

“Antimicrobial resistance is a global crisis – a slow motion tsunami.  
The situation is bad, and getting worse.”

MARGARET CHAN, WHO DIRECTOR-GENERAL



# RESISTANCE A FILM BY MICHAEL WECH FIGHTERS

## THE GLOBAL ANTIBIOTICS CRISIS

BROADVIEW DISTRIBUTION PRESENTS A BROADVIEW PICTURES FILM A CO-PRODUCTION WITH ZDF IN COOPERATION WITH ARTE WITH THE SUPPORT OF HESSENFILM FILM- UND MEDIENSTIFTUNG NRW  
A FILM BY MICHAEL WECH PRODUCED BY LEOPOLD HOESCH "RESISTANCE FIGHTERS – THE GLOBAL ANTIBIOTICS CRISIS" CINEMATOGRAPHY BY JOHANNES IMDAHL, BVK SVEN KIESCHE EDITED BY MICHAEL SCHEFFOLD  
MUSIC ANDREAS LUCAS SOUNDDSIGN & RE-RECORDING MIXER OLIVER ACHATZ DESIGN & TITLES GROSSEB PRODUCTION MANAGER KAROLINE NOTH ISABELL WEHING ARCHIVE RESEARCHER KIRBY WELCKER  
COLOR GRADING MAURICE LANGEHEIN PRODUCTION CONTROLLER BETTINA KLUGE COMMISSIONING EDITOR MARTIN PIEPER (ZDF/ARTE) CREATIVE PRODUCER PETER WOLF DIRECTED BY MICHAEL WECH PRODUCER LEOPOLD HOESCH

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Production

# RESISTANCE FIGHTERS

THE GLOBAL ANTIBIOTICS-CRISIS

a co-production with



In cooperation with



With the support of



A film by  
Michael Wech

Produced by  
Leopold Hoesch

Documentary | 98 Minutes | 4K

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## PRESS NOTE

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*„Antimicrobial resistance is a global crisis – a slow motion tsunami.  
The situation is bad, and getting worse.“*

**Margaret Chan, former WHO Director-General, September 2016**

In September 2016, global leaders will meet at the UN to hold a high-level meeting in New York to discuss the growing resistance of antibiotics worldwide. Only three times since its foundation has the United Nations agreed on common guidelines in the health sector. However, the representatives of the international community are placing the topic at the top of the agenda - because experts predict that the number of deaths from antibiotic-resistant germs could increase tenfold by 2050. If nothing is done, these pathogens could kill ten million people every year, and antibiotic resistance would be the number one cause of death worldwide.

Is a new era dawning for medicine? The first step into the postantibiotic age has already been taken. Pan-resistant germs already exist today - pathogens that are resistant to all available antibiotics. Pharmageddon can only be prevented, if we act quickly and decisively. A world without antibiotics would be very different from the world we live in today: As in the 19th century, masses of people would die from the simplest infections, life-saving operations and the treatment of serious diseases would no longer be feasible because of the consequential risks.

How did this happen, and what can we do? RESISTANCE FIGHTERS is on the global search for the reasons and solutions for the crisis and is relentlessly demonstrating the international connections that are leading to an ever more rapid spread of resistance. Starting from the UN Special Assembly, author Michael Wech accompanies antibiotics experts, such as economist Jim O'Neill, over a period of two years and takes the viewer to hot spots such as Vietnam, Bangladesh, Lower Saxony or Reno, Nevada. The film shows how much the problem has been ignored for a long time against better judgement. And it makes it clear how new resistance mechanisms could emerge that were hardly conceivable until recently. How the mass use of antibiotics in animal fattening can lead to the uncontrolled release of resistant germs into the environment. That negligence and powerful economic interests, which put their profit above the well-being of people, have been putting our lives at risk for decades. And at the same time, well-known companies are continuously withdrawing from antibiotics research because immense development costs and increasing resistance to new antibiotics make their business unfeasible. Although research is a decisive key - because in the race against the inevitable, the solution lies right in front of us, we just have to get to grips with it.

This is how the documentary develops into a real science thriller, with the "Resistance Fighters" themselves at its center: Doctors who desperately fight against development, scientists who revolt, patients who struggle with death because of resistant germs and diplomats who work for concrete solutions. An exciting portrait of an increasingly uncontrollable crisis that gives an insight into what we are actually dealing with: Antibiotic resistance is one of the greatest global challenges of our time.

RESISTANCE FIGHTERS was shot completely in 4K. The film was directed by Michael Wech (Boris Becker - Der Spieler, Der lange Arm des IS, Todesflug MH-17, Experiment Energiewende, etc.). RESISTANCE FIGHTERS was produced by Emmy Prize winner Leopold Hoesch, BROADVIEW Pictures, in co-production with ZDF and in collaboration with ARTE. The production was supported by HessenFilm and the Film- und Medienstiftung NRW.

## THE PROTAGONISTS

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### **Timothy Walsh**

Professor of Medical Microbiology and Antibiotic Resistance at Cardiff University, Wales. Leading microbiologist on antibiotic resistance, advisor to the WHO, the European Commission and the Chinese Center for Disease Control and Prevention. In 2015, he discovered the extremely mobile resistance gene MCR-1, which rapidly spread internationally in spring 2016 and can trigger multiple resistances. He is at the forefront of science and appears on the international political stage.

### **Jim O'Neill**

British economist and financial expert, former chief economist of Goldman Sachs. Appointed in 2014 by then Prime Minister David Cameron as Special Representative of the British Government for antibiotic resistance. Since then, he has fought on the international political stage for a joint solution to the global antibiotics crisis.

### **Slava Epstein**

Professor at Northeastern University, Boston; microbiologist and bacterial researcher. Researches the "dark matter of microbiology", the pool of millions of completely unexplored bacteria.

### **Gerd-Ludwig Meyer**

Dialysis physician from Lower Saxony and co-founder of the initiative "Doctors Against Mass Animal Husbandry". He treats affected patients and investigates the connections between mass animal husbandry and antibiotic resistance.

### **Maryn McKenna**

US science journalist and author, who has published and written in numerous media platforms, including her book "Superbug: The Fatal Menace of MRSA" on the subject of antibiotic resistance.

### **David Ricci**

Lost his leg in an accident in India and there, infected himself with a germ in the hospital. He had to undergo emergency surgery several times in the USA, survived only barely, several antibiotics did not work. To this day, doctors cannot say with certainty whether the germ continues to rage in his body.

### **Further Interviewpartners:**

**John Lynch**, Treating physician of David Ricci (USA)

**Sally Davies**, Chief Medical Officer (GB)

**Juan José Gómez Camacho**, UN Ambassador of Mexico

**Peter Greenhouse**, Sexual health expert (GB)

**Kevin Brown**, Medical historian (GB)

**David Cromwell**, Former Doctor of the US Armed Forces in Vietnam

**Nolan Stone**, Rancher (USA)

**Paul Menzies**, Local historian, Middlesbrough (GB)

**Ann Tucker**, Former nurse in Middlesbrough (GB)

**Steven Finch**, Brother of twins, who died in Middlesbrough due to antibiotic resistance (GB)

**Richard Novick**, Microbiologist, New York University (USA)

**Tom Grumbly**, Chairman of the Foundation Supporters of Agricultural Research (USA)

**Edward Allera**, Pharmacist and former lawyer of the Food and Drug Administration (USA)

**Dr. Tanveer Ahmed**, Assistant professor of plastic surgery, Dhaka Medical College (Bangladesh)

**Uwe Behrens**, Alliance MUT - Man, Environment, Animal, Großenkneten-Amelhausen

**Randall Todd**, Chief epidemiologist of the district Reno, Nevada (USA)

**Lei Chen**, Epidemiologist of the district Reno, Nevada (USA)

**Alexander Kallen**, National Office for Disease Control (USA)

## INTERVIEWS AND FACTS

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*„Antimicrobial resistance is a global crisis – a slow motion tsunami. The situation is bad, and getting worse.“ „The global health landscape is being shaped by three slow-motion disasters: a changing climate, the failure of more and more mainstay antibiotics, antimicrobials and the rise of chronic non-communicable diseases as the leading killers worldwide.*

**Margaret Chan, former WHO Director-General, September 2016**

*„Antimicrobial resistance is a global crisis“ „Ultimately the future of humanity may depend on our ability to respond to the great challenges of antimicrobial resistance.“*

**UN Speaker at the UN Special Assembly on Antibiotic Resistance, September 2016**

*„This is a lengthy war that's made up of many battles, and if you look at the way in which the bugs are able to evolve very very quickly and acquire antibiotic resistance there is no country that is immune to this. You know this is a global concern. So, for too long we've been myopic. For too long, we've kind of put up the barriers and for too long, we failed to understand and engage the issues. Because what actually happens here will eventually become global. The urgency of the threat is by 2040/2050 we will be back at the pre-antibiotic era that is to say we will be back in the 19th century when we didn't have antibiotics when people died from common infections. We are close to that.“*

**Timothy Walsh, Leading microbiologist for Antibiotic Resistance**

*„If we don't do something about antimicrobial resistance, in another 35 years there could be ten million, ten million people a year dying. All over the world. Both developed and developing. And as we highlight: Probably more people than are dying of cancer today. Second thing we showed, directly in terms of economics and finance: How much will that cost the world economy? And this shows you that the accumulated cost over the next 35 years would be a staggering one hundred trillion dollars.“ „Even if you're a really good country in Europe dealing with this problem – if over the other side of the world nobody is, you're gonna get affected by it. And so just like some of these other big global issues like terrorism or climate change it is a truly truly 7,5-8 billion person problem that we have all collectively gotta solve.“*

**Jim O'Neill, Special Representative of the UK Government for Antibiotic Resistance**

*„If we truly lost all our antibiotics it would be a bomb blowing up our health care systems around the world. Where I think we are now is that we have lit the fuse that leads to that bomb. It's burning. We just don't know how long it is.“*

**Maryn McKenna, Science journalist and author**

*„We exist only because they created conditions for us to exist there. The key-role the driving force of everything that actually happened on the planet during the evolution over the past four billion years – that role shouldn't steal into people the feeling of awe and respect.“ „Some of the more important diseases that kill people are the result of microbial activities. But we can utilize that which microorganisms themselves produced for our own need. Antibiotics are weapons that microbes use in their own world to fight other microbes. Those molecules have properties that are useful for us as we fight our infections.“*

**Slava Epstein, Slava Epstein, Microbiologist and bacteriologist**

*„We don't really want to go back to a world where none of the drugs work because in that situation the treatments were barbaric.“*

**Peter Greenhouse, Sexual health expert**

**In 2016, 80% of all antibiotics administered in the USA were used in animal feed. A total of 15 million kilogrammes. This is equivalent to 300 milligrammes of antibiotics per kilogramme of produced meat.**

**All hearings on the topic of antibiotic growth promoters were completely blocked in the US Congress for 40 years despite scientifically proven correlations.**

**Most recently, the US pharmaceutical industry made an annual turnover of \$13 billion with antibiotics in animal feed.**

*„When we think about the problem of antibiotic resistance to the degree that people do think about it I suspect that most people make assumptions about how we have misused antibiotics in medicine. But all along from the very beginning of the antibiotic era there's been this parallel story of misusing antibiotics in agriculture as well, of giving antibiotics to animals that are not sick that do not need them.” „It's very clear that the scientists who proved this effect didn't think there was any significant downside. It never seems to have occurred to them that those resistant bacteria – which we were raising in the animal's guts as a result of antibiotics given them in their feed – that those bacteria were not going to stay confined to the animal. That they would pass out of the animals in their manure and either contaminate the environment and move on from there or when the animals were killed get on to the meat that the animals become as the guts were removed from the carcass. So there was contamination travelling across at least two pathways into the environment and away from farms that way and on to meat and into homes and kitchens in that matter.”*

**Maryn McKenna, Science journalist and author**

*„There's lots of driving forces with respect to the dissemination to antimicrobial resistance but there is no doubt at all that the use of antibiotics in animals as a growth promoter has accelerated this process, certainly the way we have gone about surveillance in the past has actually been quite frankly profoundly incorrect. So people looked at hospitals, at animals and not really joined them up. Really nobody's looked at the environment and maybe nobody's actually looked at insects or human normal flora and try to join up all these dots if you'd like to make the picture.”*

*„They go into your home and so there are quite frankly a hundred and one ways where the bacteria that are antimicrobial resistant that can come out of the chicken houses can actually disseminate into communities contaminate if you like our normal flora and then potentially go on and cause endogenous infections.”*

**Timothy Walsh, Leading microbiologist for Antibiotic Resistance**

**According to the German VDI standard, a pen with 30,000 chickens for fattening spreads 2.1 million germ-forming units of staphylococci. Per second. The bacteria enter the environment via the air exhaust. Official investigations on the spread of resistant germs are not carried out.**

**In 2017, the WHO defined eight antibiotics as the last choice. These reserve antibiotics are to be reserved exclusively for human medicine.**

**Three of these life-saving reserve antibiotics come from Germany for use in animal fattening.**

"It was the same as for people then. If a pig was sick, only that pig got the right antibiotic after a vet's diagnosis. I don't see a problem with it. *After 13 years of dialysis, I saw the first multi-resistant germ in 2000 in my practice in Wildeshausen, where there are slaughterhouses. I perceived dramatic changes in 2005/2006 that were highly relevant. I began noticing one thing. We supervise the clinic here, an intensive care unit. Between 2001 and 2010, the chicken population in my small district of 80,000 inhabitants increased from one to ten million, or by 1,000%. And so did the use of antibiotics. You don't have to be a smart doctor to see the connection. And I see it very clearly.*"

**Gerd-Ludwig Meyer, Co-founder of the initiative "Ärzte gegen Massentierhaltung" (Doctors Against Mass Animal Husbandry)**

**As late as 2000, Pfizer sold \$40 billion worth of antibiotics. In just twenty years, the company had quintupled its sales in this sector. The closure of the Sandwich plant follows a global trend: today only six of the world's 50 largest pharmaceutical companies conduct research on antibiotics.**

**There are currently around 800 cancer and high blood pressure medications being clinically researched worldwide – but only 28 antibiotics. It is likely only two of them will reach market maturity. The last new antibiotic class was introduced in 1984.**

**Slava Epstein has already found several antibiotic substances. These potential agents must be tested on human agents before they are allowed market entry. These so-called clinical trials are so complex and costly that they cannot be performed by university research institutions. They require partners from the pharmaceutical industry.**

*„The overwhelming majority of antibiotics currently on the market came from microorganisms, mostly from bacteria. But only from those that can be cultivated in the lab because those that cannot be cultivated in the lab remain unutilized. So one percent, a tiny fraction, of microbial diversity on the planet that we've been able to cultivate provided us with health to millions, billions of people for half a century. That came from a source that may be one thousand times smaller than that we have not explored yet. Can you imagine how much the other part contains? It may be – minimally – hundreds of thousands, millions. Some people say there are millions in every gram of soil. We have not seen it, we have not cultivated it, we have not utilized it.” „That matter that we know exists in microbial world in nature but does not exist in the lab. Something that...big unknown. And the other name for that entity is 'microbial dark matter'. It's a treasure trove of various bioactive compounds. All we need to do is to find access to this 'microbial dark matter' and start using those new species in our research for new antibiotics. It's all there. You just need to find a way to grab it.”*

**Slava Epstein, Microbiologist and bacteriologist**

*„It's generally accepted that making a new antibiotic or any drug takes 10 to 15 years. And at least a billion dollars. Imagine that you are the CEO of a pharmaceutical company making a new antibiotic and you bring your new very expensive drug out. Maybe within five years 20% of a particular bacterium are no longer responsive to your antibiotic. What if your drug is very very good? That means that medicine might never want to use it – they want to keep it on the shelf as a hedge against things getting even worse. Either way you haven't made back your R&D-Investment (Research and development). And it doesn't look likely that you will. In that setting – to me – it makes perfect sense that no one would make antibiotics anymore. They don't bring the kind of return on investment.”*

**Maryn McKenna, Science journalist and author**

*„I think actually it's reflective of the modern pharmaceutical company having a narrow-minded business model. And of course you have to remember: I spent 30 years in finance as the chief economist of a famous global investment bank. So I kind of understand the mind-set of some of these things. They have all these different business lines and they give them all a return on profit-targets. And if they don't all make those profit-targets they won't do them. Guess what? That is a stupid way – in my opinion – to behave. Because antibiotics are relevant for all these different business lines. If we run out of antibiotics they probably won't be able to sell a lot of these cancer treatments. So instead of treating antibiotics as one of these separate business lines it should be embedded into all their businesses. And if they don't do it voluntarily – I think as we creep through time – policy makers are possibly gonna have to get provocative and aggressive in forcing pharmaceutical companies to behave differently.”*

**Jim O'Neill, Special Representative of the UK Government for Antibiotic Resistance**

*„Imagine the day the doctor says: 'Sally you've got cancer, we can probably treat it but you will get an infection'. And I say 'Huh but it's likely to be resistant. Have you got the treatment for it?' and they say 'No'. What am I going to do? The horrid cancer treatment and then die of infection or my bucket-list?"*

**Sally Davies, Chief Medical Officer (GB)**

**In late 2012, two years after Timothy Walsh's discovery, researchers found variants of NDM-1 resistance in 42 bacterial species. NDM-1 had spread to 55 countries.**

*„The one thing we also wanted to understand was how widespread it was in the Indian environment. And so we then took some samples around India, particularly around Delhi and found actually NDM was present in about 50-60% of the samples that we got. And also actually present in drinking water, portable water at about 5%. So that kind of gave us some sort of understanding that actually perhaps what we're seeing in these clinical samples was really the tip of the iceberg. And there's now a mechanism of resistance out there not just in the clinic in the hospitals but also in the environment that's likely to spread very very quickly.”*

**Timothy Walsh, Leading microbiologist for Antibiotic Resistance**

*„I remember it's a Friday and a Saturday so they work hard on a weekend just to try to detect what resistant mechanism this bacteria had. We got the result on September 1st and we were told it's non-susceptible to all 26 antibiotics for the United States for this type of treatment.”*

**Lei Chen, Epidemiologist of the district Reno, Nevada (USA)**

## LOCATIONS (Selection)

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### NEW YORK

New York in September 2016: Jim O'Neill arrived on a special mission. On behalf of the British government, he is preparing a UN resolution to combat the worldwide rampant resistance to antibiotics. So far, the states have not been able to achieve a breakthrough on this issue, but have remained silent on appeals from the WHO. Only three times in the history of the United Nations have the states agreed on common guidelines for health care. But all the experts here know that the international community must act urgently. For twenty years, O'Neill worked as Chief Economist at Goldman Sachs. Just a few years ago, he knew little about antibiotic resistance. He is neither a physician nor a pharmacologist. But O'Neill and his team have been working for almost two years on a study that will reveal alarming facts: The number of deaths caused by antibiotic-resistant germs could increase tenfold by 2050. Without effective antidotes, the bacteria would kill 10 million people every year. More people would die from them than from cancer and diabetes combined. And if antibiotic resistance continues to spread at the same pace as before, this global crisis will not only bring suffering and misery to people in remote parts of the world. Antibiotic-resistant bacteria know no boundaries. They affect people in the heart of Europe as well as in the slums of Mumbai. And it is not just about millions of individual fates. If antibiotic-resistant bacteria continue to spread, according to scientifically based scenarios, this epidemic will not only burden the health sector with costs in the billions, but will also slow down global economic growth for decades to come. O'Neill is trying to forge alliances for his project. And he has powerful advocates: These days in New York, Margret Chan, Director-General of the World Health Organization (WHO), is warning of a "slow-motion tsunami" that could lead to a "post-antibiotic age". It is a threat of historic proportions, the next global challenge of our time.

### CARDIFF

Cardiff in Wales. In autumn 2010, a discovery will be made public here that will attract worldwide attention among doctors and scientists. In the laboratory of the Cardiff University School of Medicine, Timothy Walsh examines drinking water samples from New Delhi. Walsh is one of the world's leading microbiologists in the field of antibiotic resistance. The Australian scientist has long been concerned with the question of how resistance develops in bacteria and, above all, how they spread. He was interested in the resistance information NDM-1, a genetic code that triggers resistance in various bacteria. Walsh was familiar with many cases of people who were infected with a resistant pathogen caused by NDM-1 in an Indian hospital. But there were also travellers to India who had only been in the country for a short time and under the best hygienic conditions. Walsh therefore procured drinking water samples and samples from Indian sewage treatment plants in the New Delhi area to examine them. He was able to detect NDM-1 in both drinking water and wastewater. "This is a disturbing discovery. It shows that people are exposed to risks that they are not aware of. Resistant pathogens are found in the environment. Anyone can catch them," says Walsh. And the investigations showed something else: NDM-1 seems to be a mobile gene capable of transferring resistance from one bacterium to another. Walsh found eleven different bacteria in the Indian water samples - all with the resistance gene NDM-1. NDM-1 primarily overrides the effect of the antibiotic carbapenem. This antibiotic is now useless against pathogens into which NDM-1 has been introduced. For some diseases, it was previously regarded as a reserve antibiotic. As a last resort: In an infection with Entero bacteria, the death rate is now 40 to 50 percent. Shortly after his publication, Walsh was invited by the WHO and the European Parliament and also reported to the NATO medical staff.

## **BOSTON**

Slava Epstein's lab. The enthusiastic microbiologist and bacterial researcher is a humble scientist. For his research, Epstein and his team cultivate bacteria in nature and then bring them to the laboratory. This gives him access to many times more microorganisms than if he were plating a soil sample in the laboratory. In this way, he discovers "domesticated" species that were previously unavailable. A rule of thumb in the pharmaceutical industry is that 100 new chemical antibiotic compounds must be found - compounds that can kill microbes - before a new drug can be developed. The other 99 are unusable because they are toxic to humans.

## **LONDON**

London, 1935: In his laboratory at St. Mary's Hospital in Paddington, Scottish pharmacologist Alexander Fleming makes a discovery that will change medicine forever: He finds out that secretions of a mould fungus, which he will call penicillin, kill bacteria. At the height of the Second World War, the military became interested in the new substance that could heal wound burns. After the bombing of Pearl Harbour, the USA and Great Britain began mass production of penicillin. When the Allies reach the French coast on D-Day, the soldiers have enough penicillin in their luggage to take care of every wounded man. Antibiotics serve as a weapon against Nazi Germany. Fleming is knighted. When he was awarded the Nobel Prize for his discovery in 1945, he warned that penicillin could one day become ineffective because bacteria developed resistance to it. Fleming was right. But hardly anyone listens to him.

## **VIETNAM**

1968: The Vietnam War reaches its climax. Over 400,000 US soldiers fight against the Vietcong. Most of them are not older than 18, 19 years and are allowed to drink beer for the first time. On the first of every month they receive their pay and go straight to the city, where there are prostitutes in every bar and everywhere on the streets. Many of them get infected with gonorrhoea, which could be treated with penicillin within a few days. After the Vietnam War, resistant gonococci spread worldwide, and ten years later half of the pathogens are resistant to penicillin. In 1980, penicillin was so ineffective that it should basically be withdrawn. It takes another 20 years for ciprofloxacin, which is also used against gonorrhoea, to fail. According to WHO estimates, the number of new cases in 2017 will be 78 million - more than one percent of the world's population.

## **LOWER-SAXONY**

In the EU, antibiotics are not approved to improve performance and yield. But there is a grey area: the preventive use of antibiotics in animal fattening is hardly tested. There is a lack of funds. On the road with Gerd-Ludwig Meyer, internist and nephrologist from Nienburg an der Weser. Meyer comes from a farm, but did not want to continue his parents' business. He studied medicine and has been running a dialysis practice for almost thirty years. His patients usually have a weakened immune system. Often they are farmers from rural areas. Most of them live near fattening farms. Again and again the doctor feels helpless and angry. Several times a year, patients die from infections with resistant germs. Out of desperation, Meyer himself has initiated research: About the connections between mass animal husbandry and antibiotic resistance. About resistant germs in waters and soils in the regions of northern Germany where intensive agriculture is practised.

## **SEATTLE**

Seattle, Washington State. David Ricci takes off his leg prosthesis. Three years ago his thigh had to be amputated. Ricci was infected with antibiotic-resistant bacteria. In India. After finishing high school, David had completed a social year in India. In Calcutta he worked in an orphanage. On his way there he wanted to take a shortcut through a slum, along a railway line. He crashed and a train crushed his leg. The lower leg was amputated immediately. In a hospital in Calcutta, he became infected with a germ that carried the resistance gene NDM-1. Back in the USA, the doctors fought for his life and several antibiotics failed. Other parts of the leg had to be amputated to get the infection out of the body. David Ricci survived. The doctors cannot say with certainty whether NDM-1 is still raging in his body.

## **SANDWICH, KENT**

Sandwich in the county of Kent. The international pharmaceutical company Pfizer maintained a large development laboratory here and was a leader in the research of new antibiotics. In 2011, however, the company closed its laboratory and 2000 scientists and laboratory staff were dismissed. Like many other large companies worldwide, Pfizer has completely withdrawn from antibiotics research. The development of these special drugs costs a good 1.5 billion euros. It takes at least ten years for these drugs to reach market maturity. Because the treatment of chronic diseases pays off better, around 800 cancer and high blood pressure drugs are currently being researched worldwide, but only 28 antibiotics. And only a few of them will reach market maturity. A race against time begins. The world urgently needs new antibiotics, but the development is not worth it for industry. The research pipeline is dry. Should the international community subsidise pharmaceutical companies or create financial incentives to boost urgently needed antibiotics research?

## **RENO**

In a hospital in Reno, Nevada, a patient is admitted who is in her mid-seventies and has broken her hip in India. There she was hospitalized and treated. After her return to the USA, she had symptoms which led to her being admitted again. The doctors in Reno diagnose Klebsiella bacteria. The case is reported to the National Disease Control Agency, which can test for a wider range of antibiotics than a hospital laboratory. It is very rare to find pathogens here that are resistant to anything. However, the bacterium found in the patient does not respond to any of the 26 antibiotics available in the US for this type of disease.

## INTERVIEW WITH DIRECTOR MICHAEL WECH

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### **Mr. Wech, how did you become an "antibiotics expert", how did you make this topic yours?**

As with almost every topic I tackle, I start from scratch. I never want to become an expert. I want to be the questioner. Experts are always the others. It has to stay that way. Otherwise we won't be able to fulfil our task.

### **They went on a global search for clues for the film. How long and where did you shoot?**

We started with a three-week film trip across the USA, spent one week each in Vietnam and Bangladesh and several times in England and Wales.

### **Did you approach the matter with a special attitude, or was it open-ended?**

The subject is very complex. After I had decided to tell the film without a speaker's text, it was clear to me that we needed a very precise script in order to master it. At the same time, I wanted to accept the challenge and allow complexity. But the deeper I got into the subject, the more often I came to a point where I said to myself, 'You can't do this. The material is too heavy. Leave it alone'. But there was no going back, because even before I could really start developing the story, we had already finished shooting at the UN in New York and the WHO in Geneva. Leopold Hoesch had already been on fire with the idea for this film, and in a way he just threw us in the deep end. I'm grateful, because thanks to his impulsiveness I now had a luxury problem that documentary directors rarely face: a stubborn producer forces you to take up the fight with a material that is set on several continents and - "only" - to be developed dramaturgically.

### **So how did the work continue?**

I developed three levels on which I wanted to unfold the subject narratively: The political level was quickly found. The British government had made the financial expert and former Goldman Sachs chief economist Jim O'Neill state secretary with special duties. As "Mr. Antibiotic Resistance" he was on a diplomatic mission to raise the issue to the highest political level. We accompanied him on this mission. On the second level I wanted to show a development. An individual fate or a single story would have been too small to do justice to the size of the subject, so I developed a narrative thread that shows the milestones of the historical development - the history of antibiotic resistance, if you will. This level drives the film forward again and again in various chapters. We start with a research in Yorkshire and tell how a children's hospital in the English town of Middlesbrough was struck by an epidemic in 1967. 15 babies die because antibiotics aren't working, possibly the first clearly documented victims of antibiotic resistance. Another protagonist of this narrative is David Cromwell, who, like many other doctors in the US Army, repeatedly gave GIs penicillin injections against gonorrhoea infections during the Vietnam War. A few years later, gonorrhoea was resistant to penicillin. On a third level, I wanted to locate the scientific debate. But there had to be a link to the other two narrative strands. I had seen several reports in which researchers, for example, travel on the Amazon and find supposed antibiotic agents. That was nice to look at, but the gain in knowledge was too small for me. I also became suspicious when terms like "killer germs" or "Nightmare Bacteria" appeared in the media. I always felt that this was pure panic-mongering. Instead, I wanted to understand why Jim O'Neill had announced to the United Nations that antibiotic resistance could become the number one cause of death in 2050. What was behind this scenario?

### **Quite a question of explosive power. Mr. Wech, how did you become an "antibiotics expert", how did you make this topic yours?**

As with almost every topic I tackle, I start from scratch. I never want to become an expert. I want to be the questioner. Experts are always the others. It has to stay that way. Otherwise we won't be able to fulfil our task. They went on a global search for clues for the film. How long and where did you shoot? We started with a three-week film trip across the USA, spent one week each in Vietnam and Bangladesh and several times in England and Wales.

**Did you approach the matter with a special attitude, or was it open-ended?**

The subject is very complex. After I had decided to tell the film without a speaker's text, it was clear to me that we needed a very precise script in order to master it. At the same time, I wanted to accept the challenge and allow complexity. But the deeper I got into the subject, the more often I came to a point where I said to myself, 'You can't do this. The material is too heavy. Leave it alone'. But there was no going back, because even before I could really start developing the story, we had already finished shooting at the UN in New York and the WHO in Geneva. Leopold Hoesch had already been on fire with the idea for this film, and in a way he just threw us in the deep end. I'm grateful, because thanks to his impulsiveness I now had a luxury problem that documentary directors rarely face: a stubborn producer forces you to take up the fight with a material that is set on several continents and - "only" - to be developed dramaturgically.

**So how did the work continue?**

Dealing with this question is a science thriller. And that's how we try to tell it. It begins in the laboratory of microbiologist Timothy Walsh in Cardiff. Walsh has recognised that the question of the increasingly rapid spread of resistance can only be answered by those who understand the resistance mechanisms, i.e. the genetic code that ensures that the attack mechanisms of antibiotics are rendered ineffective. He has shown that bacteria can exchange this information with each other like in a card game. This means that resistances can not only be transferred from one generation to the next, but also from one bacterial species to another - as in a chain reaction. This all sounds very, very scientific now, but I believe that this is the key to everything. And so we accompany the resistance hunter Timothy Walsh in his work to Dhaka in Bangladesh and the Hanoi area in Vietnam. What he finds there is really fascinating. And - I can already say that much - I am convinced that everyone who sees the film understands the connections. That was exactly what I wanted.

**But RESISTANCE FIGHTERS inevitably leads to the "Nightmare Bacteria", as you have called it.**

The film follows a clear dramaturgical arc. In the end there is actually the "Superbacterium", of which I spoke above - this term that has always made me suspicious because I had not understood the background. And now the film ends with the story of a woman in Reno, Nevada, who dies because she carries within her a germ that is resistant to all 26 antibiotics in question. It's not supposed to sound cynical or heartless - but it's something of a world record for antibiotic resistance. And the premonition of how gloomy the future of the post-antibiotic age could look.

**This means that the germ is resistant to antibiotics and not the patient. This is a crucial point, and many people may have the wrong idea about it.**

Only bacteria become resistant to antibiotics, not humans or animals. Antibiotics can kill bacteria. However, the more frequently a bacterium comes under pressure in this way, the faster it develops resistance. The antibiotic loses its effect against this bacterium. By the way, this topic clearly differs from the problems with viruses, which are commonly referred to as germs, which do not play a role in our film, because antibiotics cannot be used to combat viruses.

**With what feeling did you look at the subject before this documentary, and with what feeling do you do it today?**

I was already indirectly involved with the subject before, because I was twice in hospital with a serious bacterial infection. Fortunately, the topic of resistance did not play a role. But I realized how dependent we all are on antibiotics. I had always tried to do without antibiotics, but there are situations where this is not possible. When antibiotics are no longer effective, there is a risk that they will not work.

## Michael Wech – Director

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Michael Wech, born 1969, worked as a trainee with the filmmaker and book author Egmont R. Koch and then studied political science and international relations in Hamburg and London and as a scholarship holder at Bilkent University in Ankara. Since 1998 he has been shooting documentaries for ARD, ZDF, 3sat and ARTE. The author has specialised in complex topics, often interweaving documentary material and re-enactment. In addition, Michael Wech has produced numerous biographical portraits, e.g. on Jörg Immendorf (together with Hanns-Bruno Kammertöns and Stephan Lamby), Gerhard Schröder (with Jürgen Leinemann) and Udo Jürgens and Boris Becker (both with Hanns-Bruno Kammertöns). He has received several awards for his documentaries, including the Holtzbrinck Prize for Business Journalism and the Franco-German Journalism Prize. For the documentaries Todesflug MH17 (with Demian von Osten and Ralph Hötte) and Der lange Arm des IS - Wie der Terror nach Europa kommt (with Andreas Spinrath, Georg Heil, and Volkmar Kabisch) he was also nominated for the German Television Award in 2015 and 2016.

### Filmographie (Selection)

2019	Resistance Fighters: The Global Antibiotics Crisis	Doku	1 x 98'	ARTE/ZDF
2017	Boris Becker – der Spieler (mit Hanns-Bruno Kammertöns)	Doku	1 x 90'	WDR/ARD
2016	Der lange Arm des IS (mit Andreas Spinrath, Georg Heil, und Volkmar Kabisch)	Doku	1 x 45'	WDR/ARD
2015	Todesflug MH17 (mit Demian von Osten und Ralph Hötte)	Doku	1 x 45'	WDR/ARD
2014	Der Mann, der Udo Jürgens ist (mit Hanns-Bruno Kammertöns)	Doku	1 x 90'	ARTE
2012	Was macht Merkel? Die Kanzlerin in der Euro-Krise (mit Stephan Lamby)	Doku	1 x 45'	WDR
2012	Der Domino-Effekt – Kippt der Euro? (mit Stephan Lamby)	Doku	1 x 95'	ARTE
2011	Fischer, Schily: Mein 11. September! Wie der Terroranschlag die Bundesregierung traf (mit Stephan Lamby)	Doku	1 x 45'	WDR/ARD
2011	die story. Protestbürger	Doku	1 x 45'	WDR/ARD
2008	Duelle: Helmut Kohl gegen Franz-Josef Strauß	Doku	1 x 45'	WDR/ARD
2006	Gerhard Schröder. Kanzlerjahre (mit Jürgen Leinemann)	Doku	1 x 45'	WDR/ARD
2006	Jörg Immendorf – Der letzte Kampf des Künstlers (mit Hanns-Bruno Kammertöns und Stephan Lamby)	Doku	1 x 45'	NDR/ARD
2002	Im Schatten des Schakals: Die deutschen Terroristen hinter Carlos	Doku	1 x 45'	ARD
2001	Viren – Die unsichtbare Macht der Zellpiraten	Doku	1 x 30'	ZDF/3SAT

## Leopold Hoesch / BROADVIEW Pictures – Producer

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Leopold Hoesch, founder of BROADVIEW. University degree in regional sciences. German Ambassador of the International Academy of Television Arts & Sciences. Prizes: Nominated German Film Award, Winner German Business Film Award, Romy Winner, Magnolia Award Shanghai, Emmy Winner.

BROADVIEW PICTURES is part of BROADVIEW TV GmbH from Cologne, which was founded in 1999 and has received several awards. The owner-managed company is one of the leading independent German film production companies. Its work focuses on documentary films in the fields of history, culture and sport.

### Selected productions as producer at BROADVIEW:

2019	Resistance Fighters: The Global Antibiotics Crisis	Doku	1 x 98'	ZDF/ARTE
2019	KROOS (WT)	Doku		Kino
2018	Coal	Doku	2 x 90'	ARTE/ZDF
2018	Who Owns Nature?	Doku	1 x 96'	Kino
2018	Unser Land – Die 80er	Doku	10 x 45'	WDR
2017	Angela Merkel - 3 Days in September	Doku	1 x 52'	MDR/ARTE
2016	Angela Merkel – The Unexpected	Doku	1 x 90'	MDR/ARTE
2014	NOWITZKI. The Perfect Shot	Doku	1 x 105'	Kino
2013	Citizen Springer	Doku	1 x 90'	ARTE/ZDF
2011	KLITSCHKO	Doku	1 x 122'	Kino
2010	The chancellor who fell to his knees. The two lives of Willy Brandt.	Doku-drama	1 x 90'	MDR
2010	German Dynasties: The Thyssens	Doku	1 x 45'	ARD
2010	The German Kaiser's Empire	Doku	3 x 45'	ZDF
2009	The Krupps	Doku	1 x 45'	ZDF
2008	Franz Josef Strauß – A German Story	Doku	2 x 45'	ZDF
2006	Black September: Munich Olympics 1972 – The Attack	Doku	1 x 90'	ZDF
2005	The Drama of Dresden	Doku	1 x 90'	ZDF
2004	The Miracle of Bern – The True Story	Doku	1 x 90'	ZDF/ARTE/
2003	Stalingrad	Doku	3 x 52'	ZDF

## THE CREW

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Directed and written by	Michael Wech
Produced by	Leopold Hoesch
Production Company	BROADVIEW Pictures (A division of BROADVIEW TV GmbH)
A Coproduction with	ZDF
In cooperation with	Arte
Supported by	HessenFilm Film- und Medienstiftung NRW
Creative Producer	Peter Wolf
Cinematography	Johannes Imdahl, BVK Sven Kiesche
Edited by	Michael Scheffold
Music	Andreas Lucas
Unit Manager	Isabell Weihing, Karoline Noth
Production controller	Bettina Kluge
Commissioning Editor	Martin Pieper (ZDF/ARTE)

## CONTACT

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