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Special Topics : Probiotics : Arthur Ouwehand Interview - Special Topic of Probiotics

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Arthur Ouwehand

From the Special Topic of **Probiotics**

*In our Special Topics analysis of probiotics research over the past decade, Dr. Arthur Ouwehand's work ranks at #2 by papers and #6 by cites, based on 81 papers cited a total of 1,852 times. According to **Essential Science Indicators**SM from **Thomson Reuters**, Dr. Ouwehand's record includes 90 papers, the majority of which are classified under either **Microbiology** or **Agricultural Sciences**, cited a total of 1,948 times between January 1, 1999 and December 31, 2009.*

Dr. Ouwehand is currently the R&D Group Leader of Danisco Health & Nutrition in Kantvik, Finland.

Below, he talks with ScienceWatch.com about his highly cited work as it relates to probiotics.

SW: Please tell us a bit about your educational background and research experiences.

Originally, I trained as a secondary school teacher in biology and chemistry. Although I liked teaching, I soon realized that teaching teenagers was not my calling. Also, unlike my fellow biology teachers, I was not particularly interested in birds and plants, etc. I was more interested in biochemistry, molecular biology, and microbiology. Although I did get my degree in teaching, I continued to study at university, doing cell biology and specializing in microbiology and biochemistry.

Though to my family I was of course still studying biology. I still have bad memories of that; at birthday parties you always get aunts (never uncles for some reason) asking about the identity of some plant they found in the garden. "Arthur studies biology, so he should know that." I did my Master's on topics in environmental microbiology, but that's not biology to most people, unfortunately.

SW: What first drew your interest to probiotics?

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As part of my Master's studies at Wageningen University of Agriculture (as it was then still called) we had to do an internship. The strategy of the university was always, "go abroad." Even if you would not learn anything from your internship, you would at least know what it is like to really be away from home.

I ended up at the University of Gothenburg (Sweden) working on a project with probiotics for pigs. That was interesting and I got an opportunity to do my Ph.D. there on the topic. My main focus was adhesion of probiotics and their effect on pathogenic *E. coli*. I did the last part of my Ph.D. in Finland at the University of Turku where I continued working on probiotics, but for humans. I continued to work there as a post-doc and later as a senior lecturer, focusing on probiotics for humans; that seemed more rewarding than probiotics for farm animals.

"Supporting specific gastrointestinal and immune functions is likely to remain at the core of probiotics."

So, it was the interest in microbiology that, by chance, got me into probiotics. At that time, probiotics was still a very new and maybe a bit "obscure" area. Few products, if any were on the market and the average consumer had certainly never heard of it.

SW: Your most-cited clinical paper in our analysis is the 2001 *FEMS Immunol. Med. Mic.* paper, "Comparison of mucosal adhesion and species identification of bifidobacteria isolated from healthy and allergic infants," (He F, *et al.*, 30[1]: 43-7, February 2001). Would you talk a bit about this study and its findings, as well as how the results shaped your later research?

We had been working on adhesion of probiotics to mucus for some time. Of course, at some stage you start to wonder how do "normal" intestinal microbes bind? Not so surprising, that seemed to vary depending on the isolated bacterium. You'll find anything from high and low binding strains. We also wondered whether disease would play any role in this.

Furthermore, studies had indicated that at genus level there was a difference in the fecal microbiota of children with atopic eczema compared to healthy children. We wanted to look deeper; what about species level? And indeed there was a maybe even more dramatic difference there. That is, of course, interesting.

But, what was even more interesting is that the functionality of the bacteria was different. They induced different cytokines and adhered in different ways. This gave a first hint on the relation between an altered microbiota and allergic disease. We have continued to work on the relation between allergies and the intestinal microbiota.

What this study showed is that it is interesting to know who is there but it is more important to know what they are doing. That is an idea that is coming now with metabolomics and it is likely to be relevant for many conditions. This study was performed in collaboration with Japanese colleagues; having the right team is important to get the appropriate expertise together.

SW: Several of your papers involve bacterial adhesion studies. Tell us a bit about this aspect of your work.

Most of my past work involved adhesion of probiotics and what role it might play in efficacy and safety. I still think it is important, but, maybe not as essential as we thought in the past. We have maybe been looking too much for parallels with pathogens, for many of which adhesion is essential as a first step in pathogenesis.

But it's possible that adhesion fulfills other roles than merely making a microbe stick to a certain surface. The communication with the host is maybe more important, for both parties.

SW: Just last year, your group came out with a study on probiotics for allergic rhinitis during the birch pollen season (Ouwehand AC, *et al.*, "Specific probiotics alleviate allergic rhinitis during the birch pollen season," *World J. Gastroentero.* 15[26]: 3261-8, 14 July 2009). Would you discuss the highlights of this paper and its implications?

"We had been working on adhesion of probiotics to mucus for some time."

As an extension to the work with atopic eczema, the study was done on pollen allergy in collaboration with my current employer, Danisco, and the University of Turku. An earlier study had failed to show improvement in adults. We hypothesized that children might be more feasible as their immune system is not fully developed.

Unfortunately for the study, but fortunately for the children, all received prophylactic anti-histamines. Despite this strong and effective medication, we were able to observe a reduction in biomarkers for birch pollen allergy. Also some symptoms were further reduced, which is actually quite remarkable considering that anti-histamines are very effective.

Another interesting observation was that the intestinal microbiota changed during the pollen season—something that was more or less simultaneously reported by Japanese researchers too. That may provide new options for treating or alleviating this condition.

SW: Where do you see probiotics going in the next decade?

I am optimistic and do think that probiotics are here to stay. Supporting specific gastrointestinal and immune functions is likely to remain at the core of probiotics.

I would hope that for some serious intestinal diseases GMO (genetically modified organism) probiotics would be accepted. There are examples of their efficacy in Crohn's disease. For the general population I see irritable bowel syndrome (IBS) as an important target. IBS is a collection of different symptoms; I foresee that probiotics could aid in alleviating some of these. It is a condition that is very common and thus has substantial socio-economic implications.

Another interesting target is **obesity**. With the observation that the intestinal microbiota composition correlates with the risk of obesity, modulation of the microbiota offers hopes in this area.

However, we should remain realistic. It is unlikely that consumption of probiotics, or any other functional food ingredient, would solve a person's weight problems. But, maybe probiotics can play a role in maintaining a healthy weight or aid during weight loss. That all remains to be seen.

I also hope that pre- and probiotics find their way outside the gut. For example, the skin has microbiota as well that are involved in health and disease—that would be an interesting target. ■

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Arthur Ouwehand's current most-cited paper in *Essential Science Indicators*, with 201 cites:

Ouwehand AC, Salminen S, Isolauri E, "Probiotics: An overview of beneficial effects," *Anton Leeuwenhoek Int. J. Gen. M.* 82(1-4): 279-89, August 2002. Source: *Essential Science Indicators* from Thomson Reuters.

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