University of Amsterdam,

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THE NEXT GENERATION

Professor Constance Schultsz

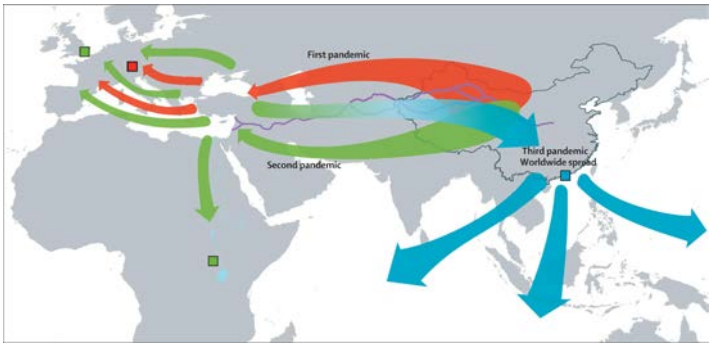
Young boys attending a punk rock concert during the official launch of the New Year Water Festival ("Thingyan") in Yangon, the former Burmese capital on 12 April 2014.

https://thediplomat.com/2014/05/the-punks-of-myanmar/?img=4#postImage

A generation is a group of contemporaries. A group of people born around the same time, but not necessarily under the same circumstances. I am a member of Generation X, also known as the "*lost generation"* or as "*Generation Nix"* (meaning "nothing" in Dutch). According to the Dictionary of Neologisms "*Generation X"* is a marketing label representing the generation of people born between the 1960s and 1970s. This generation was shaped by the Cold War, and the recession and high youth unemployment rates of the 1980s. While most of its members are more highly educated than their parents, this generation is still seen as apathetic, anti-materialistic, pessimistic and irresponsible. Case in point: this generation is known for creating punk and graffiti. Fortunately, this generation has also been called practical and independent and has been characterized as having a no-nonsense mentality (less talk, more action) and an ability to put things into perspective. For me, however, the most distinctive aspect of my generation is that its members matured in a time of globalization, when it became possible for entire families to hop on a plane to a holiday destination, when computers became everyday tools and the internet was developed and individuals slowly but surely started to communicate with the entire world. A time in which the Netherlands, a country known for its apples, started not only importing exotic spices, but also apples from the other side of the world. A time in which an infrastructure was put into place which made it possible for the 2003 outbreak of a viral infection in Hong Kong to lead to death in an intensive care unit in Toronto within a matter of days. And a time in which infectious diseases were claimed to be becoming a thing of the past due to the use of

vaccinations and antibiotics. Instead, we now spend our time discussing the post-antibiotic era that lies ahead.

It is also the time in which the foundations for the discipline of Global Health were laid. It surprises me that a consensus regarding the definition of Global Health remains to be reached, not to mention the fact that a Dutch translation for 'Global Health' does not exist. Multiple attempts to define Global Health have been published, but these definitions must not have been comprehensive or precise enough to become universally accepted. This is remarkable, considering that institutes of Global Health have been popping up anywhere and everywhere in the past decades. I will not attempt to define Global Health. Instead, I am going to illustrate what Global Health encompasses by sharing my views regarding Global Health research and education. These views started to develop when I was a student of medicine at the University of Amsterdam. During this time, I was an active member of the student organization now known as IFMSA-Nederland, and I also spent a year doing research in Dhaka in Bangladesh at the International Centre for Diarrheal Disease Research. My perspective on Global Health evolved while I was working on my PhD research on diarrhea and it matured during a rich and unforgettable time spent working for the University of Oxford at the Ho Chi Minh City Hospital for Tropical Diseases in Vietnam, several years after specializing in microbiology. Today, these views focus on the next generation, as Professor of Global Health.



Hypothetical scenario for the geographic spread of Yersinia pestis.
The Lancet Infectious Diseases 2014 14, 319-326

Economic globalization is not a new phenomenon. International trade has motivated merchants to travel the world for centuries, resulting in the exchange of goods, animals… and pathogens. One of the best early examples of the consequences of globalization for Global Health is the plague. In his book *A Splendid Exchange: How Trade Shaped the World,* William Bernstein neatly summarizes how trade allowed the bacterium *Yersinia pestis*, the cause of the plague, to be carried from South Asia to Southeast Asia and Europe in the 14th century, together with the black rat and other rodents, its hosts, and the flea, its

vector. The book not only describes how ‘The Black Death’, as an unexpected and undesirable consequence of globalization, decided the fate of entire societies but also how the same bacterium altered the course of world trade. Of course, the conditions we live in now are entirely different from the conditions people lived in 700 years ago, when the plague tormented Europe. Finding similarities between the present time and the 14th century seems difficult when you consider our increased welfare, better living conditions and the widespread availability of antibiotics. Despite all this, the most recent outbreak of the plague was in Madagascar, in 2016… just last year. Transmission of *Yersinia pestis* to travelers, and via them to the rest of the world, is only unlikely to occur due to the remote location of the outbreaks in Madagascar. Even though times have changed, human actions keep making it possible for new and old infectious diseases to spread. Migration, urbanization and industrial livestock production are all examples of such actions. These infectious diseases are often caused by microorganisms that are transmitted from animal to human or by microorganisms that have become resistant to antibiotics. I would like to give you some examples of the above. First, I will speak about the bacterium *Streptococcus suis* and subsequently, I would like to tell you about antimicrobial resistance.

www.geheugenvandrenthe.nl/page/6864/biggen-op-de-markt

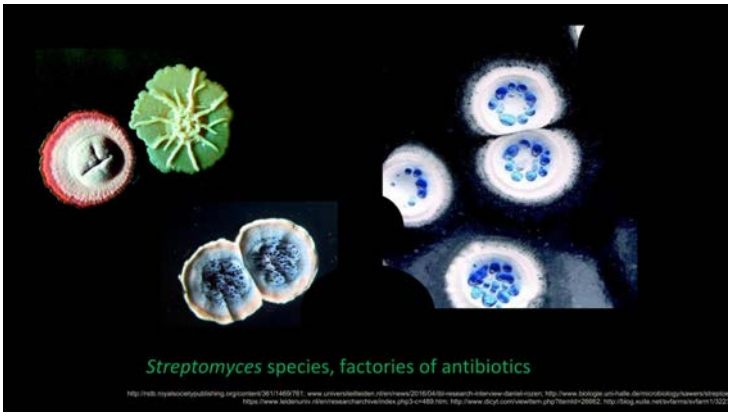
Around 150 years ago, Dutch farmers started importing pigs from the UK in order to be able to produce more meat. With these pigs, pathogens such as *Streptococcus suis,* were also imported*. Streptococcus suis* is a bacterium that is usually found in the throats of healthy pigs. Some variants of the bacterium can cause dangerous infections like meningitis. One of the first descriptions of meningitis caused by *Streptococcus suis* was published in The Lancet in 1970 by Professor Zanen, who was the Head of the University of Amsterdam’s Medical Microbiology laboratory at the time. Today, this is the AMC’s Medical Microbiology laboratory. For decades, this laboratory housed the national reference laboratory for the research and surveillance of bacterial meningitis. All microbiology laboratories in the Netherlands send isolates from bacterial meningitis patients to the Reference Lab for

surveillance purposes. This enables us to recognize agents which reappear consistently, but only in low numbers, like *Streptococcus suis*. The new bacterium described by Professor Zanen turned out to resemble a bacterium which had recently been reported in the UK. The pathogen found in the UK caused the same disease in pigs as the Dutch pathogen caused in humans. Not long after this discovery, the bacterium was called *Streptococcus suis,* "the streptococcus of the pig". It soon became clear that exposure to pigs, be it in a slaughterhouse or while illegally hunting wild boar, greatly increased the risk of developing meningitis in the Netherlands. When I moved to Vietnam in 2003 to conduct research at the Oxford University Clinical Research Unit at the Hospital for Tropical Diseases, I knew nothing of *Streptococcus suis,* despite having just completed my PhD at the aforementioned department of Medical Microbiology. In Vietnam, Jeremy Farrar led research on the use of dexamethasone to treat bacterial meningitis. During this research, we found a large number of patients infected with *Streptococcus suis*, which led us to start conducting systematic research on the incidence of *Streptococcus suis* infections and the risk factors associated with these infections. *Streptococcus suis* was revealed to be the most important cause of meningitis in adults. Our research showed that besides close contact with pigs, another risk factor for the development of meningitis was consuming food containing raw or undercooked pork products, such as raw pig's blood or pigs' intestines. There are few dishes in Dutch cuisine containing raw pig's blood, which is probably why *Streptococcus suis* is not as big of a problem in the Netherlands as it is in Vietnam. Cultural practices can explain differences in exposure to pathogens and therefore differences in the burden of diseases. During our research period in Vietnam, a large epidemic of *Streptococcus suis* infections amongst humans and pigs occurred in China. Of the more than 260 people who became seriously ill, 15% died due to the infection. This epidemic was further confirmation that *Streptococcus suis* poses a health risk in countries with a large pork industry or large amounts of pork consumption, especially if the meat they produce is not (or barely) processed before consumption.

After my return to the Netherlands, I continued my research on *Streptococcus suis* with my colleagues from the Department of Medical Microbiology and the Reference Lab. Within the EU consortium ANTIGONE, we were able to study why and how certain microorganisms are able to make the jump from animal host to human host. Discovering the changes that enable microorganisms to start infecting humans can help us understand the emergence of new infectious diseases. Together with researchers from the universities of Utrecht, Wageningen and Cambridge, we examined the DNA sequences of *Streptococcus suis* isolates from pigs and humans, going back 30 years. Our results showed that after British pigs were introduced to the Netherlands, a new variant of *Streptococcus suis* emerged, one which initially infected

pigs only, but can now also infect humans. This special variant emerged due to numerous variants of *Streptococcus suis* exchanging genetic material, leading to the mix of traits needed to infect a human being. In this way, human actions have led to the creation of an emerging infection.

Streptococcus suis, by the way, not at all resembles *Yersinia pestis.* The former, unlike the latter, cannot be transmitted from human to human, neither directly nor through a vector. This is why there is a limited risk of *Streptococcus suis* infection epidemics spreading rapidly amongst humans, as we saw in China. As the world population increases, however, so does the demand for meat, including pork. The next five years will therefore see us continuing our research on the mechanisms *Streptococcus suis* uses to infect humans within the new EU consortium PIGSs. We will use *Streptococcus suis* as a general model for emerging bacterial infections. This research will only become more valuable in the coming years, as we are increasingly faced with another problem caused by human actions. Because increasing antimicrobial resistance requires a reduction in the use of antibiotics in animals, it is very possible that we will see more *Streptococcus suis* infections in the years to come, both in pigs and in humans.



Since the discovery of penicillin and the first use of this antibiotic in the 1940's, multiple other antibiotics have been discovered and developed. This period spans more than 70 years, starting with the Baby Boomers, the generation just before my Generation X. It is astonishing to imagine how many lives have been saved by antibiotics. Millions. Even more astonishing is the realization that the generations after the Baby Boomers are already being threatened by antimicrobial resistance. The threat that antimicrobial resistance poses cannot be understated. I'll give you some examples. During our research on antimicrobial resistance in cases of urinary tract infections in Bandung and Medan in Indonesia, we found that in 50% to 100% of cases of lower urinary tract infections bacteria were resistant to the first choice

antibiotics. Worse still, we also found that the remaining effective antibiotics are either not sold in Indonesia or not reimbursed by the National Health Insurance of Indonesia. Research conducted by Swedish colleagues working at the neonatal Intensive Care of the Vietnam National Children's Hospital in Hanoi showed that more than half of the infections there were caused by bacteria resistant to carbapenems—antibiotics we prescribe only when other antibiotics no longer work. A number of these bacteria were already resistant to all available antibiotics. We see this on other continents as well. In an article published last month in The Lancet Infectious Diseases, researchers described that in Malawi, more than half of the bacteria causing serious infections became resistant to the most common antibiotics in just 18 years.

Soon after the discovery of penicillin, it became clear that bacteria can become resistant to antibiotics. "Resistant" in this case means that the antibiotics are not able to kill bacteria or stop their growth anymore. The development of antimicrobial resistance by bacteria is a natural process. While multiple mechanisms exist by which bacteria can become resistant, only one enables their endurance after this change: the use of antibiotics. Antibiotics kill susceptible bacteria while resistant bacteria remain alive. It has become apparent that this selection process is difficult to undo. Avoiding the use of certain antibiotics does not necessarily mean that we can reverse antimicrobial resistance against these antibiotics. Those antibiotics will have become useless.

So how can we protect the current and next generations from a world without effective antibiotics? The answer seems obvious: use less antibiotics. Under optimal circumstances use of antibiotics should only happen when it is necessary. We know antibiotics are needed when diagnostic tests have made it either highly probable or have confirmed that someone is suffering from a bacterial infection. Use of antibiotics without diagnostics should only happen in life-threatening situations or when the symptoms a patient is experiencing are so recognizable we can be absolutely sure of a certain diagnosis. We call all this empirical therapy. Antibiotics are given for as short a period as is possible and are chosen to be as specific to the bacteria we want to treat as possible so we do not create resistance in other bacteria. All of this combined is called antimicrobial stewardship. Finally we try to inhibit the transmission of resistant bacteria. In the Netherlands we do pretty well when it comes to all this. We have labs for diagnostics and carry out surveillance so we know the scope of antimicrobial resistance and the ways we can minimize this. We are also able to regulate the use of antibiotics. But the world looks very different outside of the Netherlands. I will describe the situation, starting with diagnostics, as that is my forte, given my background.

www.future.edu/ensuring_health

For years and years, diagnostics of bacterial infections were ignored. In 1978, the International Conference on Primary Health Care adopted the Alma-Ata declaration. The WHO still refers to this declaration on its website. Health for All focused on primary healthcare; diagnostics had to be carried out by barefoot doctors on the basis of simple criteria. Because of this view, no investments were made in local labs, let alone in bacteriology, in low- and middle-income countries. The result of this is that there is a shortage of quality laboratories for routine diagnostic procedures and of medical microbiologists, biologists and lab technicians. Lack of diagnostic capacity has caused unnecessary exposure to emerging infections and a limited understanding of the prevalence of antimicrobial resistance. An example of this would be the Ebola epidemic in Western Africa. For months and months, this was believed to be a cholera epidemic due to patients presenting with diarrhea and displaying symptoms of dehydration. Cholera is caused by the bacterium *Vibrio cholerae* which can be detected in feces. If there had been more opportunities for bacterial diagnostics to take place, cholera could have been ruled out in a matter of days. In this way, other diagnoses might have been considered earlier and effective measures to prevent the spread of this disease could have been taken.

Infectious-disease diagnostics does seem to be profiting from the technological advancements of the last two decades. These advancements have enabled us to diagnose an infection in much less time than traditional methods take, by detecting the DNA or RNA of bacteria, viruses, parasites or fungi. Millions have been spent developing so-called *point-of-care* tests, PCR-based tests that can be done outside of a laboratory at a patient's bedside. In spite of this, few affordable tests meet the minimal requirements needed to be able to use them to diagnose bacterial infections in daily clinical practice. What's more, these tests are very limited in their capacity to detect antimicrobial resistance.

Besides being able to quickly detect the DNA of bacteria, we can now also find out the sequence of DNA molecules. On paper this means that in addition to being able to detect the presence of bacteria, we can analyze specific traits of bacteria, such as antimicrobial resistance. Within the European consortium COMPARE, we are studying how we can use these *next generation sequencing* techniques in a clinical laboratory. One example of this is diagnosing urinary tract infections using direct analysis of DNA in urine instead of a microbial culture. Analysis of DNA sequences will undoubtedly be adopted in the arsenal of the next generations of microbiologists. But before this is possible, multiple hurdles need to be cleared. These hurdles are not just of a technological nature. In spite of what many people say, the costs of *next generation sequencing* are still too high to allow for use in routine diagnostics. In addition to the costs of the technology itself, costs are also created because the vast amounts of data that are generated require expertise and time to be analyzed. On top of these hurdles, which we will surely clear in the coming years, we face another, much bigger challenge: the complexity of antimicrobial resistance in bacteria is so great that current analysis tools of the DNA sequence are not sufficient to predict susceptibility. To be able to predict, based on its DNA-sequence, if a bacterium will be susceptible or resistant to specific antibiotics we need much more knowledge and tools and methods of analysis. Another area of study within the COMPARE consortium, therefore, brings bioinformaticians and microbiologists together to find out if we can use machine learning to predict antimicrobial resistance based on DNA sequences. In short, we're not quite there yet when it comes to DNA sequence analysis. The question we need to answer now is what we're going to do in the meantime. You might be wondering how diagnostic testing is happening in the Netherlands. Which techniques are being used if the new ones aren't yet up to standard? The answer is simple, but might be surprising: we mostly use traditional bacteriological methods, such as culture media and phenotypical antibiotic susceptibility testing. As long as the next generation of techniques do not work as they should, we will invest in what does work. Our holy grail is an inexpensive diagnostic tool that uses new technology to determine the presence of an infection with its corresponding susceptibility to antibiotics, right at the patient's bedside. As long as this remains to be discovered, the rest of the world, like us, needs to invest in the diagnostic methods that are known to be effective. Some will say that this is a conservative point of view, but I disagree with that. Nor do I agree with the notion that traditional bacteriological diagnostic methods are too expensive, although I will be the first to admit that no state-of-the art cost-effectiveness analysis has proven my view to be the case. What's most important to me is using available diagnostic tools in a smart and cost-effective way. The challenge here is being innovative in the application of both existing and new technology and knowledge. I will come back to this point later in this speech.

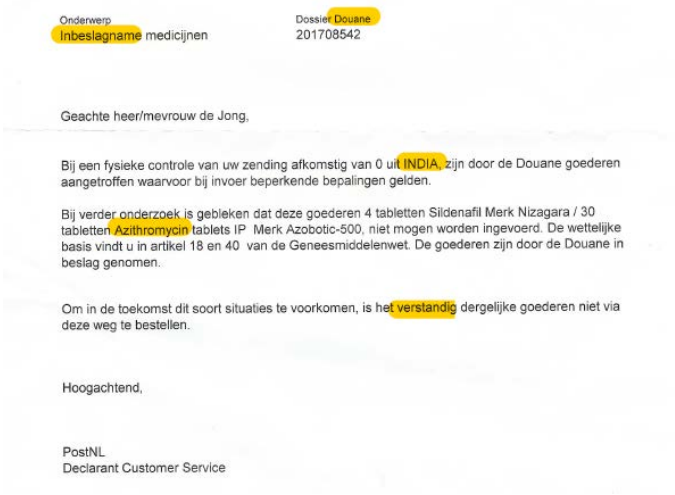
In the United Kingdom, a penny has dropped. The creation of the Fleming Fund, as part of the march against antimicrobial resistance, has enabled the governments of low- and middle-income countries to apply for subsidies which help them invest in national microbiology laboratories. These laboratories not only depend on investments in infrastructure, but also on a continual supply of reagents and similar products. Manufacturers of quality-assured bacteriological reagents are not interested in healthcare markets that cannot guarantee frequent purchase of their products, such as regions in Africa and Asia. As a result, labs will use low-quality locally produced reagents or stop carrying out diagnostics altogether. Donors and initiatives like the Fleming fund should attempt to involve accredited manufacturers in their endeavors to guarantee the quality and sustainability of diagnostics. Creative solutions for the problem of the urgent lack of microbiological knowledge and capacity are essential and for these solutions new technology can also be used. An example of a creative solution is the development of Telemicrobiology in the AMC with the company Kiestra from Drachten. By taking razor sharp photos of culture media containing bacteria and using free software such as Skype, we can share lab findings with laboratories all over the world. Our colleagues in Vietnam were the first to participate in these virtual lab rounds but since then we have also used Telemicrobiology in Indonesia and have started working with a network of labs in Cambodia. Interactive communication with colleagues using methods such as Telemicrobiology is essential to prepare the next generation of clinical microbiologists, wherever they may be. Of course, besides this we also need to increase the teaching and training capacity and match the salaries of clinical laboratory consultants to those of clinical specialists.

www.shapeways.com/product/DKP3VVFL8/pinwheel-dice-set-with-decader

Having discussed the technical side of diagnostics, I would now like to address the smart application of diagnostics. It is often difficult for national laboratories to contribute to direct patient care because of their central location, far away from local hospitals. What national labs can do is contribute to surveillance, so as to inform clinical care about the most important pathogens and their susceptibility to antibiotics. For antimicrobial stewardship and appropriate empirical therapy we need to know about the resistance of the most important pathogens. This knowledge is incomplete in many countries due to a lack of diagnostics and systematic surveillance, leading to patients receiving ineffective antibiotics. The occurrence of antimicrobial resistance can differ locally, depending on the patient population, local use of antibiotics and the risk of transmission of resistant bacteria. It is therefore imperative that we determine the threat that antimicrobial resistance poses for all possible populations, not just the patients with a severe infection who end up in the hospital, the patients who are either insured or able to pay for their diagnostics, or the patients presenting in public healthcare while most patients use private healthcare. No good strategies have been developed yet that enable swift representative surveillance of bacterial infections and antimicrobial resistance for the purpose of empirical therapy. Research needs to be done to develop these strategies. With Frank van Leth and colleagues in Indonesia we are researching how, in a short amount of time and with minimal exertion and costs, we can determine local rates of antimicrobial resistance by using smart sampling strategies. These strategies could prove to be invaluable not only in low- and middle-income countries, but also in the Netherlands. To me, this research is vitally important and highly relevant, which is why I hope we are able to expand this research in the near future.

https://www.walmart.com/ip/Super-Tech-Automatic-Transmission-Fluid/16213433

Making careful decisions about the use of antibiotics is not enough to prevent or push back antimicrobial resistance. Research has shown that certain resistant bacteria spread much faster than susceptible bacteria of the same species. Reservoirs of resistant bacteria seem to exist that have allowed antimicrobial resistance to spread across the world. Examples of such reservoirs are the intestines of humans and some animals, such as chickens. In the Netherlands there was a lot of consternation regarding the ESBL bacteria. These bacteria are present in all of our poultry farms as a result of extremely high usage of antibiotics amongst chickens, and were thought to have transferred to humans. Our understanding of the transmission of resistance is still poor, while it is necessary to successfully combat antimicrobial resistance. The Dutch findings led us to study antimicrobial resistance in healthy chickens and humans with the Oxford Unit in Vietnam. Both chickens and humans turned out to use an alarming amount of antibiotics and carried an alarming amount of resistant bacteria in their feces. Our analysis of the most important determinants of antimicrobial resistance showed that the use of antibiotics in chickens and humans is likely a much more important factor than the transmission of resistant bacteria between chickens and humans. A further question is if bacteria can transfer between different species, such as chickens and humans, at all. Much more probable is the hypothesis that bacteria in different hosts only exchange genetic material and that bacteria are only able to persist and thrive for a long period of time in their specific host species. The microbiome of the host also contributes to the likelihood of bacteria being able to succeed in a certain host and to the risk of bacteria transferring genetic material. In the coming years this transmission of bacteria and their genetic material between different species will be explored in the EU consortium HECTOR, with researchers from Germany, Vietnam and the UK.



Onderwerp
Inbeslagname medicijnen

Dossier Douane
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Geachte heer/mevrouw de Jong,

Bij een fysieke controle van uw zending afkomstig van 0 uit INDIA, zijn door de Douane goederen aangetroffen waarvoor bij invoer beperkende bepalingen gelden.

Bij verder onderzoek is gebleken dat deze goederen 4 tabletten Sildenafil Merk Nizagara / 30 tabletten Azithromycin tablets IP Merk Azobotic-500, niet mogen worden ingevoerd. De wettelijke basis vindt u in artikel 18 en 40 van de Geneesmiddelenwet. De goederen zijn door de Douane in beslag genomen.

Om in de toekomst dit soort situaties te voorkomen, is het verstandig dergelijke goederen niet via deze weg te bestellen.

Hoogachtend,

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The increasing prosperity of regions such as Southeast Asia and Latin America has led to an enormous increase in the production and use of antibiotics. Worldwide fears about antimicrobial resistance combined with the effort certain countries in the UN and the WHO have put in, has led to all of the countries in the UN agreeing to draft national policies to combat antimicrobial resistance. But what is the best strategy for these policies? Should countries in Africa have different priorities than countries in Asia or Europe? The same applies to the introduction of new antibiotics. How can we ensure that new antibiotics remain an option for the next generation? Antimicrobial resistance is not just a medical problem. It is a very complex issue consisting of multiple components, of which I have already described the biological ones. Components of a different nature also exist, such as healthcare systems and access to healthcare, access to antibiotics, the behavior of doctors and patients, legislation and regulations, not to mention economic interests within the veterinary and agricultural sectors and within public and private healthcare. In short, antimicrobial resistance affects all facets of society. But society carries a different meaning in different places across the world. Preventing and combating antimicrobial resistance requires cooperation between diverse systems and structures that barely communicate, if at all. Within the Amsterdam Institute for Global Health and Development we have bundled different disciplines such as microbiology and infectious diseases, epidemiology, health and development economics and anthropology, offering us a unique opportunity to explore the complexity of antimicrobial resistance. Could it be possible, by analyzing and modelling this complexity, to find the interventions most suitable in the different circumstances in which antimicrobial resistance develops? Over the past six months, the first steps have been taken to answer this question, for a project with the University of Amsterdam's Institute for Advanced Study and researchers from the Faculty of Science. We have only just started, but already this is proving to be an exciting collaboration, teaching us to communicate with each

other in different languages. I'm curious to see how this unique collaboration will develop in the future.

I have addressed emerging infections, antimicrobial resistance and the effective use of existing and novel technology and knowledge. These all come together in WARRiOR, the West African Network of Clinical Research for Outbreak Response. This consortium has been set up by AIGHD, with researchers from Mali and Burkina Faso. WARRiOR connects clinical expertise and research capacity with networks of public and private labs and clinics, while closely cooperating with the government, in Mali, Senegal and Burkina Faso. This consortium, in which research institutes from the aforementioned countries, the African Society for Laboratory Medicine and organizations in France and the UK work together with AIGHD and the AMC, aims to build a structure which allows for innovative clinical research on the cause and treatment of emerging infections and antimicrobial resistance in West Africa. In the event of an epidemic in the region, WARRiOR should be ready so that rapid identification of the epidemic can take place, as well as research on its source and its optimal treatment. The consortium has an ambitious and innovative agenda, but no funding yet. An international consortium such as WARRiOR can only function with sufficient sources of funding. These can come from the EU, for example, where we have applied for funding, or from the national research organizations of the participating countries, and can be supplemented by private parties. It is difficult to receive subsidies for Global Health research in the Netherlands. Global Health is often associated with development cooperation in the area of healthcare. Although health is essential for development, in my opinion it is wrong to see funding for Global Health as belonging only to development aid, as Global Health has a much wider scope. The Dutch National Research Agenda which was put in place in 2015 is mainly focused on the Netherlands. But there are enough starting points for investments in Global Health as well, such as antimicrobial resistance, in which the Netherlands is presenting itself as a leader on the world stage.

I have given you some insights into my view of Global Health. This view, as a result of my background, mainly focuses on infectious diseases. But over the years I have been able, together with my colleagues from AIGHD, PharmAccess and the Health Insurance Fund, to study other areas of Global Health as well, varying from health financing and maternal and child care to the epidemic of cardiovascular diseases in Africa. This research has provided us with a lot of experience, experience I see as invaluable for the research within AIGHD and for the research I hope to focus on in the future. This experience is also very useful when it comes to education. The AMC's updated Bachelor of Medicine has room for Global Health education. The next generation of doctors should be doctors of the world, and an

understanding of Global Health issues is an important aspect of this worldliness. By this, I do not mean that all doctors should become tropical doctors. On the contrary, clinical capacity and research capacity should be developed with doctors from regions lacking this. What I mean is that every doctor needs to understand that healthcare in the Netherlands is connected to what happens in other places in the world. Multiple examples of this can be named, from children with birth deficiencies due to the Zika virus or a student with a urinary tract infection caused by resistant bacteria after a trip to India, to the reintroduction of infectious diseases to the Netherlands by refugees from conflict-affected areas. The academic staff of the AIGHD and the department of Global Health, led by Guus ten Asbroek, are working on contributions to the development of the curriculum, together with the Global Health Institute of Duke University in the United States, amongst others.

The tiny department of Global Health at the AMC manages, thanks to both the non-academic and academic staff of AIGHD, to produce an impressive amount of publications and Master and Doctoral theses of Dutch and international students every year. Despite the department's small size and the lack of financial support for teaching activities, our level of ambition is high. The Joep Lange Chair holders, currently Dan Ariely and Mark Dybul, contribute to the critical mass needed for our aspirations in both education and research. The next step is a PhD in Global Health that transcends disciplines, using the interdisciplinarity that the University of Amsterdam also aspires to as a starting point. Our antimicrobial resistance programme could be a good example of such a PhD programme. Conceptualizing and realizing such ambitions is complex in itself, but I hope we can submit a concrete proposal to the University in the near future

Memorial plaque for Antoni van Leeuwenhoek in Delft, signed J.C. Schultsz, 1909

P. van derKrogt

I thank the College van Bestuur en the Dean of the Faculty of Medicine for the trust placed in me. I would also like to thank Marcel Levi for the trust he has placed not only in me but also in AIGHD.

I stand here in the gown distinguished predecessors from Tropical Medicine and Global Health have worn, handed down to me by Piet Kager, for which I am thankful. This gown inspires, encourages and demands. Professor of Tropical Medicine Ary de Geus also wore this gown. It was with him as a supervisor that I started doing my diarrhea research, without a doubt the first step towards my career in Global Health. It might be a cliché but life is unpredictable. Not only did Ary de Geus pass away too soon. So did my promotor and supervisor Jaap Dankert who, along with Guido Tytgat and Peter Speelman, gave me all the space I needed during my research and supported me during my specialization in medical microbiology. Peter Speelman, by the way, predicted during my PhD thesis defense that one day I would be standing here.

I am extremely grateful for my time at the Oxford Unit in Vietnam. I cherish the collaboration with Hoa Ngo which still continues and has resulted in the PhD thesis defense of Trung Nguyen, yesterday here in the Aula. Jeremy Farrar, you have contributed hugely to my reaching this moment. You have been an incredible inspiration during my time in Vietnam and you still are. I opened a Twitter account only to follow you. This says a lot about you, and probably also a little bit about me….

Obviously Joep Lange, the helmsman and founder of AIGHD, also passed away too soon. Those who knew Joep, and who amongst us didn't, knew that he had guts. Joep took a risk by plunging me into unknown territory shortly after my arrival at AIGHD. A medical microbiologist venturing into the world of health insurance… he definitely placed a lot of trust in me. With colleagues from AIGHD we formed a team, working closely together with development economists led by Jacques van der Gaag. This team now consists of members of a new generation, but it is also a multidisciplinary team Joep would undoubtedly have trusted.

I would not be able to carry out any of my current and future research plans without the Department of Medical Microbiology of the AMC. This is not because of its charismatic leader, it is because of the scientific and clinical staff with whom I closely collaborate with great pleasure, of whom I would like to mention Arie van der Ende, Yvonne Pannekoek, Caroline Visser and Marion Kolader in particular.

And now I am leading the department of Global Health with Frank Cobelens, and AIGHD with Frank, Chris Elbers, Michiel Heidenrijk and Anita Hardon, which I consider a privilege. Due to our shared ambitions, I am optimistic and full of anticipation about what we can achieve together: a synergy of disciplines that should yield innovative research and the next generation of innovating researchers and educators. I hope we will be able to pursue our goals together with the Joep Lange Institute which was founded in 2015.

Like father, like daughter. The other Professor Schultsz (written with tsz) in the registries of the University of Amsterdam is my father. He was a lawyer but he specialized in international law, including international laws of transport and the sea. Both my parents have passed away but they are fortunately strongly represented here today by the full cohort of my brothers and sisters.

Dear Menno, Nina, Simon and Shosha, I wonder if you are well aware that we make an exceptional team together? I can't think of anything more joyful than driving off in a car with a Spotify playlist and the next generation in the backseat, all of us wondering what will come next?

TRANSLATED FROM DUTCH BY NINA DE JONG