HOUSE OF COMMONS

Science and Technology Committee

Oral evidence: Antimicrobial resistance, HC 848

Wednesday 29 January 2014

Ordered by the House of Commons to be published on 29 January 2014.

Written evidence from witnesses:

- National Office of Animal Health
- Responsible Use of Medicines in Agriculture Alliance
- National Farmers' Union
- Alliance to Save our Antibiotics

Watch the meeting

Members present: Andrew Miller (Chair); Jim Dowd; David Heath; Stephen Metcalfe; Stephen Mosley; Sarah Newton; Graham Stringer; David Tredinnick

Questions 112-167

Witnesses: **Phil Sketchley**, Chief Executive, National Office of Animal Health, **John FitzGerald**, Secretary General, Responsible Use of Medicines in Agriculture Alliance, **Miss Catherine McLaughlin**, Animal Health and Welfare Adviser, National Farmers Union, and **Cóilín Nunan**, Principal Scientific Adviser, Alliance to Save our Antibiotics, gave evidence.

Q112 Chair: May I welcome our panel this morning? There is an interesting mix of people on the panel and, given some of the questions that we want to explore, we anticipate that there may not be unanimity. We want to make sure that everyone's view is clearly expressed, so please indicate to me if you have something to add after someone else on the panel has spoken. First, for the record, I should be grateful if the four of you would introduce yourselves.

John FitzGerald: Good morning. My name is John FitzGerald. I am the Secretary General of RUMA, the Responsible Use of Medicines in Agriculture Alliance.

Catherine McLaughlin: Good morning. I am Catherine McLaughlin. I am the Animal Health and Welfare Policy Adviser for the National Farmers Union.

Cóilín Nunan: Good morning. My name is Cóilín Nunan. I am the Principal Scientific Adviser to the Alliance to Save our Antibiotics, and an antibiotics adviser to the Soil Association, and I have worked on the Soil Association's campaign to reduce the use of antibiotics in farming.

Phil Sketchley: Good morning. I am Phil Sketchley, the Chief Executive of NOAH, the National Office of Animal Health, which represents the UK animal medicines industry.

Q113 Chair: First, just to set the scene, as you have seen, we have taken quite a lot of evidence in respect of human health. Is there strong concern about antimicrobial resistance in animal pathogens?

John FitzGerald: There is recognition that antimicrobial resistance is a serious issue, particularly in human medicine. In relation to animal medicine itself, and the treatment of animal pathogens, there is not so much evidence that it is a problem in relation to treating animals, other than for pig dysentery, which has developed resistance to the main courses of treatment. Other than that, as far as we are aware, it is not a significant issue, although it is fair to say that the bulk of the research that has been carried out into resistance in bacteria from animals has been into zoonotic pathogens rather than the pathogens that affect only the animals themselves. In terms of the reports that you get back from farms and veterinary surgeons about the treatment of animals and treatment failures, there is little evidence that resistance is causing a treatment problem.

Phil Sketchley: I concur with that.

Cóilín Nunan: I would agree with a lot of what John has said, both about swine dysentery and about the general lack of evidence; but also, as John said, there is a lack of research, as most of the focus has been on the zoonotic pathogens.

One specific area of concern for farm animals is that it is unlikely, even if new antibiotics come on to the market, that they will be licensed for farm animals. Farmers are going to have to make do with the antibiotics that they already have, and there may well be further restrictions in future, so we should not be too relaxed about the levels of resistance.

Q114 Chair: Why do you say that it is unlikely?

Cóilín Nunan: Some companies doing research into antibiotics have already said that they would not license them for use in farm animals, because they want to ensure that they remain available for human medicine. The more modern antibiotics tend to be the more critically important, because there is less resistance, so there will be greater restrictions, perhaps including total restrictions, as with the carbapenems, which are not licensed for farm animals.

Phil Sketchley: It is unlikely that the animal health pharmaceutical industry will now do dedicated research into new molecules for animal health. The reasons for that are, first, cost to market, but more importantly the anticipation of the regulatory hurdle disallowing the authorisation of new molecules for use in animals, because the preferential use will be for humans.

Catherine McLaughlin: As far as the NFU is concerned, nothing has been said so far that we would strongly disagree with. We recognise that there is a risk, especially with zoonotic resistance pathogens, and it is something that the farming sector is taking really seriously, in terms of its responsibilities.

It is quite important to state at this point that we also have to be mindful of the sentience of animals. They have an absolute right to be treated if they become ill with a bacterial infection. That is one of the big concerns of the farming sector.

Q115 Chair: None of you has linked this to the so-called One Health approach, the five-year strategy. Is it the case that that is because it is all about human health, and animals are just tacked on?

John FitzGerald: Most definitely not. We very much welcome the One Health strategy. It is a line that RUMA has followed almost since we started in 1997. We have always had an expert on human medicine in RUMA's membership, because we realise that the issue is not one that is simply related to animals. There is a potential for animal use to impact on human medicine, although most of the data would suggest that that is not happening. We very much see the five-year strategy that is being put forward by the Government as a balanced and proportionate document. It reflects the general consensus of belief that the bulk of the resistance that has developed in humans has come from the use of antibiotics in humans, so we think it is a quite proportionate document.

Animals were certainly not an add-on to the document. We know from our discussions with the Veterinary Medicines Directorate that they and DEFRA's antimicrobial resistance co-ordination group, better known as DARC, were consulted as key members in the development of that strategy, so the animal side was not an add-on. In fact, we in RUMA have been saying for a number of years that we need more input into the animal side so that we have better information available, so that decisions that are going to be made on how you use antibiotics in order to maintain their efficacy and get the best use out of them will be based on scientific information, and not on surmise or overuse of the precautionary principle.

Catherine McLaughlin: From the NFU's point of view, we welcomed the five-year strategy. The whole One Health principle is something that we hold very true to our core policy areas, in terms of the complete animal health picture, so it was welcomed by us.

Phil Sketchley: When the draft document was being circulated for consultation, the National Office of Animal Health submitted to it, and we certainly made strong recommendations for enhancing the aspects of animal health within the overall strategy. I concur with what Mr FitzGerald said, in that it certainly has to be seen as combining the interests of both human health and animal health.

Cóilín Nunan: My response to the strategy is that there is a lack of new thinking, and that this approach—the idea that we need to look at both farm animals and humans—is not a new idea. It has been going on for decades. Some countries are so far ahead of the UK and of many other countries in Europe that it is really quite surprising.

Although there are many things to welcome in the strategy, including on the farming side, there is a lack of ambition and there is no clear direction; there are no new aims for reducing antibiotic use. We are also very much still lacking basic data on which antibiotics are being used in which animals, and where the resistance problems are. Some countries have been collecting this data for 15 years, but the UK still has very basic data, and we

need much more precise data if we are actually to understand the problem. There was a lack of ambition in the strategy.

Q116 Chair: Before I follow that a bit further, how great an overlap is there between human and animal antimicrobial medicines?

Cóilín Nunan: It is generally accepted that most of the resistance in human medicine comes from human antibiotic use. However, a significant amount comes from farm animal use.

Q117 Chair: Mr FitzGerald said that there was not much evidence.

Cóilín Nunan: I would disagree. There is an enormous amount of evidence. In some cases, the evidence is very difficult to establish because of the complexity of the science on how bacteria behave.

Bacteria exchange resistance genes; this kind of thing happens in the human intestine, and it is very difficult to know where the resistance has come from. For certain bacteria, it is quite easy to know where the resistance comes from; if the bacteria are on meat and they cause an outbreak, you can trace it back to the meat and to farm animal use. That is why with some bacteria, such as salmonella and campylobacter, we know that most of the resistance comes from farm animal use. With other bacteria, such as enterococci and E. coli, which is a major problem and is really increasing all the time now, it is much more difficult to establish, but it is increasingly clear that a significant amount of the resistance in E. coli comes from farm animal use, particularly as there is so much resistance in the community to antibiotics. Some antibiotics are not widely used in the community but are used in farm animals, and we can see these resistances.

Q118 Mr Heath: I am a little bit puzzled by this conversation. If we set aside the purely animal diseases and the use of antibiotics—we are not talking about zoonoses but about an interaction between the antibiotic and the pathogen—the host species is almost irrelevant. It is exposure, surely, that is the issue. I do not quite understand why we are trying to decide whether animal use is "to blame" or human use is "to blame". Surely, it is the overall exposure and the extent to which the pathogen is capable of mutating in order to provide resistance. Am I right, or am I talking nonsense?

Phil Sketchley: That is entirely correct. Perhaps I should add, to respond to some of the earlier comments, that there is a lot of data on the use of antibiotics in UK animal health. Indeed, the Veterinary Medicines Directorate have been sending out reports, which the Committee may be aware of, for coming up to 10 years. This information gives a lot of detail in terms of the types or classes of antibiotics that are used, and the livestock species that they go into—whether it be beef, cattle, sheep, pigs and so on. There is a lot of information in that document. The latest report looks into the detail of the individual pathogens and the resistance profiles. That reaffirms the point that was made earlier, that there is not a significant clinical issue in terms of resistance organisms in animals causing problems for the veterinarian in treatment.

In terms of the points made about whether the organisms are the same, transmitted from one species to the other, early reports may have suggested that, but there have been recent studies—from the Animal Health and Veterinary Laboratories Agency, which published a paper last year, and from the university of Glasgow—where they did more specific gene typing. It showed that the ESBLs—the organisms causing problems, for example, in salmonella—were not exactly the same gene sequences as between the animal ones and those in humans. They were therefore questioning previous views as to whether there was a direct link in the transmission of those resistants from humans to animals or from animals to humans.

Cóilín Nunan: When you talk about ESBL and salmonella, I think you are actually thinking about salmonella DT104 and ESBL E. coli. If we take the ESBL E. coli first, it is one of the major resistance types of E. coli that has emerged. It is very clear that there is ESBL E. coli in humans that is causing infections, and that there is ESBL E. coli in farm animals. Frequently, as Phil Sketchley said, the strains can be different. However, it is well known that the ESBL resistance genes are on little bits of DNA called plasmids, which pass from bacterial strain to bacterial strain. The plasmids can be identical, and it is strongly believed that the plasmids are passing between E. coli strains. Experiments have been done where you ingest a farm animal strain with the resistance genes and it pops into a human-adapted E. coli, which subsequently can go on to infect you.

In fact, Danish research a few years ago looked at ESBL E. coli from pigs, sows and piglets, and from pig farmers. They went from farm to farm, and they generally found that on one specific farm the plasmid would be the same; they would find the ESBL E. coli in the pigs and the pig farmers. The plasmid would be the same, but the strains would be different. They even found that sows and piglets housed together had the same plasmid but in different strains. They said that clearly shows that the plasmid is jumping from strain to strain, and that it does so very quickly. It can even do this on a chopping board in your kitchen, or on a towel. These sorts of things have been shown to be happening. One of the characteristics of E. coli is that the genes pop around, and that is why it is so difficult to establish where it initially emerged, but there is no serious scientific doubt in my mind that there is a huge overlap between the genes.

Regarding the salmonella study—well, that is another long discussion, but I do not believe that the paper proved at all what it was claiming to prove, in that it looked only at a local farm. It is quite a complex paper. I could submit some evidence to the Committee in writing, or you may want me to respond right now, but it will be a long discussion.

Q119 Chair: I want the others to respond. Mr FitzGerald, you took us down this track.

John FitzGerald: To give you a bit of background, I am not a scientist, so I am probably in much the same position as members of the Committee when hearing the debate about the science that happens here. Before joining RUMA I worked at the Veterinary Medicines Directorate; for 10 years, I was the policy person responsible for antimicrobial resistance. The science has developed significantly over those years, and the science is very complex, as Mr Nunan has intimated.

The trend that I have picked up more recently is that a fair amount of research seems to indicate that bacteria from animals may be causing a problem in human resistance, but we

then find that other people, sometimes the same researchers, have done research to a different level, and rather than looking at a fairly high level they have gone much deeper into genetic considerations. We have papers by Mather et al—the Glasgow university one that Mr Nunan wishes to criticise—a paper by de Been from Holland, and a very recent paper, published only this month, by a chap whose surname is Wu. All of these look at the genetic issue.

Certainly, de Been has changed position strongly, in that in his original research he and his team said that they thought that the resistance problem in humans had been caused by poultry, but they subsequently produced a poster at a conference that said, "We have now looked more deeply into this, and we cannot support our original conclusion." That, to me, is good science. That is scientists working through the process and identifying what the science is actually showing them.

The trend that I have picked up from these three papers, which have come out relatively recently—during the last six months or so—tends to suggest that we should be reflecting on the earlier papers, and that if you are going to take decisions based on science you ought to be looking at the best quality and most detailed science that you can get. Because it is such a complicated area, we need to make sure that we take decisions that mean we control antibiotic use in the right way, and do not necessarily take decisions that may not be controlling antibiotic use in the right way; but if you are going to limit the use of antibiotics in animals you may cause problems in the health and welfare of the farm livestock.

Catherine McLaughlin: I fully support everything that Mr FitzGerald has just said.

Phil Sketchley: The papers that I referred to are the ones that John was referencing, and it would be highly relevant if those were furnished to the Committee so that you could review them in your own time. They are extremely important documents in that they challenge some of the science that came out four or five years ago.

Cóilín Nunan: I would add that the salmonella paper was criticised, and several critical responses were published by the journal. I do not think that there is any criticism to make of the E. coli research; it is simply, as I say, that they are looking at strains rather than the plasmids. I am afraid that John FitzGerald and Phil Sketchley are picking out a few small bits of evidence that they feel strengthen their position, but there is an overwhelming body of evidence showing the opposite.

Some of the clearest evidence, for instance, is on the specific use of an antibiotic in poultry called ceftiofur, which is one of these critically important antibiotics. It was being used routinely off-label, which means that it was not licensed for that particular use. Off-label use can be legal in some cases; it depends how it is used. There was an emergence of a ceftiofur resistant salmonella in poultry in Canada; this was happening in Quebec and other areas of Canada. Similarly, the same kind of salmonella—ceftiofur resistant—was increasing in humans. Eventually, the poultry producers decided that they would voluntarily stop using the ceftiofur, and resistance fell from quite a high level to quite a low level, both in poultry and in humans. Subsequently, about a year later, part of the poultry industry decided to start using ceftiofur again, and we saw resistance both in humans and in farm animals increase again. One of the Danish Government scientists commented that this was extremely strong evidence of resistance passing from animals to

humans. He was questioning the motives of those who still question whether resistance from farm animals can transfer to humans.

Chair: We will not solve the problem today, but, yes, Mr Sketchley, we would welcome sight of the papers to which you referred. Indeed, and I say this to you and the audience, both in the room and online, any other peer-reviewed evidence that helps us to address this part of our inquiry would be welcome.

Q120 Stephen Mosley: I want to ask about the RUMA guidelines. It is probably best to start on the left of the table and finish on the right, but I shall let you decide who goes first. How useful are the guidelines for reducing antimicrobial resistance in animals, and is there anything missing from them?

John FitzGerald: As I am RUMA's secretary general, I suppose it would be sensible if I started. How useful are the guidelines in reducing resistance in animals? I cannot give you any empirical evidence, because we have had no surveys that measured it in any way, other than to say that, if you look at the surveillance reviews of resistance in livestock across Europe, you generally find that the UK is at the lower end of the resistance that has been found in animals.

The general message behind our guidelines, if I can use a catchphrase, is "You should use medicines as little as possible and as much as necessary." That may sound slightly contradictory, but in essence it means that you should be working to reduce the disease challenge on your farm. The guidelines stress that a lot of work should be done to prevent disease coming on to the farm and challenging the animals. In that way, you should not need to use medicines, but when you do need to use medicines, you should use them appropriately, with the full course of treatment and in the right dose. "Right medicine, right animal, right time" is another little buzz phrase.

In terms of whether we could do more, or whether anything is missing, we have already started to look at whether there are ways that we could move forward with translating the guidelines into training, particularly for farmers but also for veterinary surgeons. Responsible use is regarded by many as an appropriate way to move forward in how antimicrobials are used, both in humans and in animals. We need a little bit more practical advice to farmers in particular, so that they can take the guidelines and develop them into how they are going to work on their farms. We have been working with the British Cattle Veterinary Association and the British Veterinary Association to see whether one of the ways of doing that would be to get veterinary surgeons to train their clients in both the practical and the responsible use of medicines, to make sure that we are using antimicrobials in a way that maintains their availability and their efficacy on the farm, and reduces the chance of any problems developing that may transfer to humans.

Cóilín Nunan: The RUMA guidelines say many sensible things, including many things that we would endorse. At the same time, the guidelines do not necessarily make much of a difference. One problem is that frequently the guidelines are not kept to. The second problem is that there seems to be a slight contradiction in what RUMA says. On the one hand, it says that it does not approve of the routine preventative use of antibiotics, which is perhaps the major issue. On the other hand, when an early-day motion was put forward calling for a ban on routine preventative use, RUMA strongly opposed the early-day

motion and put out a press release criticising the particular proposal on the preventative use side, even though it was calling only for a ban on routine preventative use, not a ban on all preventative use.

There is a bit of a contradiction in RUMA's position, and there are also some specific problems with the lack of awareness that certain practices can lead to resistance, although one might think that they would not. I am thinking of dry cow therapy—the tubes of antibiotics that are put into a cow's udder at the end of the milking period in order to prevent mastitis. It is often thought that this will not lead to antibiotic resistance because it is not getting into the intestines of the cow, but it gets into the milk when the cow starts milking again. Indeed the withdrawal period for the antibiotic covers the first milkings, so what happens is that when the calf is born it gets the antibiotic straight with its colostrum, right at the beginning.

There are some specific problems like that, but the major problem is that the guidelines frequently are not kept to. In the last couple of years, the Veterinary Medicines Directorate even published an article in the *Veterinary Record* saying that, in fact, what frequently happens is that farmers are ringing up feed mills to order antibiotic feed additives, and that the feed mills are then going to the vet and asking the vet to sign a prescription that has been made out by the feed mill. That obviously goes completely against all sorts of guidelines, but it is not clear that the practice is even yet properly illegal.

Phil Sketchley: NOAH is one of the founder members of RUMA, and our industry veterinary advisers will have contributed significantly to the initial guidelines produced for all the major species. Like any guidelines, they will work if they are abided by; it is clearly not in legislation that vets, or indeed farmers, have to use the RUMA guidelines, but they are adopted by many of the assured food standards, and I am sure that my NFU colleague will endorse how the guidelines are welcomed by those organisations and put into practice on farms.

We digressed a little into dry cow therapy. It is important that the Committee understands that the use of antibiotics in dry cows is a very small percentage of the antibiotics that are used collectively by veterinarians in animal health. It would represent a very small percentage. Dry cow therapy has proved to be a highly effective means of keeping the cell counts of dairy cows down. If we look at cell counts in dairy herds, say 15 years ago, they were extremely high. Dry cow therapy has helped to establish a lowering of those somatic cell counts in milk, and has proved an extremely important part of the veterinarian's therapeutic armoury. More important, dry cow therapy is changing; it is being used more selectively by vets now that the health of the UK herd is in a much better condition than it was 10 or 15 years ago. It is selective dry cow therapy that is being adopted now, rather than routine.

Q121 Stephen Mosley: Miss McLaughlin, before you sum up on this section, we have heard evidence that the guidelines may not be used across the board. Do you have any evidence of how widely they are being used?

Catherine McLaughlin: Yes. I disagree with Mr Nunan on that point. Just to let the Committee know, as well as being policy adviser for the NFU, I am deputy chairman of RUMA. Much like NOAH, the NFU was a founding member of RUMA, so RUMA

principles are very close to the NFU's policy heart. In terms of the RUMA guidelines, just so that I was absolutely comfortable with this discussion, I made sure that I talked to a lot of my members and our national commodity boards. I directly asked them before coming here today what their attitude was to the RUMA guidelines. I got emphatic support for the guidelines. Farmers do use them. They find them an extremely useful tool. They are using them as a teaching aid for a lot of their stockmen, and they are now widely being picked up in agricultural colleges as well, so it is part of the agricultural student curriculum. As Mr Sketchley said, they are a recommended text in the Red Tractor farm assurance, and I am sure that we could get the Committee a sample copy of those assurance standards if it would help, as it would highlight exactly the principles that are being integrated into the farm assurance schemes that farmers work to.

A couple of other areas were touched on. One of the things that British farmers are doing these days is all about farm health planning. It is all about making sure that the health of the animal is optimised, so that you reduce the risk of the animal getting sick in the first place. We need to remember that antibiotics and veterinary medicines are expensive, and they bring with them withdrawal periods and yield restrictions, so no farmer is willingly going to use antibiotics unless there is an absolute need.

All the antibiotics are veterinary prescription—they are all under the POM-V category—so you do not get the situation where farmers are creating their own prescriptions, or using them without any sort of veterinary recommendation or prescription first. That is quite an important point, given the medicated feeds issue. It is a veterinary prescription that gets medicated feeds, and it is a highly important aspect; it is a way for the farmer to get antibiotics into his animals, and it is proving a safe and effective way of getting doses right. It is a little disingenuous to discount medicated feeds as being the root of all the problems.

The big thing, in terms of the NFU, is that the RUMA guidelines do a fantastic job. They are all about preventative health care, all about optimising animal health. As a farmer tool, they are extremely useful.

Q122 Stephen Mosley: Moving on a bit, Mr FitzGerald talked about the importance of training and education. I know that this is mentioned in the five-year strategy, but Alliance to Save our Antibiotics was a bit critical of that section. Do you think that the strategy is specific enough on the curriculum requirements for veterinary medicine when it comes to antimicrobial resistance?

Cóilín Nunan: From what I understand, nowadays younger vets are much more aware of the problems relating to antimicrobial resistance, so there is clearly a lot more good training occurring—very much more so than there would have been a few decades ago. The BVA, for instance, produced really excellent guidelines on the use of the critically important antibiotics, explaining how and when they should be used. As I say, it was a really excellent document.

The problem is that a lot of the time we should not be blaming the vets, as it were; they are not the ones responsible for the fact that animals are raised in such a way that disease is widespread. According to a survey of veterinarians carried out by the Veterinary Medicines Directorate, they come under pressure from farmers to prescribe in a particular

way. They also have to consider economic considerations with some antibiotics. As Miss McLaughlin has pointed out, there are withdrawal periods for many antibiotics, but for some there are no withdrawal periods; you can use them without a withdrawal period, even for some critically important antibiotics, because withdrawal periods are not set with antibiotic resistance in mind; they are only set with residues in mind.

There are many other factors impacting upon a veterinarian's prescription. For example, since the BVA produced its excellent guidelines on critically important antibiotics, their use has gone up quite significantly, so it has not had the impact that it should have had. Education is absolutely important, and education will be part of the solution, but it cannot be the main focus of the solution.

Q123 Stephen Mosley: I do not think that you are going to have any disagreement with that, but speaking specifically about education, are there any gaps in what is currently happening?

Phil Sketchley: I concur with what Cóilín said about students coming out of veterinary college now probably having a much higher initial level on these subjects because antibiotic resistance is a relatively new science, but there is a huge amount of continuing professional development. Studies are made available to existing veterinarians, and our industry certainly works closely with the species divisions—for example, with the British Cattle Veterinary Association—by putting on courses for vets dealing specifically with the subject of the science of antibiotic resistance. Of course, the study is there and facilities are made available for the veterinary profession to have that added information, so, although everything could be better, there have been significant improvements in recent years in that area.

If may, I shall respond to one point, because I would not want the Committee to be confused. When we refer to withhold times, it is quite correct that there are some products that have zero withhold, but that is simply because the product is not excreted through the milk and there is therefore no requirement for a withhold in those situations. It is a function of the pharmaceutical biodynamics—the way the medicine is metabolised in the body—and is nothing to do with the fact that the product may be coming out in the milk. That is not the situation. If a product has a zero withhold, it is simply because the product is not being excreted through the milk.

John FitzGerald: May I add to that? I do not know if the Committee is aware of it, but veterinary medicines are authorised on precisely the same basis as human medicines, in that data have to be supplied by companies, the data have to be produced to international standards and those data are assessed for the safety, quality and efficacy of the product. The assessor will then make a judgment on a benefit-risk balance as to whether the product should go on the market. As part of that assessment process, resistance is considered, and it is built into the assessment of each individual product. Resistance is considered at that stage of the process.

In relation to withdrawal periods and the maximum residue limit, maximum residue limits are set internationally, again to international standards, and it is the data that the company supply showing how the residues of the product deplete in the animal or the animal's produce that allow the assessors at the Veterinary Medicines Directorate, or the MHRA for human medicines—no; I am sorry; human medicines do not have residues that are a

cause of concern, so there are obviously no withdrawal periods for human medicines. The VMD assessors will use those data to set a withdrawal period, and farmers are obliged by law to stick to that withdrawal period. The Veterinary Medicines Directorate, along with the Veterinary Residues Committee, carry out annual surveillance of food on the UK market, and publish all the results of the levels of residues that are in food when the animal is going to be eaten.

Q124 Stephen Mosley: Finally, the strategy focuses mainly on resistant bacteria. What about viruses and fungi? Are the guidelines different from those for bacteria?

Phil Sketchley: In that context, there aren't any antiviral products authorised for use in animals, so the situation has not arisen, but we must obviously remember that antibiotics are not, or should not be, used for treating viral infections because there is no correlation in terms of their efficacy. In terms of antifungal, they are within the antimicrobial category. There are antifungal agents available in animal health, but I am not aware of any resistance issues that are causing concerns. Our principal focus in these discussions has been around antibiotic resistance, and not antiviral or antifungal.

Catherine McLaughlin: May I make a point on antivirals? As I understand it, the big issue on the human side is with the antivirals for the flu virus. It is worth pointing out that, if cases of high pathogenic AI occur in animals, the general response is culling and movement restrictions. We would not normally treat the animals with antivirals; they would just be culled and removed from the system.

Q125 Graham Stringer: Mr FitzGerald, I was one of the sponsors, with Zac Goldsmith, of the early-day motion on the overuse of antibiotics. Surely, you cannot object to stopping the overuse of antibiotics, which is what the EDM said.

John FitzGerald: No, RUMA certainly does not object to stopping their overuse. In fact, responsible use tries to make sure that the use of antibiotics is done in a way that means that they are not being overused. Part of our problem with the early-day motion was the use of the term "prophylactic," with no real definition of what prophylactic meant. The consideration for RUMA, in terms of the preventive use of medicines, is that prevention of disease is a very good thing, and it applies across human medicines as well.

RUMA has produced a statement on preventive use, and if the Committee has not seen it I am happy to furnish it to the Committee. We define the use of medicines in three ways. Curative use is what you might understand as therapeutic use, where an animal is ill and you treat that animal. Controlled use is where some animals in a group of animals are ill, and you treat the other animals in the group at the same time in order to prevent the disease spreading from the ill animals to the animals that have yet to show clinical symptoms. Preventive use is where you realise that the veterinary surgeon understands that there is going to be a significant bacterial challenge to the group of animals, and he recommends that those animals are treated with an antibiotic to prevent them from contracting a disease. It is similar to the treatment carried out in patients going to surgery in human medicine, where the surgeons know that even though you are in an aseptic environment in a hospital—

Graham Stringer: Sometimes.

John FitzGerald: Okay, I accept that. In the majority of cases with surgery, it is as aseptic as you can make it. Certainly, it is going to be more aseptic than you are likely to find in a farmyard. The doctors know that surgical intervention is going to lead to a high risk of bacterial infection, and they prescribe and administer antibiotics prior to the operation, so that the patient has the best possible chance of not contracting a bacterial infection that will affect the patient adversely.

Q126 Graham Stringer: In your response to those of us who signed the EDM on the overuse of antibiotics, you said that there was consensus that antimicrobial resistance came primarily from the human use of antibiotics. Having listened to the evidence this morning, that does not seem to me to be an accurate statement.

John FitzGerald: I believe that it was then, and it still is. It has been confirmed by the five-year strategy that has been produced by the Government, and it has been confirmed by a joint human medical and veterinary meeting of the Royal Colleges about a year ago. There is strong consensus that the vast majority of antimicrobial resistance in humans is going to come from humans. You have only to consider the fact that you are delivering an antibiotic direct into a human as opposed to delivering it into an animal. The bacteria from that animal have to develop resistance, and they then have to transfer from the animal to the human in some way, and not be destroyed by things like cooking. With any bacteria from animals that get into humans, there are so many ways that the pathway can be interrupted—by cooking, by good hygiene.

We know that food poisoning happens, so we know that bacteria transfer, but the fact that those bacteria are going to be resistant and transfer their resistance to the bacterial flora in the human, and that human is then going to be treated with an antibiotic to which the bacteria are resistant, would strongly suggest that it is much more likely that you are going to get resistance developing because of the direct administration of an antibiotic to a human. Not only is the logic there, but the evidence that is suggested by most of the science that is around also confirms that position.

Q127 Graham Stringer: Are you part of this consensus, Mr Nunan?

Cóilín Nunan: I clearly feel that this consensus is always presented in a way to reduce the significance of farmer antibiotic use. Certainly, it is true that for many infections such as tuberculosis it is overwhelmingly a human impact. However, we all eat every day, and we very frequently get antibiotic residues and antibiotic resistant bacteria on the food. On the one hand, yes, if you take the antibiotic yourself, it is not going to be destroyed, as Mr FitzGerald has pointed out, through cooking or good hygiene and all of that; but, on the other hand, you are exposed to it to a far greater extent.

I come back to E. coli, which is by far the largest cause of blood poisoning in the UK, causing about 40,000 cases a year and hundreds of thousands of infections. This huge increase in the number of cases of E. coli, which is not just a UK phenomenon, but is found throughout most countries in Europe, has occurred at the same time as antibiotic resistance has been taking off to all the major antibiotics available for treatment. The only

study that I have ever seen that looked directly at the impact of food on the E. coli in the human gut was an experiment carried out by French scientists. They compared some volunteers for several weeks before they went on to a sterile diet, and then for several weeks after they went on to a sterile diet. What the French scientists found was a remarkable fall in the level of E. coli resistant bacteria in the human gut.

We know that the overwhelming majority of E. coli infections start off from E. coli in the human gut getting into the urinary tract and causing a urinary tract infection, and that if it is not readily treatable by antibiotics it may develop into blood poisoning. This is a huge problem at the moment. The idea that we should be downgrading the impact that farm animals are having on that is, I find, a bit irresponsible.

Q128 Graham Stringer: In simple terms, you do not accept that there is consensus across the board on this issue.

Cóilín Nunan: There is certainly not consensus regarding what John FitzGerald might say about E. coli, and salmonella, campylobacter, enterococci and those sorts of things.

Phil Sketchley: I want to give some reassurance. The comment was made that we have antibiotic residues. I don't think that is a fair statement. If we look at the Veterinary Residues Committee's report, which comes out annually and has been coming out for many years, there aren't any issues with antibiotic residues, or indeed with any other medicine's residues, in the UK. Clearly, the way that withhold times are calculated, whether for meat or for milk, is extremely thorough. Huge safety margins are put into the determination of those withhold times when a medicine is authorised by the VMD or the EMA for centrally registered products, so the public should not be concerned about residues from any medicine, full stop.

Any decisions that are made in future about which antibiotics are used in animal health, and how they are used in animal health, has to be based on scientific evidence rather than hypotheses. We have seen examples in some other member states. For example, many years ago, in the early '90s, Denmark abolished the use of certain what are now regarded as critically important antibiotics. They did that in advance of the European ban on many of these products, but we continued to see resistance to enterococci in Denmark, despite the fact that usage had stopped in animals. We might get a nice warm feeling that adopting a precautionary principle and banning the use of something in animals may appear to be the right thing to do, but science and evidence has now shown that that has not brought about the desired effect in terms of monitoring resistance in humans.

The veterinarians and our industry want to make sure that all the products are used responsibly, but clearly we have to have an armoury of medicines for vets to use in order to treat animals. As Miss McLaughlin said, they are sentient beings, and if they are diseased they need to be treated with whatever is considered to be appropriate by the vets who have those animals under their control.

Q129 Graham Stringer: If there is a ban on adding antibiotics to feed and water, what would be the impact on profits?

Catherine McLaughlin: It would be significant, to be honest. I shall give an example from the pig sector. Weaning is a really stressful time in the young piglet's life. One of the most common problems that they encounter is enteric disease leading to diarrhoea, scours and things like that. There is quite a lot going on in the gut of a young piglet. I am not a vet, so I am not going to get into the full psychological effects of weaning on the piglet gut, but I understand that quite a lot of physiological change will happen at the time of weaning. When you start, you get the removal of protective milk antibodies, and the shrinkage of the gut villi, which will reduce digestive and absorptive surface areas. There are various things that go on. It is not just a case of the pig going through a difficult time; there are some psychological things as well. The pig sector uses antibiotics through the feed to help piglets get over this stressful time. When I was speaking to some of my colleagues in the National Pig Association about the effects, their opinion was that it would make pig production in the UK pretty much impossible.

Q130 Graham Stringer: You are saying that it would damage profits to 100% if it made pig production impossible. That seems an extreme statement.

Catherine McLaughlin: I am sure that there would be some pig producers who would manage to keep going, but the indication I was getting from the NPA was that it would make it extremely difficult for a viable pig industry to continue.

Q131 Graham Stringer: We have heard a different emphasis, or disagreement, on what the research is telling us about the impact of antibiotics on animals. Is this like the situation that we had with smoking 40 or 50 years ago, when some of the research was sponsored by vested interests, or is most of the research coming out of non-vested interests within universities?

Cóilín Nunan: Yes, it is an issue. There is one particular issue that I have examined, which is the impact of certain antibiotic feed additives on the incidence of salmonella. The antibiotics, when fed orally, kill off many of the bacteria in the gut, and as a result some other pathogenic bacteria can grow—in particular, salmonella. That is why, for instance, if you get a salmonella infection in human medicine you would not take antibiotics.

I did a review of the scientific literature and found over 55 scientific papers, of which 29 were funded by industry and the rest were independent. Only one of the 29 industry-funded papers suggested that there could be a problem with some of the antibiotics—it certainly does not apply to all antibiotics—whereas about 80% of the independent papers found that there was a problem with at least one of the antibiotics that they had examined. There certainly can be situations where vested interests have produced research that seems to have been influenced by funding.

Catherine McLaughlin: We need to remember that a lot of these scientific papers are peer reviewed. The whole process of peer review is a way for the scientific community to protect itself against that kind of inbuilt bias. We need to remember that there is that level of protection.

Q132 Graham Stringer: Peer review has its faults, as we have seen in different areas. I have a final question. Are vaccines an alternative to antibiotics?

Catherine McLaughlin: From the NFU's point of view, yes. We welcome the use of vaccines. It is part of the arsenal of tools in the toolbox that farmers have available to protect the health status of their animals. Yes, the NFU would endorse absolutely the use of vaccines as a good tool for farmers to have available.

Q133 Sarah Newton: I have a follow-up question to Mr Sketchley. You were saying how carefully residues were monitored in the UK, but, sadly, in my opinion, we import too much food—too much meat and too many other products have been farmed overseas. What about the measurement of residues in those imported products?

Phil Sketchley: If the food is imported from other European member states, they will have adhered to the same residues and withhold times, because they are all set by Codex and the European Medicines Agency. If it is from the rest of Europe, I have every confidence that it would be exactly the same situation. The UK, through the VMD, would have to do statutory and non-statutory surveillance of residues for imported foods as well. Clearly, that will give us protection in terms of making sure that imported food fits the quality standards.

I see that Mr FitzGerald has his hand up. He used to work for the VMD, so he may be able to give a more precise answer.

John FitzGerald: The European Union has a procedure that any country that is exporting food to any European member state is required to produce the food to the same standard as if the food was produced in the European Union. There is what they call a Food and Veterinary Office, which is basically an inspection and audit team, which goes to the other countries to assess the practices and procedures by which the food was produced in those countries.

When I was working at the VMD, we also had what Mr Sketchley described as a non-statutory residues programme. The term speaks for itself. There was no legal requirement to carry out this work, and the Government funded the collection of samples from food that was imported from third countries. They were sampled for residue levels of substances that the Veterinary Residues Committee, an independent committee, determined were most significant from the evidence available as to how medicines were being used in third countries. It tried to identify those that were going to be the greatest risk. The surveillance was carried out and all the results were published.

Q134 Chair: Just for clarity, moving on now, we have found inadequacies in some European regulatory structures—for example, in our report on medical implants. Are the two of you saying that you are satisfied that the regulatory structure is enforced across Europe?

John FitzGerald: I was talking about how the procedure works within the European Union for imported food to come in. I knew when I worked at the Veterinary Medicines Directorate what residue sampling was done for the meat and the produce that came into the UK. I cannot comment on what happens in other member states.

Q135 Chair: With the stuff that comes in here, there is sufficient oversight to give you confidence. Is that what you are saying?

John FitzGerald: There was at the time, but I have not kept up with what might have happened since.

Chair: Mr Sketchley thinks so.

Q136 Mr Heath: Before I ask my question, I would like to follow up something Miss McLaughlin said. As a former breeder of pedigree Tamworths, I can confirm that weaners scour for a pastime. It is something that we will always be aware of.

I want to pick up on what you were saying about stockmanship. My perception is that it is at a high level nowadays, with much better training than there has ever been, but I wonder if there is any evidence to suggest what I suspect, which is that the economic circumstances of the agriculture industry mean that livestock farmers tend to use their large animal vets less than they used to, and possibly that fewer scripts are written by vets than there used to be. Do you have any information on that?

Catherine McLaughlin: That is certainly not what I pick up when I talk to my members. The whole concept of the management team on the farm is becoming more important. That is basically the vet going out on farm at least once or twice a month, and sometimes every week on the dairy side, for instance; they would potentially be sitting with a nutritionist and perhaps with some of the other para-professionals, such as foot trimmers and those types of people who help. They work through a farm health plan, and they monitor and manage the health of the animals. The vet is now part of the management team.

What I think has probably changed over the last couple of years, partly because of the economic situation in farming, is that farmers are starting to use their vet much more as a consultant, as a management tool. Yes, probably the way that the vet is being used has changed; the vet is probably less likely to be out doing the kind of firefighting that he used to do. As I say, it is a lot more of a management team approach.

I am picking up from my members that they are now a lot more educated about the nutrition side of animal production, so they understand about mineral and vitamin deficiencies. Again, all of this is done in partnership with the veterinary profession. That is also very much reflected in a lot of the farm assurance standards. A lot of farmers now have retail contracts, so it often comes into the retail contract as well. The way the relationship works has changed, but I would not say that it automatically means that there is less veterinary presence on farms. It is probably the other way, to be honest.

Q137 Mr Heath: Thank you. That was useful. I want to come back to an issue that has been touched on already, which is about critically important human antibiotics. Mr Nunan, you said earlier that you thought it very unlikely that any future critically important human antibiotic would be licensed for animal use. That is probably true, although it is hard to know what would happen if it was equally critically important to a specific animal disease.

I would like to hear the panel's views on the extent to which a ban might be extended, and the consequences of a ban, not on future use but on those that are already in use. As was said earlier, we have some experience of that, not least in the Danish position. We know a little about fluoroquinolones, which were mentioned earlier, but would each of you give your views on whether a ban should be extended, and, if so, what should it comprise? What is the evidence to support the view that it would actually be effective in reducing resistance levels to these critically important human antibiotics?

Cóilín Nunan: First, some countries have already not only banned growth promoters, which obviously the UK has as well, but have gone a long way towards phasing out routine preventative use in animal feed. The world's leader is Sweden, which banned growth promoters in 1986, and they have also greatly reduced their overall use of antibiotics. They are a very interesting example, because not only have they reduced their overall use by about 75%, but their use in feed and water now accounts for less than 10% of Swedish antibiotic use. They have reduced their group medication by more than 96%, and the vast majority of Swedish antibiotic use is now individual treatments.

Regarding what the effect of a ban on a particular antibiotic or routine preventative use would be, if we are looking at whether it reduces resistance, we have some data from the growth promoter ban. Unfortunately, the data are frequently simply not collected so we often cannot say, but we know that the growth promoter ban led to significant reductions in resistance in enterococci in some of the countries that bothered to look at farm animals and also humans.

Q138 Mr Heath: You say that we know this. Is this anecdotal, or is it published?

Cóilín Nunan: It is published evidence. In broilers in Denmark, and in human enterococci—I don't believe they were human infections; they were more enterococci from people in the community in both Germany and in the Netherlands.

I have already mentioned the example in Quebec, where a voluntary ban led to a reduction in resistance that, when reversed, led to resistance increasing again. Another recent example is the Danish pig industry, which voluntarily decided not to use modern cephalosporins, which are the critically important antibiotics. In one year, the amount of ESBL E. coli fell from about 10% or 11% in pigs to between zero and 3% in just one year.

On the other side, there can be bad consequences from a ban on growth promoters. In many countries, it led to an increased use of therapeutic antibiotics, which were often more important in human medicine than some of the banned growth promoters. It has not been a case of uniform improvement, but in countries where a growth promoter ban was seen as a genuine attempt to reduce antibiotic use—I think in particular of the Nordic countries, which have been leading the world—they have much lower levels of resistance in their farm animals. In some cases, when they publish their annual data they compare infections that are acquired abroad with infections in humans that are acquired at home, and they find that the infections acquired abroad have much higher levels of resistance. They generally have much lower levels of resistance in the zoonoses in the Nordic countries, but they also have far fewer zoonoses. As I have already mentioned, in Norway 75% of salmonella infections are acquired abroad; it seems quite extraordinary, but that is the situation.

Obviously, another consequence of banning things would be economic. That is the big issue in a way. We have examples—for instance, organic—where antibiotic use is much lower than in intensive agriculture, but clearly there would be economic consequences of a ban on routine preventative use. That, however, is if we also ignore the economics of losing antibiotics for human medicine, and the importance of antibiotics for human medicine, which is not part of what you pay when you buy the chicken in the supermarket. It is an externality that is not included in that economic calculation.

Q139 Mr Heath: I am not sure how useful Norway is as an exemplar, as it has a relatively small agricultural industry and is a massive net importer. Denmark would be better.

Cóilín Nunan: Denmark has much lower levels.

Q140 Chair: Shall we stick to the critically important antibiotics?

Catherine McLaughlin: There is one thing that might be useful for the Committee. As you know, the UK poultry industry voluntarily banned the use of some critically important antibiotics at about this time last year, and we now have a direct impact. Those antibiotics were generally very much used alongside a Marek vaccine, which is done as an in ovo vaccination. Basically, they puncture the egg with the vaccine, and they were using the antibiotics at that point.

Since the industry brought in that voluntary ban, they saw the first-week mortality of the chicks increase straight away to plus 2%. It has now come down to a steady plus 1%, so we have seen increased mortality in young chicks. When I asked some of my poultry members how they dealt with that, I was told that their hygiene has had to become scrupulous; I was told that they have gone "better than hospitals."

The one thing that I would say is that it can be done in a closed environment, but that type of hygiene would not be possible in the more extensive outdoor-type systems. That is a direct impact of that ban. The poultry industry did not feel that they would ever want to go back, so they were quite happy to accept that level of mortality and the impacts of it, but it was a clear statement from them.

Phil Sketchley: With regard to the point about what could be the impact of the removal of products, we would support the veterinary profession's desire to keep the current range of therapeutic classes available to them as it is, on the assumption of course that we continue to use them responsibly. There is evidence from some of the Scandinavian countries, where we have seen limitations in the use of some of the products, that there are lesion scores at slaughter. In fact, there is a peer-reviewed paper showing that lesion scores in pig carcases increased following restrictions on the use of antibiotics. That could be a cause of concern for both the pig producers and the vets who look after them.

Secondly, in human health we have seen situations where they tried to restrict the use of certain antibiotics, but of course that increases dependence on other classes, and therefore increases the chances of resistance to those developing as well. If we saw a restriction in the therapeutic classes available to the veterinary profession, we would probably see

greater dependence on a smaller group of products, therefore increasing the possible risk of resistance developing to those.

We need to remember that the total usage of critically important antibiotics in animal health in the UK is already a very small percentage. For example, fluoroquinolones represent less than 0.5% of the total antibiotics used, so we have to be proportionate in our analysis of the use of these products.

Q141 Mr Heath: Mr FitzGerald, you have not spoken yet.

John FitzGerald: I am not sure that I have a great deal to add. From the RUMA perspective, and indeed from everybody's perspective, it would be good if the critically important antibiotics for humans were defined. We hear that it may mean fluoroquinolones, it may mean third and fourth generation cephalosporins, and it may mean macrolides, but we do not know what we are talking about.

Q142 Mr Heath: Who would do that? Would it be a WHO definition, or a UK Government one?

John FitzGerald: Where we are, it would be more likely to be a legislative decision by the European Commission as to what is regarded as a critically important antibiotic in terms of European legislation around medicine, and medicine usage and control.

In terms of critically important antibiotics, we in RUMA have published our position. We think that critically important antibiotics are fluoroquinolones and third and fourth generation cephalosporins. We think that they should not be used in animals as a first line treatment, nor should they be used in animals preventively unless there is scientific evidence to justify their usage—in other words, you have clear scientific evidence that it becomes a critically important antibiotic to treat those animals, and is an antibiotic of last resort.

There is general acceptance among RUMA members that this is an area where these antibiotics are not used greatly in the animal sector. We would like to see them kept available for the restricted sort of use that I have already mentioned. We would not like to see them banned for the reasons that Mr Sketchley has given. In particular, as we have seen with swine dysentery—this is not related to critically important antibiotics—an antibiotic was taken off the market because it was deemed unsafe for humans, and therefore you could not allow it to be used in animals that were going to produce food for humans, Removing that antibiotic from the marketplace created a significant challenge to the other antibiotics. Those other antibiotics have now developed resistance, so swine dysentery is a disease that cannot be treated.

Q143 Mr Heath: Should we have a critically important animal antibiotic list as well?

John FitzGerald: I believe that the OIE did produce a list many years ago, but the initial lists produced by OIE and WHO effectively included all the antibiotics that were used either on animals or on humans, so it was not greatly helpful.

Q144 Mr Heath: Mr Nunan, do you want to come back on this?

Cóilín Nunan: I want to come back to a point made by Mr Sketchley about the fact that critically important antibiotics are not widely used in farm animals. Broadly speaking, that is true, and there are some countries where use is much higher. However, looking at the weight of active ingredient is a misleading way of looking at things for critically important antibiotics; because they are such powerful antibiotics, their active ingredient weighs practically nothing, but that does not mean that this tiny amount of antibiotic cannot have a huge impact on resistance.

Q145 Mr Heath: Surely, we are not talking about dosage levels but about the number of doses, aren't we?

Cóilín Nunan: No. We do not have the number of doses; those figures do not exist for farm animals. It is done in terms of the weight of the active ingredient. To give an example, we talked earlier about in ovo vaccination with the Marek vaccine used with ceftiofur. This is off-label use, by the way. You can go on the internet, where how to do this is sort of explained; 4 grams of the antibiotic is enough to do 50,000 one-day-old chicks, so presumably it was not in ovo. Even if you were to do that, which I am not suggesting is happening, on every single broiler and egg-laying bird produced in the UK each year, you would still only be using about 75 kilos, which would hardly have any impact on overall usage levels. But it has had a huge impact on the spread of ESBL E. coli. Even though modern cephalosporins are not licensed for use in poultry, and are licensed for use in some other farm animals, the levels of ESBL E. coli in retail chickens on the continent are the highest of any of the animal species. Weight of active ingredient is very misleading. One dose of tetracycline is about 70 times the weight of some of these critically important antibiotics.

Chair: That is another thing that we will have to get to the bottom of, I think.

Q146 Mr Heath: It did not occur to me that we were talking about weight of ingredient rather than the number of doses.

Phil Sketchley: Perhaps I should add that there is a European study called ESVAC—European surveillance for antibiotic volume consumption. That report is coming from Europe, effectively through the EMA, the European central body. It looks at what are referred to as PCUs, which are population control units. It is effectively standardising it across Europe, so that you are comparing an apple with an apple, so to speak.

Mr Heath: Exactly. That is the only sensible way of looking at it. Thank you.

Q147 Stephen Metcalfe: This has been a theme all the way through, I think; it strikes me that we need a more consistent and standardised way of collecting and measuring data on usage, resistance and all those sorts of things. There seemed to be a conflict of opinions earlier about how good the collection of data was. Could you describe for us what is

happening on the ground—how data is collected, how it is reported, who is the custodian of it, and how it gets shared across the whole industry?

John FitzGerald: There are effectively two types of data. There is data on how antimicrobials are used in animals; that data is pretty scarce, and can be fairly crude in terms of the simple weights of antibiotic active ingredient that is sold into any particular country, based on authorised product sales reported by the companies. Mr Sketchley mentioned the ESVAC project in Europe, which is trying to get more co-ordinated production of this type of information.

Mr Nunan mentioned Denmark as an exemplar in the past; they have what I think is a better system, where veterinary surgeons report prescription data and usage on-farm. That is centrally co-ordinated, and they are able to produce much better and more accurate data on how antimicrobials are actually being used on Danish farms. That is something that RUMA would very much support being introduced in the UK, and across the EU. We think it is quite likely, in the expected changes to European legislation that the European Commission is going to propose, that that will be one of the requirements. We very much hope that the UK Government will embrace it, and we will be able to work with that and get better data to allow us to make better decisions on how we want to move forward.

In terms of how you define resistance, there is a separate issue. This is where the world gets rather technical. Quite often, when research scientists are looking at the development and risk of resistance in bacteria from animals, they will carry out laboratory examinations. They will report resistance levels against what is known as an epidemiological cut-off value, whereas resistance in human bacteria is more generally classified against something known as the clinical breakpoint. To put this in terms of the impact, the epidemiological cut-off value is where you start to see susceptibility reducing, so you start to see resistance developing. If you like, it is an early warning point. The clinical breakpoint is where treatment will not work; if you think of a line moving from left to right, it is later along that line that you will find the clinical breakpoint.

It gets more complicated, because sometimes the clinical breakpoint and the epidemiological cut-off value are the same, but in a number of areas they are not. Scientists looking at human bacteria or animal-derived bacteria, or scientists working in different parts of the world, will have their own cut-off points from which they are measuring resistance. Basically, they are talking about the percentage of bacteria that they have found that are resistant against these measurements. If 80% of bacteria are susceptible at the epidemiological cut-off value, and 95% at the clinical breakpoint, you will be reporting resistance levels of either 20% or 5%. That is a simple mathematical example to give you an indication of the differences that can occur.

We think it is absolutely vital that there is much more co-ordination and harmonisation in this area, so that when people talk about resistance we are all talking about the same thing, and we are not potentially saying that there is more resistance either in humans or in animals—in this case, probably in animals. Comparing that against the human level gives a misleading picture, and you can therefore use that and make poor judgments.

Q148 Chair: For clarity, I take it that there is no difference of opinion on that.

Phil Sketchley: There is another initiative in the target pathogen monitoring programme, which is a Europe-wide initiative by the regulatory framework. It is now going through consultation with industry and the HMA, the Heads of Medicines Agency, in which the VMD takes quite a significant role. There is an initiative to look at monitoring the pathogen resistance. There has already been a study conducted by an organisation called CEESA, which has a lot of information on pathogen resistance through a dataset called VetPath. We would be happy to give further details to the Committee on those initiatives.

Q149 Stephen Metcalfe: Thank you for that. What I am trying to get at, following on from what you have said, is whose responsibility it is to define what antimicrobial resistance is. Would you find agreement across the whole of the industry and the scientific bodies behind it? Would it be an easy thing to find a definition?

If you were trying to design a system for data collection once you had some definitions, how would you go about setting up that system? You have already spoken about vets reporting when they prescribe and that being fed back in, with someone managing that information and then presumably disseminating what is happening. Is there commonality among your colleagues? Do they share your view that that is the best system, or are there alternative systems that people would like to describe?

Catherine McLaughlin: Yes, the NFU would support Mr FitzGerald's comments. To add to the information sources out there, it is worth bearing in mind that all farms have to keep medicine records. Every farm has a legal obligation to keep a medicine record. That will be inspected at least annually, and probably five different independent inspectors will go out to look at those medicine records, from trading standards to farm insurance assessors, of course, and the RPA, vets and retailers under contract. That is a fairly crucial, vital piece of information that every farmer is legally held to account to keep; it looks at what animals he has treated, why he has treated them, and almost the type of consultation that he has had with his vet—the mode of action, the dosage and treatment regime. At the moment, what happens to that once all those five inspections have happened? That would be quite a useful piece of information, if we could make better use of it, and could feed it into some of the other things.

Q150 Stephen Metcalfe: Who should drive that? Who would be responsible for making use of that information? Who would you identify as the person or organisation to pull that together? The Government?

Catherine McLaughlin: Yes, I suppose so.

Phil Sketchley: It would be the Government in conjunction with the regulatory process. The CVMP, which operates within the European Medicines Agency, would set a lot of guidelines for these sorts of things, and it would seem logical that it should have an interface with the regulatory bodies, because that is how medicines are authorised in the first instance. The central veterinary medicines panel of the EMA would seem to be a logical point, obviously along with input from the microbiologists.

Cóilín Nunan: On collecting data on antibiotic use, I fully agree that we need prescription data or sales data, because antibiotics are frequently sold for use in more than one species, so we do not know how they are actually being used.

On clinical breakpoints, the question is what resistance means. There is that kind of discussion going on in the scientific community, and different scientific papers will frequently use different breakpoints, so things can be difficult to compare. That is a relevant point, so harmonising makes sense, but I would be harmonising scientifically so that we understand what we are talking about scientifically, and being clear when the data are published what breakpoints are being used. That makes sense, but I would be wary of putting breakpoints up, so suddenly resistance levels are going down and we think things are getting better.

Another point that may well be relevant is that low levels of resistance can be enhanced by further antibiotic use. You might have the antibiotics being used in farming creating certain low-level resistant bacteria, with those bacteria then colonising the human, and the human subsequently taking antibiotics and gradually creating higher levels of resistance. Lower levels of resistance can be relevant; they may indicate that a greater problem is emerging, so I would be a bit worried about putting clinical breakpoints up.

Q151 Sarah Newton: Discussing data collection feeds very neatly into what I want to talk about, which is the regulatory environment. From the discussions that we have had this morning, it seems to be a bit of a barrier to research and development; what everybody has agreed on this morning is that we need to do more research. Could I ask the panel generally, based on their experience, to talk about their perceived obstacles to better regulation?

Phil Sketchley: I have consulted members of our industry, and it is fair to say that at present none of the pharmaceutical industry involved in animal health is doing any bespoke research into this area for new antibiotics, because the regulatory framework is rightly very thorough. The big concern is that, even if a new antibiotic was successfully discovered, it is highly unlikely that the regulatory framework would give permission for it to be used in animals, because it would be protected for human usage. The only antibiotics that are likely to come into the animal health sector are ones that have been passed down from previous use in human medicine.

We also have to put things into perspective from cost to market. The whole of the animal health market at present in the United Kingdom is worth something like £550 million. To put that into perspective, the human pharmaceutical medicines bill to the NHS is in the region of £12 billion, so we are very much smaller. On bringing a new product to market, particularly for the livestock sector, recent benchmarking studies have been done by our international association, and we would be looking at figures in the region of £100 million to £120 million to bring a new livestock medicine to market. With a market in the UK that is worth a fraction of human pharmaceuticals, and with a data protection period currently sitting at 10 years, the return on investment is just not there. It is therefore highly unlikely that we will see new molecules coming to the veterinary sector.

I have to say that it is probably unlikely that we will see significant research into the human sector either, because effectively we have created a market failure with antibiotics.

Research will therefore probably be focused on other areas of therapy, whether antivirals, conventional pharmaceuticals for cardiovascular, cancer and so on.

We have a dilemma that is going to be a big challenge for research in future. It is relatively easy to look at developing vaccines for virus infections, but to produce a bacterial vaccine is very much more difficult. For example, I am sure that the Committee will be well aware of the difficulties that we have faced with tuberculosis in the animal health sector, yet here we are many years on and we still do not have a vaccine. That is going to be a problem for many years to come.

Cóilín Nunan: Clearly, profits are not going to be easy to get from developing new antibiotics. With antibiotics for human medicine, if they work you use them for only a short period of time, whereas many other medicines are taken for a much longer period. Obviously, the pharmaceutical industry is going to focus more of their research efforts in areas that are going to be more profitable. That is the inevitable thing about something that works in terms of actually curing people, rather than some of the other medications that do not fully cure you.

The second thing about antibiotics is that the vast majority of them are a natural resource. We discover antibiotics because they are produced by micro-organisms. The first antibiotic was discovered by accident, but they were easy to find once we realised how the whole thing worked. We started looking for antibiotics, and we started finding loads of them in the 1940s, ’50s and ’60s; since then we simply have not been discovering as many antibiotics, perhaps because they are not there or because the ones that remain are so much more difficult to find. It is an inevitable fact of nature, as it were, that they are not easy things to develop.

From the veterinary point of view, as I have already said, we are not going to be seeing new antibiotics introduced any time soon, so we need to be thinking about preserving the antibiotics that we have. That is where the regulatory efforts should be aimed. Unfortunately, I do not really see that happening at the moment. I feel that the regulator still wants the use of veterinary medicines to promote productivity. That is what the VMD says in its business plan; it wants to promote the preventative use of veterinary medicines, which presumably includes antibiotics, to increase productivity in the farming sector. If it is still the aim at this stage that we want to increase productivity, and if the economics are so central, I do not really see us making a huge amount of progress.

Catherine McLaughlin: I do not have much more to add to what Mr Sketchley was saying.

John FitzGerald: Could I make two points? First, picking up Mr Nunan’s point, economics are obviously a key element in the use of veterinary medicines. Veterinary medicines are part of the working tools of the farmer, to make sure that the farmer is able to maintain the health and welfare of the animals that he is producing in order to produce safe food for consumers to eat. Economics are obviously a key element in that, because it is a business.

If we look at the points that have been made at the other end of the table about the return on investment in relation to producing new antibiotics, it is not a very nice picture. We need new antibiotics. I was at a conference at Chatham House the other month where there

was a lot of discussion about trying to develop some alternative ways of funding the research that is needed to develop new antibiotics. Public-private partnerships were mentioned, and for myself I thought that that was a good area to explore. If we try to work with the current model in relation to antibiotics, as Mr Nunan said, they are used relatively infrequently and are not a good return on investment, so there is not the incentive there for companies, even in the human sector, to develop new antibiotics.

RUMA would also very much welcome research on alternatives to antibiotics—vaccine products, for instance, to help prevent disease, and other preventive measures. Things like bacteriophages, which are used in some parts of the world, probably merit more research and development and consideration at the moment, when looking at the concerns that we have over antibiotic resistance and how we want to move forward from here. We think that that would be a sensible way forward.

Q152 Sarah Newton: Thank you. Basically, you have all said that, as far as it stands at the moment, you feel that there is a market failure. The current plans the UK has simply are not working, so let us have a bit of a brainstorm and look at what more the Government could do. The Government are committed to Catapult centres where, as you were saying, we can look at closing some of the gaps between research and trying to get new things to market in more innovative partnerships. Do you think that veterinary science on this particular issue could be involved in the Catapult centre—for example, as a way of bridging this valley of death and getting new products to market? Do you have other ideas?

John FitzGerald: The simple answer to your question is yes. I have to say that we did not know much about Catapult centres—I researched them over the last couple of days—but the general concept seems to be a useful one. From what I can see at the moment, in the area of medicines it is focused almost entirely on human medicines. A lot of the development of new animal medicines has, over the years, piggy-backed on developments in human medicines, because of the different economics of the two marketplaces that Mr Sketchley pointed out.

It would be a great idea if developments on the human side could be done in association with potential developments on the veterinary side, so that the veterinary angle is considered as the initial thoughts and considerations are taken forward, and not as an afterthought once all the work has been done in relation to human medicines. I cannot go into any specifics, but it sounds like a good concept that is worth exploring.

Catherine McLaughlin: One thing that probably has not been mentioned so far on the R and D side that would hugely benefit UK farming is better diagnostics. One thing that we struggle with is the time lag. Vets are doing a lot more bacterial screening when they write prescriptions, but there is a time lag between their sending samples away, getting them analysed and getting them back. Frankly, if you are on farm, you do not have a week. Again, it is going against the whole sentience of the animal; it would be a real threat to the animal's health and welfare if we had to wait a week for a result to come back. Probably from the practical farm side, we absolutely need quick and easy access to better diagnostics, pen-side diagnostics—the type of things that would absolutely help with the whole decision-making process.

Cóilín Nunan: I very much agree with that point about the importance of diagnostics, not just for animal health but to enable us to use antibiotics much more carefully. That is obviously a big issue also in human medicine; I suppose in many ways it is the same issue. That is certainly true.

Regarding the veterinary-specific things that could also be looked at, there could be alternatives to antibiotics, other kinds of treatments of the sort that John has mentioned, or maybe even some herbal treatments. These kinds of things may also have a value.

Given how difficult it is to develop new antibiotics, particularly for all the gram-negative bacteria, I do not see much point in trying to develop specifically veterinary antibiotics, other than perhaps for certain very specific veterinary diseases such as coccidiosis or things like that. Anything that is going to work in human disease from now on, given how little we are getting, probably should be reserved for human disease. From what I gather from the pharmaceutical industry—those that are still doing research into antibiotics—that is how they see it at the moment.

Phil Sketchley: To follow up on the comments made earlier, there is another initiative that I have been part of for a few years, which is the European Technology Platform for Global Animal Health. That organisation is bringing together research and industry to look at areas we can address to bring solutions to disease issues that are affecting Europe and the globe. They came out with a set of things called DISCONTOOLS—disease control tools—to bring together researchers to find solutions to infections; a number of them would of course be bacterial as well as viral infections. There was certainly a big call in the conclusions of those initiatives that there needed to be more of a public-private partnership in the development of new medicines, pharmaceuticals, diagnostics and so on. It also stressed the importance of getting societal acceptance of new technologies, because conventional technology is sometimes challenged by the consumer. If we are going to bring new science into looking at diseases in the future, Government can help in making sure that society understands and accepts the need for new technologies.

Q153 Sarah Newton: I should like to return to the question of diagnostics. It has certainly come up in evidence that we have taken about humans that you could prevent a lot of resistance if we managed the antibiotics better. Some of the issues around diagnostics are really important. You were talking about there being a week's delay from pen-side to getting good diagnostics, and knowing which antibiotics would best be used. We have heard similar issues from hospital doctors with their prescriptions. Would you explain more about what the issues are? Is it around capacity? Is it not having enough laboratories at the centre or not enough technicians? What are the reasons for these week-long delays and the inability to get better diagnostics? Catherine, perhaps you could start, and others can then chip in.

Catherine McLaughlin: From what I see, and from my experience, it is largely about physically trying to get the right sample to find out what is going on with the animal. Animals cannot talk, so they cannot tell you how they are feeling. It is about the farmer working out with the vet what is going on. Sometimes, bacteria are very difficult to grow, to replicate within a lab situation. TB has been mentioned already, and it is a classic one; it is a really difficult bacteria to grow in the lab. Some inherent physical attributes of the bacteria are causing real problems. It is those types of thing.

When it comes to some of the lab capacity, we have a few issues going on at the moment and a few concerns in the farming sector when you talk about the restructuring of AHVLA and the vet labs. We have yet to see what that will look like practically, in terms of the effect on the farming sector, what the lab capacity will be like, how it will work with things such as post mortem on farm, or with the animals. There are absolute concerns among my members that they are going to struggle with the human capacity to help them get samples, never mind the microbiological capacity.

Phil Sketchley: The veterinary profession would welcome any form of improved diagnostics, because we have to face the situation that, for example, when a veterinary surgeon is called out to a dairy unit where there is a toxic mastitis, unless that animal is treated very quickly, we are going to have a dead animal. Clearly, the vet has to make a decision based on his clinical experience. Unless there are specific tests, which currently are not available, he will have to take an empirical approach to the treatment of that animal. We therefore need rapid pen-side tests. The diagnostics industry probably needs to be invited into the discussions to see how it can bring about those solutions in future.

Cóilín Nunan: I would agree with that. The Dutch, I recently found out, are starting to try to phase out routine dry cow therapy. They are going to permit dry cow therapy only if the somatic cell count is above a certain level. I presume that they are going to be testing for the somatic cell count quite frequently. Other panellists may know better, but my understanding is that some of these tests are either inconvenient for the farmer or expensive. If we want to get away from routine dry cow therapy, we need to be doing that kind of diagnostic much more frequently, rather than just using dry cow therapy on the whole herd, which still happens frequently in the UK, according to DEFRA.

John FitzGerald: May I make two points? First, I note what Mr Nunan has said about dry cow therapy. RUMA is reviewing dry cow therapy at the moment to see whether we can provide advice on the responsible use of antibiotics for dry cow therapy.

On your question about the problems with diagnostics, the British Veterinary Association is a member of RUMA. Indeed, one of their past presidents is sitting directly behind me, and he has agreed to supply some supplementary evidence so that we can give you more detail on the problem in relation to diagnostics from the veterinary surgeon's perspective, which is not something that I know to the necessary level of detail. We shall supply that to the Committee, if that is okay.

Sarah Newton: That would be tremendously helpful. I think that I have heard the answer to my next question: based on what you were saying about the scale of the markets between humans and animals, any developments for improved diagnostic tools in humans would be beneficial for vets. You are all nodding, so that rounds off my questions. Thank you.

Q154 David Tredinnick: Good morning. What can be learned from initiatives in other countries aimed at reducing antibiotic use in animals?

John FitzGerald: We have evidence from other countries in relation to reducing antibiotic usage. I know that there have been some consultations between veterinary surgeons and farmers with their colleagues, particularly in Denmark, in relation to the changes that they have done over there and the impact that has had on the health and welfare of animals and

the production of food in the farming system. We are trying to learn from their experiences, and see whether there is anything that we can bring back to the UK to help in the responsible use of antimicrobials here.

It is important to note, if you look at the changes—some very good reports have come out from both Denmark and the Netherlands on the amount of antimicrobial usage and the levels of resistance that they are finding, both in animals and in humans—that there have been significant reductions in the usage of antimicrobials in animals, but the levels of resistance in humans have not declined in such a dramatic way. Indeed, in some areas the levels of resistance that you hope would have gone down in humans if there was a significant impact from animal use have not come down but have started to go up again.

We need to bear all that in mind when we look at changes that could be introduced in the UK—and changes across the EU as well, because European legislation is going to be changed shortly—to make sure that what we are actually doing on the animal side is going to have a beneficial effect on human medicines and the use of antimicrobials in humans. That is the driver in this whole exercise. How we make sure that we maintain the efficacy of antibiotics, in particular in relation to treating humans, is the key driver in all the work that is being done. We need to bear that in mind when looking at any changes that have taken place in other countries.

Cóilín Nunan: I certainly agree that we need to be looking at the Nordic countries, because they are the ones with the most experience in this area; they have reduced their antibiotic use by far the most. It is a small fraction generally in comparison to most other European countries; several of those countries are gradually trying to reduce feed additives and oral antibiotics, and they all have much lower levels of antibiotic resistance, but in some cases, particularly in poultry, they can import antibiotic resistance as well.

The poultry industry is a bit like a pyramid, with a small number of companies at the top that produce the great-grandparent birds, and then there are the grandparent birds and the parent birds, with the broilers at the bottom. A lot of antibiotic use has occurred in the parents and grandparents, and it has been shown in a recent scientific paper that a lot of this resistance can pass down through the generations. Even in cases where a particular antibiotic is not used at all in the broilers, they can still end up with high levels of resistance. This is what has been happening in countries such as Denmark. They suddenly realised that they have lots of ESBL E. coli in their broilers, and they did not understand because they do not use them at all. They then realised that they were importing birds from Britain and Ireland, and that the use that Miss McLaughlin described earlier in Britain in breeder flocks had led to some of this ESBL resistance. Broadly speaking, the much lower levels of antibiotic use that they have are both reflected, as I said earlier, in lower levels of resistance in the farm animals and in much lower levels of resistance in the zoonoses, but of course, as I said, they do not fully control what happens in the birds that they are importing.

Phil Sketchley: I appreciate that you have to look at things from a local perspective as well as globally. I am looking at figures from ESVAC, which looks at European usage of antibiotics and the PCU, in terms of the relationship to the population of animals. The highest level in the EU at present is somewhere in the region of 400 milligrams per animal, and the UK position is reasonably good; I think that we are at around 50 to 60 milligrams per animal compared to 400 at the highest in some other member states. The

Scandinavian bloc has been cited as an exemplar, and there at present we are looking at somewhere in the region of 40 to 50 milligrams, so the UK is not significantly higher than the Scandinavian bloc in terms of its antibiotic usage when compared to the population of the animals.

Perhaps there is one thing that the Government can help with. As I am sure you are aware, in many parts of the world, including the far east, antibiotics are available on free sale for both human and animal health. We attended a conference last year, the Chatham House conference, and in India, for example, they are starting an initiative called the Chennai agreement, whereby they are trying to regulate the issuing of antibiotics. We are in a very strict regulatory framework here, and I believe that things are working quite well, but there are parts of the world where usage of antibiotics is literally over the counter. Governments can work together internationally to try to control that and bring them all under prescription control, as we have here.

Catherine McLaughlin: I work within the NFU, but I also attend Copa Cogeca meetings on animal health and welfare, which is a pan-European organisation representing European farmers and processors. Obviously, the whole issue of what we are doing across Europe comes up quite a lot in terms of antibiotics. I have to say that one thing is coming through quite a lot: we are trying to get the RUMA model replicated across all member states, and we have EPRUMA, which is trying to lead the way in responsible use across all member states.

I know that the Committee particularly did not want non-factual information, but it is important to give you some anecdotes that I have picked up from some of my colleagues in Copa Cogeca. In some member states, they have had things like the yellow card system, which I am sure that you are all aware of, where arbitrary targets are put on usage, and farmers are almost labelled as being high users and are then subject to other things. Copa Cogeca are giving me anecdotal comments that they are starting to see a black market begin to develop. Farmers are trying desperately, not legitimately, to get hold of the antibiotics that they need, for fear that they will become classed as a high user and then expose themselves to potentially damaging business restrictions. We are starting to see some unintended consequences—increasing black markets in antibiotics across Europe, in some of the more developed member states. It is vital that we are aware of that. I know that it is anecdotal, but that is the nature of an illegal activity.

Cóilín Nunan: I want to respond to a point that Mr Sketchley made about UK antibiotic usage being similar to what occurs in Scandinavian countries. It is well recognised that antibiotic usage is massively different by animal species. We do not have exact numbers, but in the UK we know more or less that about 95% of use is in pigs and in poultry. Perhaps about 60% of that is in pigs and 35% to 40% in poultry, with 1% for fish and most of the remainder in dairy cattle. Less than 0.5% is used in sheep, for instance. There are 33 million sheep in the UK and fewer than 5 million pigs, so that gives you an idea of the different levels of usage.

Different countries in Europe have very different animal populations. In the ESVAC report they are doing a PPU, essentially calculating the total weight of the animal population, but Britain's PPU for sheep is enormous in comparison with most countries, and its pig population is tiny compared with most countries. If the usage in each animal, in each species, was on the Scandinavian level, you would expect to have much lower levels.

I do not think that anyone seriously disputes that fact. Indeed, that point is made in the ESVAC report, and there was even a scientific paper published about it. The more sheep and the fewer pigs you have, the lower the antibiotic use per PPU you will have. You therefore need to be careful when you read that statistic.

Q155 Mr Heath: You said that our pig population is very small compared with most countries. That simply is not true.

Cóilín Nunan: I mean when compared with Denmark.

Q156 Mr Heath: Denmark is not most countries.

Cóilín Nunan: What Phil was comparing—

Mr Heath: I am challenging you on the fact that you said "most countries."

Cóilín Nunan: Fair enough, but it has the smallest proportion—not the smallest but the second or third smallest out of about 25 countries—of total PPU that is made up of pig PPU. Proportionally, it is much smaller.

Q157 Mr Heath: I now understand what you are saying, but it simply was not true to say what you did.

Cóilín Nunan: Yes. Fair enough.

Q158 David Tredinnick: Denmark has come up several times this morning. You have mentioned it twice, I think, Mr FitzGerald; and you, Miss McLaughlin, have just touched on the system there. I want to ask a bit more about the yellow card system. Should the yellow card system used in Denmark, in which farmers are formally cautioned for excessive antibiotic use, be adopted in the UK? If not, why not?

Catherine McLaughlin: May I kick off on that? The NFU would be absolutely opposed to the yellow card system being replicated in the UK. We feel that it does not sufficiently allow for the animals to be adequately treated when they are challenged with a bacterial infection. Straight away, you are changing the emphasis from responsible use to protect the health and welfare of an animal to managing the arbitrary target levels of antibiotics that have been decreed. We would much prefer to have responsible-use principles, and increased emphasis on protecting the animal health status to begin with. The NFU position is fairly emphatic on that.

Q159 David Tredinnick: It has not had any real impact in Denmark.

Catherine McLaughlin: In terms of the evidence that I am getting, it is causing more problems.

John FitzGerald: From the RUMA perspective, the simple concept of setting an arbitrary percentage reduction is something that we find slightly bizarre. First, where do you set the

percentage reduction? Should it be 20%? Should it be 50%? Should it be 80%? To get down to that 80%, there are serious concerns in relation to how you measure the actual usage of the antibiotic. Certainly, while you have a relatively crude system that measures antibiotic usage on the basis of the weight of the antibiotic, you can have some very perverse incentives in relation to just reducing the numbers.

If I was a farmer, I could reduce the numbers by simply using half the dose, by giving antibiotics for half the time or by using critically important antibiotics rather than older antibiotics, because they will give me the answers that I want in order to tick the Government's box. I will not get a yellow card; I will be smiling and happy, and I will move on. We would much rather see antibiotics used in a responsible way. If you are using antibiotics responsibly, you should not be using them when you do not need to use them, and you should be using them entirely to ensure that you are protecting the health and welfare of the animals on your farm.

Phil Sketchley: I would echo those comments, but we should never forget that antibiotics are POMs—prescription-only medicines—and that they therefore have a custodian in the veterinary surgeon. I hope that we have illustrated today that there is a close association between the vet and the farmer, certainly in the UK, which we are talking about today, so I do not think the yellow card system is needed. I would share the caution that, if something like that was introduced, it could possibly develop into the areas that Mr FitzGerald suggested. Of course we all know that if we underdose an animal with antibiotic, we are more likely to increase the chances of resistance. I do not think the yellow card is needed in the UK, and it would not necessarily help us in the long term.

Cóilín Nunan: Any suggestion that a yellow card system would be introduced would have to follow proper data collection. It would not work at all with the current data collection system. You would definitely need to have data collected from prescribing, so you would then have data on active ingredient, weight, and on the particular antibiotic class, and you would have data on the number of daily doses. You would have all that kind of data available.

We need targets for reducing overall use. Some countries, I suppose, have managed to reduce their antibiotic use without targets. That has to be said. I am not aware of Sweden ever having set targets, and Denmark did not set specific targets for overall reduction for many years, but the introduction of the yellow card system and targets in the Netherlands has had a huge impact. In the Netherlands, they have reduced antibiotic use by 50% in three years. I do not know the full details of exactly how they have done that, I have to admit. Has it led to problems somewhere? I do not know, but, broadly speaking, my understanding is that targets have been very helpful.

Q160 David Tredinnick: We should move on. Mr Nunan, earlier you mentioned herbals. Staying with Europe, I am sure that you are aware that the European Union Agriculture Committee passed an amendment to the 2012 budget for funding research into homeopathy and phytotherapy, or herbal medicine, in livestock farming. It allocated €500,000 to co-ordinate a search on the use of homeopathy and phytotherapy in livestock farming. The object of the pilot project is "to coordinate research on the use of homeopathy and phytotherapy in livestock farming, in line with the motion for a resolution on antibiotic resistance in which Parliament called for the use of antibiotics in livestock farming to be

reduced and for alternative methods to be used; such methods include the use of homeopathy and phytotherapy." That is the European Parliament's view. Do you have anything to say on the use of alternatives? You have already mentioned herbal medicine—I should have said herbals.

Cóilín Nunan: Antibiotics should as much as possible be avoided under organic standards. You are meant to try to avoid using antibiotics, and to use alternatives when available. At the same time, for instance, Soil Association standards state that, if the alternatives are not working, you must use an antibiotic. You can have your certification withdrawn. If, say, a farmer only believes in using certain alternative medicines and refuses to use antibiotics, their certification can be withdrawn if that results in animal welfare issues. Certainly encouraging alternatives to antibiotics has to be a good thing, and it obviously has to be based on good research as well. We want things that work and are effective, not things that are not.

John FitzGerald: From RUMA's perspective, we would agree with much of what Mr Nunan has said. We want medicines that work. Standards are clearly set at the moment against which what you would describe as conventional medicines are authorised and approved, and allowed to be used. They cover the safety, quality and efficacy of the product. There have been serious problems in the past in getting sufficient data to show that herbal, homeopathic or other alternative medicines meet the standards that are currently set for conventional medicines.

RUMA would very much welcome the extra research that you have already identified is likely to happen. We would want that evidence so that farmers knew that the medicines they were using were likely to work on the animal, and that we were not taking a risk with the animal's health and welfare and potentially making the animal suffer because we wanted to use an alternative product that was not an antibiotic—so that ticks one box—but which might not work. We would be leaving the animal to suffer unnecessarily when we knew that an antibiotic would work and would help to treat that animal appropriately.

Q161 David Tredinnick: We have about 70 homeopathic vets in the UK, and there is an international association with a membership of about 650. They have been producing good quality trials in recent years, but I want to focus on one, which has been the subject of debate today. It is about a problem with pigs and piglets and mastitis. Camerlink and Ellinger produced a paper, "Homeopathy as a replacement to antibiotics in the case of…diarrhoea in neonatal piglets." This was a high-quality trial in 2009, published in 2011. A statistically significant positive result showed that, of 52 sows that were considered, 26 were given a placebo and 26 were given E. coli 30, which is a homeopathically derived treatment. The result was that there was six times as much diarrhoea post-weaning in the placebo. The report says, "Piglets of the homeopathic treated group had significantly less E. coli diarrhoea than piglets in the placebo group…The diarrhoea seemed to be less severe in the homeopathically treated litters, there was less transmission and duration appeared shorter." Would you agree that this example of a well-conducted trial in Scandinavia suggests that we should conduct more research into this area?

Catherine McLaughlin: From the NFU's point of view, we are not a closed shop to the concept of alternative therapies, but we are waiting to be convinced and reassured. If there

is quality science coming out, we would certainly be happy to consider making recommendations on how it is interpreted and used.

Phil Sketchley: There is a process and procedure under the current VMR, the Veterinary Medicines Regulations; there is a capability to register alternative treatments. That is one trial, but our industry would expect any future products coming to the market to go through the same vigorous peer review within the assessment teams of the VMD, to ensure that they fit the requirements for safety, efficacy and quality, in the same way as all existing authorised medicines.

Q162 David Tredinnick: Finally, do you think that looking more closely at these alternatives should be part of the UK five-year antimicrobial strategy?

Catherine McLaughlin: From the NFU's point of view, if there is any research or any science—bring it on. Let us look at it, let us see it. However, we are also trading within a commercial marketplace. Our farmers have retail contracts that they have to meet, and they have to produce to those standards, so there are also a lot of commercial aspects that would have to come into it. We would need to convince the market that it was safe for the end product and safe for the consumer. I would hate to see the UK going down the line of something that could potentially disadvantage us across the European marketplace.

John FitzGerald: In this area, the group most likely to consider the sort of research that you have identified is going to be the European Medicines Agency. They will provide advice, through their committees looking into human medicines and veterinary medicines. It is quite likely that that sort of research would also be taken into consideration when setting new legislation on what sort of controls were necessary to authorise alternative products such as homeopathics.

Cóilín Nunan: I certainly think that we need more research into alternatives to antibiotics. As I have mentioned several times, I do not think that we are going to get new antibiotics, and resistance is not going to go down unless we reduce our antibiotic use. We are going to have problems in the future if they are not always going to be there, so we are going to have to think of alternative ways of treating animals. Even more important, perhaps we should be thinking about how to reduce disease incidence in the first place. That, for me, needs to be given far more consideration in the strategy.

Q163 Jim Dowd: The heading for David's section of questions was "Global Initiatives." We have heard very little globally from you. There seems to be a concentration on Scandinavia; and it seems predominantly to be a northern European occupation. I was particularly concerned by something that Mr FitzGerald said about Denmark—I think it was Denmark; we have heard so much about Denmark this morning it is beginning to blur—where they have done most to reduce use. On the figures for both animals and humans, I think you said that the animal figures had barely moved and that the human ones had gone the wrong way.

John FitzGerald: I think the point I was trying to make is that the work being done, particularly in Denmark and the Netherlands, started because they were concerned about resistance levels in humans, and they felt that there was a significant impact because of the use of antimicrobials in animals. Denmark and the Netherlands have taken significant

steps to reduce the amount of antibiotics used in animals, and they have been very successful in doing that, but the reports they produced—as I said, they both produced good reports—indicated that the levels of resistance in humans have continued to rise in areas where you would hope that they would have reduced.

Q164 Jim Dowd: What is the point, then?

John FitzGerald: The point is that any steps that are taken to control or limit the use of antibiotics—antimicrobials—in animals need to bear in mind the outcome of people carrying out similar sorts of restrictions, and what that has done. The key purpose of all of this work is to help protect human health and help protect the continued efficacy of antibiotics in human medicine. The analogy, in my simple mind, is having an oil leak in your car and repairing the exhaust. It does not deliver what you want, but you may feel quite happy because your car sounds a bit better. Why go round changing it with additional controls—

Q165 Jim Dowd: Are you saying that we are doing good by incompetence, by focusing on the wrong things?

John FitzGerald: Incompetence may be slightly strong, but I think there is a risk that we may not take into account what has happened elsewhere. We have good examples of other countries taking positive steps to reduce the use of antimicrobials in animals because they felt that it was going to have a significant impact on the level of resistance in humans, but the outcome from their own reports would suggest that it has not had that effect.

Cóilín Nunan: If I am correct, I think that John FitzGerald may be referring to the use of fluoroquinolones and the effect that that has had on campylobacter—I suggest this from reading his submission to the Committee.

Quite simply, as I mentioned earlier, Denmark imports a lot of poultry from abroad, and has imported quite a lot of resistance because of that. What they realised is that, although they were not using fluoroquinolones any more in poultry, not only was human resistance not falling but neither was resistance in poultry. It was not providing any evidence that resistance was not being transmitted from poultry to humans; it is just that their non-use of fluoroquinolones was not reducing resistance. Overall, they still found far less resistance than in what was brought in; the campylobacter acquired abroad had far higher levels—we are talking of 30% versus 80%, or something like that. It still seemed to be an effective policy, but it was not completely effective because it did not cover the imports.

Q166 Jim Dowd: Finally and briefly, if anyone wants to answer, why is the rest of the world seemingly unconcerned about this? Is it a northern European thing?

Phil Sketchley: I think that the rest of the world is concerned. I attended the Chatham House conference on antimicrobial resistance last October, and that was a global, international meeting. I think that there is genuine concern about the impact of antibiotic resistance around the world.

Q167 Jim Dowd: People are not doing anything about it.

Phil Sketchley: They are starting to do something about it, but given all the things that have been stressed this morning, we have to base our decisions on science and evidence. I do not want to appear frivolous, but when I studied science, I remember a statement by a lecturer in biochemistry, who said, "The tragedy of science is the slaying of a beautiful hypothesis by a few ugly facts." We have to address the facts. I am sure that the initiatives in Denmark were done with good intention—to reduce, hopefully, the incidence of resistance—but sadly that has not proven to be the case. The facts are now showing the opposite. We have to stress that all the decisions that we make are based on scientific evidence.

John FitzGerald: Work is going on around the world. There is a discussion between the EU and the US on antimicrobial resistance—it is called TATFAR, or the Transatlantic Taskforce on Antimicrobial Resistance—which is primarily based on human medicines, not veterinary medicines. My colleague has just given me information about the USA, where they banned enrofloxacin in poultry in 2005. They are looking at the issues as well, because there were problems about fluoroquinolone resistance in campylobacter in man. The evidence—the data—shows that since they introduced the ban, resistance in man has continued to rise. Again, science would suggest that you have done one thing, but are not necessarily getting the result that you hoped you were going to get.

We must not simply turn this into a "them and us" argument. We do not want that. There may be issues in the way that fluoroquinolones are used in man in the United States that may have led to the increase. It may be masking a decrease. We simply do not have enough information to take this forward in a draconian sort of way, such as making a 50% reduction in usage in animals or banning prophylactic use in animals and in man. The consequences might be more significant, more draconian and more damaging than the benefits that you had hoped for, so we need to be very careful in how we move forward.

Chair: We have covered an awful lot of ground this morning. It has been a very long session, so I am extremely grateful to the panel for their patience. Thank you very much for your attendance today.