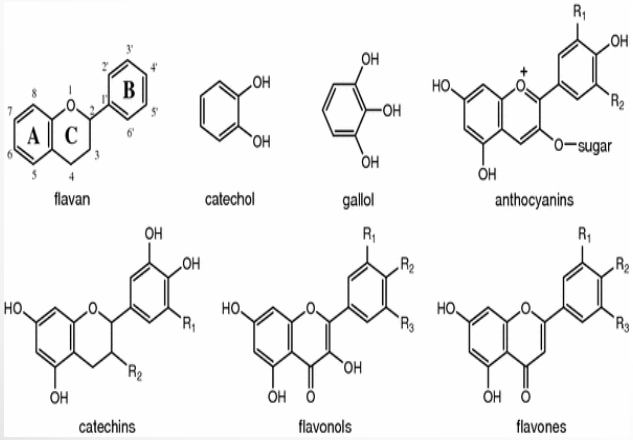
丙烯酰胺
Acrylamide

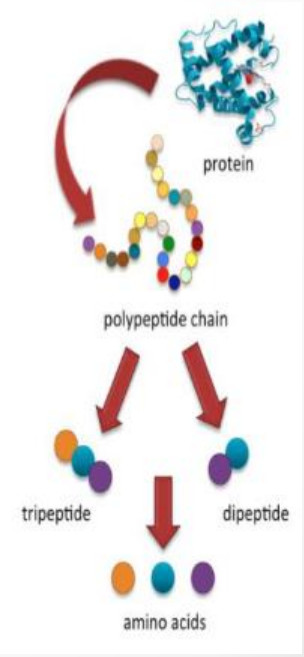
MOLD MODIC Carboxyethyl-lysine (CEL)
Argpyrimidine MGO-MDA-Lys Carboxymethyl-lysine(CML)
G-H1 G-DH1 MGO Imidazolone Carboxymethyl-arginine
G-H2 G-DH2
G-H3 GOLD GOLA GODIC MGO-MDA-His1 MGO-MDA-His2

晚期糖基化终末产物
Advanced glycation end products (AGEs)

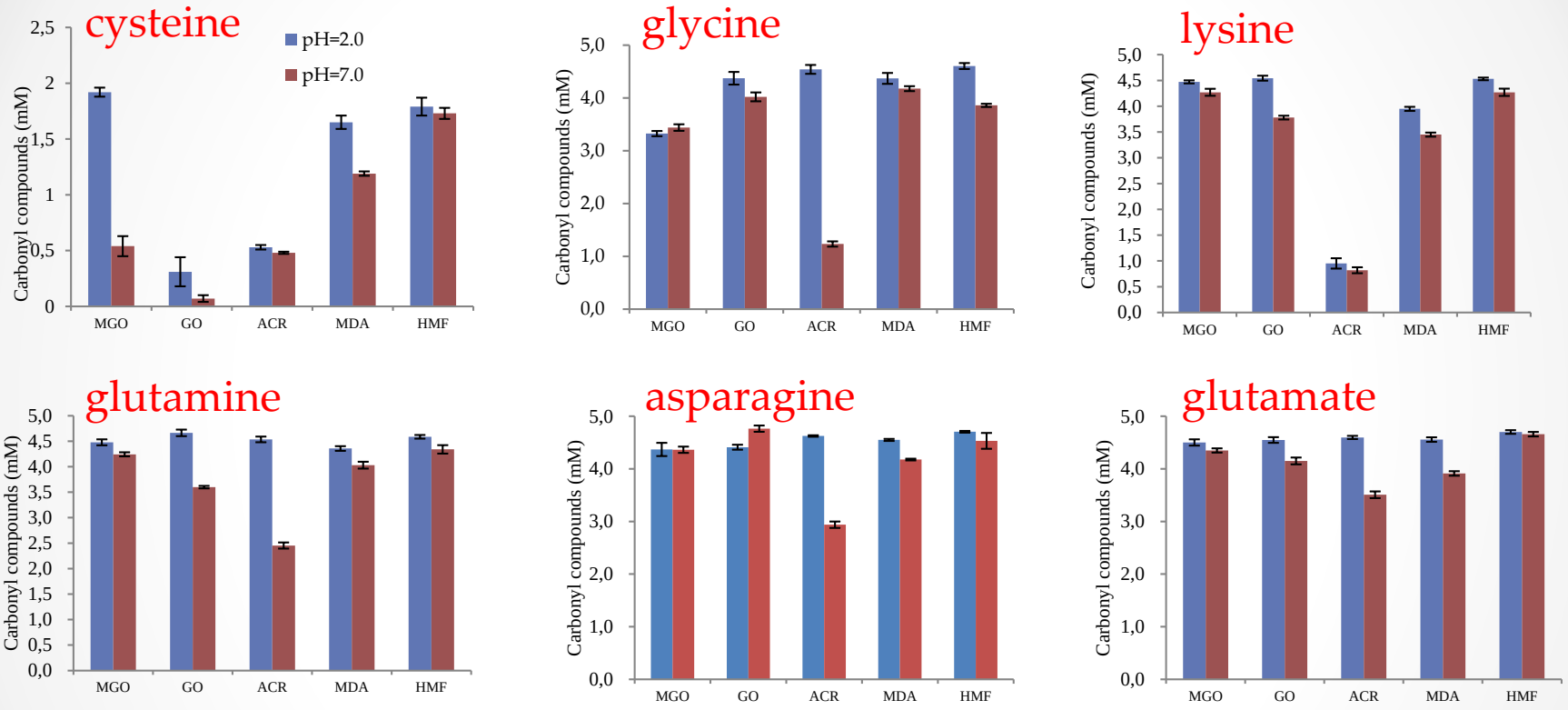
Control of reactive carbonyl compounds (RCs) with natural ingredients







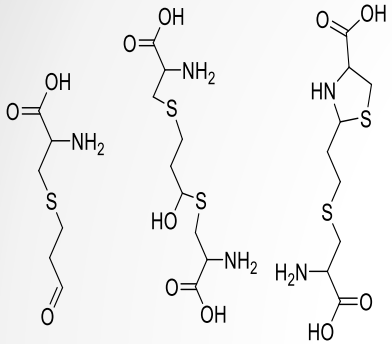
Scavenging capacity of amino acids for toxic aldehydes



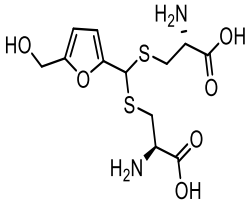
Residual concentration of carbonyl compounds after incubation of 5 mM carbonyl compounds with 50 mM cysteine, glycine, lysine, glutamine, asparagine and glutamate, respectively, at 37 °C for 2 h

Jiang et al. Journal of Hazardous Materials, 2019, 363, 26-33.

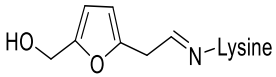
Adducts we identified forming between amino acids and toxic aldehydes



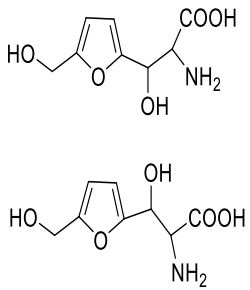
Cysteine-acrolein



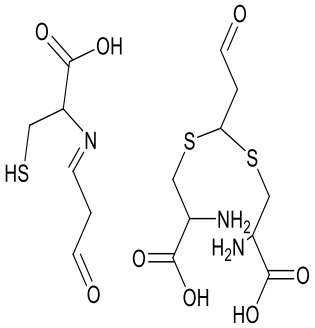
Cysteine-HMF



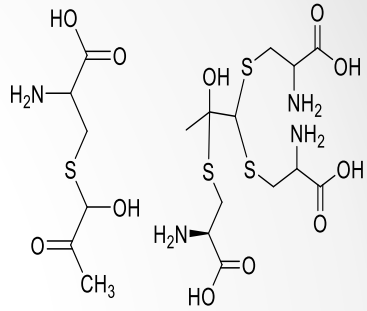
Lysine-HMF



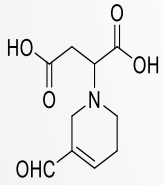
Glycine-HMF



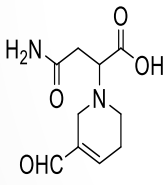
Cysteine-MDA



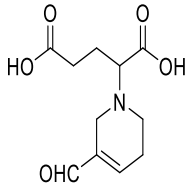
Cysteine-MGO



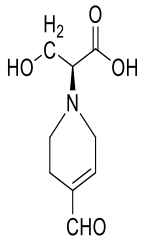
Asp-acrolein



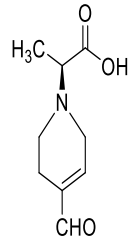
Asn-acrolein



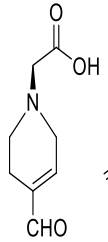
Glu-acrolein

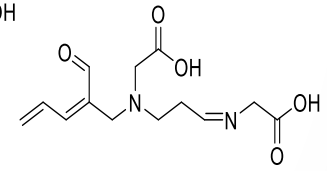


Ser-acrolein

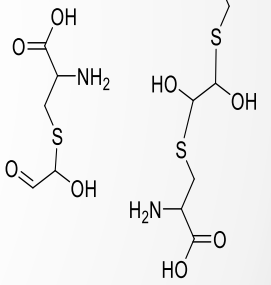


Ala-acrolein

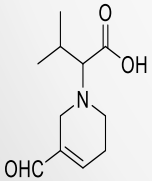




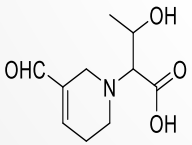
Gly-acrolein



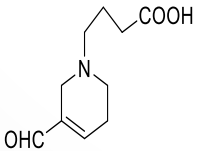
Cysteine-GO



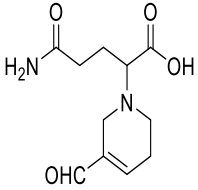
Val-acrolein



Thr-acrolein

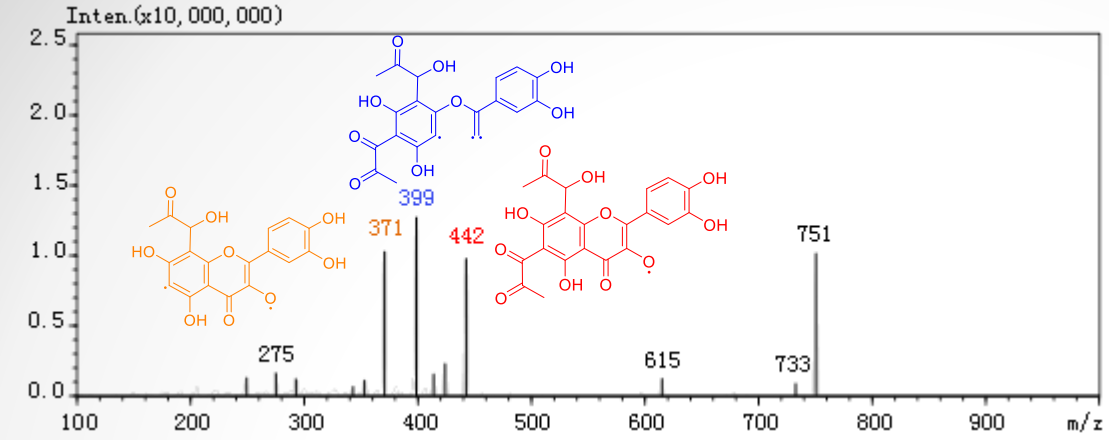


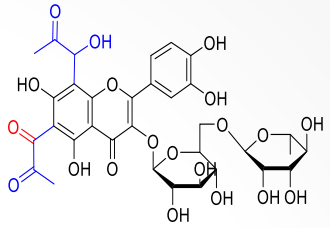
GABA-acrolein



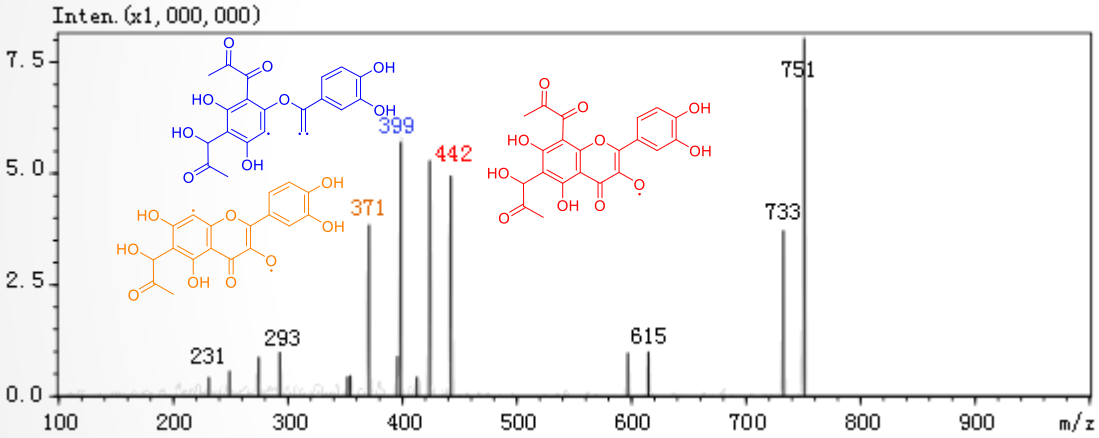
Gln-acrolein

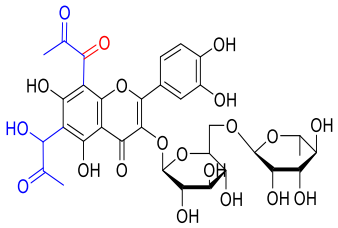
Zhao et al. J. Agric. Food Chem. 2017, 65, 9902-9908.
Zhao et al. J. Agric. Food Chem. 2018, 66, 11451-11458.
Jiang et al. J. Hazard. Mater. 2019, 363, 26-33.
Wang et al. J. Agric. Food Chem. 2019, 67, 10214-10221.
Zeng et al. J. Agric. Food Chem. 2019,68, 384-389.
Yin et al. J. Hazard. Mater. 2020, 387, 121686.
Zou et al. Food Chem. 2021, 361, 130164.
Hu et al. Food Chem. 2022, 369, 130952.



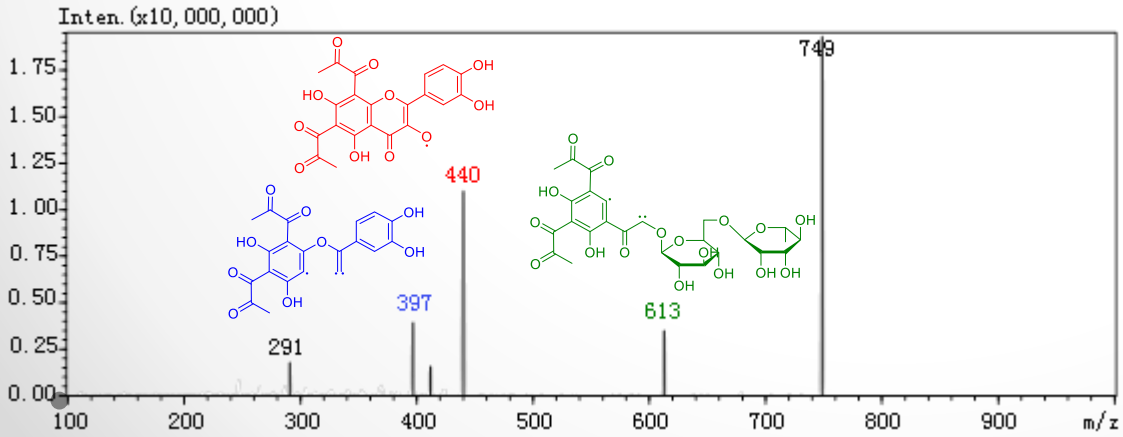


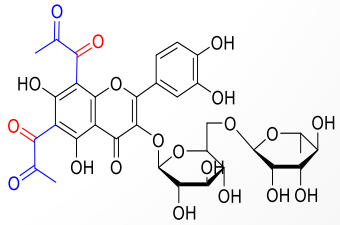
6-(1,2-propanedione)-8-(1-acetol)-rutin



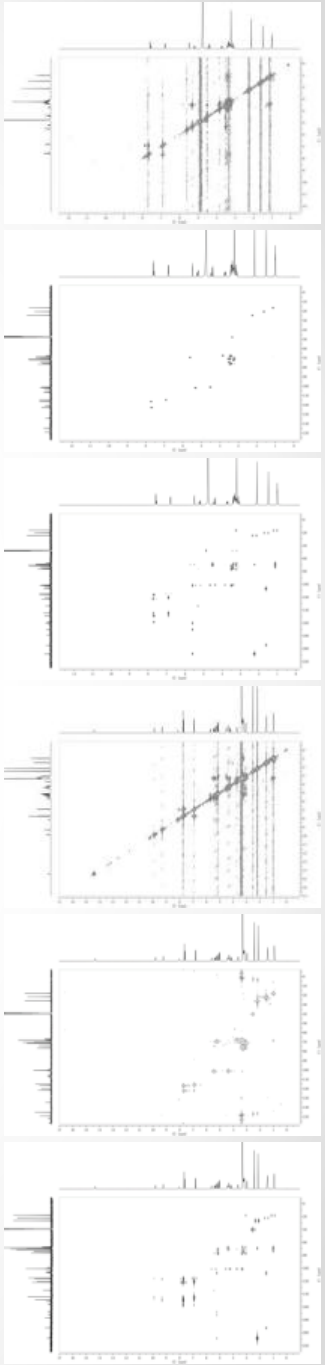


6-(1-acetol)-8-(1,2-propanedione)-rutin





6-(1,2-propanedione)-8-(1,2-propanedione)-rutin



Commercial product	Adduct content (mg/kg)		
	Adduct A	Adduct B	Adduct C
No. 1	1.43±0.43^{a}	1.94±0.20^{b}	1.78±0.07^{b}
No. 2	1.36±0.23^{a}	2.43±0.30^{a}	2.79±0.18^{a}
No. 3	0.41±0.07^{b}	2.85±0.17^{a}	0.29±0.09^{e}
No. 4	0.15±0.05^{b}	--	0.50±0.07^{de}
No. 5	--	--	--
No. 6	0.39±0.07^{b}	0.54±0.04^{c}	0.78±0.01^{c}
No. 7	0.33±0.04^{b}	0.41±0.03^{c}	0.55±0.02^{d}
No. 8	--	--	--
No. 9	--	--	--
No. 10	0.25±0.02^{b}	0.30±0.04^{c}	0.44±0.01^{de}
No. 11	0.20±0.03^{b}	0.17±0.01^{c}	0.29±0.11^{e}
No. 12	--	--	--
No. 13	--	--	--

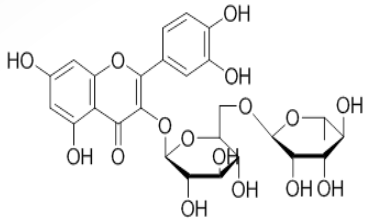
~ 17950 mg/kg

~ 38 mg/kg

~ 4.7 mg/kg

~ 36 mg/kg

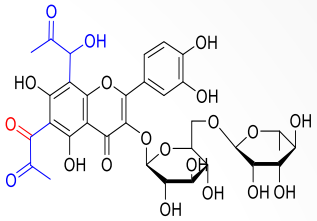
Postprandial variation of plasma levels in rats



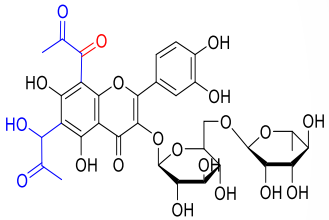
Rutin

Oral administration

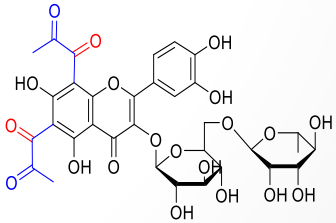
100 mg/kg BW



Adduct A



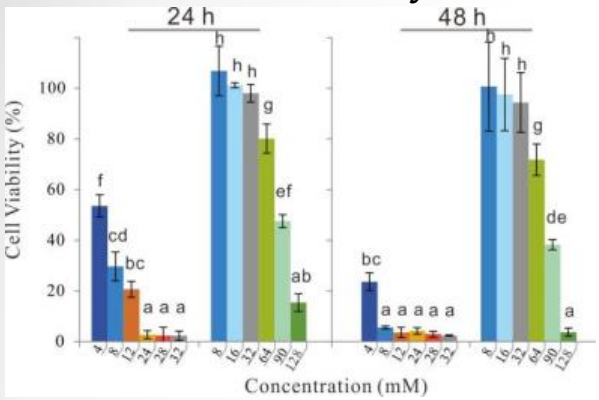
Adduct B



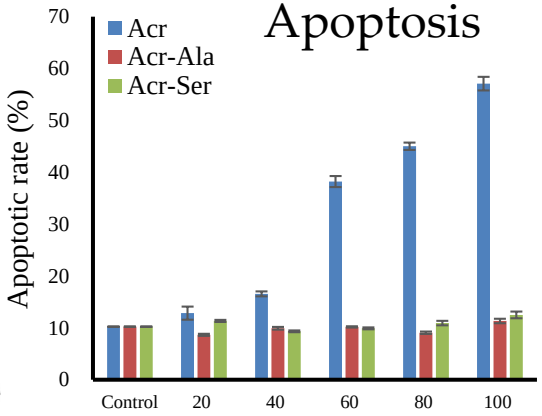
Adduct C

Cytotoxicity commonly reduced by formation of adducts between RCs and amino acids

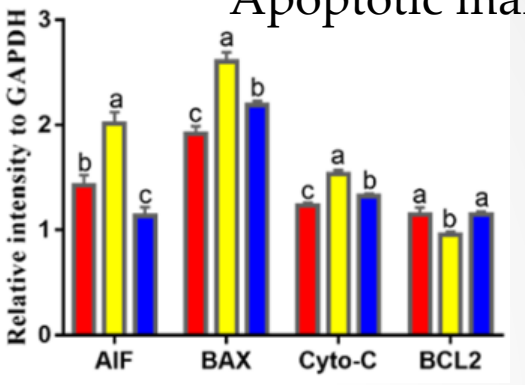
Cell viability

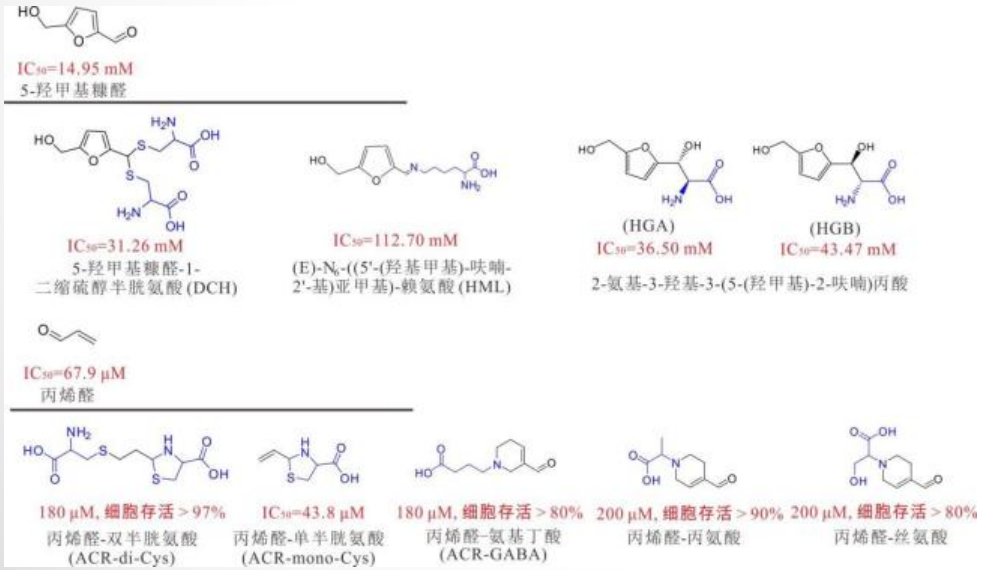


Apoptosis

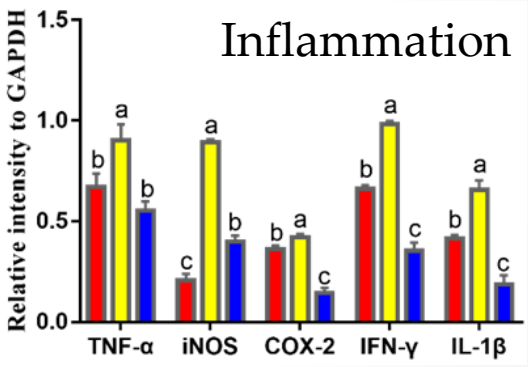


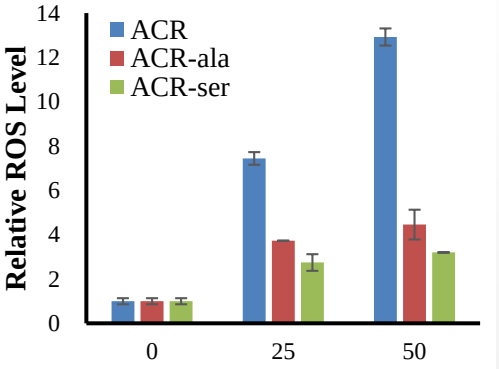
Apoptotic markers



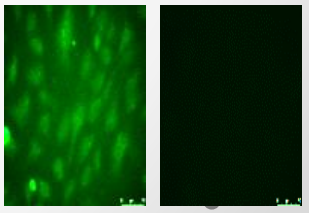


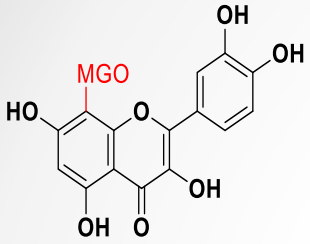
Inflammation



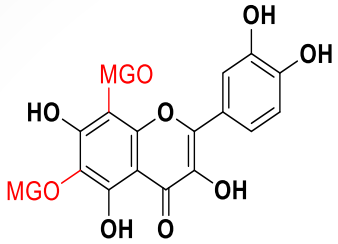


DNA damage

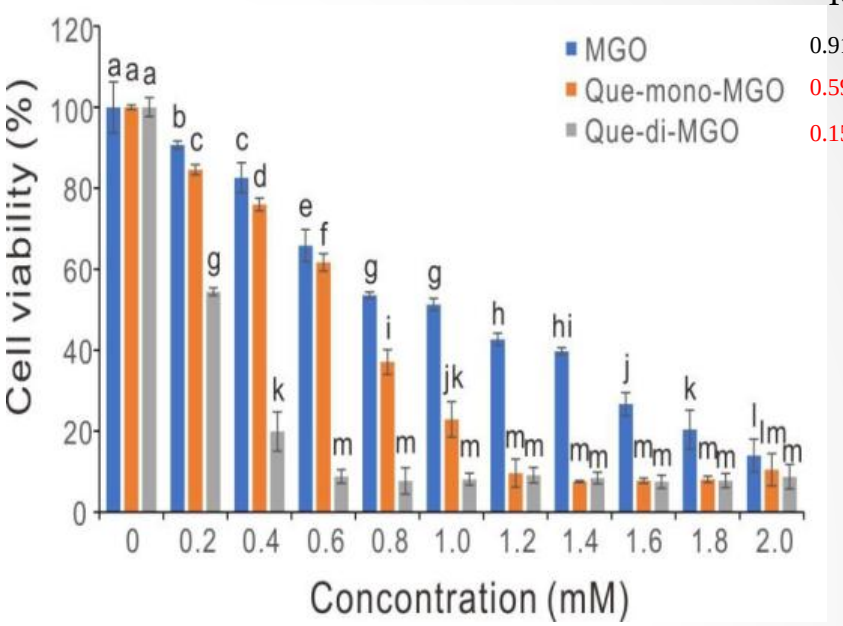


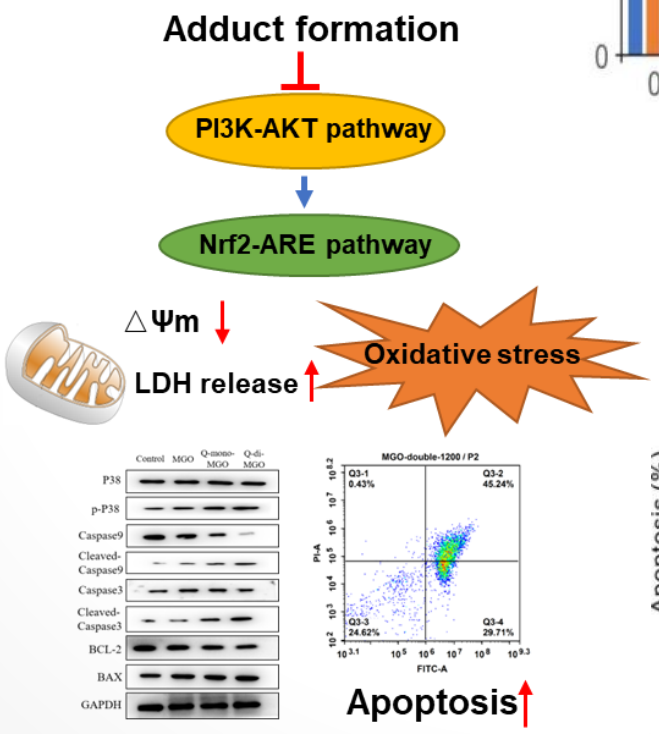


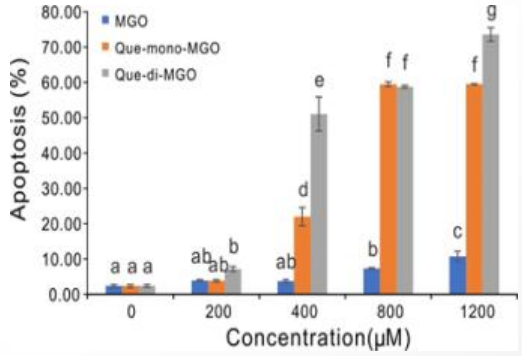
槲皮素-单丙酮醛加合物
（Que-mono-MGO）

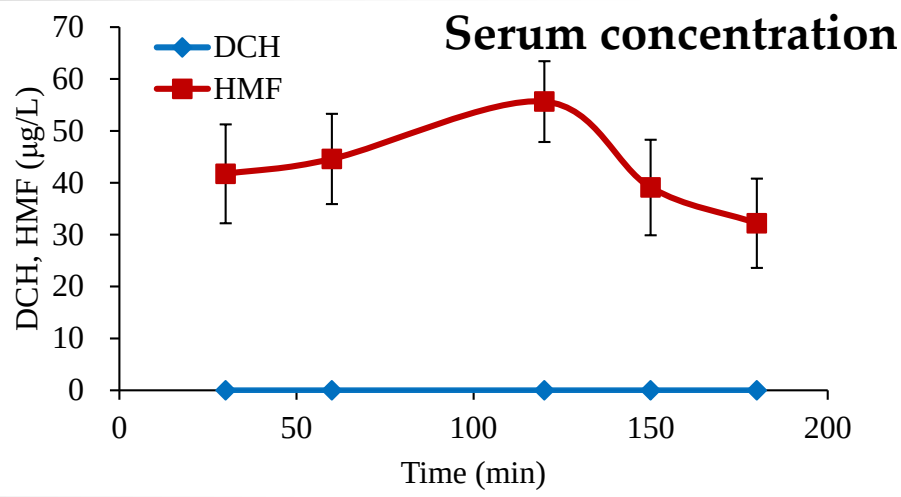


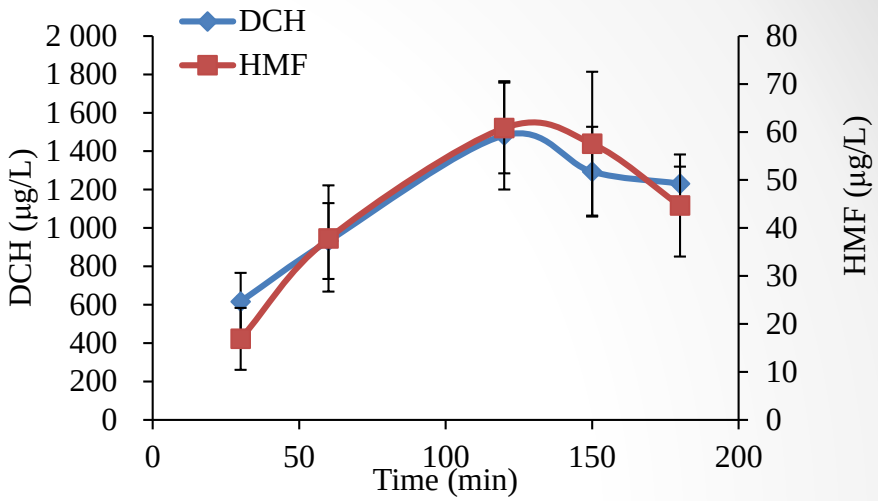
槲皮素-双丙酮醛加合物
（Que-di-MGO）



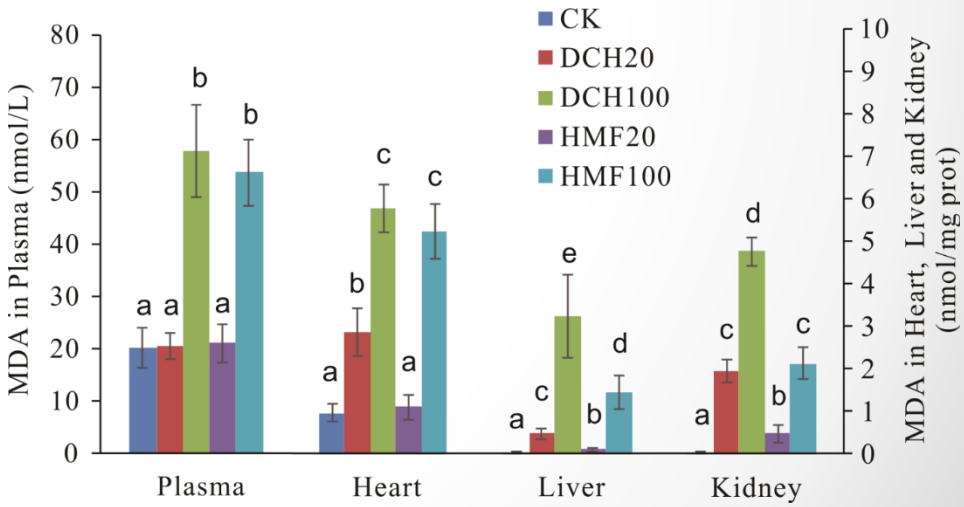








		Heart	Liver	Kidney
HMF administration	HMF content	0.4±0.2	0.1	1.2±0.3
	DCH content	ND	ND	ND
DCH administration	HMF content	0.2±0	1.0±0.4	1.1±0.5
	DCH content	5.0±1.3	3.4±1.8	36.5±4.8



Recent Publications

1. Formation of a hydroxymethylfurfural–cysteine adduct and its absorption and cytotoxicity in Caco-2 Cells. J. Agric Food Chem., 2017,65(45), 9902-9908.
2. Absorption of 1-dicysteinethioacetal–5-hydroxymethylfurfural in rats and its effect on oxidative stress and gut microbiota. J. Agric Food Chem., 2018, 66(43), 11451-11458.
3. Identification of a 5-hydroxymethylfurfural–lysine schiff base and its cytotoxicity in three cell lines. J. Agric Food Chem., 2019, 67(36), 10214-10221.
4. Adducts formed during protein digestion decreased the toxicity of five carbonyl compounds against Caco-2 cells. J. Hazard. Mater., 2019, 363, 26-33.
5. Formation and identification of two hydroxmethylfurfural–glycine adducts and their cytotoxicity and absorption in Caco-2 cells. J. Agric Food Chem., 2019,68(1), 384-389.
6. Formation of di-cysteine acrolein adduct decreases cytotoxicity of acrolein by ROS alleviation and apoptosis intervention. J. Hazard. Mater., 2020, 387, 121686.
7. Interaction of acrylamide, acrolein, and 5-hydroxymethylfurfural with amino acids and DNA. J. Agric Food Chem., 2020,68(18), 5039-5048.
8. Morin decreases acrolein-induced cell injury in normal human hepatocyte cell line LO2. J. Funct. Foods, 2020, 75, 104234.
9. Cytotoxicity of adducts formed between quercetin and methylglyoxal in PC-12 cells. Food Chem., 2021, 352, 129424.
10. Benefits, deleterious effects and mitigation of methylglyoxal in foods: A critical review. Trends Food Sci. Tech., 2021, 107, 201-212.

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Associate Prof.

Jie Zheng

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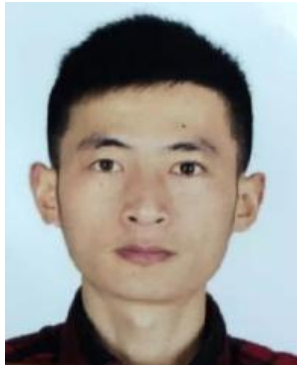

Fu Liu

Associate Prof.

Juanying Ou

Lecturer

Thank you for your attention!

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中国農業大學
China Agricultural University

Finland-China Food and Health Network (FCFH)

Food nutrition and health research summary

Guanghua Zhao

College of Food Science and Nutritional Engineering， China Agricultural University

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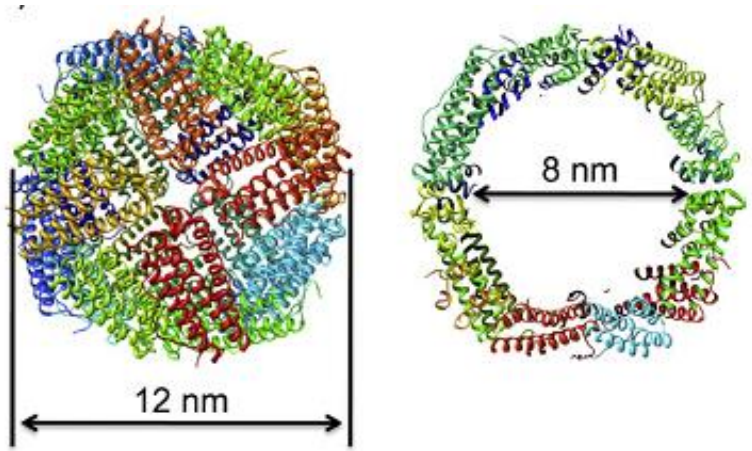
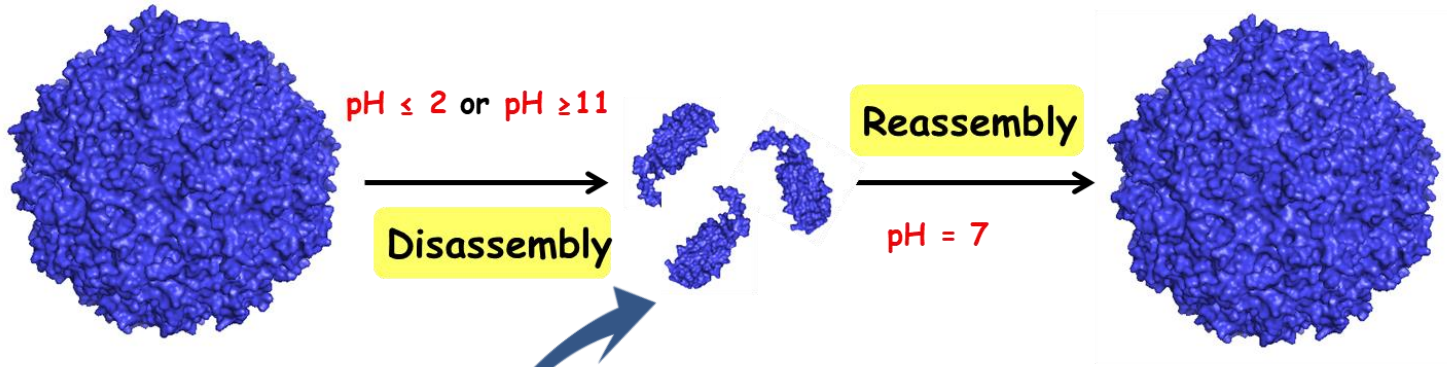
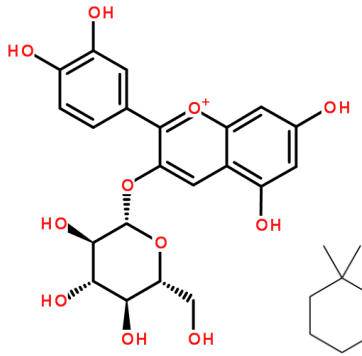
- Protein nanocage design and applications in encapsulation of nutraceuticals
- Mineral elements transport and regulation
- Natural compounds and chronic diseases
- Cereal production and nutrition

Encapsulation and delivery of nutraceuticals

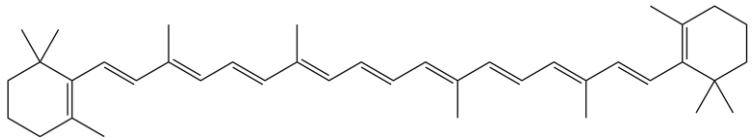


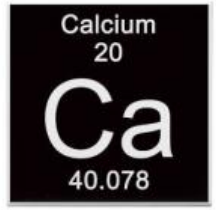
Reversible self-assembly property





water/lipid soluble pigments



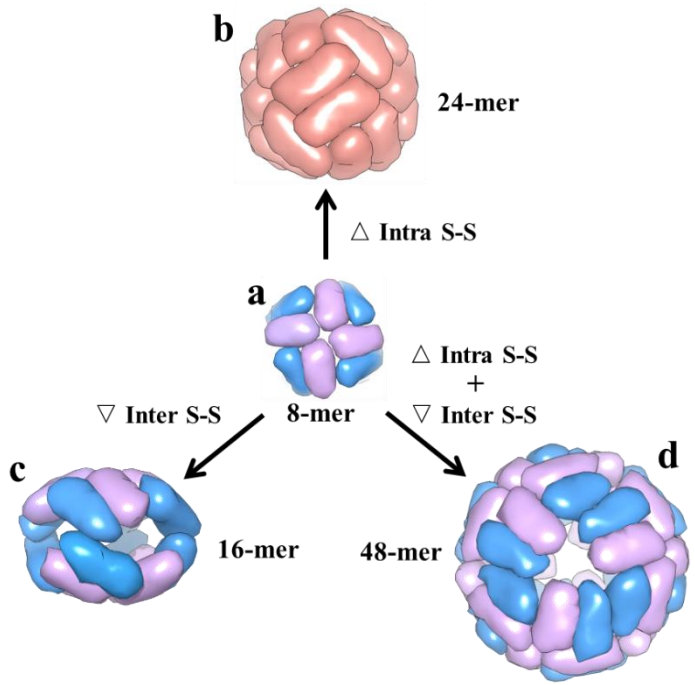


mineral elements

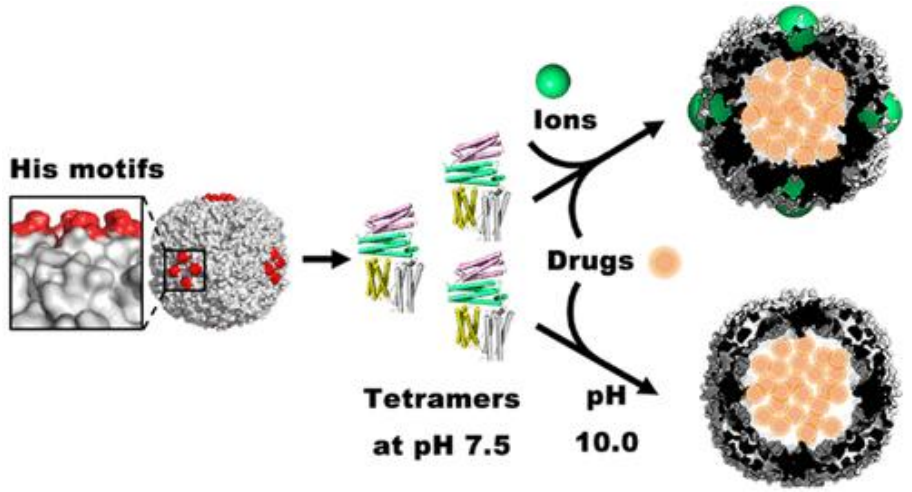
High selectivity for cancer cells **which overexpress two kinds of receptors: SCARA5 for L-ferritin and TfR1 for H-ferritin.**

Crit. Rev. Food Sci, 2017, 57: 3673

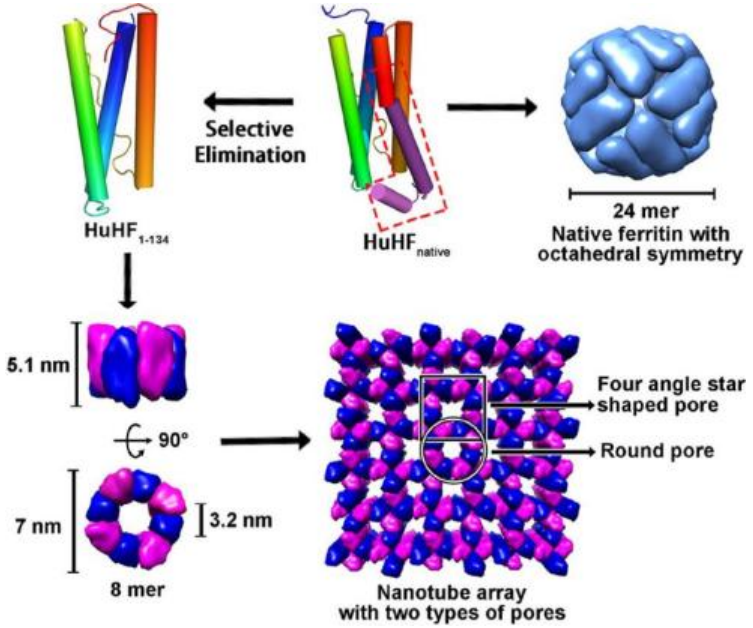
Protein cage redesign and applications



Nature Communications, 2019, 10, 778.
Angew. Chem. Int. Ed., 2016, 55,16064.

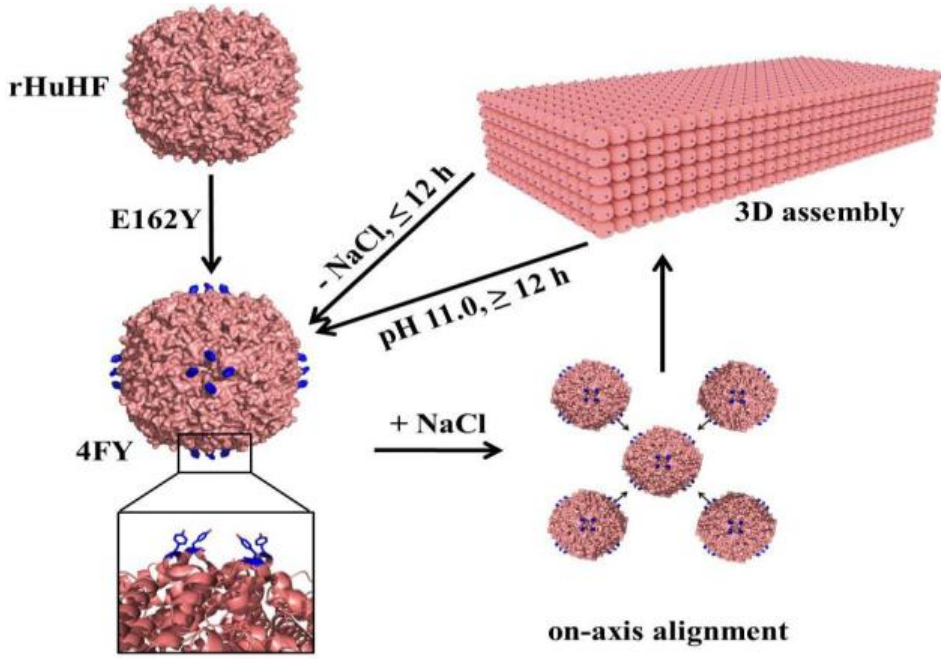


ACS Nano, 2020, 14, 12,17080.



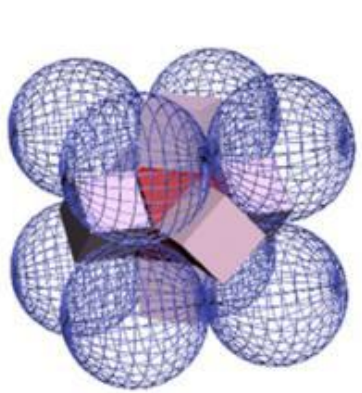
J. Am. Chem. Soc., 2018, 140,14078.

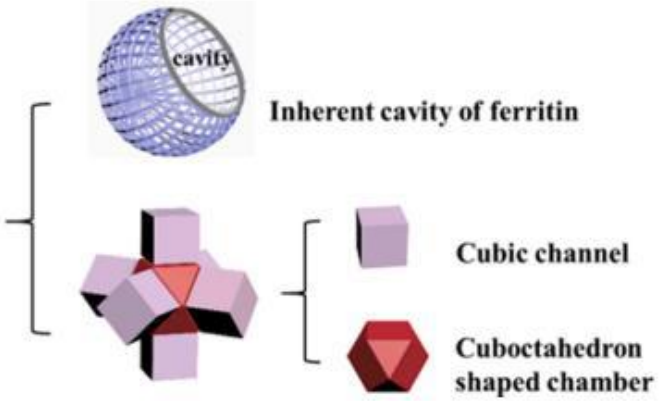
Protein cage redesign and assembly



ACS Nano, 2018, 12, 11323-11332

Nano Lett., 2019, 19, 4023−4028





Food Chem., 2021, 349, 129089

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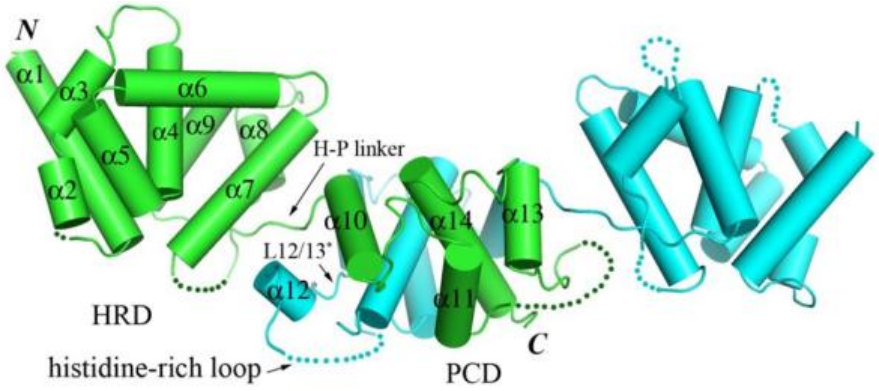
Redesign of protein nanocages: the way from 0D, 1D, 2D to 3D assembly

Chenyan Lv, Xiaorong Zhang, Yu Liu, Tuo Zhang, Hai Chen, Jiachen Zang, Bowen Zheng and Guanghua Zhao *

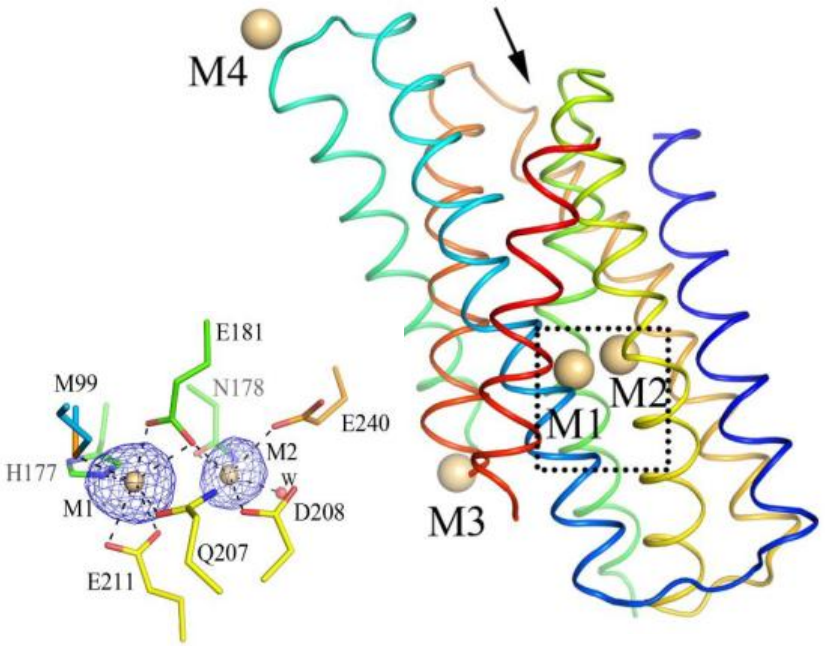
Compartmentalization is a hallmark of living systems. Through compartmentalization, ubiquitous protein nanocages such as viral capsids, ferritin, small heat shock proteins, and DNA-binding proteins from

Chem. Soc. Rev., 2021, 50, 3957-3989.

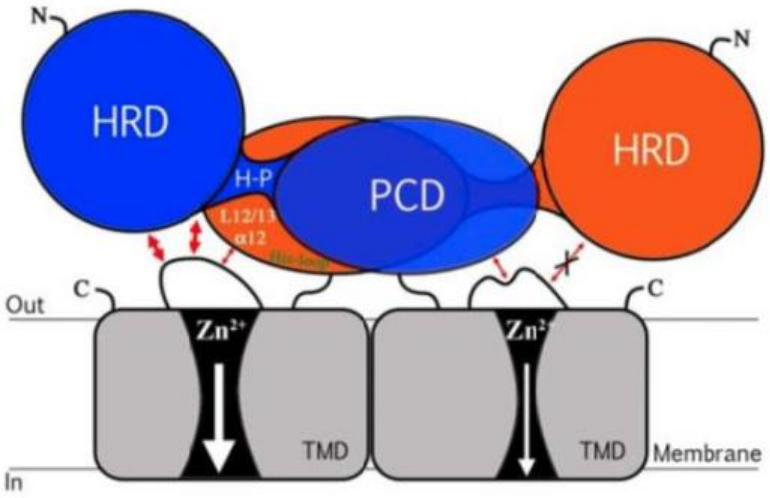
Mineral elements transport and regulation——ZIP4

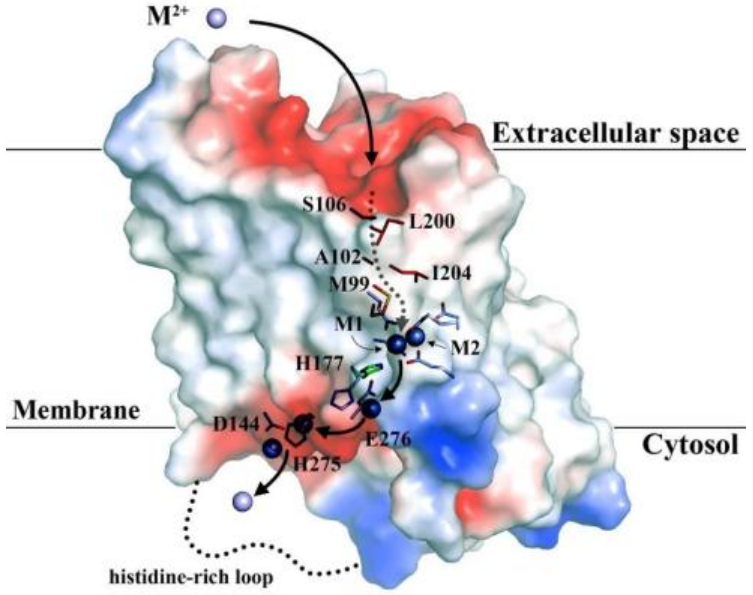


Nature Communications, 2016, 7, 11979



Science Advances, 2017, 3, e1700344

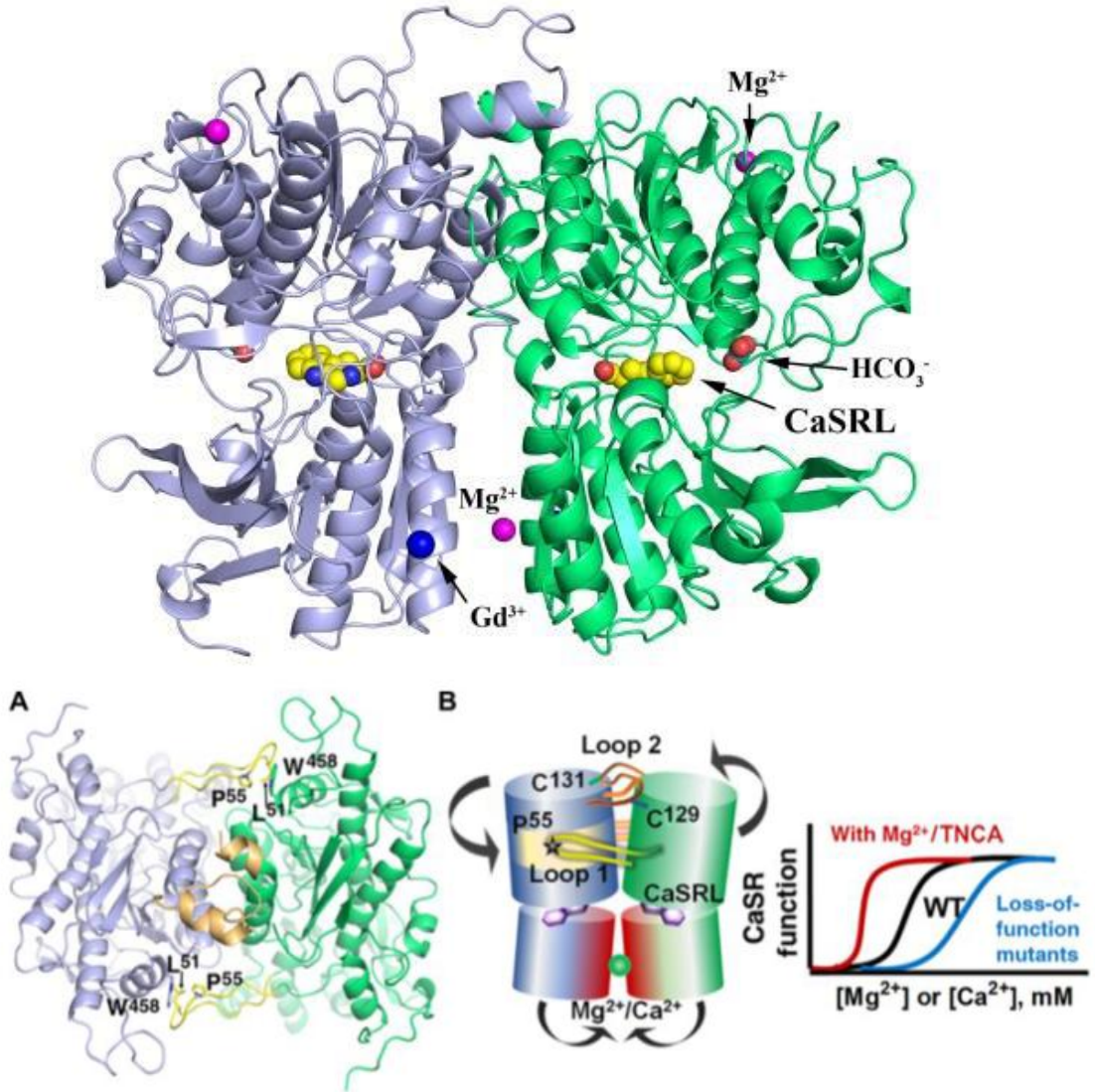




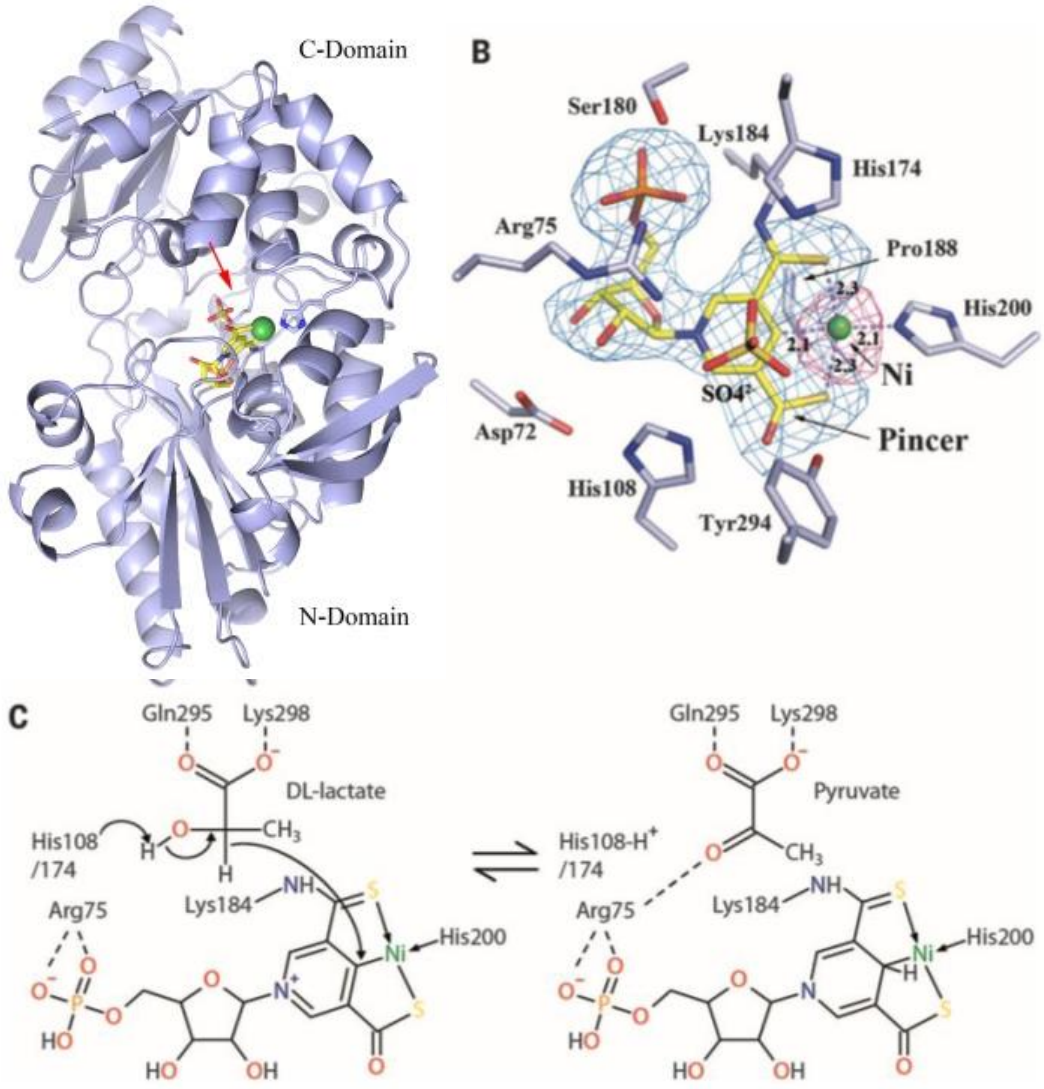
Cell Reports, 2020, 31, 107582

ZIP4 is a zinc transmembrane transporter which is responsible for the absorption of zinc from diet in small intestine.

Mineral elements transport and regulation——CaSR, Lar



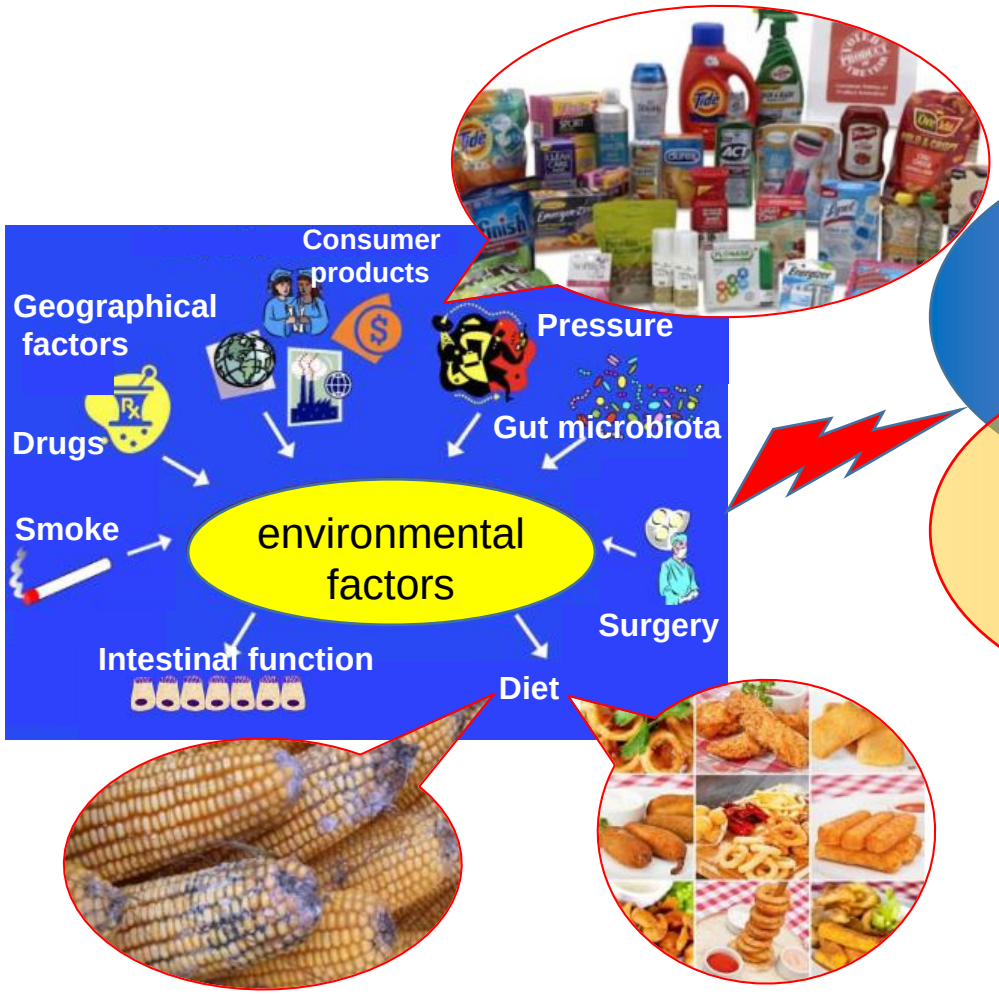
Science Advances, 2016, 2, e1600241

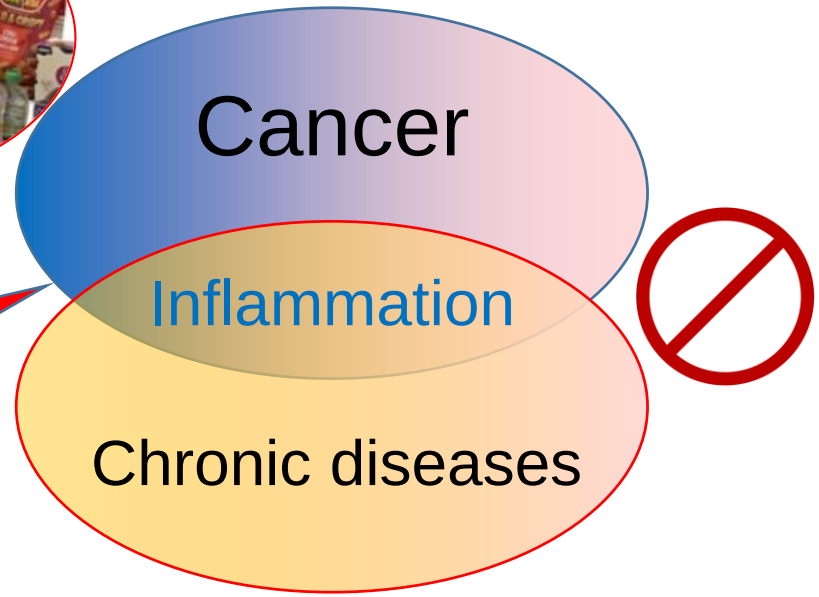


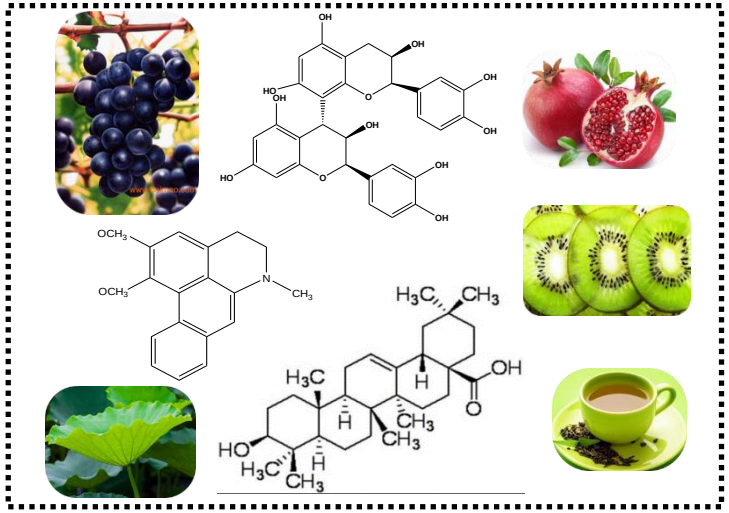
Science, 2015, 349, 66

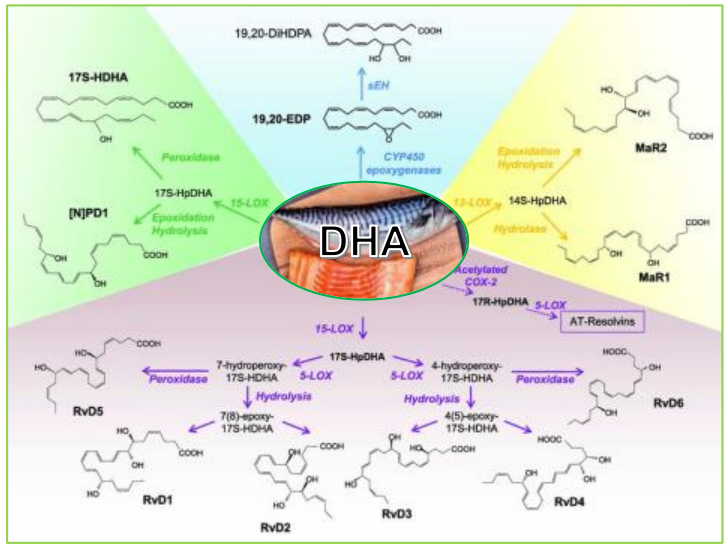
Natural compounds and chronic diseases

- Effects of environmental factors on inflammation-related chronic diseases and cancer.
- Prevention of chronic diseases by natural compounds from foodstuff.









Sci. Transl. Med. 2018, 30; 10 (443)
Gut Microbes 2020, 12, 1
Proc. Natl. Acad. Sci. U.S.A 2020, 117 (35)

Natural compounds and chronic diseases

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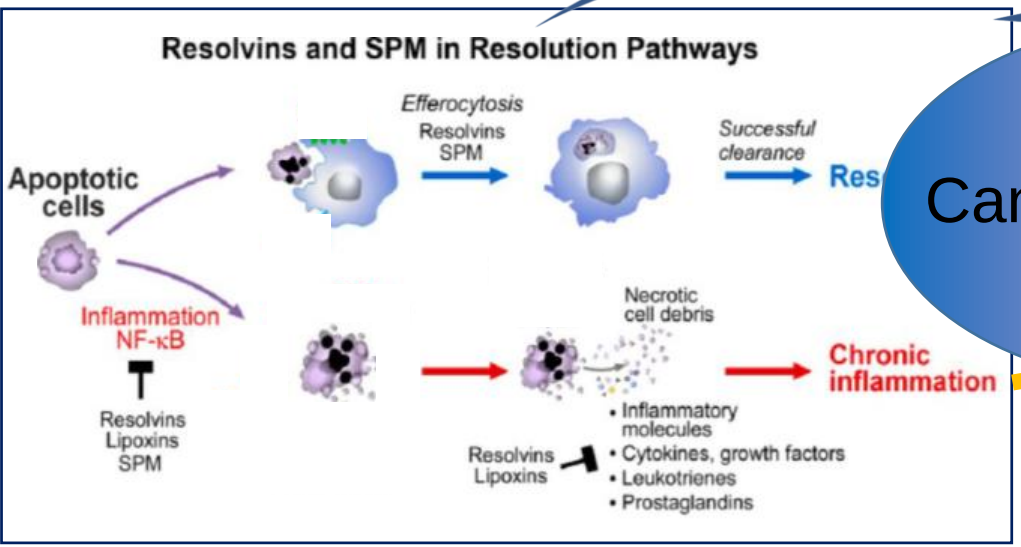

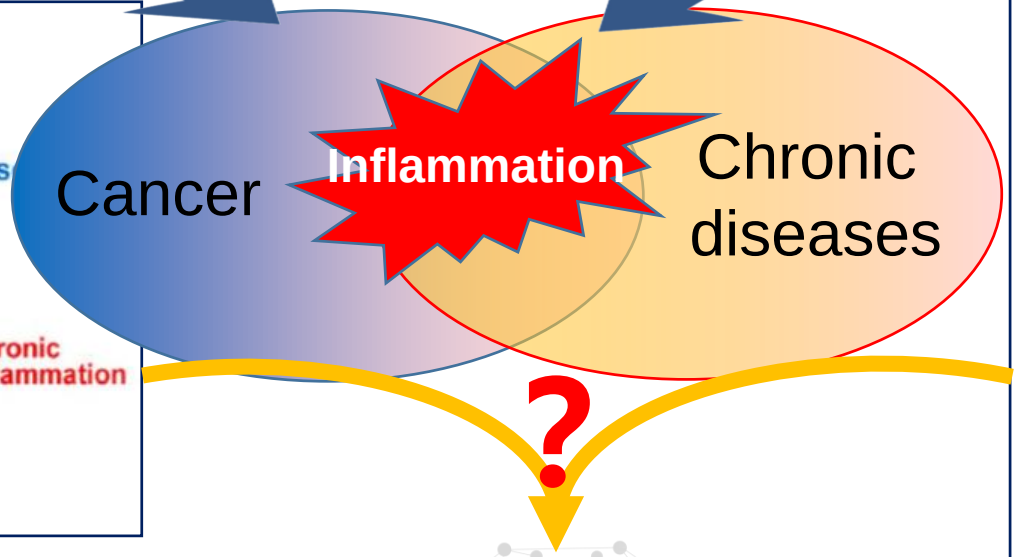

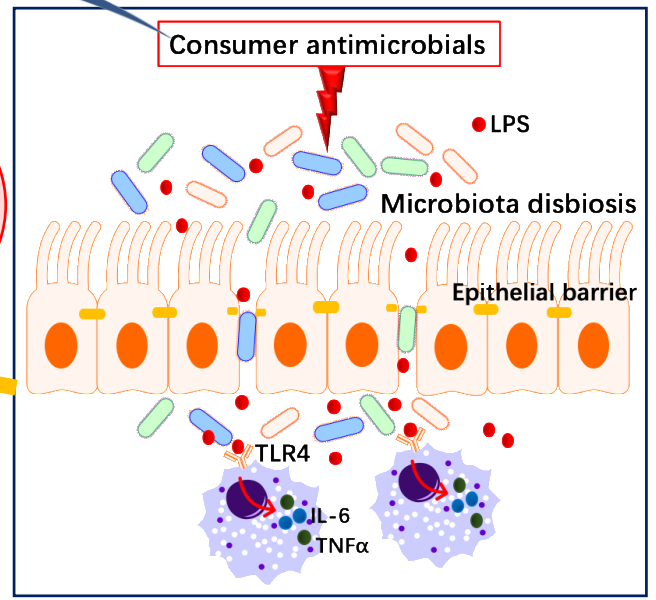

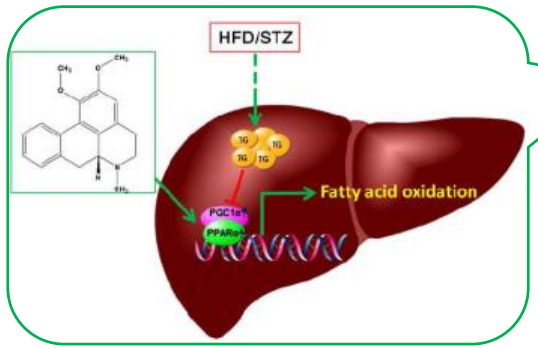

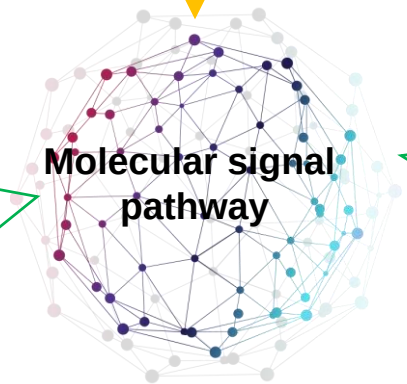

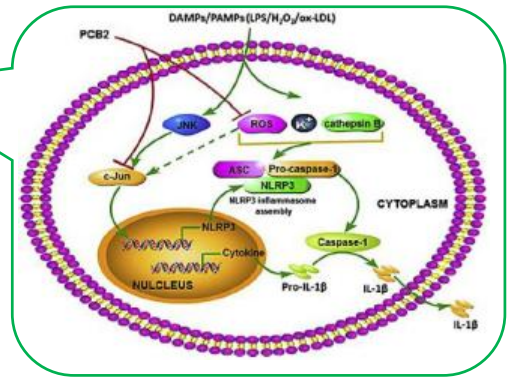

Trends Food Sci. Tech. 2021, 111
J. Ag. Food Chem. 2021, 69, 8428
J. Funct. Foods 2020, 71, 104014
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Food Microbio. 2018, 76: 346

Cereal production and nutrition

Material

- Cereal grain raw materials


Maize


Black Wheat


Rice

- By-products of grain processing


Maize germ meal


Wheat bran


Rice bran

Processing

- Physical treatment

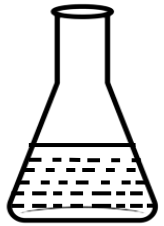

Superfine grinding

Vacuum freeze drying

- Biochemical technology


Soaking


Fermentation


Enzymolysis

Improved quality

- Micronutrients bioavailability

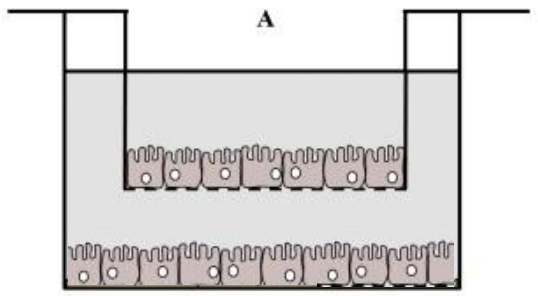


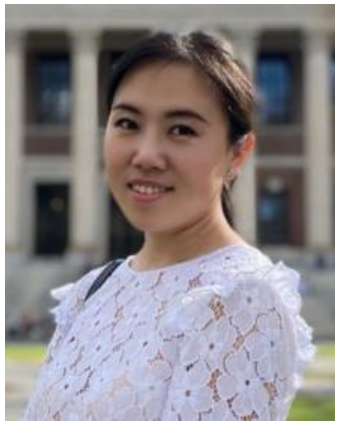
Diagram of two-tier Caco-2 cell culture model

- Low energy density products

Our team

Guanghua Zhao

Jianfen Liang



Haixia Yang

Tuo Zhang

Jiachen Zang

Chenyan Lv

中國農業大學
China Agricultural University

FSNE College

食品科学与营养工程学院
COLLEGE OF FOOD SCIENCE & NUTRITIONAL ENGINEERING

Thank You!

HEAL Project

Principal Investigator: Anni Pakarinen PhD, MHSc, RN
Development Manager, Senior Researcher
Department of Nursing Science
University of Turku
Finland

Presented by: Kaile Kubota MHSc, RN
Project Researcher

UNIVERSITY OF TURKU

Anni Pakarinen (PhD, MHSc, RN)
Development Manager, Senior Researcher
Department of Nursing Science
University of Turku, Finland

Research Expertise:

- Children's Digital Health Promotion
- Gamification and Serious Games
- Design Thinking in Health Technology Innovations

Kaile Kubota (MHSc, RN)
Project Researcher
Double Master’s Degree in Future Health & Technology
Fudan University and University of Turku

Research Focus:

- Digital Health Promotion
- Gamification and Serious Games
- Application of Artificial Intelligence in Healthcare

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AI-driven Gamified Intervention
and Intelligent Intervention Support Module to Foster the
Health Equity for the Life of Children

H E A L

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All children should have the right to a healthy life and future.

However, they are prone to health inequalities encompassing their physical, psychosocial and food health.

Health interventions around the world has been developed aiming to promote the health of children. **And yet, we continuously strive to effectively alleviate their health disparities**.

Photo by call me hangry on Unsplash

21% of school-aged children consume vegetables less than once a day; **34 %** eat fruit less than once a day; **42%** drink sodas daily; and **46 %** consume fast food at least weekly[1]

Pakarinen 2021

UNIVERSITY OF TURKU

Photo by ABC News 2020

In Finland, a recent study showed that 27% of 2- to 16-year- old boys and 17% girls are at high risk of obesity[2]

Pakarinen 2021

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Food and nutrition play a vital role in everyone’s health. It fuels the cognitive development of a child as well as their physical and psychosocial growth.

However, children and adolescents today are failing their healthy food consumptions and this phenomenon deprive them of having long, productive and healthy lives.

Global progress towards health equity and its determinants has been slow and largely due to lack of awareness and investment[3].

Therefore, we should extend our noble efforts forward in making a change and helping the children achieve health equity.

- To foster the health equity of children in middle childhood (6-13 years old)
- To develop a novel and child-centred intervention with the combination of gamification and AI techniques
- To alleviate their subjective nutrition, physical and psychosocial health disparities
- To examine the validity of the approach while considering the ethical issues of digital health promotion and processing of data for use in support for timely research, decision-making and action plans.

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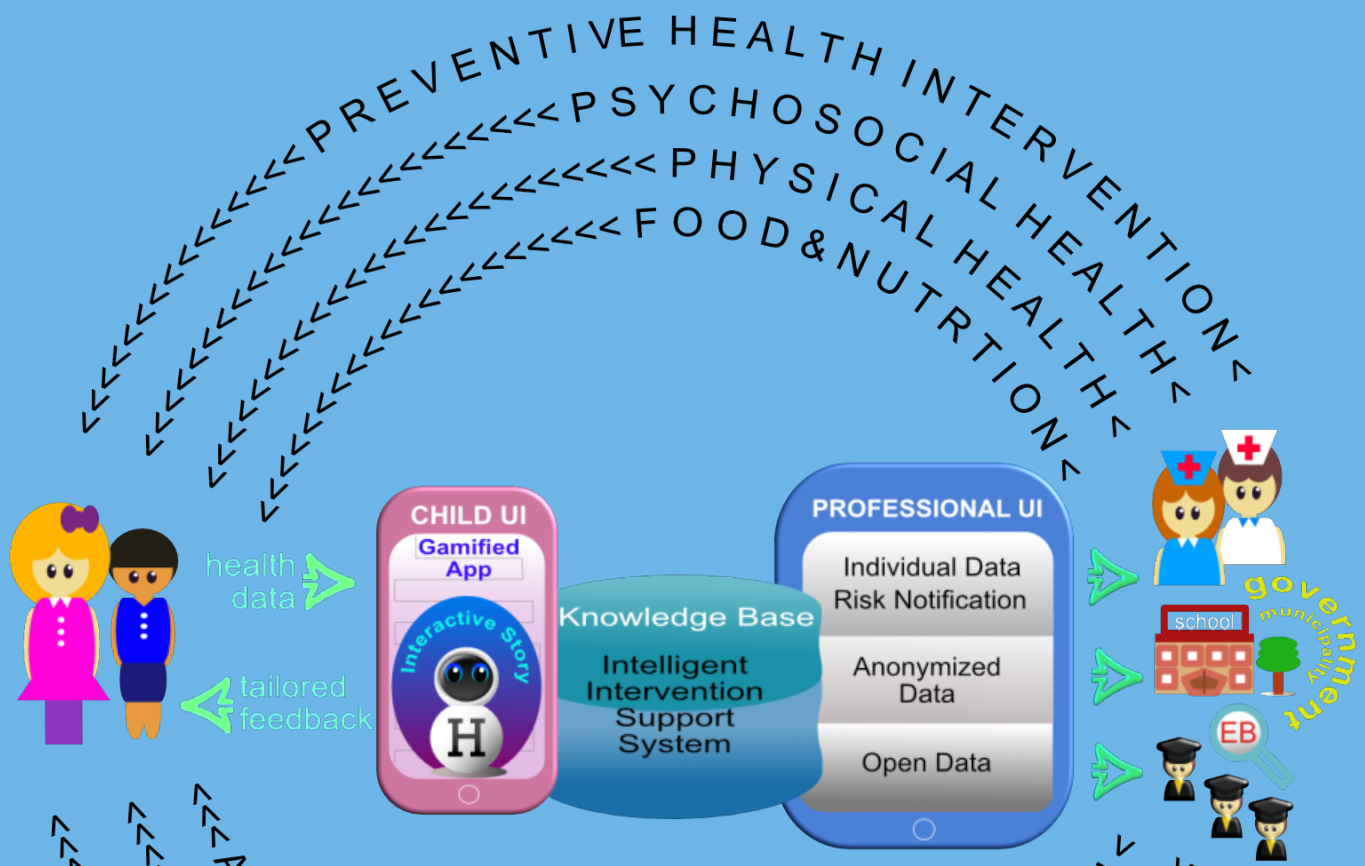
VALUE

Supports:

- Health Literacy
- Autonomy
- Competence
- Motivation
- Health Behaviour

HEALTH EQUITY OF CHILDREN



VALUE

Supports:

- Tailored Health Counselling
- Predict-Prevent
- Evidence-based Decision Making
- Research
- Secondary Data
- Big Data Analytics
- Increase of Knowledge in Child Health

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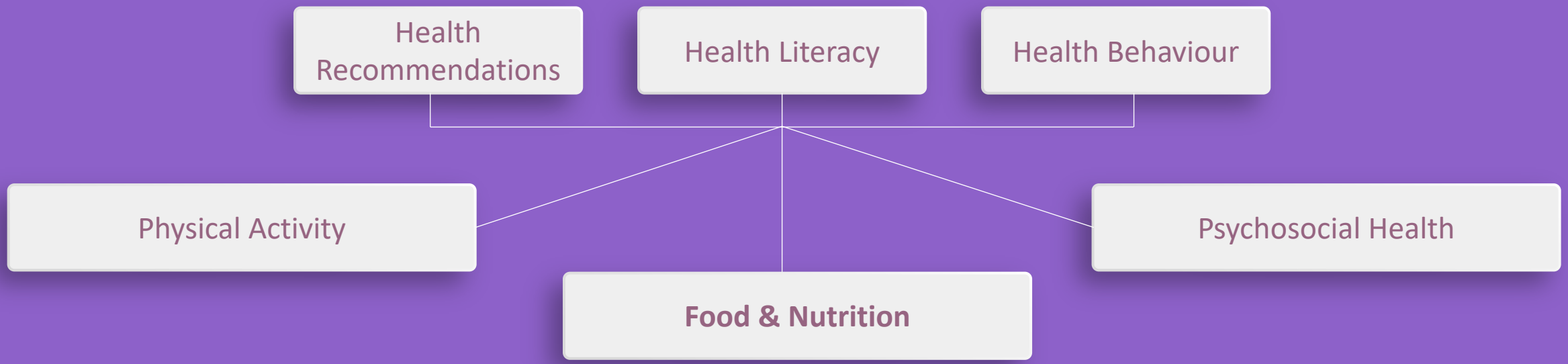
Pakarinen 2021

Scope of Intervention



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Effective & Sustainable

(Image credit: European Commission 2021)

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Collaborations

- ✓ Collaboration with the University of Tartu, Estonia
- ✓ Collaboration with the University of Lleida, Spain
- 🔍 Collaboration with Chinese Higher Education Institutions for food and nutrition research and development of HEAL intervention

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Thank you! Kiitos! 谢谢!

For research collaboration, please contact us!

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e-mail: anni.pakarinen@utu.fi

Kaile Kubota MHSc, RN
e-mail: kakubo@utu.fi

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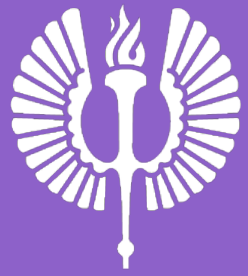

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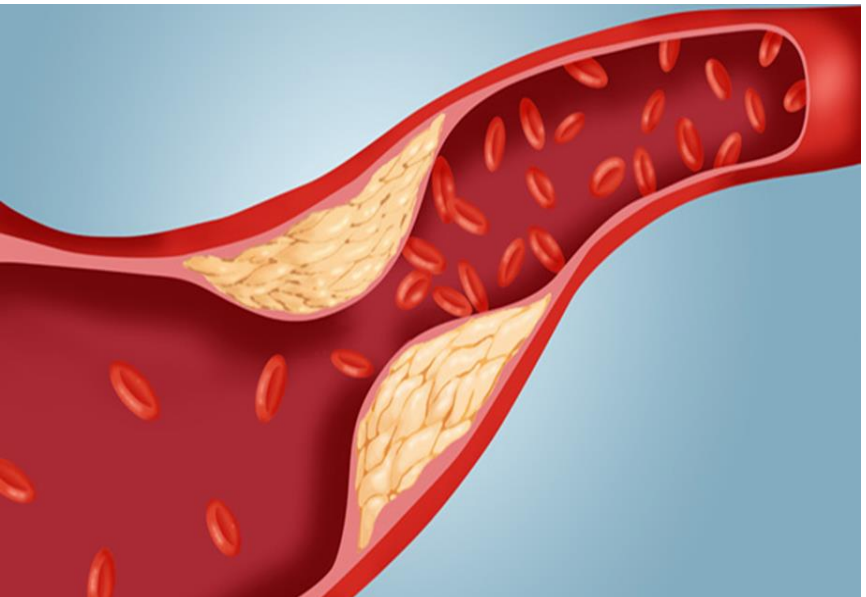
Food Active Ingredients , Nutrition & Health



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

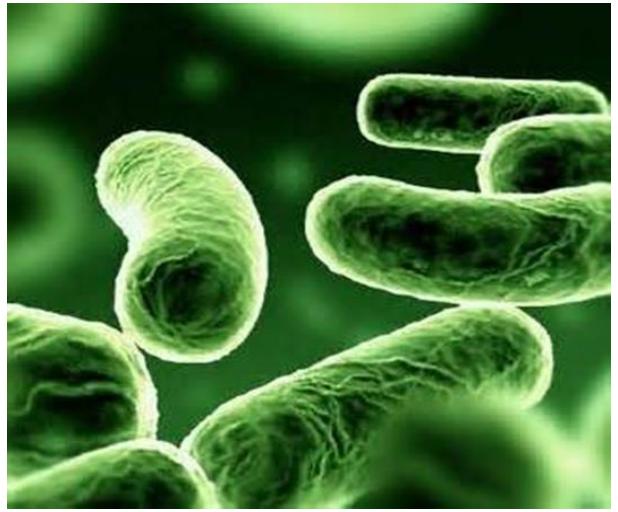
Breastfeeding cohort study

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 :

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Thanks !
Wonderful future cooperation!