Virulence profile
Yoshikazu Nishikawa

Yoshikazu Nishikawa
Food and Human Health Sciences; Osaka City University Graduate School of Human Life Science; Osaka, Japan

When did you first get interested in science?
I was 10 years old, in the fourth year of elementary school.

How did you get interested in science?
In an experiment at the elementary school, I was very surprised to see that table salt can be produced by mixing dangerous solutions of both hydrochloride and sodium hydroxide.

Were there any people who influenced your decision?
My uncle, Osamu Nishikawa, studying atomic physics as an associate professor at Pennsylvania State College, talked to me about his world when he happened to come to Japan for scientific meetings.

Where did you perform your internship/residency and what field of specialization did you choose?
I was going to be a veterinary practitioner and majored in surgery at the Hokkaido University Graduate School of Veterinary Science. I was interested in working as an anesthesiologist during the first half of my graduate school.

How can one successfully combine working in the clinic with heading a research lab?
I am a veterinarian but had lost interest in being a clinical practitioner. Instead, I started to work as a field epidemiologist to clarify the causative agents and routes of foodborne infectious diseases in Osaka City, Japan from 1985 to 1999. Consequently, my research targets always appeared through the investigation of outbreaks: how can I screen, detect, identify, and isolate the pathogens; what are their reservoirs; how could the pathogen reach at the patients; what can be used as the fingerprints to distinguish the pathogen? I have performed research to solve the practical problems in the field.

What was your first position after university?
A researcher for bacteriology and food hygiene at Osaka City Institute of Public Health and Environmental Sciences. As I described above, I have investigated about one hundred or more incidents including outbreaks, false incidents, and complaints. Throughout 14 years, I experienced lots of impressive incidents: the river pollution due to Vibrio cholerae O1, the second outbreak of enterohemorrhagic Escherichia coli O157:H7 in 1991, the world-famous mega-outbreak of enterohemorrhagic E. coli O157:H7 in Sakai City, 1996.

Each year, an estimated 47 million episodes of foodborne illness is caused in the United States. Most citizens do not believe it, but I can because I isolated enterotoxigenic E. coli O148:H28 from my own samples in 1990. That was the first experience that I detected a pathogen from myself. Afterward, I isolated a new type of enterotoxigenic E. coli O169:H41 from samples of myself and my family members in 1991; of course, I reported it to the journal Emerging Infectious Diseases of the CDC. In 1996, my daughter was suffered from awful abdominal pain and was diagnosed with viral enteritis; however, I showed the doctor a photo of culture plate where Salmonella Enteritidis grew alike in pure culture next...
morning. In olden days when PCR was not equipped, my colleagues and I ate raw oysters intentionally to show the risk of small-round structured virus *Norovirus* and similar viruses, so-called at that age based on the electron microscopy. I had been convinced myself about the risk of foodborne infection, and I have cooperated with National Institute of Infectious Diseases, National Institute of Health Sciences, Japan, and Central Public Health Laboratory, UK.

**When and where did you start your own lab?**

When I moved to the Osaka City University as an associate professor of food hygiene in 1999, I got my laboratory.

**How many people work in your lab?**

I have 8 graduate students, 4 undergraduates, and 2 visiting research fellows.

**What is your function in your institution?**

I am a professor of food microbiology and a councilor of the University.

**What areas or topics does your lab currently focus on?**

My students are getting interesting data on the colonization factor of the enterotoxigenic *E. coli* O169:H41 and the virulence of diffusely adherent *E. coli*. Further, we could publish the immunonutritional and/or anti-senescence effects of probiotic bacteria and functional food factors.

**Tell us about the most important stages of your professional career**

When I stayed as a visiting fellow at Central Public Health Laboratory, London for one year (1992–1993), I got many chances to see professional works. Dr Sylvia M. Scotland, Dr Henry R. Smith and his wife Dr Geraldine Smith were my good friends, colleagues, and supervisors there.

**Who were your mentors?**

Ex-Prof Tsuyoshi Baba at Osaka Prefecture University College of Agriculture was my mentor.

**What makes a good mentor?**

I would like to know it to improve myself! Unfortunately, I do not know, but I think naively honest scientists who have broken through after a lot of failures would be good rather than smart scientists who can easily get over problems all the time. I always tell myself that a farmer cannot force cattle to drink water but can prepare the water and make it feel like drinking. To encourage my students, I try to persuade them that the road to the mountain is not in front of them but should be established behind of them.

**What are your research interests?**

Investigations of outbreaks made me recognize that infectious diseases are produced as the result of interaction between pathogens and host condition. Since I got my laboratory in the Department of Food and Nutrition where registered dieticians are educated, I have been interested not only in pathogens but also in hosts: prevention of senescence of host defense and prolonging lifespan through the immunonutritional intervention were added as my important theme. One of the reasons why we chose *Caenorhabditis elegans* as the model host is its short lifespan (Fig. 1).

**What was your most significant scientific accomplishment?**

Lactic acid bacteria have been found to have a variety of physiological influences on their hosts since Metchnikoff hypothesized that lactobacilli were important for human health and longevity one century ago. However, there were no reports on the influence of lactic acid bacteria on longevity. We have studied whether food could influence the lifespan and host defenses, using *Caenorhabditis elegans*. Fortunately, we found that lactobacilli and bifidobacteria can prolong the lifespan and enhance the resistance to *Salmonella* (Appl Environ Microbiol 2007; 73:6404). To our knowledge, it was the first report that lactic acid bacteria bring prolongevity to metazoan. Recently, we found the clues to reveal the mechanism (Biogerontology 2013; 14:73).

**What are some of your “highlights” in recent research performed in your field?**

We succeeded in development of methods to make the worms ingest chemicals efficiently and quantitatively (Mech Aging Dev 2009; 130:652–5; Biogerontology 2012; 13:337–44.). Using these methods, *C. elegans* could be more convenient as a model host to study effects of drugs, food factors and so on.
About Dr Yoshikazu Nishikawa. Dr Yoshikazu Nishikawa graduated from Veterinary College at the Osaka Prefecture University in Japan. He then studied as a graduate student in the Laboratory of Veterinary Surgery at the Graduate School of Agriculture. While he investigated the effects of the estrous cycle on purulent endometritis in animals, his interests started tending toward bacteriology than clinical practice. After getting his PhD, he served as a researcher to investigate outbreaks of foodborne infectious diseases at Osaka City Institute of Public Health and Environmental Sciences from 1985 to 1999. In 1992, he got a chance to spend one year as a visiting fellow at Central Public Health Laboratory, UK. He is currently the professor and councilor of Osaka City University, and the councilor of Japanese Society for Bacteriology, Japanese Society of Food Microbiology, Japanese Society for Food Hygiene and Safety, and Japanese Society of Nutrition and Food Science. He is an associate editor for Microbiology and Immunology and the Japanese Journal of Food Microbiology, and serves on the editorial board of Virulence. He has had a laboratory at the Department of Food and Nutrition, Osaka City University since 1999. In that time, he has studied not only bacteria but also effects of nutrition and senescence on host defense. Using Caenorhabditis elegans, he first succeeded showing that lactic acid bacteria could bring longevity to metazoan, first hypothesized by the Nobel laureate Metchnikoff in 1907.

Members of the Nishikawa lab.