

# Transcript of interview with Professor Barry Marshall

**Voice-over:** Welcome to the National Health and Medical Research Council podcast series, a conversation with some of the great minds and leaders in Australian medical research. The NHMRC is Australia's leading funding body for health and medical research. We provide the government, health professionals and the community with expert and independent advice on a range of issues that directly affect the health and wellbeing of Australians.

**Interviewer:** Professor Barry Marshall is professor of clinical microbiology at the University of Western Australia in Perth. In 2005, along with his colleague, Dr Robin Warren, they were awarded the Nobel Prize for physiology or medicine. And in the words of the Nobel committee, they were honoured for their discovery of a bacterium, *Helicobacter pylori*, and its role in gastritis and peptic ulcer disease. And in this interview you'll hear the story of how this discovery was made. Barry, welcome to this National Health and Medical Research Council podcast here in your hotel room in Canberra.

**Prof. Marshall:** Thank you.

**Interviewer:** Barry, I'd like you to take us through the story of what led to you being awarded a Nobel Prize. In the introduction I talked about the fact that this was around the work you'd done on a very interesting bacterium called *Helicobacter pylori*. So why don't you start at the beginning.

**Prof. Marshall:** Okay. Well, I'll go to the last page and just say quickly that this is the germ that lives in the stomach and causes ulcers, and that was our discovery. And the discovery was made with me and Dr Robin Warren, who was a pathologist at Royal Perth Hospital. So that part aside, let me go back to my background. I was born in 1951 and my father was a fitter and my mother was a nurse. I was born in Kalgoorlie. And then I generally followed my parents around, of course, as you do in those ages. And my father was an engineer on the whaling station in Carnarvon for a few years; then he was a crayfisherman - that was back in Perth; some time back in Kalgoorlie; and finally in Perth after about the age of eight, where he was a refrigeration engineer and ran a chicken factory ultimately. And I have three brothers and sisters - grew up in Perth and was always interested in science, chemistry, physics, all those geeky kind of things. I had two younger brothers and a younger sister.

**Interviewer:** Did your family environment encourage those sorts of interests?

**Prof. Marshall:** Well, it did encourage me, because my father was a tradesman, and he was always interested in practically everything. We always had a garage full of pretty complicated salvage equipment, from oxyacetylene to valve radios. I remember one year we had an ice-cream machine off a Mr Whippy truck that we were fixing up and churning out ice-cream with. And even the things that he didn't do himself, he had technical books around which I was interested in and I was from an early age making things like Morse codes and generating electricity, making batteries, all that kind of stuff. So I was very naturally interested in science.

But the other side of the coin was that the other books that we had available were my mother's nursing textbooks and I can remember from an early age they were practically the only books we had in the house, so I could read anatomy, I could see pictures of men and women and babies in

the womb and ulcers and all that gory stuff out of my mother's books. So that was also very natural to me as well. So with all that going on in the background and with a pretty interesting school life as well I was quite busy, but always had this issue that I was not focused. So I suppose if I was sitting there trying to do my homework I could get the minimal part of it done, but then I'd race off and be making something or doing something else with everybody else in the family. And always had lots of interesting activities to do on weekends, et cetera. So my teachers were always complaining, 'If only Barry would be focused and try harder and study better he could be top of the class every year.' And my mother, she just used to weep tears of blood when ever we went to the school. So these days, these poor kids are called ADD - you know, mild ADD. And I say, 'Well, it's also creativity and originality is part of it. So maybe you shouldn't be suppressing it all that much, and don't be too disappointed if your kid doesn't top the class every single day if he's interested in having fun.'

**Interviewer:** Just as well they didn't have Ritalin in those days.

**Prof. Marshall:** I might have been on it, I'm not sure. So I used to do okay at school, but I was never - well, occasionally I topped the class, but most of the time I'd be in the top 10 per cent, you know, and I was quite satisfied with that.

**Interviewer:** Okay, so those were the early days in Kalgoorlie and Perth. What then led you on to going to university and getting into medicine?

**Prof. Marshall:** Well, in my day - you can imagine growing up in the '50s and '60s, the things that happened early on. Of course, we had radio - in 1960 we had black and white TV and a telephone, and a car for the first time, Australian families had that. And then that was about all the technology you had available when I was growing up in school. And I didn't really have this feel or knowledge of medical research. The only doctors I saw were doctors - like, you know, doctors on TV, general practitioners coming around to the house, giving you needles, getting you vaccinations, things like that. So I went into medicine partly because I didn't think I was good enough in mathematics to go into electrical engineering or pure science, so I went into medicine. I thought, 'Well, it has all the things that I like.' And, of course, you make a good living out of it. Let's face it, people think about that. So going back, I remember years and years before in Kalgoorlie I'd been walking to get a polio shot or something with my mother and my little brother and we walked past this house in Kalgoorlie and I said, 'Hey, mum, how come these people have got two cars.' And she said, 'Oh, he's a doctor, dear.' So maybe that sunk in and the idea of not having to worry about, you know, not having two bob to rub together was one of the issues.

**Interviewer:** So you went to the University of Western Australia?

**Prof. Marshall:** University of Western Australia - again the same sort of thing happened. My performance at the University of Western Australia was patchy, because you have other things on your mind once you're in university - mainly the opposite sex and having a few beers with your mates just to make sure that you don't get too geeky by all the study and everything you do. I think I had a pretty good balance at university and I was always interested in the subjects, but I did find it quite difficult to actually put in hours and hours intensively studying everything. So I always looked for short cuts. So if I could figure out how I could get through a subject by doing a minimal amount of study and cramming in the last couple of weeks that was usually my strategy. For instance, I naturally have pretty skinny legs and feet, so I can remember the anatomy of the foot. The exam that I went to I made sure that I wore thongs so I could see every

single artery, vein, nerve and tendon on my foot and get all the anatomy right. So using tricks like that, you can kind of cheat, I suppose, in medical exams.

**Interviewer:** An example of some smart genes coming through there.

**Prof. Marshall:** So getting through medical school was very interesting. And I met my wife, who was a psychology student, at Rottnest - so sort of a beach week type idea in Western Australia is that the uni students finish their exams and go over to Rottnest for a week.

**Interviewer:** For international listeners, that is a small island about, what, an hour by boat from Perth?

**Prof. Marshall:** Yes, I think it's eight miles out from the coast.

**Interviewer:** It was a convict island and it tends to be a very famous recreational spot.

**Prof. Marshall:** It's interesting. You cannot drive a car there, so you ride a bicycle or walk around on the beaches. And the story behind that was that I was snorkelling and catching fish at that time, but I'm allergic to shellfish, so I ended up with a bag of lobsters, crayfish, and I happened to meet some girls who were over there staying in the tent camp and they were eating pork sausages and baked beans every night or something, so they were quite keen to cook me up a meal and take the crayfish off my hands. So that was a pretty good introduction. So I met my wife there, and we married in the beginning of fifth year medicine and started our family straight away - that was the Whitlam years, and we found we got an extra \$5 a week if we had a baby. Little did we know it was going to cost that much for soap powder and nappies. But we had a pretty interesting life and I was sort of heading off into a non-specialised area and then started to be interested in the more complicated parts of medicine. I felt that the average stuff didn't challenge me enough, and I felt that subjects like diabetes were pretty challenging, high blood pressure, rheumatoid arthritis, cancer, those things in internal medicine, where the tough cases always existed - also geriatrics, because patients have many conditions.

**Interviewer:** This was as a student still or as a resident?

**Prof. Marshall:** Getting on as a resident. So I graduated in 2000 and - let me think about this, 1975, sorry; all these numbers. So I was in internal medicine training and studying arts and everything at the different hospitals, QE II medical centre and then at Royal Perth, and it was in 1981 that I started a little research project off the side with Robin Warren. Each year you're encouraged to do some research. So my boss said to me, 'Go down and have a talk to Robin Warren, the pathologist down there, because he's seen some bacteria. He thinks they're important, but everybody knows there's no bacteria in the stomach.' I said, 'Well, that's pretty interesting. Maybe it's a weird Australian germ - catch it off kangaroos or something.' And it was similar to germs that cause trouble in chickens, and because my father was in the chicken business, I thought, oh, well, I sort of knew about these bacteria called campylobacter - it means curved bacteria. And I went down there and met Robin Warren. He showed me a list of patients that he had with these bacteria in the stomach, and he said, 'Can you go and call these people and see what's wrong with them.' That's how it started.

**Interviewer:** Did he pick them up from biopsies?

**Prof. Marshall:** Yes, typically - that was an interesting era, because in those days stomach ulcers were incredibly common, so that maybe one in five or one in ten people if you walked into

a pub anywhere or just talked to people in the street, people would be carrying ulcer treatment, which lowers the acid level in the stomach, and they would have a history of ulcers which came and went during their lives, unpredictably could cause a haemorrhage, or even death, and they would be paying about \$3 or \$4 a day for this medication which they'd take every day and could never stop, because the underlying ulcer problem was always there. And everybody - nobody actually even considered that you would ever find the cure for ulcers, because it was supposedly hereditary, runs in your family, or it was caused by a high acid level, and that was caused by the stress of 20th century life, and the media particularly used to love this stress story. When ever anything happens that you can't explain, 'Oh, a lot of stress - he lost his job or something happened at home.' So it was always a good explanation for everything.

**Interviewer:** I believe it was even called a psychosomatic disease.

**Prof. Marshall:** Well, that was true. There was a whole industry, actually, treating stress in people with ulcers, because the poor ulcer patients, you can imagine, you've got this hard-working guy, and he smokes a packet a day and he has a busy life, and from the age of 20 he starts having ulcers, and he's continually going to doctors and taking medication. And so finally he does the right thing - he looks after his diet and changes his job, and he cuts down on his cigarettes, stops his cigarettes, and he's doubly miserable at that point and he still has an ulcer. So what can he do?

**Interviewer:** So what was it that sort of really turned you on to the study of this particular organism in the gut, which you didn't really know what it was then?

**Prof. Marshall:** Well, I sat down one afternoon with Robin Warren, and he showed me all these microscope slides of the patients that we were studying at that point, and I could see, as he could, that there were bacteria on the surface cells of these stomach biopsies. The way it works, the patient with ulcers needs a diagnosis, so he goes and has the light anaesthetic, the tube goes down into the stomach, the gastroenterologist looks in there, 'Ah, there's an ulcer, it could be cancerous maybe so we'll take some biopsy samples', which are tiny little pieces of tissue which you don't feel and it's quite safe. Dr Warren then looks at these biopsy tissue samples under the microscope and he can see these black bacteria sitting on the surface of the cells.

Now according to all the textbooks it says bacteria cannot survive in the stomach because it's full of acid. And I was there with Robin. Well, there's acid in the stomach, there's definitely acid in these patients, because they have ulcers. So how come there's bacteria there? It must be a new kind of bacteria not described, or a new illness where bacteria are living in the stomach. So how did they survive in the acid? That was our interesting question - were they a new type of bacteria? Wouldn't it be great to publish a research paper describing a new bacterium? And I hadn't done any published research at that time, so I was interested in that, and I thought I could present it at the research meeting at the end of the year and it would be fantastic. So I was quite happy then to work with Robin and off I went then to look at these patients. We didn't really find anything out in the first few months. We couldn't grow the bacteria. It wasn't as easy as we thought it was going to be. So I became more involved in it the following year and set up a study on 100 patients in 1982, so Robin and I would look at every single patient that came into Royal Perth Hospital and had stomach testing.

**Interviewer:** What did the clinical microbiologists think about all this?

**Prof. Marshall:** Well, of course everybody in clinical work in the hospitals in those days, and even today, is quite busy, so it's not as if you can find an hour a day to do any research. So they

say, 'Well, you guys go ahead and do it. We don't know - you know, awarding to the books there's nothing there, so I don't expect you to find anything.'

**Interviewer:** But you could see these under the microscope?

**Prof. Marshall:** We could see them there, and we could tell that it wasn't just contamination, because if you swallow bacteria from your mouth, you have a hundred different kinds of bacteria all mixed up, and you will see those in the stomach from time to time, but they're not all exactly the same. If you want to know what these helicobacters are like if you're not sure, they're like the *tilde* character - it's like a flattened out 's' on its side on your key board on your laptop. So curved bacteria, helico bacteria means spiral bacteria - so they do have a kind of a 3D spiral to them. So off we went. And after quite a lot of hard work we eventually figured out how to culture them in 1982 over Easter and the trick we found was that we were doing the right thing, but it took a lot longer than everybody thought. So they took five days to grow. So when we started leaving the culture plates for five days instead of just two days we could grow the bacteria.

**Interviewer:** Hence the significance of Easter, I take it?

**Prof. Marshall:** That's right. The story with Easter is the lab tech was quite busy over Easter. So when we took a sample from a patient on a Thursday - on what's it called, Holy Thursday, I suppose - Saturday was the time to look at the culture plates. And he was so busy and wanted to get home on Saturday morning, I guess, that he didn't look at the culture plates on Saturday, just left them in the incubator. And then there's a public holiday on Monday, so it's not until the Tuesday, which was five days later, that the tech looked at our culture plates and lo and behold there were these little tiny colonies of the new bacteria. And so once we realised that it was a simple modification and we were growing them quite easily. Now that's a major breakthrough, because now you can culture the bacteria in the lab and then you can apply different antibiotics to them and do all kinds of testing and you can say what sort of bacteria they are and we showed that they were definitely a new kind that nobody had ever cultured before, so that was pretty exciting, and we could show they were sensitive to penicillin. We even found that one of the ulcer treatments that people were using in those days, containing the heavy metal bismuth, which is related a little bit to arsenic, but it's not as poisonous. So that was an ulcer treatment. We found out that it didn't actually do anything to your acid or coat the ulcers - all it did was kill the bacteria. So that was good evidence that things that killed the bacteria might heal ulcers. Then we developed all kinds of diagnostic tests and blood tests for it and we started treating people with antibiotics the following year.

**Interviewer:** Now when did you first publish these findings? Because it was quite controversial, wasn't it, when you first published this?

**Prof. Marshall:** That's true. Looking back on it, it was an exciting year, 1983. We had figured out that maybe we had discovered the cause of ulcers, and we'd written a letter to the *Lancet* to stake our claim on the discovery, so it's a little one-page report from each of us, and that was in press, and we got the same information and put it into an abstract and submitted it to the local scientific society that was having its meeting in Perth that year. So we thought it would be great - it's in Perth, we don't even have to pay for an air ticket, and we can present this information. So we were rather dismayed when our abstract was rejected, and they wrote us a standard sort of form letter and said, 'Dr Marshall, we had so many submissions this year, in fact we had so many, we had 67, and we could only accept 57 because of the space allocation.' So our abstract was in the bottom 20 per cent. So it wasn't rated very well.

**Interviewer:** I hope you've still got that letter.

**Prof. Marshall:** Well, I do. And I say too if anyone out there is in research, I say always keep your rejection letters in a brown paper bag in the bottom of your bedroom drawer. You don't read them, but years and years later you'll be able to show them in your lecture.

**Interviewer:** But you had this piece coming up in the *Lancet*. What was the response to that?

**Prof. Marshall:** Well, immediately after the rejection, my boss, David McGauchie, at Fremantle, said he knew somebody who was the world authority on these bacteria in England, Martin Skirrow, and he said, 'Why don't you give him a call on the telephone?' In those days it was pretty heroic to call someone in England and get permission from the hospital authorities to use their long distance number. So I did that and I spoke to Martin Skirrow, and he said, 'Oh, that sounds exciting. Send some bacteria over.' So we did that, and he cultured them.

Then I went to an international meeting right after the publication in the *Lancet*. So at that point there was a lot of enthusiasm in England, because Martin Skirrow, who was an authority, was now supporting me. So in the infectious disease microbiology fraternity I immediately had followers and in Australia one of the first people that was on my side was Professor Adrian Lee from the University of New South Wales, and we'd corresponded a little bit. And I met him there. And he was a chicken bacteria expert in those days. So we had a bit of a following, and then when I came back to Australia, still the gastroenterology community didn't believe it. And there is a bit of a history of people discovering bacteria all the time and always thinking they're important and they're just, you know, harmless. So for the 12 months I had this frustrating time of some enthusiastic groups around the world - and I'd actually spoken also to some of the top gastroenterologists in Europe, who were pretty excited about it.

**Interviewer:** So you really at this point had to kind of prove the connection, though, didn't you? Is this where you did something pretty dramatic?

**Prof. Marshall:** Well, that's right, because when ever I presented the bacteria to pathologists and doctors in Australia, they were all very sceptical and they would always say that people with ulcers probably have a bacteria in their stomach just by coincidence and the ulcer forms first and then you would catch a little bacteria sitting around the site, same as if you had a sore on your skin or something. So it was very frustrating to present the information, and I used to get into pretty hostile arguments. At one conference I remember I was just about leaping off the stage throttling people who were making what I considered very inane comments about the whole thing. And so I said, 'I've got to prove that these bacteria can infect a healthy animal and cause an ulcer, or the inflammation at least, in the stomach.' And we had no success infecting pigs or mice or rats, so that part of the experiment was really holding everything back.

I had a plan from a year earlier to get a human volunteer, but when I came to get the human volunteer, it was obvious that the only person who knew anything about it, or the only two people who knew about this bug well enough to sign a consent form was Dr Robin Warren, the pathologist, and myself. And we found out that Dr Warren was already infected with the helicobacter, and I had treated him, so I had to rule him out. So it was up to me at that point.

So I planned this experiment in secret, and I remember my boss, Ian Hyslop, doing an endoscopy on me, and he said, 'Barry, I don't want to know why I'm doing this endoscopy on you; I've got a vague idea, but I don't want to officially know.' So he did a test on me that showed I was not infected and everything was normal down there. About a month later I drank a brew of the

bacteria, which I'd fished out of another patient, and then I was just waiting to see what would happen. So what I thought would happen - I thought it would take hold and I would have no symptoms and be perfectly well for a few years and ultimately get an ulcer. So I was surprised when after a week I developed bad breath, and everyone in the family was complaining about me, and then all my laboratory friends put me in my own private lab and I had nobody else in there, it was so bad, and I started having vomiting attacks every morning, which was very, very weird, and I noticed there was no acid in the vomit. So weird things were happening at that point. So I had another endoscopy.

**Interviewer:** Were you documenting all this?

**Prof. Marshall:** I was taking some notes, but you see in your life you have all kinds of sensations and things are happening all the time, so you don't really know at that stage whether it's taken hold and you're really getting it from the stomach bacteria or it's just coincidence. But I was taking some notes and thinking about it. So after 10 days Dr Hyslop put the scope down me again and took the biopsies - Dr Glancy and Dr Robin Warren ultimately had a look at it and said, 'Yep, you've got information in the stomach. The bacteria all down there, they have infected you', so it proved you could get the bacteria first without having an ulcer. And I was so excited. I came home and told my wife about it. Then I kind of realised that I hadn't told her about the experiment. She was - she knew that I had been planning it from the year before, but didn't actually know it was under way that week. So she made some very concerned comments and insisted that if I was to remain in the house I had to start some antibiotics very shortly. She gave me another four days for the experiment to run. Then I took some antibiotics and it terminated. The details, the gory details, are actually on my Wikipedia page if you want to go there and get into it.

**Interviewer:** What was the corollary of that? What was the next step?

**Prof. Marshall:** The thing was it was a crucial experiment because at that stage in my career I hadn't really differentiated - I was ready to go into private practice or something else - and the issue was if the bacteria looked like they were the cause of ulcers - and that was the outcome of that experiment - that means I would have stayed in research and gone on a research path for the rest of my life. And if nothing had happened, well, I would have had to reconsider and say maybe we were wrong, the whole two years we've spent on this bacteria was wasted, and I'll be an internist, a physician, work in a hospital or private practice or something. So both were interesting ones - of course, if you're a physician in private practice that's a pretty good career and that would have been exciting; if I was a research scientist it was exciting for the research but as far as being paid a salary and having a regular job it was pretty iffy. So I didn't know where I was going to go at that point.

**Interviewer:** Did you actually publish the results of that work, of your self-experiment?

**Prof. Marshall:** That's true. As I was - the month that I did that experiment, Robin Warren and I then had a big paper published in the *Lancet*, which was a year after the initial letter, so it was the middle of 1984. And that was a key paper. In that we explained about the bacteria, the link with ulcers, and in one of the letters the previous year we'd linked the bacteria to stomach cancer, which is very important numerically around the world because more than half a million people a year. So at that point we had locked in the discovery and it was starting to create some controversy. And then the *Medical Journal of Australia* editor called me up and said, 'Barry, I wish you'd give us a paper for the *Medical Journal of Australia*.' And I was sitting there writing

up my self-experiment. And I said, 'Well, I've got a very quirky paper. Maybe I'll send it to you.' He said, 'Okay, I don't guarantee anything.'

So we then put in another year's data and published the self-experiment plus some more data in the *Medical Journal of Australia*, and that one also took off, because it turned out that all around the world in the top research laboratories for ulcers, they had been putting tubes down people and sucking out the stomach acid to measure it. And they didn't realise they were passing the bacteria from one patient to the other. So they had seen weird epidemics of the same thing that I had had, and they'd written them up, but couldn't figure out what was causing them.

So when we published in the *Medical Journal of Australia*, the *Lancet* in England gave it an editorial saying, 'Hey, we've discovered the cause of all these epidemics - it's Marshall's and Warren's bacteria in Australia.' And again we got good publicity from that, and it created a big controversy, because, of course, people were funding research programs worth millions all over the world. The ulcer treatments that were on the market were worth billions and the drug companies were all building giant manufacturing plants and banking money on the current treatments, and lo and behold it suddenly appeared that maybe all people needed was a cheap course of antibiotics. And then they would be cured. And all this investment and billion-dollar business was just going to go by the wayside. That sort of happened, but it wasn't too dramatic, and those companies are still good companies today because they got around it somehow.

**Interviewer:** So what actually happened - now it really got into the mainstream as part of the accepted practice that you treat it through antibiotics and using some bismuth as well, is that right?

**Prof. Marshall:** That's right. In Australia there was a drug called De-Nol, which was a bismuth treatment for ulcers. That could heal ulcers even though your acid level stayed high or the same. Whereas the other treatment that healed ulcers - that was Tagamet, or cimetidine - that healed ulcers by lowering the acid level. But the bismuth treated the bacteria, but the Tagamet just treated the acid, the symptoms. So we got into treatments at that point and we worked out a treatment, and the National Health and Medical Research Council funded a clinical trial which I decided to do, where we compared the old treatment with acid lowering versus some kind of antibiotic combinations. So I then got a three-year fellowship. So it kept me in the academic clinical research area. And I worked with Dr Warren and colleagues at Royal Perth Hospital after that. And then during that year, because I was seeing so much of it, really hundreds of patients, we really got - we were for a few years the top team in the world because we just saw so many patients. We ended up, we had a treatment, we made some discoveries which led to interesting diagnostic tests. I discovered, of course, that bismuth, this funny treatment that's used around the world for traveller's diarrhoea and dyspepsia, in the United States it's called Pepto-Bismol, and that company, Proctor & Gamble, called me up and said, 'Barry, we're interested in patenting some treatments based on Pepto-Bismol. Why don't you come over to America on a fellowship?' So very quickly I had all kinds of activities going on and my family and I uprooted and raced over to America with a fellowship there for 10 years.

**Interviewer:** The University of Virginia, was it?

**Prof. Marshall:** Yes, the University of Virginia is one of the almost Ivy League universities. It's a state college about 100 miles south of Washington DC, and it was founded by Thomas Jefferson, so they have a pretty good medical school there, one of the top 10 in the US, I think. But they also have a very strong infectious diseases program, one of the top five in the US. So I had some colleagues in infectious disease. The chief of gastroenterology there was actually an

ex-pat Australian, who'd lived in the States for years, so he knew about the Aussie scene and he invited me over. And when I went over there I assumed that everybody would be on board with this thing, but, of course, they were totally sceptical in the States and I had to really step back a couple of years and repeat all the work that I'd done in Australia back in the US, plus get my doctor's ticket over there, a lot of exams and things to do. So it took another three or four years after that before people in the US started becoming excited and we had some diagnostic things coming on the market in the United States which meant that I didn't have to have a private practice, I could stay in research once again. And it was about 1993, '94, that we had respectable treatments and good data in the United States, and at that point the authorities over there put their imprimatur on it.

So internationally it was accepted after about 1990, but people didn't have a good treatment for it, so a lot of patients had to stay on the old medicine. Then by '94 the Americans signed off on it and everybody was interested in the bacteria after that, it was totally respectable. Then the modern treatment came on line about 1997. So nowadays really everybody with significant ulcer problems in Australia has had this dealt with and they would - typically they would have a diagnosis by blood tests or an endoscopy test and then they would take antibiotics for about seven to 10 days, and a month later nowadays you would go and have a breath test ordered by your GP which would say whether or not the bacteria had gone. Usually after that you were pretty well and things settled down and your ulcer was gone.

**Interviewer:** Do you think that back in the '80s, the isolation of, one, Australia, and, two, probably the double isolation of Western Australia, were important in not contaminating your thinking, so use that kind of inverted commas phrase, because, as you said, when you went to the US, and it's a common experience, they tend to follow the mainstream, the dogma. There was original thinking going on and communications weren't that easy in those days, so you weren't tainted by a lot of outside thought.

**Prof. Marshall:** That's true. In my Nobel lecture I gave this quote by Daniel Borsten. He said the biggest obstacle to new discoveries is not ignorance, it's the illusion of knowledge. So everybody thought they already knew the cause of ulcers, and I hadn't been trained in that dogma, because I was not a gastroenterologist, I was looking at all kinds of other specialties, but not necessarily gastroenterology. So people say I was thinking out of the box, if you like. So I always was a lateral thinker and rather than do the same as everybody else, you would have to be incredibly good to be the top of your field. So it would be easier to try and find a different angle than everybody else, where there's less competition to go after that. So I suppose that was my strategy. But from what you're saying in your question. Australia, if you like, is out of the box already if you're an American. And Western Australia is out of the Australian box.

**Interviewer:** I wish it was.

**Prof. Marshall:** So the beauty of it is if you are in this early stage looking at new angles, it's often useful not to know all that other stuff and not be influenced by that dogma, because then it's what happened with us - we were able to look at the National Library of Medicine online, so you could pull up all kinds of research papers on ulcers, and you could read them without any bias, and you could say, 'Hey, well this is an interesting finding. That supports us. This is an interesting finding. That's pretty much what we found.' So we found evidence that we were right in the literature and we found other discoveries of these bacteria going back 100 years. So there were smatterings over the past hundred years in the literature.

**Interviewer:** But no-one had linked them all together, though?

**Prof. Marshall:** That's right. So we had - it was as if people had a jigsaw puzzle with no edge pieces and no picture, and they were finding these little facts about ulcers and trying to always fit them into this scenario of how could stress be related to this, you see. And the other thing is they were all searching for different genes, genetic connections with ulcers, because, of course, ulcers run in families, so obviously you inherit them off your mother and your father and your aunts and your uncles, et cetera. But then our discovery really was that the bacteria was spread around in the family and you might catch it off your mother, she caught it off her mother, and so it was exactly like a genetic illness. I can tell you now it's really excited a lot of people looking for causes of all kinds of diseases to say, 'Well, we thought ulcers were genetic, so why couldn't high blood pressure be caused by a virus or an infection, or diabetes, or rheumatoid arthritis.' So all these chronic diseases now have a whole group of enthusiasts looking for infectious causes.

**Interviewer:** That's right. I'm aware in the literature that there are quite a lot of people trying to link various bacterial infections with some of these chronic diseases.

**Prof. Marshall:** Well, you know, there's even a theory that obesity is caused by a virus. And I'm very interested in that. Everyone wants the vaccine.

**Interviewer:** What is it like to win a Nobel Prize - the moment when you either officially hear or are told, I assume secretly just prior, but to learn that you've won a Nobel Prize?

**Prof. Marshall:** Well, Dr Warren and I were down in the pub, because we used to have this tradition of having a few beers on Nobel Prize night.

**Interviewer:** Hence that famous photograph.

**Prof. Marshall:** So drowning our sorrows, more or less, because the years had gone by and we'd never won it, even though we were rumoured to be on the list or something, but we didn't know. By then Robin had retired, so once a year I'd round him up and we'd go and have fish and chips and a few beers. So we received a phone call on his cell phone about half an hour before the official announcement, press release, was going to come out. So we didn't know until almost everybody else that we'd won it. And I think you're just frozen - it's the sort of thing that you can't really say that you felt a lot of emotion. You say - you're thinking, 'Can this really be true, this is great, but what do I do now?' If you're trying to win the Nobel Prize, when you finally win it, you say, 'Hang on a minute. My life has changed but I've got no idea what's going to happen now.' So it is great, though, because you - I say it's a bit like dying and going to heaven, but when you get there, what do you do. The idea of floating around with wings and playing a harp doesn't really excite me.

So the other thing I'd say to people is although it's exciting to win the Nobel Prize and go to Sweden et cetera, the most exciting thing about winning it is actually making the discovery that bacteria caused ulcers, so Robin Warren and I, we had far more emotional ups and downs and excitement in 1983, 1984, right up - you know, until about 10 years ago, the whole thing was just one exciting trip, and that was emotionally stronger, I think, than actually winning the medal.

**Interviewer:** If you had one piece of advice for young people interested in a career in science or medicine, what would it be?

**Prof. Marshall:** Follow your heart, in that if you think something is interesting and exciting, well, you will probably be much better at doing that than any other old-fashioned stodgy career. So, if possible, I would say try to do things that you like. These days, because of

communications, pretty soon you'll find that there are millions of other people exactly like you. And I look at my kids, they're all in careers that weren't even discovered when I was in school or even when I was a parent and they were teenagers. I can tell you my son, he spent so much time playing computer games and Star Wars games and shoot 'em ups and things like that, and he got sick of it after a while, but then became a computer programmer, which is really what he loves, and he probably doesn't spend too much time playing games now, but it's interesting how that game thing turned into a big career for him.

**Interviewer:** It's a common geek pathway.

**Prof. Marshall:** Yes. Similarly with my daughter, she was sort of undifferentiated, but ended up in computers, Internet and medical science ultimately. And so I - you know, we all like to see our kids grow up and be secure with their families, et cetera, have good career paths, but quite often they'll be more successful in stuff that they like doing, so even if they are not obviously going to be cardiologists, if they're doing what they like, I think, I'm quite happy with that.

**Interviewer:** Can I ask what does a Nobel laureate do?

**Prof. Marshall:** Well, I was talking to some of the old professors at the Karolinska and saying, 'What can you do after you win the Nobel Prize?' And one of them said to me, 'Well, Barry, you should try to win another one.' So I looked at the statistics - there are actually four Nobel Prize winners that won two, starting with Marie Curie. And so if you are in your career in the mid career, potentially you could win another one in another 20 years. So I was actually cooking up an interesting little biotech company to work on vaccine ideas for helicobacter --

**Interviewer:** What was the name of that?

**Prof. Marshall:** That's called Ondek, O-N-D-E-K. So we have that company going. It's something that was starting before the Nobel, so I continued to do that. And I have - so I now have several other jobs unfortunately. I have the Ondek company and I have my professor appointment, clinical professor appointment, in infectious disease and medicine at UWA, so I do a few lectures, not a great deal. I still see some patients, because it is still a very high specialty to look after people with helicobacter who have failed antibiotic treatment, so they have a resistant infection and complicated ulcers. But it's a very boutique kind of a practice, if you like, because I don't have time to see patients every day. And then I'm supported by the University of Western Australia and the state government in Western Australia to go on lecture tours and things like that. So about a third of my life is spent on planes and travelling around the world to give lectures and collaborate overseas. And I've found that there are a large number of very high-profile scientists, academics, financial people from Australia, all around the world. So typically I'd turn up at an alumni fundraiser in New York City or Paris or somewhere and give out some prizes and give a bit of a speech. So it's great fun seeing all the Australian highflyers around the world, because I think there are so many talented people who are overseas at the moment, and probably a lot of them will come back to Australia. So I'm very optimistic about the state of science and government in Australia. I think it's going to go very well.

**Interviewer:** And, of course, the NHMRC has supported you for a long time, hasn't it, in a lot of your work?

**Prof. Marshall:** Yeah, well, I don't have a perfect track record with the NHMRC as far as those successful grants, but I've just trusted that when I really needed them or when I needed some funding I would receive it, so way back since 1984 I've been sporadically funded by NHMRC.

When I came back to Australia 10 years ago, I received the Burnett fellowship, which kept me going for six years, I think. So we all have to worry about funding, but I think we're close in Australia to having the right balance of - you don't want to be too easy with the funding. It's important that the people who are good researchers and hard workers, who are original thinkers, they should be the ones who get the grants, not the guys who do it because they need the money. So it has to be a competitive process. I can see that education and health could be better funded and I think it will be better funded in the future, because these days more and more of the things we do in our lives are taken over by machines and it's all organised, we're just organising things on the telephone, we're all carrying cell phones, et cetera, so potentially we do have a lot more - we're more productive and we do have spare capacity in our lives. So I think there is income and money there that the government can give us value for, and part of the value would be convenient and excellent health care.

**Interviewer:** And on that positive note, Barry, thanks for sharing what is a fantastic story, a very interesting story today, and I wish you well in whatever endeavours you take on in the future. Maybe that second prize will be just around the corner.

**Prof. Marshall:** Thank you very much.

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