Interview

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In conversation with Professor Simon Dufour, Université de Montréal, Canada

M²-magazine spoke to Professor Simon Dufour about his background and education, his work in veterinary practice, at the University of Montreal, Canada and with external organisations; and about life outside of academia.

M²-magazine. *When did you first become interested in the veterinary profession and are you from a farming background?*

Professor Simon Dufour. For as long as I can remember, I always had a passion for animals. When I was about 5-years-old, I saw the movie "Dr Dolittle", the original 1967 version! And I thought, "speaking with animals in their own language and being such a polyvalent Doctor is exactly what I want to do with my life!". I grew up in Northern Canada in Eeyou Istchee, which can be loosely translated as, "where no cow has ever set foot". So no, I did not grow up on a farm. My family moved to the South (which was still North of many places), when I was a teenager. The family of my high school sweetheart, however, had a dairy farm. This is where I met cows for the first time and I fell in love with this animal species, mainly because of their kindness and generosity. After finishing high school, I shilly shallied between pursuing a veterinary degree and studying mathematics, which I very much liked at the time, and still do nowadays. If I remember well, at the time, astronaut, beach bum, and ski bum were also quite high on my career-to-do list! However, I ended up doing a short detour for studying mathematics, but then moved back to a veterinary degree at Université de Montréal after realizing that I had never met someone who said to me, "Hello, I am Mr. So-and-So, and my profession is mathematician!".

M². *Having completed your veterinary education, what was the next step in your career?*

Simon Dufour. When I graduated from the veterinary school I thought: "This school was great, but I want to work in a large animal practice and I will never come back to school!". I was hired in a relatively large (7 dairy practitioners) veterinary practice in the province of Québec where 95% of my work was with dairy cows, and the rest with beef cattle and small ruminants. After two years I became a partner in this clinic, but after three more years, I had to become the first (and youngest ever) partner to retire! My reason was to follow my wife for her career (between the two of us, she was clearly the one with a "real career"). I then worked two more years as a clinician, still with dairy cows, at the Ambulatory clinic of the Université de Montréal (yes, a veterinary school, even though I had said I would never go back), and then two further years, again as dairy practitioner, in a private dairy practice in British-Columbia, in Western Canada. I was also able, during that latter experience, to nail down a part-time ski bum and beach bum career path! Prospectively, this career path (or, to be more precise – the absence of a path) looked, at the time, quite hectic. But, having experiences in different dairy practices in different contexts (Eastern Canada vs Western Canada) was a very good preparation for what was coming next.

During that time, I was able to sharpen my veterinary skills. Of course, herd health work was a big component of my work, and I was already very interested at that time in monitoring and improving udder health on the farms of my dairy clients.

M². *You majored in epidemiology at PhD level, how did your interest in epidemiology emerge?*

Simon Dufour. At some point during my veterinary practitioner career, I felt that I wanted to acquire stronger epidemiological skills. I was playing daily with various herd health indicators, diagnostic tools, dairy management software, etc, but I wanted to better understand the logic behind

Simon Dufour

these tools. I wanted the skills to crack the computer open, and, in turn, the algorithms it used, and understand what was inside. I started looking for a part-time degree in veterinary computer surgery. But what seemed like the closest option was a part-time Masters degree in epidemiology under the supervision of Dr Daniel Scholl at the Université de Montréal (yes, I know, a school – the place I swore never to return to!). During that time, I conducted research on the effects of various udder health management practices on the incidence of *Staphylococcal* intramammary infections. I got so passionate about it that it went from part-time to full time, then from Masters to PhD (from 2007 to 2011). In 2012, I woke up one morning and I was a post-doctoral fellow in Epi-informatics at the University of Prince Edward Island, under the supervision of Ian Dohoo and Crawford Revie. This is when I realized, OMG, I had changed from a cool veterinarian, to being a total geek! What have I done? Is it too late to recover?

M². *Following the post-doctoral fellowship, what was the next step in your career?*

Simon Dufour. Well, at this point I was pretty nervous about this whole career path thing. So I did what most animal species do when they are in a "fight or flight" situation – I stopped thinking and I followed my instinct! And I did the thing that I was used to, and which gave excellent results in the past – I went looking for more schooling! But this time, I was to sit on the other side of the class. I was appointed in 2012 as Assistant Professor in epidemiology at the Veterinary Medicine Faculty of the University de Montréal and as Director of the Canadian Bovine Mastitis and Milk Quality Research Network. Since then, my students are teaching me, and I have finally accepted that I am an eternal learner, and that I belong in a university setting. Still, my research work and my teaching are deeply tainted by my professional experience as a veterinary practitioner. And I try to focus my work on research questions that are relevant to today's dairy producers and practitioners.

M². *So, your teaching and research work at the University – what does that involve?*

Simon Dufour. At the university I am responsible for teaching quantitative methods to veterinary students (yep, mathematics!, I turned full circle!) and advanced epidemiology to graduate students specializing in epidemiology. I also led the development of a series of Massive Open Online Courses (MOOC) on mastitis and milk quality. https://www.simondufour.ca/courses/mastitis-mooc/. These courses were taught by a group of experts from around the world. These MOOC were launched in 2018 and the initiative was a big success with 2,370 participants so far! I have also offered many workshops on methods for

By family of antibiotics

Select the unit of measurement:
- ● Full course of antibiotics
- ○ Daily dose of antibiotics

Antibiotics administered by intra-mammary, injectable, intra-uterine, oral or topical routes

Usage rate by route of administration in full course

2016   2017   2018   2019   2020
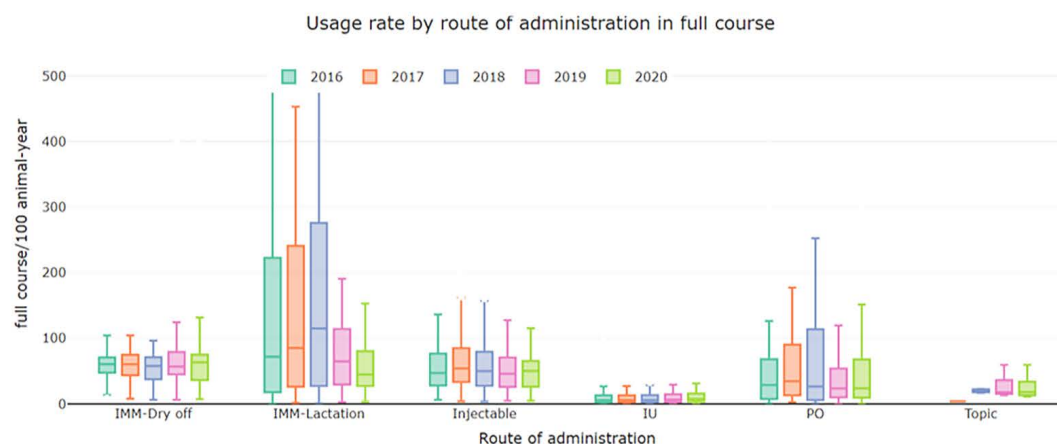
R Shiny interface for monitoring AMU on dairy farms

validating diagnostic tests (which are a cornerstone of mastitis research and mastitis control) and on mastitis control to professional epidemiologists, veterinarians and dairy producers. Since 2012, my research program covers three themes that are intertwined:

    a) mastitis control and milk quality;
    b) usage of antimicrobials in dairies; and
    c) the validation of diagnostic tests.

Under the *first theme*, my collaborators and I are studying the dynamics and impact of intramammary infections (IMI) in dairy cows. Currently, more than 250 different bacterial species can be isolated from milk. Many of them are possibly not very harmful to the cow (e.g., there is no measurable increase in somatic cell count; SCC). Others may cause some inflammation, but they would be so short-lived that there will be no economic impact for the farmer. A better understanding of the dynamics and the impact (on SCC, milk production, and milk composition) of these IMI is the foundation to inform prevention and treatment decisions. Under this first theme, we also conducted various projects aimed at validating novel approaches for controlling mastitis that are not relying on antimicrobial usage. We led a number of studies on selective dry cow treatment strategies, which is a very interesting strategy to reduce the use of antimicrobials in dairies, without affecting cows' health or productivity. We also studied pre-dry management of cows milked with automatic milking systems (AMS) to better prepare them for drying-off. We validated the effect of an incomplete milking around calving time to better control early lactation hyperketonemia and thus, early lactation IMI.

Considering the *second theme*, the use of antimicrobials in food-producing animals is, of course, a big concern nowadays. In Canada, 80% of antimicrobial consumption is for food-producing animals. Compared to other types of animal production, the dairy industry has a rather small usage rate. But we have to do our homework and aim for a more judicious use of antimicrobials in dairies as well; and mastitis prevention and treatment is a "big player" when we measure and seek to reduce antimicrobials usage in dairy farms. In the last few years, we have compared different methods for monitoring antimicrobial usage (AMU) in dairies. In our province, almost all veterinarians use the same software, Vet-Expert, for their accounting records. Recently we were able to develop algorithms to transform this electronic centralized information into farm-level, longitudinal data. We are now developing benchmarking tools for producers so they can compare their usage to that of their peers, and to themselves through time. We are also developing a similar tool for veterinarians so they can compare their prescription habits with that of their peers. Using some of these tools, we were also able to describe change in AMU habits before and after a provincial regulation restricting the use of very high importance antimicrobials in food producing animals. Usage rate of these antimicrobials was reduced by 80%, and many producers and veterinarians agreed that it had little impact on the health of the cows, nor on farm productivity. The new regulation was an opportunity for the farmer and the veterinarian to review and modify the treatment practices in place. A big challenge, though, was the fact that many of the other antimicrobial products were not available during the implementation period, due to a shortage caused by the COVID-19 pandemic. Also, many farmers from our province felt that it was unfair that they were the only ones that had to apply this very restrictive regulation. Nevertheless, we were able to highlight positive changes in antimicrobial resistance patterns on dairy farms as soon as 24 months following the new regulation. This is a positive impact for these dairy farmers, although not directly quantifiable in an immediate economic return for them.

Recycled manure bedding

With regard to our *third theme*, in terms of the validation of diagnostic tests, we worked on various on-farm tests to better identify cows or quarters that need treatments. For instance, dehydrated culture media, SCC algorithms, and a combination of these. We also worked on laboratory-based tools such as MALDI-TOF technology that can identify at species-level most of the bacteria that can be isolated in milk samples. Recently, we have been investigating whether we could use the massive data generated by MALDI-TOF analyses to inform producers on the IMI prognosis, the bacteria sensitivity to antimicrobials, etc. It is a very interesting research avenue, since there would be no additional analyses or costs for the farmer to provide this information. It just takes a bit of computer time.

M². *More recently, how have your research interests developed?*

Simon Dufour. In the last few years, I got more and more involved in dairy producers and veterinarians' software development (for instance the AMU benchmarking tools that I mentioned earlier). So, I finally got to crack the computer open, and I would like to pursue some activities in that direction. This is a very rewarding part of my work, since I get to combine my scientific knowledge with my practical expertise into something that can be useful for my peers. With my colleague Juan Carlos

Arango Sabogal from Université de Montréal, we recently obtained a Research Chair in the biosecurity of dairy production. Therefore, I have already expanded my research activities to other diseases that can affect the productivity of dairy cows, and also milk quality, including salmonellosis, leukosis, digital dermatitis and paratuberculosis.

M². *You are involved with Op+lait – what's the picture with this organization?*

Simon Dufour. I was one of the founding members and, since 2020, I am the Director of a new research group founded in 2015, Op+lait. The Op+lait group is an interuniversity and intercollege network that brings together 68 researchers, more than 100 masters and doctoral students, as well as postdoctoral fellows affiliated with more than 6 teaching institutions in Quebec. Its members also include researchers from the Canadian and Quebec government sectors, from the industrial sector, from universities outside of Quebec, as well as international scientists. It is funded by the Fonds de Recherche du Québec (a provincial funding program) and the Québec dairy producers' association (Les Producteurs de lait du Québec). The motivation behind the creation of this group was to break the model where animal scientists and food scientists work completely apart, each in their own separate "silo". At the time,

most animal scientists had the vision that they had to improve milk quality to the point where the milk was in the bulk tank, and then the milk magically disappeared and their job was done! On the other hand, food scientists magically received the milk at the dairy plant and then started to do research to improve the quality of fluid milk and dairy products. But, in many instances, what we do on the farm will have impacts at the milk plant and will be influenced by what can be done with that milk. For instance, we recently showed that the use of recycled manure bedding on the farm has an impact on the bulk milk microbiota and could change the proportion of some heat-resistant bacterial species. Another well-known example is the use of palmitic oil-based supplements in the diet of dairy cows, which has an important impact on milk composition. The objective for Op+lait, was to assemble an interdisciplinary team that would bring together diversified expertise that converges towards the optimization of milk quality. It actually worked out so well that it recently became international! In 2021, we created Galactinnov, an international research network for high-quality and sustainable dairy production. This research network reunites the Canadian members of Op+lait with the scientists from French organisations, INRAE and Institut Agro; the National Veterinary School of Toulouse, ENVT; and the University of Tours, France. Our common objective is to structure and develop collaborations based on high-quality dairy production while respecting the environment as well as animal health and welfare.

M². *More generally, what do you think are the best opportunities for young people coming into the veterinary profession?*

Simon Dufour. I realized after the fact that my veterinary degree and later, my work as a veterinarian trained me in a very specific way, viz., in "problem solving": gather information – analyze – evaluate options – get consensus (with the client) – monitor results – go back to the analysis step. This type of training and mindset is transferable in so many professional situations. I was really lucky to get such training and I would strongly encourage young people to pursue a veterinary profession. Plus, you get to spend most of the time with animals! If you're passionate about animals, you cannot ask for more. Currently in Canada, as in many countries, there is an important shortage of veterinarians. Not just in dairy practice, but in all fields of animal medicine. A major limitation is possibly the salary, which has improved greatly in the last decade, but which is still quite low relative to the number of years of schooling required to get a veterinary degree, and considering that it is a very competitive program.

M². *Outside of your academic sphere, what are your other interests?*

Simon Dufour. When I am not running behind my two kids, you will usually find me engaged in sport. During summer time it's soccer, mountain biking, windsurfing, cat sailing, and surfing. During the winter, you will find me (or not) deep in the mountains doing backcountry telemark skiing or kite-skiing. Throughout the year, though, you will also find me

Simon Dufour is a highly skilled veterinary epidemiologist with 20 years of practical and research experience within the dairy sector. He has a strong network of collaborations with international researchers and with dairy stakeholders and has demonstrated outstanding abilities for obtaining substantial research funding through private sector and governmental programs. He has a well-established research and knowledge transfer program on mastitis and on other infectious diseases of dairy cattle and plays a leadership role in dairy research in Canada. Currently he leads a professional development program for graduate students working on mastitis and milk quality. His goal is to support them so they can achieve the highest academic standards and acquire the cutting-edge technical and professional training needed to work in academia, government or in industry. Simon is Associate Professor at Université de Montréal since 2017, having been Assistant Professor from 2012 to 2017. He graduated Doctor in Veterinary Medicine in 1998 and PhD in Veterinary Science, option Epidemiology in 2011, both at Université de Montréal. He was a Post-Doc Fellow in Epi-informatics at the University of Prince Edward Island from 2011 to 2012. Having helped found FRQNT-Op+lait in 2015, Simon has been Director since 2020 and is responsible for the scientific and strategic leadership of this network of 68 scientific investigators and researchers from four universities.

on the Tatami floor, twisting arms and pinning friends to the ground. I started judo at a very young age and never quitted. Nowadays, I am focusing on helping the young judoka to progress. As a martial art, judo is a great way of channelling children's energy and it helps them through the difficult situations they may have at school or at home. It helps them build self-respect, respect toward their opponents, and encourages discipline. I really enjoy seeing the young ones make progress. *M²*