



## Interview:

# “Anybody Should Follow Their Own Footsteps”: An Interview with Pietro Alano

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### Abstract

Pietro Alano (26 May 1959) is Principal Investigator at Istituto Superiore di Sanità (ISS), Rome, Italy. After his Ph.D. (University of Milan, 1986) on the bacteriophage-E. coli interplay he entered molecular parasitology (Woods Hole course Biology of Parasitism, 1986; University of Edinburgh, 1987-1991) and joined ISS in 1991. Over the past 30 years Pietro's team has investigated genetics, cell biology and development of the human malaria parasite Plasmodium falciparum and human and mosquito host-parasite interactions. This work, described in over 90 publications, generated 'omics' datasets, molecular tools and transgenic lines recently used in anti-parasite transmission drug discovery and development of innovative P. falciparum diagnostics tools. What comes below is an interview with Pietro Alano (PA) conducted by Mostafa Pourhaji (MP).

**Keywords:** Istituto Superiore di Sanità, Malaria, Microbiology, Parasitology, Pietro Alano

**M**P: Thank you very much Dr. Alano for accepting to do this interview with us. Though you're a well-known scholar, just to start with, could you please introduce yourself to our audience?

PA: First of all, a thank-you to you, to Shahid Beheshti University of Medical Sciences, and to the Archives of Advances in Biosciences for this invitation. To tell you the truth, I feel a little bit

embarrassed because I'm not used to talking about myself rather than about my research. Well, my name is Pietro Alano. I'm a senior investigator at the Istituto Superiore di Sanità, which is the main public health research center in Italy. My group works on the transmission of the malaria parasite; it's our expertise and long-term commitment.

MP: My second question has to do with your motivation to become a microbiologist. How did you become interested in the field of microbiology?

PA: I think the main issue is that micro-organisms traditionally provided us with the best way to explore molecular genetics and mechanisms of gene regulation. So my original experience was with bacteriophage and the bacterium *Escherichia coli* genetics, but shortly after I realized that micro-organisms are so important for our health and for the environment in general. Then I got interested in exploring the biology of micro-organisms, especially of those which have to do with our health. All this led me to the field of molecular parasitology, long time ago.

MP: You've been a prolific writer and researcher for decades. How do you compare your initial publications with the more recent ones?

PA: It's a very good question. Actually, there are several issues. One of them, whose importance you get to know later in your career, is writing itself. Scientific writing is very important, yet very difficult. Learning to write synthetically and unambiguously, without exceeding in your personal speculations, is a long-term process. This could be one difference between my early and my late works. The second big issue, when comparing my initial publications with the recent ones, is that technological approaches have progressed so immensely over the past twenty or thirty years. I would say, even with some regret, that certain old experiments were totally driven by hypotheses, with the experiments designed to disprove or to confirm them; in brief, the experimental design was very important. Now, ideally, you still need to do the same in the era of "omics" and big data. I have to say that in some cases the work described in the literature tends to be less hypothesis-driven. It is sometimes assumed that if you produce lots of data, somehow you get answers and you have solved an issue; I think instead that before producing and analyzing a lot of data, you need to bear in mind the logic of your data collection design and accordingly set your questions correctly. If you ask a clear question, you can expect to get a clear answer.

MP: What are the current hot topics and debates in the field of microbiology?

PA: Microbes enter our lives in so many aspects and very often they are very beneficial to our environment and to our health. My perspective is biomedical research, so I would mention two or three issues where microbes, in contrast, are bad for us. If I want to single out two or three issues, I think one is driven by the disaster of the Covid-19 pandemic. One lesson is that it is very important for scientists to address the issue of zoonoses and the possibility that microbes are transmitted from animal reservoirs to the human species. Covid-19 pandemic taught us that we need to

explore nature more thoroughly to understand this potential danger for our species. Another issue which I think is going to be more and more relevant in the future is the threat of anti-microbial resistance. I can give you the data for our region, but this is a widespread issue. In Europe, we still have every year almost seven hundred thousand cases of infections given by anti-biotic resistant bacteria. And we have thirty to forty thousand deaths for this very reason. Now, it is very important we don't take it for granted that the antibiotics we know today will work for ever because microbes are constantly able to build up resistance. Another big issue is that it is very important to remember that microbial resistance is actually not restricted to bacteria but it is a concern also for parasites, viruses, and fungi. And if I can just narrow down to the field of investigation of my concern, the news from few months ago that in Africa was reported for the first time the appearance of clinical resistance to artemisinin combination therapy (ACT), the most effective treatment to cure *Plasmodium falciparum* malaria, well, it's a very bad piece of news. They not only identified the parasite molecular genetic fingerprints of drug resistance but also documented, for the first time in Africa, cases of delayed clearance of parasites in the context of artemisinin combination therapy. If something similar to what is happening in Southeast Asia, where ACT resistance is today fairly spread, takes place with a high impact in Africa, we are really facing a major disaster. So this is the third hot topic in microbiology with medical relevance.

MP: My next question has to do with your specific field of interest; I mean research on malaria. In your opinion, when can an effective vaccine against this parasite be developed?

PA: There is a preliminary consideration in discussing vaccines for malaria. Vaccines have proved to be very effective against viral diseases, although not for all of them, like HIV, a virus still escaping a good vaccine. But in other cases they do work. Even in the case of SARS-CoV-2 it has been possible to rapidly develop several vaccines which are effective in terms of efficacy in inducing a fairly long-lasting immunity. In contrast, protozoan parasites are much more complex, so the first issue is that the target organism in itself is much more challenging. We know that immune activity against parasites is very complex, involving several layers, from cell-mediated to antibody-mediated immunity, against several "moving targets", exposed at different times of infection from different parasite stages and which are often polymorphic; this is to say that looking into a vaccine for malaria is very difficult. Nowadays, the news is that the World Health Organization is recommending

the implementation of a new vaccine, called RTS,S, in Africa. I think there are two levels in considering this news. In one we have to recognize that this vaccine, by the standards that we generally use to evaluate vaccine features, is not a good one. In terms of efficacy and protection against severe diseases and mortality, it is undeniable that it doesn't compare with many other viral vaccines. On the other hand, we cannot forget that in certain situations, even starting to implement one vaccination campaign can improve per se health conditions and somehow helps to combat the spread of the disease. In this sense, the WHO very clearly states that this suboptimal vaccine is just an extra step in malaria control, as it attacks the parasites from the side of immunity in addition to attacking its transmission targeting the mosquito vector or using drugs to cure the disease. In brief, the WHO is implementing a fairly pragmatic approach in a multi-faceted and multi-disciplinary battle, in which even a suboptimal vaccine can help.

MP: Now I'm going to ask you a more personal question if you don't mind. Are you happy with being a microbiologist? I mean if you were given a second chance to live the life you have, would you choose to be an academician and, more specifically, a microbiologist?

PA: What really drives me as the main source of motivation is to see the young people around me entering the field of research and starting to challenge themselves with their ideas and experiments. The smile of somebody who succeeds in an experiment is so rewarding that my answer to your question is definitely yes. I think being a microbiologist and being a researcher in general in the public sector in a country like Italy, which is not allocating much budget to research, is surely more difficult than in other academic situations of other, more committed countries. Nevertheless, I would do the same, and I would maybe get more engaged to communicate science to the younger people and to promote a better public perception towards science. In this respect, the Covid-19 pandemic probably made it clear to many people that doing good science and having good research infrastructures can really make a difference and that science is not an academic exercise but it is very important for our everyday lives as human beings.

MP: Dr. Alano, there are lots of researchers and practitioners in Iran who are willing to cooperate with you or seek your advice, especially at Shahid Beheshti University of Medical sciences. How can they make it happen?

PA: Well, not only my team, but the entire Istituto Superiore di Sanità is absolutely open and prioritizes international collaborations. In fact, in our department

of infectious diseases we've had students from Iran doing part of their scientific careers. A few years ago, I remember there was a delegation of academic researchers from Iran who visited Istituto Superiore di Sanità and there was a very good exchange of information. Unfortunately, this happened before the Covid-19 pandemic and since then everything has stopped in that respect, but I would be very happy to help restoring this channel of communication. In practical terms, we can really think of designing research projects and discuss how to financially support them, either from here or at your university, with PhD titles issued in Rome or in Tehran according to whatever scheme is implemented; we are absolutely open to undertake schemes like that. Also, consider that the Italian embassy in Tehran can be a good way to open a communication channel.

MP: In the end, words fail us to thank you for the time and the input. Is there anything else that you would like to add or share with our audience? Especially any further recommendations for junior researchers wishing to follow your footsteps?

PA: [Laughter] well, I think anybody should follow their own footsteps. Maybe to the young people, my main recommendation is to try to do really good research despite the sacrifices that this requires in terms of time or economic difficulties, as you generally don't make a lot of money by doing fundamental science. The other thing is just follow your sheer curiosity and creativity. Many times, nowadays, there is pressure to translate science into a new drug, a new vaccine, or something immediately useful. This may be in part understandable, but at least in the early time of your career, follow curiosity about the basic questions that in your opinion need to be solved. Experience has clearly told us that looking for answers to very fundamental questions, and sometimes even by serendipity, we came up with discoveries which eventually turned out to be useful to solve very practical problems. If, on the contrary, you only try to immediately apply your discoveries to specific problems, you may end up thinking in a narrow window, losing the general landscape; so, in conclusion, this is my main recommendation to the young researchers who want to engage in this wonderful field.

## Ethical Considerations

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