

Special Issue: Vectors

## TrendsTalk

## Denise Valle – On Bugs, Dengue, and Swimming



Denise Valle\*

Dengue is a mosquito-borne viral disease that has rapidly spread worldwide in recent years. Over 50 million dengue infections were estimated in the Americas in 2010, and of these, approximately 40% occurred in Brazil, where the virus is transmitted by female *Aedes aegypti* mosquitoes. For 15 years, Denise Valle worked with the Brazilian Government to devise strategies to eliminate *A. aegypti* in Brazil through the use of insecticides. However, it became increasingly clear that the insecticide approach was not enough, and in 2011 a group of researchers from the Instituto Oswaldo Cruz, led by Denise, launched the '10 Minutos Contra a Dengue' (10 Minutes Against Dengue) campaign. This project urges people to act once a week and take ten minutes to clean domestic breeding sites of the mosquito, as a way to reduce transmission of dengue.

Denise, originally from Rio de Janeiro, trained as a biologist at the Federal University of Rio de Janeiro. She is currently a Researcher at the Instituto Oswaldo Cruz, in Rio de Janeiro. Here, Denise shares

how she first became interested in science, her love of bugs and swimming, and wonders what the future holds.

**What motivated you to become a scientist?**

I had several excellent high school teachers, I studied in an 'application school' in Brazil, a school where teachers were also undergraduate students of a public university. There, every new content was built together with the students. It was a very special, extremely critical, and exciting environment. My choice to work in science is certainly the natural outcome of the education I had, of this way the high school taught us to deal with problems.

Since every discipline turned out to be extremely interesting, it was very hard for me to choose a career. I was in doubt among, for example, biology, mathematics, and physical education. The option for biology was undoubtedly because of one teacher. He was so committed that he gave extra classes on Sundays. Although not mandatory, many students came. By the way, my passion for embryology began on these Sunday biology classes, when he even reenacted, using all his body, as in an improvised theatre play, an embryo under development, with its germ layers in time/3D space dimension.

**What does your lab focus on?**

Although I have always sought consistency in my professional career, my research focus changed a few times as an outcome of the experience acquired at work.

Developmental biology was my very first specific interest. And, to the dismay of my mother, I was very fond of insects. All my work as a graduate student was related to oogenesis or embryogenesis. Kissing bugs and *Drosophila*. After finishing my postdoc in Toulouse, France, and coming back to Brazil, I made the choice to work with mosquito embryology, an academically interesting subject with a potential strong practical application in the control of vector-borne diseases. At this point it is

important to say that the opportunity to employ science to change real life health problems was always a strong motivation.

However, in the meantime, I was 'knocked down' by dengue dissemination – a huge health problem in Brazil, able to concern the whole country. It was at the end of the 1990s. A specific field caught my attention: the insecticide resistance of the dengue mosquito vector, *Aedes aegypti*. It appeared to spread throughout the country. At that time, much of the dengue control failure was attributed to the insecticide resistance of *A. aegypti* populations. For almost 15 years my laboratory assisted the Brazilian Health Ministry to monitor the resistance of dengue vector populations to various insecticides, to detect the mechanisms involved in resistance, to define rational strategies of insecticide use, to seek alternative surveillance, and control approaches, to work in an integrated manner on the South American continent.

However, during this period it was increasingly evident that, although we were working efficiently, the insecticide approach was not being effective. It became clear that dengue is not only a question of health, but also, and primarily, of education, mobilization, and social responsibility. There are lots of limitations in insecticide use; besides, owing to several biological features, *A. aegypti* is a mosquito strongly adapted to the human environment. Other approaches were clearly necessary.

Today I keep on working on some aspects of resistance to insecticides, but I also try to act in a more real world-related field. Currently, I take part in various initiatives that seek to inform and advise Brazilian society about the importance of prevention and of the mechanical control of the dengue vector. Several initiatives regarding communication with the population are ongoing, mainly with information multipliers, such as managers and health workers, journalists and other media professionals, young students, scouts, military personnel, and many more. For instance, we took the idea

of 'media training' taught by press officers to scientists – a routine in many scientific institutions – and turned it the other way around. Since 2009, we perform 'dengue training' of these information multipliers by means of seminars, videos, web, and other media.

### How can established scientists best serve as mentors to young researchers, both male and female?

First I need to make a distinction between an 'established' and an 'experienced' scientist. I probably belong to the second category, and surely not to the first one. My professional career took me out of my 'comfort zone' sometimes. It provoked personal revolutions. New beginnings. However, beyond the subject itself, what fascinates me the most is the use of logic and deduction to answer questions and to solve problems. This is at the basis of the ability to walk through different methods and even areas of research or activity. I believe my professional trajectory is the best mentoring I give to my students. Personal example and attitudes are the best mentoring a scientist can provide.

### What advice would you give young scientists planning to start their own lab?

Is leading one's own laboratory the best way to make the best science? I am not very sure about this. At least in Brazil, there is a huge amount of work involved with the coordination of a research laboratory. It requires a lot of investment in managing financial and human resources, physical space, logistics, bureaucracy, equipment, and so on. In general, being a lab leader means a significant sacrifice of the researchers' core business, the science itself.

To think, reflect, prepare, test, analyze, interpret. . . these are very time-consuming activities. How to reconcile them with the management of the complex structure of a laboratory? This can be a fairly long discussion, out of the scope of this talk.

But if the question is, 'what advice would you give to a young scientist who wants to start his career?' I would answer: start with something you truly enjoy. Because you will work a lot. So it is not a bad idea to add pleasure to your routine. I would also recommend focus. However, in this journey, new challenges will arise, and it is nice to be prepared for some of them. This is a fine line to tread, the focus on the original question, and the alternative routes.

My final advice would be to talk a lot to young and not so young scientists, to listen to different opinions. There is always a chance to meet someone who has already done what you are thinking of doing, or someone that knows a better way to do what you intend to do. Or even someone who did it and it just did not work well.

### Do you think you encountered any extra hurdles as a female scientist?

Amazingly, in Brazil, my home country, at least in my area of expertise, I did not find additional obstacles for being a woman. However, my two pregnancies were the exception. At both periods the discomfort, disagreement, and the embarrassment of male scientists, especially the higher-ranking, were very clear to me, explicitly and deliberately.

However, in general, there were very few qualified professionals, the graduate programs were still at their beginning in the country, and competition for positions in science was not even a shadow of the current scenario. At that time, when scientific researchers were a minority, cooperation prevailed. Somehow we exercised the 'founder effect', with plenty of exciting academic discussions, and little room for gender bias.

I think two other factors contributed for keeping myself preserved from major gender obstacles in my career. First, a solid family structure, with a huge support and complicity of parents and partner. Second, the luck of participating, since the beginning, still as an undergraduate student, on

the construction of an informal network of entomologists in Brazil. As I said, we were few researchers in the country at that time; but, entomologists, and I refer to both biochemists and physiologists, barely filled a small room. And this, a small room, was precisely what was provided to us, for example, in the Brazilian Biochemistry Society Congresses. This potential weakness greatly approached that embryonic research community, researchers, and students. Collaboration was the rule, even for the sake of survival. Up to now, I realize this remains more the rule than the exception in our area.

Unfortunately, it is not possible to attest the same in relation to other richer and 'more developed' countries where I worked. Surely the fact of being a 'foreigner', regardless of gender, played a role. Especially in Europe, more traditional, the discrimination and arrogance against foreign and native scientist women could be felt in many ways, some less subtle than others. In the lab, I noted that women remained in the kitchen/bench/technical side of the work, whereas the living room, with the conceptual and relevant discussions, in general, was reserved to men.

Nevertheless, I feel it is important to leave a positive message here. I recognize that this is a very sensitive and controversial issue. But I also realize that in an individual context, our attitudes, whether self-confident or submissive, will largely determine our interlocutor's reaction. In the end, in science, the gold standard will always be the knowledge and the ability to argue, regardless of gender or any other category.

### Collaboration is now the foundation of research. For some early career researchers, especially women, it might be intimidating to make that first move and initiate conversation that might lead to collaboration. How did you manage this?

At least in my country, I generally did not feel intimidated by being a female.

However, regardless of gender inequalities, I always considered the formal situations, such as oral presentations at congresses and seminars, a very intimidating experience for young people. To help with this issue, I organized the Arthromint ('Arthropods and Helminths') Meetings, one of the initiatives I am very proud to have participated in. This is an annual meeting of entomologists, based on several simultaneous and successive small discussion groups, rather like in a pub. In these groups the students are the stars and present – and discuss a lot – their work, as well as their questions, to other students and to senior researchers. This has proved to be a very productive approach, currently reproduced in other areas.

### What can institutions do to support women in science?

This is a difficult question. The institutions are simply the collective and formal manifestations of the thoughts and beliefs of each one at each period of time. I also learned that true revolutions have a precise direction: 'bottom up' and 'inside out'.

This question of the gender bias, and even of general prejudice, is very subjective. Most people do not consider themselves as prejudiced, although this condition is manifested in many ways, even unwittingly.

Institutions may establish rules. But so what? In Brazil we have laws that became 'popular' and are followed, and laws that simply do not receive attention, and are 'discarded'. In general, I think that behind a 'popular' law there is a strong educational work towards the awareness of society.

### You said that revolutions go from the bottom up and inside out. Should scientific institutions, a small subset of society, be leading the revolution by educating the general public and making them aware of issues related to workplace gender equality?

Scientific institutions play their role, and are very relevant nowadays, in the sense

that people in general respect science and believe researchers. This is true not only for gender issues but also in a general context. However, I consider that any scientific institution interested in educating the general public should allow education to happen in the other direction as well. In other words, the general public perspective should be heard, listened, and learnt. This is what I mean with 'bottom up'. Because education you do not receive from above, education you acquire, you win. Furthermore, there is a major unanswered question in science that deals with behavior, the 'know-do gap'. In other words, the distance between what one person believes to know and what he (she) really does know. This is a real challenge, at both the individual and collective level.

I think this is not a question of leading, but doing together. Just as I believe, as mentioned earlier, that the best mentoring is one's own personal example. In Portuguese we have a proverb that fits nicely here: 'you should do what I do, and not what I say I do'.

### If you were not a scientist, what would your alternative career be?

Wow... I always wanted to be, and to do, many things. When I was young this was what worried me the most: 'I will not have time! A life, even a long life, will not be able to fit in everything I want to do!' – I despaired sometimes.

I started agricultural college; I was about to do math and I thought about studying physical education. I enjoy cooking and presently my favorite hobby, almost an addiction, is swimming.

The full exercise of one's own potential as a scientific researcher is totally rewarding. When working with a clear question, it is natural to make use of many resources to find the answer. In my personal experience, I am presently touching many skills that I would like to have had time to deepen if I was younger.

But, yes, now in this second half of my life, I would rather do something very different. It would be nice to leave, again, my comfort zone. I am still looking, wondering, 'What do I want to be when I grow old?'

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## Special Issue: Vectors

# Spotlight

## Genetic Control Of Malaria Mosquitoes

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**Experiments demonstrating the feasibility of genetically modifying mosquito vectors to impair their ability to transmit the malaria parasite have been known for well over a decade. However, means to spread resistance or population control genes into wild mosquito populations remains an unsolved challenge. Two recent reports give hope that CRISPR technology may allow such challenge to be overcome.**

Genetic modification of wild insect vector populations to suppress their ability to transmit human pathogens is a longstanding scientific dream. The advent in 1982 of transgenesis in the fruit fly *Drosophila melanogaster* [1] gave impetus to the idea of genetically manipulating mosquitos to render them incompetent vectors of pathogen transmission. The feasibility of this strategy to block transmission of the malaria parasite by an anopheline mosquito was first demonstrated in 2002 [2] and followed by a number of other studies. However, translation of these successes to the field faced a major challenge: the