HOUSE OF COMMONS

Science and Technology Committee

Oral evidence: Antimicrobial resistance, HC 848

Wednesday 12 March 2014

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Written evidence from witnesses:

- Department of Health
- Public Health England
- Veterinary Medicines Directorate

Watch the meeting

Members present: Andrew Miller (Chair); Mr David Heath; Stephen Metcalfe; Stephen Mosley; Pamela Nash; Graham Stringer; David Tredinnick

Questions 241-355

Witnesses: **Professor Dame Sally Davies**, Chief Medical Officer, Department of Health, **Sally Wellsteed**, Antimicrobial Resistance and Healthcare Associated Infections Team Leader, Department of Health, and **Nigel Gibbens**, Chief Veterinary Officer, Department for Environment, Food and Rural Affairs, gave evidence.

Q241 Chair: Good morning. Can I welcome the panel to the first of our sessions this morning? We have a number of questions that we need to get through before we invite the Ministers in, in about an hour, so we want to rattle on fairly quickly if we can. If there are additional points you would like to raise and I have to cut you off because we are tight on time, please feel free to follow up in writing if there is more information you need to submit.

First of all, if I may start with you, Dame Sally, you discussed your intentions for tackling antimicrobial resistance in front of the Committee in January last year. Could you outline what you have done nationally and internationally in that respect since our last meeting?

Professor Dame Sally Davies: Thank you. Over the last year, since I published the report in March last year, a terrific amount has happened at both levels. Nationally, we published, or the Government published, a cross-Government antimicrobial strategy in October. Work is ongoing with that. There is a high-level steering group chaired by the director-general of public health from the Department of Health, which involves DEFRA and all our appropriate arm's length bodies working up a plan; we will see the first draft publicly in April. They are working on stretching metrics and then, when they have received your report, they will do some more work, and we will have the final plan and an update in November. Meanwhile, with a lot more noise in the system and awareness of

antimicrobial resistance, people are beginning to look at how they use antibiotics, and what is going on. In research, we from the Department of Health, through the NIHR, launched a themed call on antimicrobial resistance. The Medical Research Council has set up a funders forum bringing together all the different Government funders, but also the Wellcome Trust, and we are on that. The Medical Research Council has started with a £20 million AMR research platform.

At the international level, which is where I focused a lot of my personal effort, we have a resolution, co-sponsored with Sweden, that went through the WHO executive board in April, with 50 countries' unanimous support; it goes to the World Health Assembly in May, and I hope will be passed there. That then tasks the WHO to develop a global action plan and metrics, and to support countries in developing their plans. They have set up a strategic technical advisory group, which I am chairing for them, so I am being advised on their behalf by experts from all round the world and trying to help them.

I have to give recognition to the Foreign Office. Ambassador Pierce, the ambassador and permanent representative of the UK to the UN, has led a lot of this work. She set up a champion's network in Geneva with a great regional spread of members, and has really made this happen. Meanwhile, it has been picked up by many others. For instance, last Thursday I went for three days to Hanover to the European Academy of Sciences scientific advisory group, who were doing an unusual meeting, for them; they brought together experts from the basic sciences in AMR to discuss where we were, what is happening and what needs to be done at the European level. I am involved in a number of things internationally. The other thing I would highlight, which you are aware of, is that I have written a book, and I have done a TED talk to try to get through to the public. That gives you a feel for the activity, both nationally and internationally, but clearly you will want more detail from all of us.

Q242 Chair: Thank you for that. As a result of your work, are you still of the opinion that antimicrobial resistance should be on the national risk register and, if so, why?

Professor Dame Sally Davies: I am. If anything, it has got worse; what I omitted to say is that it is already on the Department of Health and DEFRA risk registers, and we are working to the previous Cabinet Office guidelines to develop the case to go on to the national strategic risk register. We have had expert workshops on the modelling. We hope to have final confirmation from the Cabinet Office before the summer about what form the update will take, so it should go on to the national strategic risk register before Christmas. That register is only updated every two years.

Q243 Chair: Thank you. Nigel Gibbens, the five-year strategy is described as a "one health" approach. Can you explain how DEFRA has worked with the Department of Health on the antimicrobial resistance policy?

Nigel Gibbens: Yes. This is a true partnership between the two Departments. The Veterinary Medicines Directorate—you will hear from Pete Borriello, the CEO, later—is our lead on medicines and has been closely involved in production of the strategy. I

co-authored the foreword with Dame Sally. We are fully committed to this, and it follows on from work we have been doing in the animal and veterinary area for some years. The strategy will build on quite a lot of work to pursue best practice guidelines to make sure that veterinary medicine is properly licensed and properly used. Of course, with the animal role in the food chain we have to maintain a structure of controls to ensure that residues do not enter the food chain, so in the strategy we build on all of that foundation, but there is more to do.

We recognise that the development of antimicrobial resistance is complex, but we have to address all the threats of the development of antimicrobial resistance, including that through animal use. Having said that, animal use needs to be kept in perspective and we need to recognise that it is probably not the main driver; but it is certainly a risk that we need to deal with and to close off, both nationally and internationally. I think Dame Sally was right to focus on the international aspects, because action at home will not protect us when we are dealing in a global marketplace.

Q244 Stephen Metcalfe: Good morning. When you came before us—I think it was in January last year—you said in one of your answers, "when I need a new hip in 20 years, I will die of a routine infection because we have run out of antibiotics." Are you any less concerned a year on than you were then that that might be the nightmare scenario?

Professor Dame Sally Davies: I remain concerned. I hear stories of big pharma disinvesting in their infection groups and downsizing. I understand more now about how difficult it is do the basic science and find new antibiotics. The meeting I have just been to cheered me up, in that the Germans are doing some very interesting stuff with insects, but even if new drugs are found, they will take a minimum of 10—they usually take 20—years to come into practice. Meanwhile, drugs are being misused across the world, not only here; in a modern global age they travel very fast. If I take the example of gonorrhoea, there is only one drug combination that is now effective, and we are beginning to see some resistance to that combination. It is a very unpleasant disease with long-term sequelae—urethritis for men, arthritis and infertility.

Q245 Stephen Metcalfe: Where do we need to focus our efforts on research—on the areas where we are running out of drugs first?

Professor Dame Sally Davies: We clearly need a multi-pronged approach. We need the basic science to discover new drugs. We have a poor development pathway for new antibiotics, though the regulators are looking at that—I met with the commissioner of the FDA last week as she was over here working with EEMA. We need new drugs and a better development path, which can be contracted so that they can be trialled where there is resistance rather than compared with present drugs. But we also need to understand the behavioural science better. Why are people using drugs badly? How do we help get guidelines into practice? We have a swathe of excellent guidelines in this country, produced by NICE and Public Health England in different areas, but they need to get traction and be used. So I worry—

Q246 Stephen Metcalfe: I am sorry to interrupt you, but do you mean used in this country or used globally?

Professor Dame Sally Davies: They need to be used here and then we need, through the WHO and their tripartite working with the FAO, which is agriculture, under the UN system, and the OIE, which is animals but is a partnership of countries rather than in the UN system, to carry those through to other countries. One of my concerns—I know the chief vet shares this—is how antibiotics in the animal kingdom are used in many countries for growth promotion. We need to do more research around how you can simplify and use hygiene, which northern Europe has done very successfully, and not lose growth. There are rather a lot of areas for research.

Q247 Stephen Metcalfe: Do you think, as some people have said, that the establishment of centres of excellence would help in the process to get that development pathway working? Do you agree with that?

Professor Dame Sally Davies: You cannot do this sort of science without a critical mass, so we clearly need centres of excellence working at different levels. I do not think we need one: we have just funded two applied research units—they start work in April—one in Oxford and one at Imperial, to work with Public Health England on antimicrobial resistance, but we need them at the basic level. What I think we need for this nation—and it came up last week that Europe needs it—is a coming together of everyone who works in this field, be it pharma, biotech, or academia, so that once you have a potential drug, it is a single development pathway, because in doing toxicology, animal studies and first in man, you do not want to set it up new each time you want to try something. We ideally would have one antibiotic pathway in Britain, and we need a couple in Europe.

Q248 Stephen Metcalfe: But don't we need to think bigger than that in terms of global, because surely resistance is a global problem? I know there are different diseases that are developing different resistances in different parts of the world, but the world is getting to be a smaller place year by year. Surely we need this combined effort, perhaps under the umbrella of WHO, that brings scientists from around the world together.

Professor Dame Sally Davies: We do need scientists working together. I think scientists are pretty good at working together if the money is there. At the meeting over the weekend, there were people from all over Europe discussing openly, without industry there, what they were doing and what their hopes were for their work. The European Union plays a big role in this through its Innovative Medicines initiative and other work that it does. Meanwhile, on 13 February, the United States launched—we were present with the WHO in Geneva—a big new thrust on global health security, and clearly they have antimicrobial high on their list of issues for global health security. Indeed, President Obama mentioned antimicrobial resistance in his State of the Union speech. We all need to work together. The scientists always do, or almost always. The question is: how do we aggregate the funding and make sure we are not wasting money?

Q249 Stephen Metcalfe: The five-year antimicrobial resistance strategy downplayed the rise of antifungal and antiviral resistance. Do you think those are of equal importance? Do you think the strategy got it right in focusing on antimicrobial?

Professor Dame Sally Davies: Antimicrobial encompasses bacteria, fungi, viruses—all things—but at the moment the emergency is bacteria. Of course we need to keep our eye on other things: 7% of HIV viruses are resistant to standard therapy, but people are working on that. With fungi, yes, increasingly there is resistance. I do not think we have lost it; what the Government have done is focus on the emergency. Meanwhile, there is work going on in the other areas.

Q250 Stephen Metcalfe: That is interesting; we are focusing on the emergency, which is, "What do we do now?" Do you think we are at the tipping point where we will have developed a strategy that will take us over the next hundred years? What I am concerned about is that we are dealing with your nightmare scenario of dying on the operating table in 20 years. Will we not be back in the same position in 20 years? Do we need to change the strategy from hereon in, into the future indefinitely, so that we are always developing new drugs?

Professor Dame Sally Davies: Absolutely. When we look at novel funding mechanisms, which we are starting to model, in Government and discuss them with people, it is clear that we need a global solution to novel funding mechanisms for new drugs, be they antibiotics, antifungals or whatever, and that it has to be a sustainable one that will roll forwards. I see the cross-Government strategy as a great start, but it will need updating and reviewing at least at three years, if not before, and rewriting at five years definitely.

Q251 Stephen Metcalfe: And that is why antimicrobial resistance needs to be on the national risk register permanently. It is a war effectively, isn't it? We are fighting a battle.

Professor Dame Sally Davies: It is, yes, and it is guerrilla and full frontal, unfortunately. They keep coming round the back.

Stephen Metcalfe: Let's hope you find them. Thank you.

Q252 David Tredinnick: Good morning. Dame Sally, on page 59 of your book "The Drugs Don't Work" you say that it can cost over £1 billion to develop a new medicine. Have you considered what your approach may be if we continue to fail to produce new classes of antibiotics?

Professor Dame Sally Davies: Well, we'll all be in it together. It will be very expensive. We know that it doubles the cost of in-patient admissions and that people will die early. We are looking with the WHO and World Bank at how we can do better economic studies to quantitate the present scenario rolling forward, because that helps to give us some

understanding of what we should as a society be prepared to spend in solving the problem. But it is a global problem. A billion pounds is what is always quoted for developing a new drug because of the time it takes from basic science into patients, and because of the failure rate. If you got a hit and you pulled it through, it might cost half that, but the £1 billion allows for the failures. We need to find a mechanism to get more successes early on and pull them through.

Q253 David Tredinnick: Have you had a chance to look at some alternatives, such as herbal medicines? When you came in front of the Health Committee on 4 March, I asked you about alternatives to antibiotics and I think you volunteered that you had yourself used tea tree oil in your family.

Professor Dame Sally Davies: Against nits, yes.

Q254 David Tredinnick: I wasn't going to go into that; I wasn't sure you'd want me to repeat it. All of us who have had children have found it to be a very effective treatment. I wanted to inquire whether you look more broadly at this. With tea tree oil and, another witness suggested, myrrh, which is antiviral and antifungal, frankincense and artemisinin, a traditional Chinese medicine that has been used for 2,000 years and has now been shown through trials to be effective in artemisinin combination therapies—ACT—for the treatment of malaria, are we not getting some pretty big clues that we need to look sideways as well as forwards when we are dealing with these things, and look at what we have around at the moment? Perhaps you would address herbal medicine first and then I will move on to another topic.

Professor Dame Sally Davies: Clearly, herbs and plants produce a lot of chemicals and they have been used for eons—for ever—in the treatment of patients. The problem in using them in the modern day is that they are usually soups of chemicals, and for evidence-based medicine you need to extract the active ingredient, make sure it is clean and then demonstrate its efficacy and safety. Artemisinin, used for malaria, is absolutely a wonderful example; it is the best drug for malaria and, as you said, comes from a Chinese herb. It was the Wellcome Trust that funded all of that work, which cost millions, and did not take out a patent, and therefore made it available for the world. There will be active ingredients to be found in plants for disinfecting, or even managing infections. I heard in Hanover that some people are working in those areas, but we have to treat it as extracts from insects, fungi and all the other places that we get antibiotics or disinfectants from.

Q255 David Tredinnick: I use traditional Chinese herbal medicine and have done for years. They always work in combinations of herbs, and this is one of the problems; you are talking about extracting and checking an individual plant or herb, whereas in herbal medicine it is the combinations that are effective. Some Chinese treatments use up to 25 different herbs in one treatment. I think this is something that we really have to address, because if we are going to use herbal medicine, we have to look at it as it is usually used.

Professor Dame Sally Davies: We have some concerns. As you know, some Chinese medicines lead to liver failure and kidney failure, and, under our legislation, much of it European based, we have to have a market that is regulated by the MHRA.

Q256 David Tredinnick: Fair enough. I wanted to ask you also, and I have given you notice of this, about the French studies on homeopathic medicine, which apparently show that where homeopathic and allopathic medicine are used together it increases patient satisfaction and reduces the amount of allopathic medicines used. I wrote to the Secretary of State following a conversation with him in July, and he wrote back to me in December saying that he had asked the chief medical officer to have the studies reviewed, that they were well designed with appropriate conclusions but that there were some concerns about the size. I put it to you that, whatever the results of this particular exchange, we really do need to look at all the potential treatments around, and this is one of them. I would like to ask you to comment on that exchange, please.

Professor Dame Sally Davies: I am very happy to, as clearly I was responsible for the draft of the letter from the Secretary of State to you. I asked a couple of really good high-quality methodological reviewers, and they said there were limitations to the studies because they were descriptive, and on one of the studies there was a relatively low response rate at 12 months, and a lack of randomisation. Those studies, while interesting and hypothesis-generating, were not proof for use. But we do know that patients like to spend time with clinical staff and get benefit out of that interaction, and I am on record to this Committee talking about the value of the placebo response.

Q257 David Tredinnick: Fine. I want to ask you one more question on this—you nearly side-tracked me. Do you think it is odd that in France and Germany there are 4,000 homeopathically trained doctors practising, quite happily treating patients with the support of their Government, and that here we have perhaps 500, but there is very limited access on the health service? Do you think it is strange that we are out of line with those two European countries, without even addressing other countries in the rest of the world?

Professor Dame Sally Davies: Not at all. This is absolutely cultural. The French, as you know, use many of their antibiotics and other drugs anally. The Italians use many of them vaginally, whereas we are apt to use them orally. Culturally, we practise medicine differently.

David Tredinnick: Thank you.

Q258 Pamela Nash: I would like to move on to our medical professionals' knowledge of AMR, and to ask you about the design of personal development requirements for clinicians and also about the training that our doctors get at university. Do you think that they are adequate at the moment in terms of training about AMR? How involved are you in the design of that for clinicians in England?

Professor Dame Sally Davies: Thank you. I am not involved—oh, to have the time to get into everything!—but also I am not an expert in this field, and the experts are involved. It

starts with the General Medical Council, who supervise the curriculum and its delivery in medical schools. Under their "Tomorrow's Doctors", which is a standard publication, they actually say that students must be taught so that they can demonstrate a knowledge of drug actions, including the effects on the population, such as the spread of antibiotic resistance. It is there as core from the General Medical Council in the undergraduate curriculum.

Then, as they come through into practice, we have a Department of Health code of practice, from 2010, on the prevention and control of infection, and related guidance that was worked up with stakeholders to ensure prudent prescribing and antimicrobial stewardship. Of course, as they go through their first couple of years, they will get training on the job from the infection control teams and their microbiologists. Meanwhile, the Department has put antimicrobial resistance in the new mandate to Health Education England, and they have said they will work with professional regulators to make sure it is embedded in all the professional curricula, competencies and principles of prescribing, including antimicrobials. The Academy of Medical Royal Colleges is developing an infection training curriculum and an assessment system at the moment for infectious diseases and microbiology, which will be completed early next year. The Royal College of General Practitioners have an online tool called TARGET that they improve every year, and we kind of re-launch it every November on European antibiotic awareness day to help them. Then there is guidance from Public Health England, mainly at the laboratory and surveillance end, and a terrific tranche of guidance—I can give you a list—from NICE into the specifics of how to treat individual patients. Our specialist advisory committee, ARHAI, which deals with antibiotic resistance, put out some guidance in 2011 called "Start Smart—then Focus." There is a terrific amount of work, and, more and more, because of the cross-Government antimicrobial strategy, there is work to bring this together and make it coherent.

Q259 Pamela Nash: I am glad you ended on that point because, to me, that sounds very comprehensive but also extremely complex. Are any of those mandatory? Is there any mandatory requirement on a clinician?

Professor Dame Sally Davies: The GMC is mandatory. NICE guidelines are the gold standard, and if people depart from them, there is trouble if the patients suffer.

Q260 Pamela Nash: Just to be clear, is there mandatory regular training for practising clinicians on AMR?

Professor Dame Sally Davies: I am not aware of mandatory regular training, no, but general updating is part of their professional development.

Q261 Pamela Nash: Is that something you would consider?

Professor Dame Sally Davies: I do not think we need mandatory training; we need coherent, easy packages. I think the GP package has been good. You can take a horse to water but not make it drink, and I think we really need to continue—

Q262 Pamela Nash: You can if it is mandatory.

Professor Dame Sally Davies: No, but they don't always drink; that was my point. There are areas where I would like to see mandatory action, and that is on surveillance data and the collection of it, which no doubt we will come back to, but on this I think we need really good, regularly updated training packages. I think the GP one is a very good one.

Q263 Pamela Nash: Can I ask Mr Gibbens the same question about vets? Are you aware of what training is given on AMR throughout vets' careers? What training is available to them?

Nigel Gibbens: We have a parallel regulatory body, the Royal College of Veterinary Surgeons, and in their guidelines for professional conduct, responsible use of medicines is a responsibility placed on vets. They have that responsibility. It is covered in the undergraduate course, and the Veterinary Medicines Directorate works with the schools—relatively few schools—in the training given to undergraduates. Then, through our professional organisations, we have a range of guidelines for vets—and farmers, because we have the vet-farmer interaction to deal with. We have RUMA—the Responsible Use of Medicines in Agriculture Alliance—providing guidelines on a species basis for farmers and for vets to use, and we have the veterinary professional divisions, the British Veterinary Association, the British Equine Veterinary Association and the British Small Animal Veterinary Association, all producing guidelines on best practice, which helps our vets meet their obligations under our code of conduct. Similarly, we have mandatory continuing professional development, as do doctors, but we do not have a mandatory antimicrobial resistance element to it. But I am confident that this is a live issue in the veterinary field that my colleagues cannot fail to be aware of. There is, however, a need for us, with our vets and our farmers, to ensure that we get behaviour change and move constantly towards minimising our use of antibiotics and maximising good practice in husbandry. It is slightly different in the animal field, in that you can control their lives so much. We can do quite a lot of intervention to prevent the need for antibiotics. We have not touched on vaccines yet, and we are not here to talk about them, but preventative measures are also really important.

Q264 Pamela Nash: Thank you. I would like to return to you for a second, Dame Sally. We are very aware from evidence that we have already heard in the Committee that doctors feel there is a lot of pressure from patients often to be prescribed antibiotics. Do you think that there is cause for a public awareness campaign?

Professor Dame Sally Davies: I do, and I think it is going to be part of this ongoing war for our lives and our children's lives. I have asked Public Health England, who hold the expertise for social marketing as well as the budget, to prepare plans for that to go to the relevant Government committee for clearance. I would like to see one in November, if we can get it ready, because that is when we have European antibiotic awareness day, and it is at the beginning of the coughs and colds season as well.

Q265 Pamela Nash: Finally, is advice given to clinicians on how to deal with patients coming in and demanding antibiotics?

Professor Dame Sally Davies: Yes. That is the Royal College of General Practitioners TARGET product or tool. The other thing that is increasingly used—we would like to raise awareness and monitor it—is the use of delayed prescriptions. We funded research that showed that if you have a mother with a child who is pyrexial—has a high temperature—and you say, "I don't think you need this antibiotic, but I don't want to waste your time coming back, so here is a prescription. Cash it in if your child has not improved in 24 or 36 hours," that can reduce the use of antibiotics quite considerably. We funded the research, and a number of GPs are using it. We would like to promulgate that and monitor it.

Pamela Nash: Thank you.

Q266 Stephen Metcalfe: I have a very quick follow-up to Pamela's question. Can you tell us how the mechanism of postdating prescriptions works, whether it is voluntary or mandatory?

Professor Dame Sally Davies: It is voluntary. We do not make the GPs do it, but good GPs use it. They do not postdate it. They sign it with the date, because you can cash it in whenever you want, but what they are saying is: "I don't think you need it, but if your child gets worse or doesn't get better, you can have it."

Q267 Stephen Metcalfe: It is dependent on the parent not cashing it in.

Professor Dame Sally Davies: Yes.

Q268 Stephen Metcalfe: It is up to them to say, "I am happy to wait 36 hours."

Professor Dame Sally Davies: Yes, but the evidence shows that parents then relax, go off and sit it out at home, and find that they do not need them. I cannot tell you the figures. We can send you the paper if you want it.

Stephen Metcalfe: That would be useful, yes please. Thank you.

Q269 Stephen Mosley: Could I ask about the NHS targets for health care associated infections? Do you think those targets are useful to NHS trusts and the NHS as a whole?

Professor Dame Sally Davies: I think they have been excellent. We started off with bad health care-acquired infections, MRSA and C. difficile. By putting in mandatory targets and a zero tolerance system, we have reduced deaths and morbidity dramatically, so I have no problem with the fact that we have had them. The question is now—the high-level steering group and our respective scientific advisory committees are reviewing it—should we continue with them as they are, considering the rise of gram negative organisms and the resistance in those, or are there other things we should collect? I am quite convinced

that we need to have, expert-led, a kind of scorecard of metrics, which may continue to include those. I would like them to be mandatory, because otherwise there are a number of things. First, how do we know what is going on if they are not mandatory? The second thing is that I would like the Care Quality Commission to review the AMR data, but they cannot unless it is national data—they won't use just voluntarily given data. The only way we can have national data that is really good is by mandating it. In order to assist the CQC to help us in this area, which I want it to do, I would like a scorecard for a number of measures that are mandated.

Q270 Stephen Mosley: Okay, so the CQC cannot look at things like MSSA or E.coli and—

Professor Dame Sally Davies: They can look at those because they are mandated, and that is there. I would like to see them do two things. I would like to see them do themed reviews and I would like to see them, on their visits, take an infection control specialist and a microbiologist and look clearly at the mandated ones like E. coli and MSSA, as well as C. diff and MRSA, but look more broadly at prescription practice in the hospital as well and how they are using things.

Q271 Stephen Mosley: You said that at the moment there is a working group looking at the targets. Who would be involved with that?

Professor Dame Sally Davies: We have ARHAI, which is chaired by Professor Mike Sharland from St George's and has experts on it. You, Nigel, have DARC, an animal committee, and they are doing some cross-working. They have under discussion some papers with metrics, which I have seen. That is going to broaden the scorecard, but I would like some of it to be mandatory.

Stephen Mosley: Thank you.

Q272 David Tredinnick: I want to talk about animals and antibiotics. What advice would you give about the effect of animal consumption of antimicrobials on antimicrobial resistance found in pathogens that affect humans? Is more research required in this field?

Nigel Gibbens: The pathway from antimicrobial resistance in animal pathogens to antimicrobial resistance appearing in humans is often not clear. Frequently, there is an assumption that that is the case, which is not borne out when you go and do detailed research to see whether it is true. But sometimes it is true. The classic case is probably MRSA in pig keepers in the Netherlands, and the care they have to take when those people need to go to hospital. We have a very clear warning there. There is room for us to do more research to understand that pathway and to see whether it is a bigger factor than we currently believe it to be.

Professor Dame Sally Davies: I agree that the evidence is not strong, though clearly you can get resistant salmonella transferring from poultry to humans, but I find it odd that, as a world, we have to prove that broad antibiotic use in the animal kingdom—not as occurs in this country, but for growth promotion—is harmful to humans, which seems to be where

we are at the moment globally, although not in the EU, rather than the animal husbandry people who use them proving that they are safe. I think we have got this the wrong way round, but the evidence to make the case is not as strong as I would like.

Q273 David Tredinnick: Are you aware of the European Union agriculture committee amendment to the 2012 budget, which has allocated €500,000 for funding of research into homeopathy and phytotherapy—that is herbal medicine, obviously—in livestock farming as an alternative to the use of antibiotics? Do you support research into alternatives in this way?

Nigel Gibbens: I think that is for me as well. It is hard to pin down what happened to that budget, but it is clear that they made that move, and I would agree that it is worth pursuing all lines of inquiry. I think you covered this in discussion with Dame Sally earlier. I would not set any source of effective therapy apart from any others, but the proofs of efficacy have to be the same, and that brings the same barriers on the veterinary side as it does on the human side.

Professor Dame Sally Davies: I hope they are randomised studies.

David Tredinnick: I couldn't tell you.

Q274 Chair: You are saying that if they are not randomised, they are not worth a light.

Professor Dame Sally Davies: No, because you might have had one farm cleaner than another.

Q275 David Tredinnick: "The evolving threat of antimicrobial resistance" report of the World Health Organisation says that to overcome this problem we should be looking at all alternatives, and we should have an inclusive way of dealing with things. I put it to you that, with the huge research budget you have now, it would be a very good idea if we did not rely on countries overseas for research, but that we actually spent a little bit more money on trying to find out for sure, according to scientific principles, why so many people are using these different alternatives.

Professor Dame Sally Davies: If we received a really good, methodologically and scientifically sound proposal, I expect it would get funded, but under the Haldane principle, the committees take that decision, not me.

Q276 David Tredinnick: Thank you. That is very helpful. Finally, guidelines such as RUMA have been recommended by the strategy. Are there any plans to create mandatory guidelines for vets or farmers on the use of antimicrobials?

Nigel Gibbens: There is a lot currently mandated. Treatment of animals with antimicrobials is only under veterinary prescription and, as I said earlier, vets are under professional guidance to ensure responsible use. Those two things together, plus RUMA guidelines and the others that I referred to on a veterinary and species-specific level, equip

our professionals to make sure that there is proper use. However, I do not want to give the impression that I and Dame Sally are separate on the importance of dealing with use in animals as a potential driver for antimicrobial resistance in human pathogens. I am absolutely sure that we need to deal with that, and we are committed to doing that, both at a UK and an EU level. You touched on the agriculture committee; we also have the Commission 12-point plan on antimicrobial resistance, several of which deal specifically with the veterinary side. We need to deal with that issue.

David Tredinnick: Thank you.

Q277 Stephen Metcalfe: We have heard various bits of evidence that suggested that there are some gaps in our diagnostic techniques and technologies, and that if we improve diagnostics we could identify more rapidly the cause of disease and whether or not that disease had resistance. That could lead to better treatment—better treatment being less prescribing of inappropriate treatment—and hence we could help tackle AMR. Do you agree with that?

Professor Dame Sally Davies: I do. Rapid diagnostics could absolutely be game changing.

Q278 Stephen Metcalfe: Therefore, what do we do about it? Should the Government be focusing more on improving investment in diagnostics?

Professor Dame Sally Davies: The Technology Strategy Board is doing some work in this area. We are also in discussions about whether this would be an appropriate area for a prize. As you know, one of the ways of game changing in med-tech is sometimes to have a prize rather than to just invest in something. I know that by raising awareness, as we are doing here and globally, more and more companies are coming into the field. We need a number of levels. We need to be able to distinguish bacteria from virus, from malaria and, ideally, TB at the point of care—quick and heat resistant. If it is a bacteria, we need to work out what bug it is and then—and it will be possible with new genomics—to have some dipstick genomics that tell you whether it has a resistance gene or not. There is a kind of pecking order. It is quite clear what we need, and there are companies beginning to look at this, so I agree absolutely. They would be very useful for animals too. We are in cahoots on this.

Q279 Stephen Metcalfe: Would you have any concerns, if new diagnostic techniques and tests were developed, about how rapidly the NHS would take them up? We have heard, not necessarily in this inquiry but in others, that change potentially can be quite slow, and perhaps the system is not able to adapt so easily.

Professor Dame Sally Davies: I think if we can get a cheap rapid diagnostic, we can get it taken up. If we get an expensive one, it will be difficult, because people will start to do the trade-off, which is not the right trade-off, between cheap antibiotics and an expensive test. It is very difficult for doctors who are faced with a patient to think of the bigger population needs, so we need a series of cheap diagnostics, and then I am sure we can get it into practice.

Q280 Stephen Metcalfe: But does that mean we need to start now, even though the diagnostics may not exist, working on the guidelines in the NHS so that when they come forward they will be adopted quickly, which is how the financial model for developing the diagnostics works? It strikes me that sometimes what happens is that someone comes forward with a great innovation and then it dies or crashes because it is not taken up and the financial model doesn't work.

Professor Dame Sally Davies: I think this one is so important, if we get a good product and it is a sensible price. We need it for the global market. We need it for abroad more than us. It has to come out at 10 or 20 cents a hit, per test, actually. If you do not say that up front, people will use expensive technologies. We need some transformational technology, so that people start by looking to do it cheaply.

Q281 Stephen Metcalfe: I have one final point. The NHS is a great testing ground for things because of its sheer scale and size, so if it is taken up by our health services, perhaps it will get the kick-start into the global market that it needs.

Professor Dame Sally Davies: I hope so; I would love to see a British company produce the winner.

Stephen Metcalfe: Marvellous, thank you.

Q282 Pamela Nash: In the evidence we have had, we have had a mixed bag of opinions on the transfer of AMR from animals to humans and the effect of reducing antibiotic use in animals on resistance in humans. Can I ask, Mr Gibbens, how important do you think restricting the use of antibiotics in animals is?

Nigel Gibbens: I think it is very important. As I said before, there are clear examples where antimicrobial resistance can translate to being a real risk to humans. We should pursue research to make sure that we understand the whole spectrum of drivers for antimicrobial resistance, because we have to deal with the environment as well; we have both human use and animal use potentially driving resistance through the environment. Minimising use to where it is really needed, which is what all the best practice guidelines are doing, is absolutely essential. Antibiotics continue to need to be used in the animal field for both production and welfare reasons, but "Use them when they are needed, in the right amount and for long enough" are the standard guidelines. It is important and we need to pursue it. The European lead is very helpful in this regard. Monitoring at a European level is showing which member states are doing better and which worse—we are broadly in the middle to the bottom end of the pack—and driving change. I would like to see us pursue that sort of driver to change, which improves practice in our animal production and minimises antibiotic usage.

Professor Dame Sally Davies: Can I just say that "middle to the bottom end of the pack" means less use and being good, rather than top of the pack.

Nigel Gibbens: Yes, thank you.

Q283 Pamela Nash: I understand. As part of that, though, we have heard a lot of evidence showing that there is a lack of collection of information on AMR in animals in the UK. Is that the case, and is it something the Government could be involved in—having a centralised database?

Nigel Gibbens: Yes. We need to look at both. On the development of resistance, we do have surveillance, but we do not have a national health service so we do not have access to the data in the same way as on the human side, and we are pursuing, and continuing to spend on, identifying resistance in animal pathogens. We also need better understanding of our antibiotic usage. We currently have sales data. We do not have animal-specific data, and we therefore have difficulty in understanding what is happening in antibiotic usage and doing what I said earlier, which is setting clear benchmarks and understanding how we are doing against targets. We need to maintain and improve both of those things.

Q284 Pamela Nash: How do we overcome that obstacle?

Nigel Gibbens: On data, we need to look at systems. Again, the European Union is working on this at a cross-member state level and getting information on usage, basically at the point of prescription, even though we do not have a prescription system to draw on. That involves setting up a new system to gather that information, so that we have it and can carry out analysis on it.

Q285 Pamela Nash: Thank you. My last question is can you be a bit clearer on how much information we have on the transfer of AMR to humans? I know you said it is patchy. I do not know if that is something you want to comment on.

Nigel Gibbens: I want to avoid any impression that I am here to say that we do not need to act on antimicrobial resistance in animals. We do, and we definitely need to pursue best practice. What we need to be clear about is, if it is happening, how animals could be a driver to risk in humans. There are some very clear cases; there are others where an assumption is made that animal use drove resistance in the human field, but when you look at it in detail that proves not to be the case. We need to work on that harder, I think, because, conversely, we might not be looking at an area where it is the case. Research to look at those pathways of transfer of resistance, whether they are direct animal to human or via the environment or whatever, is an important area that we must not lose sight of. As Dame Sally said earlier, hard evidence of a direct relationship is hard to come by, but we should act on the precautionary principle. We should recognise that there is a risk and deal with that risk.

Q286 Pamela Nash: I think there would be a public expectation that that was being looked at.

Nigel Gibbens: And it is. We touched earlier on the use of antibiotics as growth promoters. That has been banned in the EU since 2006. The potential threat from antibiotic use in animals has been recognised since the Swann report in '74, so this is something that we are alert to and need constantly to work on.

Pamela Nash: Thank you.

Q287 Mr Heath: Moving back to surveillance in the human population, Dame Sally, do you feel that there is enough work being done to establish good surveillance techniques, and enough data from the community sector, from primary care as opposed to the hospital sector? Some people have suggested to us that perhaps the data are weak in that area.

Professor Dame Sally Davies: We need two things. We need to monitor antibiotic use, and we need surveillance of what bugs are out there and which are resistant. I am interested in the community, but if they are not presenting to hospital, they are not really sick with it—remember, I am not an expert: I am not a microbiologist; I am a haematologist—so I am more interested in the patients who go from the community into the hospital because they are showing the end where it is impacting on health rather than just carriage. It may be that we could get more data from the community, but I would like to start with better and more complete data from the hospital sector. One of the things that is going up, for instance, is E. coli in old people coming in from care homes, who have been catheterised because they were not able to urinate, and that has introduced infection. A lot of that is antimicrobially resistant. That doubles the death rate. If we have a good picture of what is going on in hospitals, it gives us a window into the community.

Q288 Mr Heath: There is still a lot of data going AWOL that could be collected and might be of value.

Professor Dame Sally Davies: It may be that the experts will recommend that, in which case I would support it, but I would have to go to the experts and ask them.

Q289 Mr Heath: Within that database, another thing that it has been suggested we are not doing terribly well is recording failed treatments. That would be possibly both in hospital and community settings. Would that be something that you would recognise?

Professor Dame Sally Davies: Yes. I think what we know if we look after patients—and I was a hospital haematologist—is: "Ah, they have changed the antibiotic there to something else because it was not working." Sometimes you have a lack of clinical impact, and sometimes it is because the microbiologist has told you—me—to change it because of AMR. There is some data in the hospitals, but it is not collected.

Q290 Mr Heath: From the sound of it, it is anecdotal rather than systematic.

Professor Dame Sally Davies: Yes, I have just told you an anecdote.

Q291 Mr Heath: Yes, you have. That is why I said it.

Professor Dame Sally Davies: With the data the laboratories hold about their tests and the resistance that they are encountering, they can and do map it. They need to know, and they do know, the profiles of the bugs that are causing community pneumonias and acquired pneumonias and what the resistance patterns are, so that the formulary of that hospital is appropriate for what they are seeing, and is modified as what they see changes. It is there at a hospital level.

Q292 Mr Heath: I hope so. I am just thinking that a senior hospital pharmacist could probably tell us an awful lot more about what is going on in the hospital with prescribing practices—the number of times something is prescribed and is shown to have no effect—and that is not getting back to the researchers who need that information in order to identify gaps.

Professor Dame Sally Davies: I agree. Hospital pharmacists sit on the data and the prescribing committee brings together that data and the laboratory data for that hospital, but it is not collected nationally. It would be available, I assume, on request to researchers.

Q293 Mr Heath: I have one last point, and this applies to both human and veterinary medicine—although I suspect Peter Borriello will be the person who would perhaps know the answer better, Nigel. Is there no systematic process at the moment for revisiting the drug use protocols after a period of time to see whether they are still at appropriate dosage in appropriate systems? It seems to me, looking at it from outside, that there is not, and that once it goes through the process of validation, individual practitioners may come up with tweaks, but there is no systematic review after a period of time as to the efficacy and the most effective use of a particular drug.

Professor Dame Sally Davies: In hospitals, there is regular review, as I explained, between the laboratories and the pharmacists about the pattern of bugs, the pattern of resistance and, therefore, what are the appropriate antibiotics. At the national level, there is guidance, which is regularly reviewed, on specialist areas such as gonorrhoea and TB. In the community, the NICE guidelines stand and NICE have to review them regularly, so there is a fair amount of—

Q294 Mr Heath: NICE do that, do they? For any licensed drug, there will be a review process that says, "Is this still the correct dosage and the correct methodology?"

Professor Dame Sally Davies: In the infection areas, we ask them, on occasions, to review their guidance and they have been updating some of it. I would have to go back and check which ones.

Q295 Mr Heath: Thank you. Nigel, is there anything you want to say about that?

Nigel Gibbens: On the veterinary side, our system of authorising medicines does not have a regular review. If you will allow him, Pete can chip in if he wants to add anything to that. This does allow me to say, though, that on the veterinary side a lot of the traditional medicines, antibiotics, are still very effective. The degree of challenge we face is very different. Tetracyclines and penicillins are still working. Even on the veterinary-only pathogens, the striking example where we have a big problem is swine dysentery, and we need a new therapy. We have run out of useful drugs. But in other areas, the traditional drugs are still working very well. We are not presented with the same degree of challenge, I think.

Chair: If you have any further information on that, we would welcome it. Our last question is from Stephen.

Q296 Stephen Mosley: During the previous evidence sessions we heard some criticism of the five-year antimicrobial resistance strategy. That is your area, isn't it, Ms Wellsteed? Yes. The concerns that we have had raised are around the environmental areas, which we heard have not been covered particularly by the strategy, and we heard that the strategy says relatively little about antibiotics and the environment, the effect of poor waste management or the use of biocides and detergents on antimicrobial resistance. When you were doing the strategy, did you look at those areas and did you find them important?

Sally Wellsteed: We did look at them and we did not find very much evidence, but the strategy flags up the environment as an area to be investigated. It is one of our gaps—how resistance genes transmit between humans, the environment and animals. Those people are quite correct: it does not really go into the detail, but that is because we could not find very much to put in, and there is not that much activity in the UK on it. But it is not an area that we want to ignore; it is just that we need to build up our evidence base more.

Q297 Stephen Mosley: In terms of the research, in terms of getting that background information, is there any drive to get that information?

Sally Wellsteed: Yes. The MRC funders forum is getting all the research councils together and is having a much stronger look at working with the environment, as well as traditional biological groups and health groups. The research platform produces a strategic approach, and that will include the environment.

Q298 Stephen Mosley: Who has been involved with that?

Sally Wellsteed: All the research funders, so all the research councils plus the Department and the Wellcome Trust. It is only a recent development, but it is one of the things that has actually come out of getting together to develop the strategy.

Q299 Stephen Mosley: There is recognition that there is this gap.

Sally Wellsteed: Yes.

Q300 Stephen Mosley: Has any funding been put aside to do that?

Sally Wellsteed: As in most systems, there is not a pot of money ring-fenced solely for the environment, but the platform has a certain amount of money, so good proposals can be put in and a bid can be made.

Chair: It would be helpful—because we have not heard that joined-up bit before—if you could send us a formal note explaining what is happening in that respect. Can I thank the panel very much for an interesting session? Thank you.

Examination of Witnesses

Witnesses: **George Eustice MP**, Parliamentary Under-Secretary of State for Farming, Food and Marine Environment, Department for Environment, Food and Rural Affairs, **Jane Ellison MP**, Parliamentary Under-Secretary of State for Public Health, Department of Health, **Professor Dame Sally Davies**, Chief Medical Officer, Department of Health, and **Professor Peter Borriello**, Chief Executive, Veterinary Medicines Directorate, gave evidence.

Q301 Chair: Good morning. Thank you very much for coming. Just so that our viewers can understand the oddities, you are sitting slightly lop-sided for a deliberate purpose, because one of the microphones died down at the other end of the table.

First of all, can I welcome Ministers to the session? This has been an intriguing inquiry and we are coming to the end of it, so your evidence is hugely important. Can I ask you both whether you see antimicrobial resistance as a top priority for the UK Government?

Jane Ellison: Yes, certainly. From my point of view in the Department of Health, it is pretty much the first conversation I had when I took up my ministerial post in October last year. I think probably on the second day I was in post I had a conversation with Sally about it, and I have carried her book in my handbag ever since to remind me of its importance. It is something I have raised on a number of occasions with international colleagues in debates. So, yes, it is a real priority and it is being given very high priority through the high-level steering group and the work the Department of Health is doing.

George Eustice: Yes, I would agree with that, and obviously DEFRA is working closely with the Department of Health on this issue as well. I know that Dame Sally Davies has made a very strong case that this is an issue. We think the evidence suggests that actually antimicrobial resistance on antibiotics used in humans tends to be distinct from those used in veterinary practice. While there is a potential for crossover, the evidence so far is that there is not a huge amount of crossover, but it is something that we are not remotely complacent about, and it takes up a big part of our research budget at the VMD.

Q302 Chair: Having agreed with the chief medical officer, Minister, do you agree also with the chief medical officer's view that antimicrobial resistance ought to be on the national risk register?

Jane Ellison: Yes, I do. We are working very hard to make sure it goes on there, and I think we have a fair degree of confidence that it will be seen in that context. But, yes, I agree that it should, and we will be preparing submissions this spring for the next round of consideration.

Q303 Chair: That would mean, logically, that in the next register published after that you would expect it to be public.

Jane Ellison: I would very much hope so, yes.

Q304 Chair: But given this strongly held view, both by the chief medical officer and by yourself, one would hope that in practice the Cabinet Office will be treating it as if it were on the register now. Would you not hope that?

Jane Ellison: If you look at the priority it is being given right across Government, and from the top of Government, that is the de facto position. For example, when we were leading the G8, we had a summit alongside the G8 last June, which brought together G8 scientists to discuss this. The Secretary of State for Health has raised it with partners internationally and, as I say, right from the top of Government, from the Prime Minister downwards, it is taken as a really important priority. My own view is that there is no question that it is not on the national risk radar already, even if it is not yet formally on the register.

Q305 Chair: Putting it in a historical comparison, you would not foresee the kind of gap in taking action that there was, for example, in pulling together the right expertise around the volcanic ash episode. You think the work is done already.

Jane Ellison: The work is well under way. Clearly the work is not done, because we face a very significant threat, but because we have had such dynamic and senior leadership from the chief medical officer, and we have lots of the strategic groups in place and there is complete buy-in from all levels of Government, there is nothing in the way of us following through on this as a priority.

Q306 Chair: There is no resistance from the veterinary side.

George Eustice: No resistance from us at all. As I said, we take this seriously. Although the evidence is that antimicrobial resistance in animals is low—there have been some cases—we are not at all complacent, because we absolutely recognise that overuse of

antibiotics can be a driver of that resistance. It is why we commit quite a bit of our research and development programme at the VMD to that.

Q307 Stephen Mosley: The first UK antimicrobial strategy was published in 2000, and, while the evidence we have seen saw nothing wrong with that strategy, we have heard quite a bit of criticism about the implementation of it. We have heard evidence that as many as 20 of the recommendations were never implemented, and there are concerns that it did not have the funding or the infrastructure to deliver. You published the 2013 to 2018 five-year strategy last year. What are you doing to ensure that this strategy is a success and that it is actually implemented this time?

Jane Ellison: Obviously, I was not around when the previous strategy was in place, but it seems to me that the key components you need in place are clear leadership and a clear sense of direction, which we have from the top from the chief medical officer, and you need substantial Government commitment, and you have that as well. All the expertise has been brought together in the high-level steering group that sits behind the strategy. We have all the right people round the table, and also we are working across Government. I think that is really important; this is everyone's business. All the building blocks are in place. The next stage is obviously to move to an action plan with metrics, which we will then judge against annual reports. If you put all of those things in place, you hard-bake in the momentum to the strategy. If we are failing against 20 items or whatever, by this autumn when we have published the action plan and the first update on the strategy, we will have to confront that and we will have to do better.

Q308 Stephen Mosley: Will the high-level steering group have the teeth to be able to publish this and confront you as Ministers and say, "Look, you are not delivering what you promised"?

Jane Ellison: Yes, definitely. I have absolutely no sense at all that if Ministers were not responding adequately to the priorities put down in the strategy, the chief medical officer and others would not make us aware of that, and that is quite right.

Q309 Stephen Mosley: The new strategy is very much focused on antibiotic resistance. From some of the evidence, we heard concerns about the dangers of overlooking viral and fungal resistance as well. Have you considered those two aspects, and do you think there are dangers of overlooking fungal and viral?

Jane Ellison: I am aware that that is a concern. I am not a scientist by background, so there are areas where I need to defer to those who have the technical expertise, but I am aware that that is a consideration. Again, I think it is one that has been considered and is very much part of the thinking of our high-level steering group and all the people involved in thinking about this. I do not think it has been overlooked.

Q310 Stephen Mosley: As the research or the evidence changes—if during the plan period of the next five years, you see there is an increased focus on things like viral and fungal infections and resistance—would you have any sort of review point within the five-year strategy to say, "Look, we need to make some alterations here," or is it a five-year strategy that you are going to go ahead with and judge at the end of it?

Jane Ellison: The fact that we have committed to annual updates and an annual report against the metrics, once those are published later this year, means we have plenty of pulse points within that five-year period to make those adjustments if we need to.

Q311 David Tredinnick: I want to look at alternatives to antibiotics if we fail to produce any new classes of antibiotics. Have you considered what your approach may be if that is the case—that we fail to produce new classes of antibiotics? What are we going to do?

Jane Ellison: I have not given a huge amount of thought to that at the moment, because one of the key strands of the strategy is to encourage the pipeline for new drugs. I know some thought has been given to, for example, herbal medicines—I believe the chief medical officer has responded on that—but our principal aim is the three key strands of the strategy, which are preserving what we already have that works, looking at the pipeline and making sure that we do not compromise the potential in the future for things that can actually make a difference. It is not something I have given a lot of thought to, because I do not think we are at that stage yet.

George Eustice: On the veterinary side, the VMD funds a number of projects looking at antimicrobial resistance, and I think two of those have an element looking at some alternative treatments. There is a range that may provide some enhanced immunity. There are the prebiotics and probiotics, and internationally there is some research being done on that, and then other systems to try to improve natural immunity. The VMD is doing a couple of projects that have elements of that, but are not dedicated solely to it. One of the difficulties you sometimes get with these treatments, although anecdotally they have some impact, is that when you get to clinical trials they tend sometimes to fall at that final hurdle. But as I said, it is an area where we are doing some research.

Q312 David Tredinnick: We have indeed covered in the earlier session and in the Health Committee, on which I also sit, this issue of alternatives. I have discussed alternatives with the chief medical officer, and the Secretary of State as well. We have quoted tea tree and artemisinin—artemisinin is derived from a 2000-year-old Chinese medicine—and I suggest to you that what we actually need is more research into these options, so that we have some kind of fall-back position. Also, we need to look at the research that has been going on since this Committee reported to the last Parliament on homeopathic medicine. Research at Toulouse university, about which I have been in an exchange with the Secretary of State, seems to show that where homeopathic medicine is used with allopathic medicine, two things happen: patient satisfaction goes up and the demand for conventional drugs, including antibiotics, goes down. I got the House of Commons Library to come up with figures for the National Institute for Health Research funding for 2012-13. I think the budget is £209 million. Those are the most recent figures. Surely we should be spending some of that—not

none of it—on looking at alternatives, given the absolutely dire situation about new antibiotics coming on stream. Should we not be backing other options—hedging our bets, to use a horse-racing term?

Professor Dame Sally Davies: Perhaps, as that is a technical question, I can answer about research. Clearly if we got a good application to NIHR, both scientifically and methodologically, as I said before, we would be keen to fund it. What I have not told you before is what a lot of effort the Chinese are putting into herbal medicines. They have in Shanghai a very big institute that is taking their herbal medicines, looking for the active products and isolating them using HPLC and modern science. They were aware of artemisinin before the Wellcome Trust picked it up and developed it for malaria. As they have this big institute and this expertise, if there are things to be found, I am confident that they will find them.

Q313 David Tredinnick: It was helpful to have your response, but could I ask the Minister?

Jane Ellison: Mr Tredinnick, I keep an open mind. As a Minister, as much as possible I will be led by the evidence and by the guidance of my experts.

Q314 David Tredinnick: Just to finish on this area, the Health and Social Care Act—the big health Act that has just gone through—emphasises patient choice. Patient choice, according to conversations with the Secretary of State and from what he has said on the record, is to be at the heart of the health service. If we are going to have patient choice, we have to listen to what patients want. A lot of patients out there are very worried about antimicrobial resistance. They do not want to have antibiotics first; they want to try other things. Surely it makes sense that the Health Department tries to encourage people to use other treatments first. Surely if a general practitioner believes, in their clinical judgment, that going to a herbalist or a homeopath is a good idea, we should support that, because we are trying to reduce the consumption of antibiotics.

Jane Ellison: I have responded to questions probably a couple of times at Health oral questions, and we have always been clear that CCGs can prescribe as long as they prescribe against the normal criteria, which are value for money and efficacy. That is on the record in the House of Commons.

David Tredinnick: Thank you very much.

Professor Borriello: I think it is important to note that resistance is now emerging to artemisinin. Resistance can emerge to all things, and artemisinin is not against germs; it is against a different beast. Yes, of course there is a role for traditional in many aspects, and certainly for learning from some of the things that may have worked in the past, but it is also worth remembering that prior to the antibiotic era, the only thing that was available were all the alternatives and we know the consequence of that. There was a huge amount of morbidity and death.

Professor Dame Sally Davies: Forty-three percent of people died prior to the golden age of antibiotics.

Professor Borriello: That is not a reason to dismiss alternatives; it is a reason to apply the best science to learn from them, particularly in some of the old methods for managing wounds. Another important point is that in the veterinary field viral infections are not a major problem. We don't use antivirals; we use vaccines. Antivirals are not traditionally used in veterinary medicine. On the human side, fungal infection, where resistance is a problem, is predominantly in the immuno-compromised. Although it is very important, it is not such a major issue numerically.

There is some research on alternatives, including in the veterinary field. One area where there could be some mileage is on phage therapy—that is, viruses that kill germs—but there are some problems with that as well. It is not that industry is not interested. Of course they want new products that will be useful and give them a profit, so there is a lot of activity. The reason many of them do not come to market is that they do not work as well they should in practice or in general practice.

Q315 Mr Heath: I think what I am hearing, as far as Government policy is concerned, is that the Government retain an open mind to looking at unrefined drug applications derived from plants, or whatever, to identify active ingredients, provided there is efficacy supported by evidence, but that you are not in the business of supporting placebos as an alternative to fighting microbial infections. Is that correct?

Jane Ellison: I think it is right to say that we will be led by the evidence of what works, yes.

Q316 Graham Stringer: Do the Government attempt to co-ordinate research into antimicrobials or antimicrobial resistance, and should they do more?

Jane Ellison: I will give a quick comment and then ask Sally to give the detail. I think there is a lot more effort going in to trying to co-ordinate the research. This is one of the areas, certainly coming to it relatively new in the last few months, where I have seen an awful lot of effort, whether it is the themed calls for research or the attempt to co-ordinate public and private funding. I think there is always more you can do, because we have a huge mountain to climb, but we are making a good start. The key is making sure we are getting the message out that we have to work internationally; this is not something we can do just in our country. That is one of the reasons, at an advocacy level, that I have raised it in at least half a dozen bilaterals, including formally with my opposite number in the Chinese health ministry at a recent conference in the Foreign Office, but I will ask Sally to comment on the detail.

Professor Dame Sally Davies: Clearly we need to co-ordinate. We have some historical co-ordination going back to about 2006, with the UK Clinical Research Collaboration and the Translational Infection Research Initiative where we funded seven centres across a lot of funders. There was our joint funding from the Department of Health with the Wellcome Trust, the Health Innovation Challenge Fund, funding nearly £3 million over three years in genomic technology to inform outbreak recognition and surveillance. Now, as I told you earlier, we have the new AMR research platform led by MRC, bringing in the research

councils, and the cross-Government antimicrobial research funders forum led by the MRC, that the VMD, the Department and all the funders, including the Wellcome Trust, have started to attend, to debate what needs doing and sharing the work out.

Q317 Graham Stringer: Do we need a centre of excellence devoted to this area?

Professor Dame Sally Davies: We need critical mass around certain issues, and that could then be called a centre of excellence, and we might need a number. The needs are different and the expertise may lie in different universities. More and more, we set up networks and collaborations. We need a single development pathway. We have just funded, as I mentioned earlier, two new research units to work with Public Health England on antimicrobial resistance. They are both units of excellence. We need quite a lot of different things, but they should collaborate.

Q318 Graham Stringer: In other areas—the Francis Crick Institute is just being developed, and there is the Hadley Centre and the Sanger Institute—people are bringing expertise and excellence together, simply so that people can talk and learn from each other's research. Do you not think in an area of such importance as this that we should have the equivalent of those centres?

Professor Dame Sally Davies: Actually, no. The Sanger Institute needs its sequencing farm, so it is technology as well as science driven. The Crick is our national institute, and we are not going to recreate that. What we need to do is build on the expertise that is in many different places, many different universities, and then get it co-ordinated and collaborating. I would argue that if we set up one centre, we would be leaving out some expertise that would not move. That would be a great pity.

Q319 Graham Stringer: That is a really interesting answer. If this problem is anything, it is an international problem. Do we need the equivalent of the IPCC in this area to look at the problem?

Professor Dame Sally Davies: I think it is very likely that, at the end of the day, we are going to need something along those lines, but there is a lot of work going on, initially at the WHO, with their resolution that we led, supported by 50 other countries—it goes to their Assembly in April—that will start a world action plan, a global action plan development, and I could imagine or envisage that an IPCC-type mechanism might come out of that at the end of the day.

George Eustice: We need collaboration in two different directions, first of all between Government Departments. One of the key features of the new AMR strategy is the "one health" approach where you look at the connections between animal and human health and make sure that work is joined up. Secondly, you are right; internationally, the EU is co-ordinating some work in this, and the VMD is, as I mentioned earlier, funding six studies at the moment which are part of a trans-EU collaborative project. In addition, there

are other organisations like the OIE and a committee on the UN that are doing some of this work. It may be that those could develop more of a co-ordinating role globally.

Q320 Chair: Can I follow that up? I am familiar with some of the work that goes on in the veterinary world, because one of the large veterinary schools, Leahurst, is in my constituency—Minister, you will always be welcome to visit. On the human health side, how do you ensure that you pull together the expertise that exists across the UK, particularly within academia and some of our research-led hospital environments?

Professor Dame Sally Davies: We have different models, and we have not yet chosen the right one for this, but if you take dementia, another Government priority, what we did was fund competitively a number of centres and say, "If you win it, your research contracts will stipulate you are going to work together." And they do: they have shared workshops, and they move trainees and techniques between them in order to make the sum of the parts greater than the separate bits. We have a number of models of collaboration and networks, and I think that out of the AMR research funders forum will come not only decisions about what needs supporting but, following the competitions to give that support, how they will need to work together.

Q321 Stephen Metcalfe: We have heard that the pipeline is blocked or broken and in need of repair. One of the reasons for that, potentially, is that the market itself is failing, that the incentives to develop new antibiotics are that you "pile it high and sell it cheap," and you get your return on investment. But, of course, as you are piling it up, the resistance is building up. Actually, just for the record—because I think I heard David Tredinnick say that someone he had come across had decided not to use antibiotics, but to use an alternative first—can you just state that the resistance exists in the microbes and not in the human? It is the disease that becomes resistant to the treatment, not the individual. Is that correct?

Professor Dame Sally Davies: Absolutely true. The bacteria become resistant to the antibiotics, and it can be in a number of ways. One of them is little circles of DNA called plasmids that they can then pass to other bacteria, so, if I have resistant bacteria, those can be transmitted to the bacteria in my gut, for instance.

Q322 Stephen Metcalfe: Thank you for that. Going back to the market failure, how can we change the market so that there is more incentive for business to come forward and develop?

Professor Dame Sally Davies: This, as you know, is a very complex area and we have our analysts doing a lot of modelling of different ways of looking at it. In December, I led a forum on antimicrobial resistance that looked at this for the World Innovation summit for health. Essentially, it looks as if we will probably have to separate how you fund the development of antibiotics from how you pay for them, because, clearly, if we get an effective new antibiotic I, as chief medical officer, will want to say, "Never in animals. Just kill them if they've got it." Meanwhile, I want to lock it up and only give it out to save lives. There are models where you can separate it; one that was used for vaccines was an advanced purchase initiative. What we have to find is not the right model for Britain

but the right model globally, and then one, as we discussed earlier, that is not a one-off that has to be replenished. My observation on these ways of doing things globally is that everyone is very excited up front and they put the money in, but the replenishment is hard work. We need a sustainable system. We are doing a lot of work on that and the Treasury is inputting on the analysis and the help as well, so this is truly cross-Government.

Q323 Stephen Metcalfe: The Government are considering this as an alternative model.

Jane Ellison: Yes, very much so, particularly the point Sally makes about the need to co-operate internationally because of the whole problem of market failure. The issue is being considered at various international forums, including Chatham House, the World Innovation health summit forum, and there are also discussions with regulators going on. One of the areas of work has been looking at regulatory processes and whether, if you can harmonise more of them, it is easier to co-operate internationally.

Q324 Stephen Metcalfe: There is a recognition that the model needs to change.

Jane Ellison: Definitely.

Q325 Stephen Metcalfe: Is that the same with veterinary?

George Eustice: There is an added complication on the veterinary side, which is of course not just whether it is safe to use on the animal but whether it is safe then to enter the food chain. That is a further barrier and creates some uncertainties. Companies that develop these antibiotics potentially have the doubt that they could pour a lot of money into developing it only to find that, down the line, somebody says there is a health risk and it gets withdrawn, so they are left with the liability of that investment. I do not know if Peter wants to add to that, but there is the added complication on the veterinary side, which is that you have the food safety issue as well as the safety of the animal.

Professor Borriello: I think the anti-infectives industry, whatever those anti-infectives are, faces an additional problem compared with other medicines. They have to bear in mind the risk, even if it is working now, that, because their target might change, it will cease to work, which is unlike many other drugs. There is the added risk in recovering investment, plus competition from generics to help keep bills down in the health care sector. On top of that, peculiar to the veterinary side, is that they face the additional risk that, even if it is working very well and there is no resistance, it might still get banned on the precautionary principle because of the potential risk to humans.

Chair: Stephen, before you move on, David has a question.

Q326 Mr Heath: If I may. Just as a corollary to that on the veterinary side, Dame Sally now wants any animal that catches a disease to be killed rather than cured.

Professor Dame Sally Davies: No.

Mr Heath: I am parodying what you said.

Professor Dame Sally Davies: I recognise that.

Q327 Mr Heath: It is clear that there is going to be limited application, certainly of any antibiotics developed for human health reasons, in the veterinary world, which means that there is yet more emphasis likely to be put on preventatives—vaccination. Yet in the veterinary world, the commercial model for vaccination is also quite perilous. I am thinking back to Schmallenberg and the great big outcry, "What are we going to do about Schmallenberg? Develop a vaccine." Unless it has changed, the take-up of vaccine is relatively low, simply because the sums do not work out; for the average sheep, it is not worth vaccinating them against the risk of Schmallenberg coming across every few years. Is there a need to look again at the economic models for vaccine creation or formation, if we are to have a satisfactory solution for veterinary services?

George Eustice: I might ask Peter to come in on that specific one. The only thing I would say on the use of antibiotics in agriculture is that, as I said in my opening comments, there has not been the development so far of a lot of resistance. There have been, particularly with swine dysentery, I think three or four cases where resistance has built up and they have had to cull the herd. But, as a general rule, even some of the older antibiotics such as penicillin have been quite stable when used in agriculture, and they tend to be used, I think, in the veterinary world more sparingly than in the medical world. Coming back to my earlier point, some of the problems we have with antimicrobial resistance are happening because of the way they are used in the health sphere rather than the way they are used in the veterinary sphere. I do not know, Peter, whether you want to come back on the specific point around vaccines.

Professor Borriello: It is an important point, although we made light of it. There is an economic consideration, both in human and veterinary medicines; it is just that the barrier is much lower on the livestock side. You have QALYs—quality of life years gained, and so on—as part of the economic argument on the human side, but you do not quite get that on the animal side. As you said, the cost of administering a medicine to a sheep and continuing to feed it and what you will get at market, allied against not giving it the medicine and seeing if it will survive or killing it, is something that you would not consider on the human side. So there is that element. Market forces play a much bigger role on the veterinary side and it is a lower economic barrier, so there is yet another market disincentive to veterinary medicines compared with the human side.

Professor Dame Sally Davies: Could I pick up on the wonderful story about fish?

Professor Borriello: Yes.

Professor Dame Sally Davies: I am told that in America farmed salmon eat their weight in antibiotics, but in Europe they have individual fish vaccination, which started with one and I think it is now three different ones joined together, and antibiotic use has dropped to 2% of what it used to be. We do have success stories with vaccinations.

Professor Borriello: Yes, we do, and the major risk there is needlestick injury to the people who administer the vaccine. You are quite correct; currently, in the UK there is about 10 mg of antibiotic use per 1,000 kg of fish produced, so it is a very low ratio.

Q328 Stephen Metcalfe: Thank you. I have one final comment that I really wanted to make. As a dedicated free marketeer, it pains me to say this, but is this issue so important that we cannot just leave it to market forces to come forward and develop the next generation of antibiotics and on into the future, and we have to change that permanently?

Professor Dame Sally Davies: Sadly, you are right.

Q329 Stephen Metcalfe: Do the Government agree with that?

Jane Ellison: I think because of the need to co-operate internationally, yes. It does not mean to say that the kind of innovation and everything that we associate with the free market cannot be brought to bear. That is why the chief medical officer and others are talking to a range of partners. It is not just in academia; there is a lot of engagement with industry as well. In terms of things like creating the size of market that will incentivise people to invest in this area, and harmonising regulatory structures to make it easier to work across borders, clearly, yes, there is an important role for Governments in co-ordinating.

Stephen Metcalfe: Thank you.

Q330 Chair: There have been discussions inside the industry about decoupling sales volume from unit price. Are the Government willing to explore for new antibiotics some licence fee model within the NHS?

Jane Ellison: I have not considered that specific issue in any detail, but I think we are open-minded to all the things that might need to be considered to make sure that we can tackle this. I do not know if Sally wants to comment on that particular item.

Professor Dame Sally Davies: That is one of the mechanisms we are modelling and looking at the cost, but we could not do it on our own. We have to find the best mechanism for incentivising, but it is the public's health, the public purse and what would work globally, so it is a complex area.

Q331 Chair: At the very least, you would need a pan-European model.

Professor Dame Sally Davies: At the very least.

Q332 Chair: And probably even a bigger market, perhaps bringing in north America as well.

Jane Ellison: There has already been work between the EU and the US. I think they have recently clarified guidance for clinical studies for products, again to try and get harmonisation, to make it easier to make progress.

Q333 Pamela Nash: Could the Minister clarify for the Committee, following the restructure of the NHS, exactly where responsibility lies with the various bodies now in the health care system that relate to AMR?

Jane Ellison: The first point I would make is that the new strategy is contemporaneous with the new structures within the NHS. While in some areas there has been more challenge around, if you like, working things across, the new strategy has been set up in the knowledge of the new architecture of the NHS. You obviously have NICE setting some kind of clear governance guidelines and PHE are very much in the surveillance, bearing in mind that they are the successor organisation to the Health Protection Agency. PHE have an important surveillance role, as well as some practical delivery roles around things like developing tools. They have done work, for example, developing things that could be used in care homes to help people, as well as throughout the NHS. There is a clear leadership role from the Department of Health, which you can see through the work we are doing on co-ordinating leadership, research and all of those things. Obviously NHS England has a huge implementation role, as well as looking at how they drive that through primary and secondary care. All of those groups sit on the high-level steering group.

Q334 Pamela Nash: Are you happy that those roles are very clearly defined for each of those organisations?

Jane Ellison: Yes. As I said, the high-level steering group has been brought together in the new NHS architecture, so in that sense it does not have some of the kind of undoubted challenges in other areas where you are trying to take something from where it used to sit and to sit it somewhere else. The new strategy has been designed in the knowledge that we started with those organisations. I should have mentioned Health Education England too, with their role around education and training, and making sure that AMR is hard-wired through that. They all sit on that. The strategy is new, and it clearly is going to go through revisions. We are going to make sure it responds to this Committee's findings, for example, in terms of looking at the metrics and the action plan. I think people are clear, and we have so many opportunities now because we are going to have regular updates and reviews, and the high-level steering group meets to look at all these things. Where there is lack of clarity—if the Committee, for example, feels in your report that some of those areas need clarification—we are in a position to respond to that rapidly.

Q335 Pamela Nash: I was going to ask you to respond to Imperial college's criticism that the UK AMR strategy does not incorporate "fully the wider changes to the NHS and public health structure." Do you think that is a fair criticism, and that it could be improved?

Jane Ellison: I probably need to look at the detail of exactly what they said, which I have not had a chance to do. I would be very happy to look at that; again it is something that we can refer into—

Q336 Pamela Nash: Just to be clear, it is in the written evidence to the Committee.

Jane Ellison: I have not had a chance to look at the detail of it. That may well be a fair point to make—it is a new system which is settling down—but I think it presupposes that there was high-level attention to this subject in the old NHS architecture, and I do not think there was. I think we have gone up a complete gear now in terms of where we are. For that reason, I think we are quite front-foot, but we will look at all of those points and see if we think there needs to be clarification. One point I would make is that, if you do not have everyone involved, you do not get that level of cross-system buy-in. Another point I would make, because this often comes up in discussion of the old and the new NHS architecture, is that just because it might have looked like a simpler system under the old NHS architecture, it did not mean it was any less a complex and difficult-to-influence organisation. This is a big, complex health economy, and it would always be difficult to drive change across such a big organisation. I think there is greater clarity around some of the roles—for example, Public Health England—and we will continue to work with them to get clarity around their role across a range of things, including this, but actually I think there are opportunities, as well as the obvious challenges, in the changes.

Q337 Pamela Nash: The Government have concentrated on speaking about the benefits of localism, in terms of the NHS restructuring, and devolving power down. Something like antimicrobial resistance clearly needs a national response, and indeed an international response in this case. Do you not think that now it will be much more difficult to have a centrally pushed strategy against antimicrobial resistance? How much control can the UK Government have centrally over how we fight this across the country?

Jane Ellison: The leadership is central. The leadership is coming from the top; it is coming from central Government. NHS England sits on the high-level steering group, so they are driving it across the NHS. On the extent to which health care is localised, where for example, we might want to see local systems responding, clearly we want to see CCGs responding to the leadership and guidance they get, and we would want to see local authorities in their role with care providers, and their own role as a care provider, drive best practice. But in terms of where the leadership is coming from, where the targets are being set, driving things through joint strategic needs assessments, that leadership is coming from the top, and I do not think there is any sense in which central Government feel this is something that we are going to just let happen or not happen at a local level. It is too important for that. Actually, although there is a great deal of localism about the way we deliver health, the architecture, in terms of setting the strategy through things like the mandate, remains something that we drive from the centre in terms of setting national standards.

Q338 Pamela Nash: I have one last short question, Minister. It is clear that you have political responsibility for this in Government, but, under you, who has civil responsibility ultimately for AMR?

Jane Ellison: I am sorry, I did not catch your question.

Q339 Pamela Nash: Who has responsibility in the Department of Health for this?

Jane Ellison: For AMR?

Pamela Nash: Yes.

Jane Ellison: It sits in my portfolio, but ultimately—

Q340 Pamela Nash: I mean in terms of staff, the civil servants.

Jane Ellison: It is led by the chief medical officer.

Pamela Nash: Thank you.

Q341 Chair: I want to pursue this line slightly, because we have heard—not just in this inquiry but in other exchanges in Parliament—that organisations like the ABPI are expressing concern about the management of, for example, clinical trials. We know there is the new research agency which is supposed to be addressing some of those things, but things are happening around us. We have just had the closure of Novartis at Horsham, for example; they have pulled their research out of the UK, full stop. That cannot be good for UK plc, both in terms of the health of our nation and the economy of our nation. One of the reasons they cite is the issues around clinical trials, the lack of central direction in managing research programmes. Yet at this stage, in response to my earlier observation, you appear only to be just beginning to look at things like new models of economy for driving drugs into the market. Is there enough work going on in this area? Is there not a huge gap there? We are losing some of our research expertise on the one hand and, on the other, we have market failures, which you acknowledged to Stephen Metcalfe—a problem that is extremely serious. Isn't it time to think of a different approach rather than simply relying on, "The new structure will deliver"?

Jane Ellison: Do you mean on research?

Q342 Chair: I mean in all respects. How are you going to manage new clinical trials, for example, in the new structure? How is that going to happen? How are we going to ensure that there is, taking Pamela Nash's point, some central direction in prescribing to ensure that there is a consistent approach? How is that going to be led from the centre in the new structure?

Professor Dame Sally Davies: Let me start with the research because I hold that responsibility from Ministers, for the clinical and applied part, through the National

Institute of Health Research—the NIHR. Actually, the NIHR has not changed as the system changed, because what the NIHR does is provide a fully-funded infrastructure to the NHS regardless of how it is constituted. Indeed, when they are non-public providers of services we can even, through our managed clinical research networks, support research in non-public sector providers. I think if companies are saying that they are withdrawing because the clinical research environment is not good enough, they are not looking at the metrics. For instance, a very important metric to them is global first patients in clinical trials. This year so far we have had 25 in England, last year 12, the year before two, and before that none. Putting in the managed clinical networks has absolutely changed delivery in clinical trials to time and target. They are working with the NHS, whatever its management structure. NIHR both funds some research, as your membership has brought up, and co-ordinates infrastructure. We work very closely with industry, because we are the arm of the Department that has to work directly around the economic investment and growth area, so we are concerned about disinvestment. On this occasion, I want to highlight how concerned I am that AstraZeneca has closed down its Bangalore site, which was on anti-infectives, and is downsizing its anti-infection group—or its infection group—as it moves from Alderley Edge to Cambridge. This is worrying not just for Britain but for the world in the production of new antibiotics; but it is not because we do not have an organised, supportive clinical research system.

George Eustice: That links back to the point that Mr Metcalfe made earlier. Like him, as somebody who believes in free markets, I am reluctant to abandon the concept that we should encourage private enterprise to fund these things. Another element is having regulatory certainty and consistency, so that companies that make an application for a patent know that they are going to get that patent protected properly and things are not going to change in a few years' time. The EU veterinary medicines directive is currently being reviewed and we are waiting to see what comes back from that. But I think that having something that could extend data and patent protection might strengthen the incentives for private companies to do more research to find new antibiotics.

Q343 Chair: In general, it seems easier to effect change in the veterinary world. Is there an underlying reason for that? The patients do not complain as much perhaps?

George Eustice: Perhaps the patients do not argue. I do not know. Peter?

Professor Borriello: I cannot comment on that because I do not know whether that is true or not.

Q344 Chair: But you have been able to affect prescribing practice more. In earlier answers, you explained that fewer antibiotics are used in our animal population than, I think, in many other countries. That is a combination of things. I see it in other areas of agriculture—for example, in the use of agrochemicals. Many of the manufacturing companies work very closely with farmers in testing products and making sure that overuse does not occur. That also seems to happen in the veterinary medicine world, but there is not the same effect coming out on the human side. Is there something special happening in veterinary science that we ought to learn from?

Professor Borriello: Coming back to your original question about fragmentation and having uniform responsiveness from various bodies, the veterinary field has both advantages and disadvantages from this fragmentation. We do not just have lots of different types of animals; we also have lots of different types of animal sector. Even with cattle, you have dairy cattle and beef cattle. There is not an NHS equivalent. They are all independent, including the general practice equivalent, which is local veterinary practices, for small animals. We already have that fragmentation, which makes it difficult to have a single lever. But contrary to that, because there are discrete sectors, it means that you can look at sectors in almost bite-sized chunks, and they do work together very closely; they have to, because it is about produce, particularly on the livestock side. There are advantages and disadvantages to fragmentation. It would be lovely to claim that the advice, the newer prescription guidelines and the tight regulations from Europe are the cause of better regulation, better use and less resistance. Actually, I do not know the reason why there appears to be less resistance in veterinary pathogens. It could be by chance.

Q345 Chair: This leads me to where I was going, back to the Department of Health. Are you prepared to amend health care-associated infection targets, should they prove to drive greater use of critically important antibiotics?

Professor Dame Sally Davies: We are advised by ARHAI, as I said—our specialist expert advisory committee. If they believe that we should be collecting different metrics or changing the mandated collections because it is impacting out there on practice and making it change for the worse, then the Government would do so.

Q346 Chair: What advice have you received from your scientific advisers on the efficiency of HCAI targets?

Professor Dame Sally Davies: I have seen the dramatic impact that having targets has made and I know that there is some rising concern about the issue of, "Is it pushing an increase in carbapenem use?" We are seeing increased carbapenemase-producing enterobacteriaceae. That is worrying, but we have not, that I am aware of, had formal advice that this should change at this point, but that is exactly why we have an overarching steering group and a scientific committee so that they can advise us on metrics. You heard my view that I would like a broader collection of metrics. I am not sure we should give those up—because it is for the experts to tell us—and I would personally like to see them as mandatory. The scientists will need to make the case to Government because then the CQC will be able to use them and inspect and help us drive up performance.

Jane Ellison: We are aware that we need to look at the need to move away from some specific indicators to a more comprehensive approach. We are very much open to that.

Q347 David Tredinnick: I would like to return to limiting the use of antibiotics for animals. Twenty-six years ago, in the House of Commons Chamber, I raised the issue of feeding antibiotics to chickens in Indonesia. I was not the only Member at the time to be concerned

about the misuse of antibiotics. Rolling the clock forward, my understanding is that we now have a situation where the European Union may legislate to ban the use of antibiotics in animals altogether. Have you been involved in those conversations, Minister?

George Eustice: If you are talking about the use of antibiotics preventatively, my understanding is that farmers, even if they are using those antibiotics in feedstuffs, still need them to be prescribed by their vet. The protection is the same, and I think some progress has been made in reducing that.

In terms of banning it altogether, I might ask Peter to come in on that because I am not aware that the EU is talking about banning it altogether, but the central point is right: they should still be prescribed by the vet based on the evidence on the farm. There are cases where, for instance, if you have some of the bugs that cause diarrhoea in piglets and things like that, the ability to have it administered through the feed to that herd of pigs is more effective than trying to manually vaccinate them all. I do not think you would want to remove it as an option, but you are right: where it is used we have to make sure that it is done the right way round, that the vet linked to the farm actually prescribes that as an approach rather than—this is where there are some concerns—a situation where a feed company says, "We can do this. Just get your vet to sign off a bit of paper." We need to make sure that the controls are right, but we would not want to remove it as an option. Is that right, Peter? Is there anything to add?

Professor Borriello: Yes. Briefly, there is no indication whatsoever that the Commission intends to ban all antibiotics for animal use. That would be contrary to the animal health and welfare regulations anyway. There is an indication that they wish to have greater control on antibiotics that might be used in a preventative way. They are used in a preventative way both on the human and the animal side in a number of different ways. Our personal view for the UK is that any preventative use as a substitute for good animal husbandry should be banned. It is as simple as that—preventative use, to prevent disease, just as it would be for the case of a child with meningitis in a school, where you might treat her close contacts and her classmates. The same is true on the veterinary side, irrespective.

Q348 Chair: Can you cite an example of where antibiotics have been used in place of good husbandry?

Professor Borriello: I cannot cite a particular example, but there is the view held by many that improved biosecurity, which is the animal side equivalent to infection control on the human side, may reduce the need for some of the preventative use. There is a view that in some cases it could be that they are being administered because they are needed, but they would not have been needed if there had been better biosecurity. All those aspects are looked at as part of the process of improving animal management in the livestock industry.

George Eustice: There was some progress made in 2006 when the routine use of antibiotic growth promoters in some foods was banned at that point. That was precisely because there were concerns around antimicrobial resistance building up.

Q349 David Tredinnick: Are you aware of the European Union agriculture committee amendment to the 2012 budget, which has allocated €500,000 for funding of research into homeopathy and herbal medicine in livestock farming as an alternative to the use of antibiotics, and do you support research into alternatives in this way?

George Eustice: I did look into this and there was a fund—I think you are right—of around €500,000 that was set up in October 2011 to look at this. It has now been subsumed into a more general budget, but which is to look at alternatives to the use of antibiotics. Yes, obviously we support that. As I said, in the VMD's own research—the six projects it is looking at—two of them have elements of some of these things, preventative measures other than just the straight use of antibiotics. One of those is looking at the drivers behind the use of antibiotics and whether alternative approaches could reduce it.

Q350 David Tredinnick: Could I finish on this, Chair, if I may? Having looked at this field over the last 25 years in both people and animals, I suggest to you that there is a way of reducing antibiotic consumption by making greater use of people like Hydes Herbal Clinic in Leicester or going to doctors who are qualified as homeopaths. They have been qualified by Act of Parliament since 1950; it went through the House unopposed—I checked yesterday—so it was not controversial at the time. If we embrace these alternatives, there is a way of reducing demand for antibiotics, and I would suggest to you that, in the face of the huge obstacles in creating new antibiotics, this has to be part of the package.

George Eustice: Okay, I know you have been a long-standing advocate of these approaches, and all I can say is that we support, obviously, the fact that the European Commission has allocated some budget to that, albeit that I think it has now gone into a slightly broader budget, to look at a broader sphere of things, including whether we can mitigate or reduce the use of antibiotics. But I fully take on board your point. As I said, there are elements of what you are asking for in two of the projects that the VMD is doing.

Q351 Chair: In terms of the allocation of such budgets, how would you expect research programmes to be designed?

George Eustice: I would expect Peter to design them. The six of them that I have in front of me look very thorough but are part of a trans-EU collaborative project, as I said earlier, so there is other work being done in other countries of the EU so that we do not duplicate our effort.

Professor Borriello: My only comment would be that with respect to scientific process, which has stood us in great stead for a long time—going back to the era of the Greeks; the scientific process has been with us for a long time—particularly for medicines, there is no such thing as alternative. Everything is considered and everything has to go through the same rigorous process. A key element of the scientific process is not to try to prove something, but to try to disprove it. The more rigorously it stands up to attempts to disprove, with appropriate controls, the more certainty you have in the findings of the conclusions. We have no prohibition, and there is no prohibition, on anything coming forward for a marketing authorisation for a medicine as long as it meets the accepted

criteria for proven efficacy, safety and, in the animal field, not just safety to the animal, but also safety to the environment and to humans. On that basis, there is no prohibition. Equally, we do not hypothecate research to particular areas. We would have an open call for certain research areas through research councils.

Professor Dame Sally Davies: I want to make sure that we do not lose sight of the fact that some people are very sick with bacteria; they need antibiotics and there is no alternative. What we are talking about is trying to limit the use of antibiotics, or stop their inappropriate use in order to conserve them, and indeed globally not only conserving what we have, but actually trying to increase their availability to people who need them. I think alternatives may come in for prevention—clearly vaccination is very important. However, we must never lose sight of the fact—this is one of the reasons I am so concerned about antimicrobial resistance—that there are people, probably about 5,000 a year in England, dying of resistant E. coli infections, for instance, and they needed antibiotics and nothing else would have worked.

Q352 Stephen Metcalfe: I want to go back to something I was asking about earlier, diagnostics, but also to build on Graham's questioning about centres of excellence and the focus for research. We now have a series of Catapult centres. There has been talk about creating a Catapult centre for diagnostics and stratified medicine. Now I think it has been slightly renamed as a precision medicine Catapult centre. Do you think there is a role for that, and is it something that the Government would support?

Professor Dame Sally Davies: By definition, the TSB is an arm of Government; it is an ALB in part of the BIS family of research councils. I am interested in how precision medicine, or stratified medicine, will get us to where we need to be on rapid diagnostics for AMR. I think it could, but most people when they hear "precision medicine" and "stratified medicine" think first and foremost about cancer and cancer drugs. My concern is: will they, if they fund it as "precision medicine," then end up supporting just cancer and therapeutics like that, or will they help where we need it in rapid diagnostics for AMR?

Jane Ellison: We very much recognise that developing new diagnostic techniques is a big part of how we respond to this challenge, not just developing them but obviously then seeing how they would be used.

Q353 Stephen Metcalfe: Do you think the change of name to "precision medicine" rather than "diagnostics and stratified medicine" is not terribly helpful in actually making clear what we want to come out of this Catapult?

Professor Dame Sally Davies: I felt I needed an explanation, but maybe people in the field do not.

Q354 Stephen Metcalfe: I am sure that will be noted. Thank you for that. BIVDA have commented that there are good diagnostic tests available—not enough perhaps, but there are some good ones—but they are not used to their full extent here in the UK. We have heard

elsewhere on other inquiries that the NHS, as our main health provider, can be very slow to adapt to change, for various reasons. If we are to develop new diagnostic tests, how do we ensure that they get taken up?

Jane Ellison: That is certainly one of the reasons why NHS England is a critical member of the steering group; we are aware of that challenge. I know that this is something that is being looked at. Partly it is about things like making sure there is NICE guidance, and partly it is about removing perverse incentives that might exist in the system that would stop people using a rapid diagnostic. I do not know if Sally can comment any further about the detail of how we are addressing this.

Professor Dame Sally Davies: As I said earlier, if people produce a really good cheap one, we will not have a problem. BIVDA actually cover in vitro diagnostics. It is always nice to have better equipment in the lab, but that is all working all right; what we need is cheap point of care, and, while the technologies exist, I am told they have not been put together into the cheap rapid diagnostic we need.

Q355 Stephen Metcalfe: You may well be right, but it is not quite that that I am disputing. It is the ability for the NHS to adapt to change rapidly enough to adopt something new. We heard—as I said, on another inquiry—about something that might help remove prions from surgical instruments, but it was not taken up because it was very difficult to get the NHS to fit in that extra process. That is in the public domain because we heard it at an open inquiry, but it was an example of that inability perhaps to adapt its systems.

Professor Dame Sally Davies: I think you and I will be discussing that at the end of April, so I will leave that debate for then. This is quite different from prions. This is something that touches every single person, and they know it does. We are getting through to even, I discovered, the London taxi driver, with one telling me that I might not need antibiotics for a cough. I think that if we can get a good, effective rapid diagnostic on this one—it has to be specific and precise and all of those things—I do not foresee the same problems. Doctors, and doctors are key in this, embrace new technologies if they know there is a problem and they can see it will help. This is an area where there is growing recognition of the magnitude of the problem, the severity of the problem and the need to change. This will be one area where we can make a difference.

Jane Ellison: Of course we want to try to get this area embedded in the mandate as well, which will give it that absolutely system-leading importance. Work is under way on that.

Mr Miller, earlier I think I misunderstood Pamela Nash's question about who leads in the Department. For the record, it is worth saying that our senior responsible officer in DH is the director-general for public health, and she reports on progress in this area to the executive board.

Chair: Thank you very much.

George Eustice: Can I add something on the rapid diagnostics? I know it is more pertinent to the NHS, but we are aware that there is some research being done in the private sector on veterinary rapid diagnostics as well. It is generally termed "pen-side diagnostics," for reasons I do not understand, but there is an incentive, if we can get it right, for vets to want

to go down that route, because at the moment you have a delay, sometimes of several days, before being able to get the diagnosis and prescribe the right drug. If you could get a reliable enough diagnostic, there would be an incentive for it, and a commercial incentive as well for farmers to be able to act early to deal with problems.

Professor Dame Sally Davies: Not only are we working towards the next NHS England mandate in November, but we have asked them in their discussions with GPs about the new GP contract to make sure that AMR is properly reflected in their contract. That is a discussion with the BMA, but they are doing their best.

Professor Borriello: For both the human and the veterinary side, there is the issue of whether you are talking about quicker diagnostics or rapid diagnostics. Certainly the NHS has adopted some very innovative new technology—the so-called MALDI-TOF: mass spectrometry for identifying germs. It works and it is being adopted quickly. The problem with trying to get near-patient or pen-side is that it means you take it out of the hospital and into the community setting, and there you have the whole problem of, "Is it the right sample for that particular diagnostic? Is the price right? Can it be read properly? What is the quality control?" By and large, if you are going to influence treatment for infections, rapid can only mean one thing—immediate—otherwise you will go with best, appropriate and empirical, and wait for your diagnostic to inform you whether or not you need to change it.

Stephen Metcalfe: Thank you very much.

Chair: We have covered a huge amount of ground this morning and I am sure there are a few additional bits that might be fed in. Please feel free in the next few days, if there are additional comments you would like to make, to submit further evidence. In the meantime, two Ministers and two professors, thank you very much for your time this morning.