



Vaccine Update - Ref179

with Nicolas Locker

27th July 2021

TRANSCRIPT

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Steven Bruce

Good afternoon, welcome again to the Academy of Physical Medicine. I'm Steven Bruce. And I'm joined today by Professor Nicolas Locker. Now, Nic has been on our show twice before, he's been a great source of information about vaccines and viruses. And in case you didn't join us for those shows, perhaps you'd like a little bit of background. He started life as a simple biochemist, he went into molecular biophysics. He is now the professor of biology at the University of Surrey, where he's had his laboratory there for well over 10 years now. It's a great pleasure to have him back. Nicholas, I'm really pleased, you're prepared to join us again, after the first two experiences. Thank you for coming on the show.

Nic Locker

My pleasure. It's always good to be here.

Steven Bruce

Thank you. And a few caveats before we start. First of all, I've introduced Nic, he's a professor of biology. He's not an epidemiologist. He's not a politician. He's not a sociologist. But he will give us really good evidence based scientific answers to questions about viruses and vaccines, which he has been closely involved in, obviously, over the last two years. And for many years before that. The other thing I would like to ask is, this is an emotive subject, as many people will know, and tempers get raised, questions get roused over who is vaccinated and who is not vaccinated. And I would ask you, please, after the show, please do not try to contact Nic directly about whatever we discuss on the show. We rely on the goodwill of so many speakers to come on the show. And when people approach them directly afterwards, it's not something they've signed up to. And particularly if those emails, messages, Twitter, tweets are unfriendly, and it kind of alienates them from the Academy. And we'd like to get lots of people like Nic, back on the show. So Nic, having said all that, what's the latest on vaccines and viruses?

Nic Locker

I guess that question relates to COVID-19. Right?

Steven Bruce

Of course, I should have said that, it seems so obvious these days, that's all we ever talk about, isn't it, is COVID-19, you, of course, are involved in a whole lot of other things.

Nic Locker

Absolutely. So, I think one point that's really important to raise going back to the conversation we had, I believe, back in March together is that, at that time, the UK was really far ahead in terms of vaccine coverage. And in comparison to the rest of Europe, in particular. And one of the things that we had discussed was that we were carrying out or using a different strategy from what was being done on the continent in terms of the timing between the two doses. And our prediction at the time was that we would kind of, or Europe would kind of level up and catch up with our vaccine coverage by the summer. I possibly mentioned July. So we are at the end of July, so it's a good time to reflect on that. So, if we look at the number of people in the UK that have had their first dose, we are nearly at 70%, which is fantastic. We have about 55% of the population that is fully vaccinated. Again, it's fantastic for a virus that we've only known for a year and a half. And despite a very slow start, what we can see is that on the continent, the vaccination coverage is basically catching up with those numbers. So for example, if you take France

or Germany, the number of people that have had their first dose is 60%, 70 for us. The number of people fully vaccinated is slightly over 50% from the figure I've looked at last night. So you know, we can see that those different strategies at reducing the impact in the early coverage in terms of vaccine in the population, vaccine uptake in the population. But now we are kind of globally reaching into similar targets. Which is good because, you know, we have that old saying that nobody is safe until everyone is safe. And I think this is really something that we should all worry about or think about right now, especially as we're thinking about, or we are hearing about, you know booster jab or third vaccination in the autumn, and you know, protecting ourselves against the emergence of variants. This may be something that you want to talk about later. But, you know, I guess the ones that are the most commonly cited in the news are the Indian Delta variant, and the South African beta variant, and vaccine coverage in South Africa, I think only 9% of the population have received their first dose.

Steven Bruce

Sorry to interrupt you there. Of course, a lot of what you said there touches on the subject probably of herd immunity. And just, I mean, Anthony Fauci said we needed 70, 75% of the population to be vaccinated to achieve herd immunity, but I'm not sure what he based that figure on. Is that a realistic figure? And if we only have 9%, as you say, South Africa has, what does that mean, in terms of further mutations of the vaccine quite apart from anything else?

Nic Locker

Well, so the figure that Dr. Fauci was referring to are based on what we know about herd immunity for other viruses. And these are basically epidemiology calculation that are almost irrespective of the virus but are kind of related to the way it is transmitted. So I think, to be conservative 75 to 80%, of the population vaccinated. And here, not the adult population, but the entire population worldwide vaccinated is what helps you to achieve herd immunity. You know, achieving that figure in the UK alone would be a great achievement. But it's not going to get us very far, because we are still then exposed to potentially those new variants that are coming from abroad. And I guess this is where those figures of really low vaccination coverage in, you know, I'm taking South Africa as an example, just because of the beta variant that has emerged there, really highlights the fact that without vaccination, we basically create breeding grounds for those variants to emerge, right, we allow the virus to spread, we allow the virus to multiply to make mistakes, and to create those variants for which the current vaccine may well protect us for now, but who knows what could happen against, you know, variant epsilon, gamma? And whichever Greek letter comes after?

Steven Bruce

What happened to the Kent variant, what was that? Was that alpha?

Nic Locker

The Kent variant, yeah, was the alpha variant, and I believe the original viral strain, so the one we call Wuhan 1 hasn't got any name and is still referred to as the original Wuhan 1 virus.

Steven Bruce

Okay. I suppose, you know, one of the burning questions on everybody's lips is whether to vaccinate or not to vaccinate. And of course, from a virologist point of view, the more that get vaccinated, the more

likely we are to be able to control the vaccine. And I also noticed that vaccine hesitancy, as it's called, has dropped markedly across most countries. I think it's about 10%, when it was last surveyed in the UK. And if that's the case, I don't know who they surveyed, whether they were already vaccinated or not. But if that's the case, that means we perhaps might achieve 90% vaccination in the country.

Nic Locker

Yeah, I mean, you know, it's great to see that basically, vaccine hesitancy worldwide has basically been receding. I think, you know, as always, when we introduce not just vaccines, but new drugs and new treatments, it's good to be critical, we have to be critical, we have to assess carefully the safety of vaccines and drugs and there are safeguards in place at the international level, at the European level and at the national level, so that each individual country can make their own decision as to which vaccine they deem safe. Again, which fraction of the population and I think having heard safeguards has, probably in the long run, perhaps helped the population to buy in more into the vaccination progress, although I have to say in the UK, that that was never really a huge issue. You know, it's more in other countries, in mainland Europe or worldwide that vaccine hesitancy was a little bit more prevalent?

Steven Bruce

I suppose one has to address people's genuine concerns about the virus and some of those concerns are probably malicious rumors spread on social media. But equally there are genuine concerns, aren't there. And we know about anaphylactic responses to the Pfizer vaccine, we know about rare, but nonetheless, there were blood clots associated with the AstraZeneca one. I've just had a question in from Kathy, who says that she's had several patients come in with bilateral shoulder problems, acute pain and stiffness, polymyalgia rheumatica type problems all following their second vaccine. Now, is that possible that there's a connection? Or is it just a coincidence would you say?

Nic Locker

Well, it's going to be difficult to conclude without, so first of all, I'm not an MD. Second, it's going to be difficult to conclude without seeing the patient and exactly the set of symptoms, the onset of symptoms versus vaccination, what's clear is that different people react differently to the vaccination, and to the different vaccines. More importantly, now, it's entirely possible that, you know, muscle pain and general fatigue will be consequences of your vaccination with any of the vaccines that have been ruled out in the UK population, they are very immunogenic, they are going to trigger quite a shock to your body and to your immune system. And that's what we want those vaccines to do. Right. And so this is not unsurprising. What I would say the point to which really people need to start to take action is whether after a few weeks, they see that those symptoms are basically continuing, and this is where they should start consulting and those symptoms, so it may well be associated with the vaccination, but they could also have other origins.

Steven Bruce

Do you know if there is a feedback mechanism where people who suspect a connection can provide that information to a central database where the statistics can be made sense of?

Nic Locker

Well, so this is why consulting a GP when the symptoms are persisting is really important, because this is then fed back into the Royal College of General Practitioner, which will then relay all those information

into our vaccine safety database, which gives us a much better overview of, you know, not just the word of mouth of, okay, my neighbor had this covid vaccine and he felt crap for two weeks, have had mine and I was absolutely fine, you know, those sort of almost very localised or micro cosmal word of mouth data point that we have. What we need are really scientific evidence and collecting data. And the way to collect that data is to consult basically and to report.

Steven Bruce

It might be useful if there were a mechanism for practices like our chiropractic and osteopathic practices to feed that in without having to overload GPs with patients. But we'll think about it. We've had a couple of people apparently ask us to explain how the virus works. Why is it that unvaccinated people are responsible for virus strains developing when actually vaccinated people can also be infected?

Nic Locker

So it's all down to the level of replication of the virus. So in a vaccinated individual, the replication level for the virus will remain very low. And the operation of those mutation is really associated with the ability of the viral enzyme that copies the genetic material to make mistakes. It's an inherent property of this viral enzyme. It's something that allows viruses to emerge with evolution, that allows viruses to survive and to propagate. And basically, in a non-vaccinated population, you have much higher viral load, so much higher quantities of viruses in individual bodies, those viruses replicate much better. So the probability that those viral enzymes make mistakes is much higher. So this is why variants will emerge much more likely in the unvaccinated population.

Steven Bruce

That makes complete sense. Of course. Lucy has preempted the question that I had for you, which is, what my question was, which gives you better immunity, having had COVID or having had the vaccine? And her question is actually, she's had COVID. Does she also benefit from being vaccinated? I suppose that also hinges on the durability of the immunity, doesn't it?

Nic Locker

Yeah, so it's going to be individual specific, how much our body can cope with the virus and how strong our immune system is, for example, is known to depend on our gender, our age, so unfortunately, the immune system ages and is less potent with age. So if you are a more elderly individual, you will be far much better protected by vaccination than by a prior infection. If you're a younger individual, it would probably be the opposite or you know, they would be on the on similar levels. In terms of, and was the question related to whether...

Steven Bruce

The durability of that immunity. How long does the vaccine last? How long does your immunity as a result of infection last?

Nic Locker

Yeah. So I think these are all questions that we are actually trying to answer now. Because the only way to answer those questions is to follow the vaccinated population and to try and understand which proportion gets reinfected or infected for the first time after a vaccination. So I'm afraid we haven't got a

clear cut answer right now. But what almost every big medical center in the UK is doing is to follow a cohort of patients, or a cohort of individuals that have been vaccinated and that are being exposed to the virus, to monitor their antibody level over time. And you may have seen in the news reports that, for example, you know, with the AstraZeneca vaccine, it seems that the antibody levels are actually dropping quite sharply, I would say, after eight to nine weeks. So these are data that we are able to obtain by following the patients and the vaccinated individual and analysing their antibody level. But for people that are worried about this, I would like to highlight one point, which is that your antibody levels are only one part of the equation in our fight, our immune fight against viruses. So antibody levels are great, but actually at the same time, we need to keep in mind that our immune system keeps a memory of infection, viral infection, bacterial infection, parasites infection, in dedicated cells that are called memory B-cells. And these are the cells that will basically, when challenged with a pathogen or viruses that they have seen before, when challenged with that known pathogen will be able to trigger the synthesis of antibodies against viruses. So in the case of COVID-19, we may well see that the antibody levels are dropping after eight to nine weeks of the second dose with the AstraZeneca vaccine, but in fact there were B-cells, are still there to carry out the job, as in when stimulated by another SARS-2 infection.

Steven Bruce

How long do you think before we get an answer to that question, then, how long does the vaccine remain effective?

Nic Locker

I think we will get answers very fast from small cohorts geographically, so we may have you know, reports from the study that is being done at King's College right now within a few weeks. We have similar stories being done in Edinburgh, but I think to really get a much more, I would say holistic view with cohort that are perhaps more representative of different technique backgrounds, we probably need to wait several months.

Steven Bruce

Okay. I'm just going to have a quick word with my audience, Nic, if that's okay. I know you might have joined us after the start of the show. A lot of people did join us afterwards. And I just wanted to re-emphasize what I said in my introduction that Professor Locker is a professor of virology. That's his area of expertise. And that's where he will be trying to answer our questions from. However, this is an emotive subject. And we've made it clear, I think, on various platforms that if questions are not polite, or they're hostile in any way, then we won't be asking them of Nic. But also particularly, please don't try to contact Nic directly after the show. Somebody did that after the last show. And it's not fair on our speakers that they then have to follow up on what we do. But otherwise, there are lots and lots of questions coming in. I will try and deal with them. Right back to you, Nic. Sorry to bother you with the admin there. Pip has sent in an interesting question. She says she's heard of cases where long COVID has been treated by the vaccine, has been resolved through the vaccine. Is that something you're aware of?

Nic Locker

I'm not aware of that. I think, actually long COVID is probably one of the most important question we are trying to solve at the moment, A, defining what long COVID is, B, recognising long COVID and making sure that people that have those long-lasting symptoms are really treated appropriately. And I think at

the moment, we have a little bit of a gray zone as to what long COVID really is and how it is qualified, you know, in terms of an array of symptoms, and I think that makes the assessment of what we can do for the patients that are suffering those months lasting symptoms, that makes it really, really difficult to address on a quantitative level.

Steven Bruce

Thank you. This kind of follows on from what you were saying earlier on, I think, but Felicity says what are your thoughts on the body of evidence that suggests that testing for T-cell immunity might be a better response than vaccination? Or should this be tested before vaccination is requested?

Nic Locker

I think these are both things that, so, by doing serology called testing and keeping blood samples of people that have been vaccinated, this is something that can be done in parallel. And that is being done in parallel, as well as monitoring cytokine levels, and how well our body responds to or, how our body responds to either infection or vaccination, so all of those things have to be done parallel. It's not one or the other.

Steven Bruce

Right? I want to go back to side effects, if I can. I mean, just very briefly, do we have any updated statistics on the AstraZeneca blood clots or the Pfizer anaphylaxis side effects? I think the last I saw it was about five and a million for anaphylaxis for Pfizer.

Nic Locker

Yeah. And you're absolutely right. And in terms of the blood clots, so in the UK, there have been, if I'm not mistaken, 77 cases that have been reported, which is, you know, which, of course for the patients that have been suffering those blood clots is terrible, but in terms of safety concerns over this particular vaccine is not something that we should be concerned, it's something that we need to keep monitoring. But if those numbers remain as they are, this is not something that should impact the vaccination strategy.

Steven Bruce

Okay, so, turning specifically to the Pfizer vaccine. Somebody has sent in a message to me saying that I think it was Ed who sent this in saying that concentrations of, vaccine derived lipid nanoparticles, well outside my area of expertise, are found in the highest concentrations in women's ovaries and the bone marrow of both sexes 14 days after vaccination. And that apparently has consequences for long term fertility and birth defects. And Anna has sent in an observation that her children are refusing the vaccine because they are worried about long term fertility issues and so on. Is that something which is a genuine concern? Or has there been some research to dismiss that?

Nic Locker

So there has been some, well, first of all, there have been some extensive monitoring of the different age group and sex group in the vaccine trials. And there hasn't been any report of an impact on fertility, but I think what's important is to try and break down those different points. Because they relate to different things, right? So what are those nanoparticles? So the Moderna and the Pfizer vaccine are both an RNA vaccine that are packaged in lipid nanoparticles. This is absolutely needed because it's a layer or a coat

of lipid, fat if you will, that will basically protect the genetic information of the vaccine and allow it to basically reach its rightful destination in our cell. Okay, so this is kind of a vehicle in a way for the vaccine. Now, I believe most of the concern first originated from a few Facebook posts around a study that reported the danger of nanoparticles in the body. And actually, if people go back to the source of the article and the data that were circulated, these nanoparticles were, the nanoparticle referred to in that study were actually other type of nanoparticles, not the ones that are used in the current COVID-19 vaccine. These were referring to silver nanoparticles that are being used in other pharmacological application and can have some toxicity. But I want to stress out that these are not the nanoparticles used for the COVID-19 vaccine. Okay.

Steven Bruce

It's not going to be the first time that COVID-19 or its vaccines have been blamed for something which has nothing to do with them.

Nic Locker

Exactly. So here it's about going beyond the name nanoparticle. And really trying to consider what we are talking about. Now, with regard to the specific targeting of the ovaries, this is linked to a study published, and to data that actually have been presented by the vaccine manufacturer, where they have looked at the pharmacokinetics of the vaccine component. So the accumulation of those nanoparticles in different organs over time. And what has been found is that the lipids derived from the nanoparticle tended to accumulate higher in the ovaries than in other organs. Okay? Now, if you think about what your ovaries are about, or, what ovaries are about, it actually makes perfect sense. Ovaries are really efficient at metabolising lipids, because these lipids are the prime constituent of the hormones that the ovaries have to synthesise. Okay, so the fact that if you inject lipids into an individual or into an animal to study their pharmacokinetics, if you notice that these lipids tend to accumulate in a much higher proportion in reproductive organs, this is actually what one would expect and almost the positive control, if you want, that the study is working well. So the fact that we have accumulation of lipids, nanoparticle derived lipids in the ovaries, there are not really much concerns here. So you know, the type of nanoparticulate is one thing, I think we can debunk that. The fact that lipids would accumulate in the ovaries, this is normal and expected. And impact on fertility, currently, there is no evidence that the different vaccines that have been approved for use have any impact on fertility, male or female.

Steven Bruce

Thank you. I hope that puts some minds at rest. We've had another question and I'm just trying to find it now because it was one that caught my interest. Mary Lou has said, what is the best response to anti vaccine people who say we're being injected with a poison that has a long term effect of collapsing our immune system. And I kind of suspect that there are some people who we will never convince, there are people who sit on one side of the fence and they're not going to be swayed. I've also heard that explaining the science to people does not affect in any way what they believe. The statistics, the numbers might be more influential. But science often tends to just confuse.

Nic Locker

Yeah, and I think what's important is to look at, as you say, is to look at the numbers, you know, since we've started, so for example, we can compare what's happening at the moment with the third wave of

COVID in the UK, the number of people that are being hospitalised. And more importantly, the number of people that are dying from COVID-19 is significantly lower than pre vaccination. And this is because with the vaccines, you are going to reduce hospitalisation rate. With vaccination, if you have less people in hospital, you will have less people that will go on to develop a severe and critical condition and die from COVID-19. And, you know, what's really good is that even with those new variants that we see appearing, we can still see that even though the vaccines we have, are perhaps less efficient at reducing transmission of the Delta or the Beta variant, they are still extremely efficient, more than 90% efficiency in reducing hospitalisation. And this is all down to the vaccines. Right?

Steven Bruce

Yeah. We've had a lot of questions about the safety of vaccines and the relevance of vaccines in children, people saying, you know, what's the transmission rate like with children? What is the data about safety with children? And you know, why is it important for young people who don't really get any symptoms to get vaccinated? All sorts of questions, which I know you'll have heard over and over again, perhaps you can give us the lowdown.

Nic Locker

So I think in terms of rolling out the vaccine in the younger population, at the moment, there are no scientific reasons for which we should not vaccinate children over the age of 12. Right. The three main vaccines that we have for use in the UK, are safe to use in children over the age of 12. And this is basically based, you know, the fact that we are or we aren't using them right now in that age group is basically a political decision. And, you know, it's down to our governments to take those decisions, you know, the studies on which the decisions will be made differentially in different countries are available for every own health service in different countries to decide, and so, you know, some countries have decided that, based on the evidence, yes, we can vaccinate every single person over the age of 12. We haven't yet decided to do that in the UK. What the evidence is saying is that it is safe.

Steven Bruce

Neil's raised an observation based on what you were saying there, that on that premise, we are vaccinating children largely to achieve herd immunity not for their own protection. Is that correct?

Nic Locker

Yeah. And so this is based on the reports that children are less likely to develop severe forms of COVID. And to be fair, this may have well been true in the earlier days of the pandemic, but with new variants, emerging constantly, whether this is still the case at the moment and whether this will still be the case against the next prevalent viral variants that emerge is debatable. So I think it's a combination of both, you want your children to be safe, and you want to break the chain of transmission.

Steven Bruce

Yeah. Okay. Pip's asked for some clarification on whether COVID vaccines are still considered to be experimental. I don't know where they are in the stages of normal ratification of vaccines. Are they experimental or are they now established?

Nic Locker

No, from the point that they are approved or used in the general population, they are not experimental anymore. What is true is that, should we tweak? As, for example, I believe Pfizer and Moderna are doing, should we tweak the vaccine so that it has different properties and is able to react better against the new variants. These tweaks would have to go through reapproval again. Okay. So they would not be simply rolled out based on the fact that well, the previous Pfizer vaccine was approved. So this is just, you know, like, changing your car's wheels.

Steven Bruce

But it's not the same for every, the flu vaccine gets tweaked every year.

Nic Locker

And it's the same. It has to be checked for safety again, and it has to be checked for efficacy again.

Steven Bruce

The three vaccines which are currently in use Moderna, Pfizer, AstraZeneca, they're all messenger RNA vaccines, is that right?

Nic Locker

Not the AstraZeneca vaccine. But Pfizer and Moderna are.

Steven Bruce

Right. I was reading an article earlier today about Novovax vaccine, which is apparently a, I don't know, what's it called, a subunit?

Nic Locker

A subunit vaccine. That's absolutely right.

Steven Bruce

Yeah. So how does that differ? Is that better or worse, or?

Nic Locker

It's just a different strategy. And to be fair, it's, I mean, you know, for a virologist, it's amazing that we have all those different tools in our arsenal against COVID. So an mRNA vaccine is basically injecting people with a nucleic acid sequence that will express to COVID, SARS Coronavirus-2 protein that will then stimulate or trigger our immune system. The AstraZeneca vaccine is using a non-offensive virus that is already displaying the spike protein of SARS Coronavirus-2 to stimulate our immune system. And a subunit vaccine is a vaccine in which you again use an inoffensive virus as a scaffold to present a fragment or a subunit of a viral protein in that case, the spike protein to stimulate the immune system. So what we see is that basically with all the different vaccines that are in use or approved, we have the different type of strategies of a vaccine designed that are being rolled out.

Steven Bruce

Are there, do you know fewer side effects with the subunit vaccines?

Nic Locker

It's similar to the ones that are already implemented in the population, what we should keep in mind is that what makes all those vaccines efficient are also the adjuvant that are added to the formulation to stimulate and to boost or to prime the immune system. And usually, the side effects that we are developing are actually not against, you know, the spike protein, or the subunit of the spike protein but against the adjuvants.

Steven Bruce

Okay. Again, I'm going to get back to side effects. This is a question that was sent to me some time ago. And I'll read it out, again it's from Ed. A cytotoxicity of the viral s protein and the discovery that far from remaining attached to the cell membrane when expressed, gets detached and travels freely around the body for several weeks after inoculation, causing he says unknown and potential multi system damage with a risk of both long- and short-term health consequences. Is that a real problem?

Nic Locker

So, to my knowledge, this is not a problem because from the vaccine trials, what has been shown is that the level of soluble spike protein in the body after vaccination are extremely low, and in fact, this is to be expected because our body is equipped with enzymes that are called protease or proteinase, whose entire function is dedicated to binding and chopping or degrading proteins that are soluble. And so proteins are very, if they are not protected by chaperone proteins, so protected by other proteins, or packaged within ourselves. Proteins are going to have a very low stability in our bodily fluid, because very rapidly, so here we are talking about a matter of hours, they will be degraded by those proteases.

Steven Bruce

Okay. And this may well be our last question. It comes from Vero, sorry if I'm mispronouncing your name, the initial COVID vaccine trials avoided recruiting people with autoimmune disease. And there's been a study in Israel on RA patients' rheumatoid arthritis. Do you think that COVID, the vaccine could exacerbate these diseases or these conditions or trigger new ones? Such as Hashimoto's, graves' and a number of others that she lists or he lists?

Nic Locker

Yeah, no, that's a very good point. I mean, it's absolutely fundamental that in vaccine trials, we exclude, to start with people with autoimmune disease, because the sole purpose of the vaccine is to boost your immune system and provoke an immune reaction, which is kind of the opposite effect you would like for a patient with an autoimmune disease. So what we are trying to do now is to try and evaluate the safety of those patients when exposed to the vaccine. And if you think about it, the best way to protect those patients with immune disease is actually to achieve herd immunity, so that they can be protected by the fact that we are all vaccinated.

Steven Bruce

Let me see if I can find one more for you. I've got so many questions in my list. I've also got massive thanks from the team today, because we're getting lots and lots of praise for you having come on the show and shared all this. Martin's actually asked an interesting question, what do we do about a control group? Because if we're trying to vaccinate everybody, we won't have a control group, which where we

can say, well, this is what happened if you didn't get vaccinated in terms of side effects or long-term effects. This is what happened if you did. Do we just have to put up with that?

Nic Locker

So, A we just have to put up with that. And B, we also have people that will refuse to take a vaccination. And actually, there are four other vaccines, such as a measles vaccine, we've been able to follow the impact of not being vaccinated by actually engaging with population, or cohorts of people that have refused vaccination for their children and being able to gather really interesting data on this. Data that in fact have shown that not being vaccinated against measles increased the incidence of measles in the non-vaccinated cohort, not surprisingly.

Steven Bruce

Yeah. So here's one, which has been asked in a different form by several people. Well, this is Sue's wording. What do you think of Geert Vanden Bossche's opinion, that vaccination during a pandemic will actually put pressure on the I think virus she means to produce more virulent mutations?

Nic Locker

Yeah. So, you know, viral evolution is not really something that we can address in two minutes. It's true that viruses mutate to avoid immunity and to avoid the immune system. And this is what we see we flu every year, right? We roll out a vaccine, and then the virus adapts, mutates. And so, the way you have to think about it is, it's an arms race between our immune system and the virus, it's who can be the most clever or the more rapidly. And so yes, by vaccinating a lot of people without reaching herd immunity, we will, we can potentially create a breeding ground for the emergence of a variant. But once we have achieved herd immunity, then we have won that race. And we have reverted that pressure, if you will, on the virus, which is why, you know, vaccinating a lot of the population in the UK is critical, but vaccinating most of the worldwide population should be our main concern right now. So sharing those that are not used with lower income countries, making sure that they have access to the vaccine and cheap vaccines.

Steven Bruce

And maybe I should try and get a politician on the show to address the problems in those areas because it's definitely outside your area of expertise, isn't it? But we won't hold you responsible for under vaccination in third world countries. Nic, thank you so much. It's been kind of you, this is the third appearance by you and a load of information there. I've got lots and lots of questions. So, Joseph, Gwynneth, the potato viewer, Ellie, Rachel, Koryn. I'm sorry, I didn't get around to your questions and all those other questions which were in my list, but we just ran out of time. It's been really informative. I hope you've been able to settle some worried minds. I hope you've been able to put some of it to rest. And I hope that your work with viruses and vaccines goes on and on. And also, you're off to France this weekend, presumably for holiday. So I hope that goes well as well. Thank you, Nic.

Nic Locker

Thank you very much. And it was my pleasure to be on the show again.

Steven Bruce

Thank you very much indeed.