APAC DA session

Drug Discovery Ecosystem in Asia

Possible Collaboration in Asian area

April 10, 2018

Norihiro Nishimura, Ph.D.

Professor / Graduate School of Regional Innovation Studies, MIE UNIVERSITY Vice President, MIE UNIVERSITY

who I am and where I'm coming from.

Resume of Norihiro Nishimura

Educational background

1987 Graduated from Tsukuba University with B.A. in Biochemical engineering.1995 Conferred Ph.D. from Tsukuba University in Molecular Biology.

Career in industry

1987-1996 Researcher at Biotech Research Institute, Kobe Steel Ltd., Japan.

1996-1998 Staff scientist at SLS, Pall Corporation, USA & Japan.

1998-1999 R&D Researcher at Molecular Research Div, GlaxoWellcome, Japan,.

1999-2002 R&D and Marketing Manager at GeneticLab, Japan.

2002-2004 CEO & President at GeneticLab, Japan.

Career in Academia

2004-2006 Management Professor, Mie University.

2007-2016 Professor, Graduate School of Medicine, Mie University.

2011-2013 Assistant to the President, Mie University.

- 2013- Vice President, Mie University.
- 2016- Professor, Graduate School of Resional Innovation Studies, Mie University.



I am a professor of Mie University

History of Mie University...

Origin of Mie University (Yuzoukan) was established in 1821.

Mie University was **founded in 1949** as the **only one National University in Mie**. It was comprised of **Faculty of Liberal** and **Faculty of Agriculture**. **Faculty of Engineering** was established in 1969. **Faculty of Medicine** was established by transferred to Mie University from Mie Prefectural University in 1972. **Faculty of Humanities, Law and Economics** was established in 1983. **Graduate School of Regional Innovation studies** was established in 2009.





Mission From Mie to the World!



Mie University provides world-class community-based education and research focusing upon the harmonious coexistence of nature and mankind.

I am coming from Mie Prefecture, Japan





Iga Ninja

Ninja aren't fictional characters! Trace the footsteps of real ninja and find out who these people really were.



Ama

Ama, all-female deep-sea divers, have preserved their ancient traditions up to the present day. Meet real ama and enjoy delicious seafood that they have caught.



Kumano Kodo Pilgrimage Routes

The ancient Kumano Kodo pilgrimage routes are registered as a World Heritage Site. Experience this sacred piece of nature and religious culture.



Ise-Jingu Shrine

At Ise-Jingu Shrine, you can step back in time to the Japan of more than 400 years ago. Find out about the must-see features of Ise-Jingu Shrine.



Ise Spiny Lobster

Known as the 'King of Lobsters,' large Ise spiny lobsters weigh more than one kilogram. Here are the best places to try one!



Matsusaka beef

Matsusaka beef is recognized as Japan's premier beef and known as an "artwork of meat". Here are the top-ranked restaurants where you can enjoy Matsusaka beef.



Iga beef

Iga beef is characteristic for its vivid color, rich aroma and flavor, and melt-in-yourmouth softness. Here are the best places to enjoy Iga beef.



Local Cuisine

There are many more local specialties you can enjoy. Check out the dishes and restaurants that tourists love best!

ISE Jingu, the repeat of reconstruction makes eternity



Ise Jingu, officially 'Jingu', is a Shinto shrine dedicated to goddess Amaterasu Ohmikami who is the origin of Japanese imperial family, located in the city of Ise in Mie prefecture and was erected more than 2,000 years ago.

常若 always young = eternity

Every twenty years, a new divine palace with the same dimensions as the current one is constructed at an alternate site which is adjacent to the main sanctuary. This ritual is called Shikinen Sengu.



Referred to Jingushicho HP

Seaweed, as a traditional and offered food to the god

Seaweeds (kaiso) have been an important part of the Japanese diet for many centuries.



Sargasso (Akamoku)





Foods offered to the god at Ise-Jingu

The seaweed is taken in the Japanese culture as well as dietary habits. The dried Sargasso (Akamoku) has been offered to Ise-Jingu every day for over 2000 years.

The seaweed contains a lot of protein and lipid, glucide, mineral and vitamins and begins to become the popular foods as **sea vegetable** (vegetables of the sea) in Europe and USA.

Why has Japanese people continued eating Seaweed?

Functional analysis of traditional food

with zebrafish

What is Zebrafish?



The **zebrafish** (Danio rerio) is a tropical freshwater. The zebrafish is also an important and widely **used vertebrate model organism in scientific research**. It is particularly notable for its regenerative abilities, and has been modified by researchers to produce several transgenic strains.

3~4年

60~80年





Good for ontogenesis study





Construction of obesity model of zebra fish



Medical analysis

- •Growth rate of the length, the weight, BMI
- •Change of blood lipid, blood sugar level
- •Change (liver fat) of the internal fat



Obesity >>> Life style related disease

A Novel, Reliable Method for Repeated Blood Collection from Aquarium Fish Liqing Zang, Yasuhito Shimada, Yuhei Nishimura, Toshio Tanaka, and Norihiro Nishimura ZEBRAFISH Volume 10, Number 00, 2013

Construction of obesity model of zebra fish



Construction of obesity model of zebra fish



CT scanning image of over feeding Zebrafish

CT scanning image of normal feeding Zebrafish



Hitoegusa (Rhamnan Sulfate)

VS

Obesity

Hitoegusa, the most traditional seaweed eaten



一重草

Hitoegusa (*Monostroma nitidum*)





Hitoegusa is cultivated mainly in Mie







Foods using Hitoegusa





Rhamnan sulfate is the main polysaccharide extracted from Hitoegusa

Obese restraint with Rhamnan sulfate



Fig. 1 – Effects of rhamnan sulphate (RS) on body weight and food intake in DIO zebrafish. (A) Changes in body weight in each group during 6-week overfeeding experiments (*n* = 10). (B) Food intake of each group by counting Artemia numbers before and after feeding during the RS administration period. Values are means ± SE. *P < 0.05, **P < 0.01 vs. the DIO group.

Obese restraint with Rhamnan sulfate



Fig. 2 – Effects of RS on fasting blood glucose, plasma TG, LDL-C in DIO zebrafish. (A) Fasting blood glucose levels in each group. (B) Plasma TG levels in each group. (C) Plasma LDL-C levels in each group. n = 10. Values are means \pm SE. *P < 0.05, **P < 0.01 vs. the DIO group.



討

Obese restraint with Rhamnan sulfate



Fig. 3 – Effects of RS on lipid accumulation in the liver. (A) Oil Red O staining of liver sections. Red droplets indicate neutral lipid staining. (B) ImageJ quantification of the Oil Red O-positive areas (%) in each group. n = 3. Values are means \pm SE. **P < 0.01 vs. the DIO group.



Effect of Rhamnan Sulfate on physiological

Rhamnan sulfate (Hitoegusa) It suppre beside th

It suppresses the fatty deposition in liver, beside there is no change in body weight.

It releases compounds dissolving in fat?



.||•



Possible Collaboration in Asian area

Asia has traditional medicine standing on natural products

Ayurveda (India)



Traditional Chinese medicine (China)



Kampo Yamato Honzo (Japan)



The **World Health Organization** (**WHO**) defines **traditional medicine** as "the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the **maintenance of health** as well as in the **prevention**, **diagnosis**, **improvement** or **treatment** of **physical and mental illness**"

Our Experience; Cooperation with Taiwan - Mie Model -





Cooperation in University (STUST and Mie Univ.)

- Development of an effective cooperation strategy between Taiwan and Mie.
- Construction of the most suitable business combination between both areas.

Construction of cooperation system

Companies in Mie prefecture will open the ASEAN Gateway by cooperating with a Taiwan companies, especially in the field of manufacturing, medical equipment, and health foods.

Possible drug discovery ecosystem in Asian area

Key words;

Maintenance of health Prevention of illness Traditional medicine Natural products

Government, Academia, and Industry collaboration beyond the countries in Asia

Encourage the strong points of Asia, do not compete to US or EU, and promote a new pharmaceutical category such as "prevention of illness."

Thank you for your attention.

nishimura.norihiro@mie-u.ac.jp