



Select Committee on Science and Technology

Uncorrected oral evidence: Life Sciences and the Industrial Strategy

Tuesday 16 January 2018

10.05 am

Watch the meeting

Members present: Lord Patel (Chairman); Lord Griffiths of Fforestfach; Lord Hunt of Chesterton; Lord Kakkar; Lord Maxton; Baroness Morgan of Huyton; Baroness Neville-Jones; Lord Oxburgh; Lord Renfrew of Kaimsthorn; Baroness Young of Old Scone.

Evidence Session No. 25

Heard in Public

Questions 262 - 271

Witnesses

John Bassett, Policy and Scientific Development Director, Institute of Food Science and Technology; Professor Paul Kellam, Chair-Elect of the Policy Committee, Microbiology Society; Dr Mark Downs CSci FRSB, Chief Executive, Royal Society of Biology.

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Examination of witnesses

John Bassett, Professor Paul Kellam and Dr Mark Downs.

Q262 **The Chairman:** Good morning, gentlemen, and thank you for coming today to help us with this inquiry. We are very interested to hear from you about the life sciences strategy and other areas of life sciences. Before we start, it would be helpful if, starting from my left, you could introduce yourselves for the record, so we know who you are and who you represent.

John Bassett: I represent the Institute of Food Science and Technology. We are a charity and membership body that is made up of food and science technologists across academia, industry and any other area of employment. We are all independent scientists.

Professor Paul Kellam: I am a professor of virus genomics at Imperial College London and the vice-president of infectious diseases and vaccines at Kymab Ltd. I am here in the capacity of an elected council member for the Microbiology Society, which is another membership charity for scientists interested in microbes, their basic biology, effects and practical uses. It is one of largest microbiology charities in Europe, with a large membership base.

Dr Mark Downs: I am the chief executive of the Royal Society of Biology. We are a registered charity incorporated by royal charter. We have about 18,000 individual members. We also represent around 100 organisations, which are subsets of charities within the bioscience community—biochemistry, microbiology, pharmacology, et cetera. We try to create a unified voice for those organisations. It is worth saying in the context of today's discussion that our membership is incredibly broad. We have school children in the membership, Nobel Prize winners, people in the private sector, public sector and academia, and so on. It is a very broad church and across all the disciplines of bioscience.

Q263 **The Chairman:** Thank you very much. I will start with the first question to explore with you. It is related to the life sciences strategy, which, as you know, forms part of the industrial strategy, which has 10 different pillars. Life sciences is the first of the 10, and it is the first to come out with a sector deal, which is what they call it, but really it is a report produced by Sir John Bell.

The Green Paper focused mainly on biomedical aspects of life sciences and not the totality of life sciences. I do not know whether at the consultation stage of the Green Paper you had the opportunity to comment on that strategy. What do you feel about the life sciences strategy, as it is now called? Our main reason for exploring the biomedical side is the UK's strengths in the biomedical sector, not just in science but in industry and a number of new start-ups, et cetera, that are coming about. We were told in one of the evidence sessions that that same strength does not exist in other life sciences, but we were also told that it was a missed opportunity that other life sciences were not included. To answer that, we cannot change this life sciences strategy, but we can suggest that there might be

other ways of doing this. There are three or four questions there.

Dr Mark Downs: I will kick off on the generic subject area. The report has focused on the pharmaceutical biotech sector and so on. That is absolutely fine, and we understand why that is important; it is a very important sector. What concerns us is that it misses out on some opportunities to make the linkages across the whole of bioscience. Yes, it is a big sector, but £112 billion is the gross value added of the agritech food chain supplies sector, from the farm through to sales in supermarkets. Agritech food areas generally are massive parts of the economy and a large part of the bioeconomy. It misses out, perhaps, on the opportunity to make linkages with some of the obvious things, such as veterinary medicine. If we have a strategy that looks at the value of medicines and pharmaceutical uses in humans, that can be applied equally to the veterinary agenda.

A third important area is plant science, which is incredibly important to a whole range of activities that add value. Viruses can be used in plants to produce therapeutics, antibodies, and so on. Plant science has become very important for health. We need to make sure that it is joined up with what is proposed here. I do not think there is anything fundamentally wrong with the strategy focusing on that area, but it concerns us that Government and the public at large might now believe that life sciences are only that area, when it is so much broader, and there is huge benefit by interlinking those areas and building on the experience of both blue-sky research and applied research across the whole of the bioeconomy.

The Chairman: Does anybody else want to comment? By the way, I asked whether, at the stage of the Green Paper consultation, these points were made.

Dr Mark Downs: We were not actively involved in the Green Paper stage. We responded to the call for evidence for this and other inquiries.

The Chairman: So you had not.

Professor Paul Kellam: From the Microbiology Society's perspective, we were not involved in the Green Paper. We responded to the Royal Society of Biology's call for a response, and contributed through that vehicle to the White Paper.

To pick up on Dr Downs' response, we share the view that it is very clear that the pragmatic nature of the life sciences industrial strategy is to focus on, as you say, something that is demonstrably a contribution to a positive aspect of the UK economy and industrial output. We share the view that you start to lose some of the breadth of the life sciences. Microbiology is a very good example of how, even in the life sciences industrial strategy, if you focus just on human health you miss some of the components of how human health comes together.

Microbiology spreads across all the domains of life. If you think about some of the things that are mentioned specifically in the life sciences industrial strategy, for example antimicrobial resistance, that spreads from what you have in human healthcare settings. Antibiotics are used in agriculture and

other industrial settings. Transmission happens between humans. Antimicrobial resistance organisms occur in the environment and in livestock. That view of One Health is probably a more accurate way of seeing, from a microbiology perspective, how a narrow focus on biomedicine does not encompass the full breadth of what you need to contribute to.

The Chairman: What is the industrial aspect of microbiology in animals and producing antimicrobial resistance?

Professor Paul Kellam: It is part of the same ecosystem that you describe as farm to fork: livestock well-being, the production of healthy animals and ecosystems, including plant health. That is an industrial component and how you manage and improve it is part of life sciences.

John Bassett: The Institute of Food Science and Technology has not made a submission previously, to answer your original question. We also think that the scope should be broader. The aim of the strategy is to drive economic growth within the themes of human health and medicines development, but it is difficult to see how you would drive it using those themes alone.

Food, food safety and food technology are key parts of driving that economy and improving the economic outcomes. My colleagues talked about microbiology. Understanding the interactions of food with the human gut microbiome is important. New technologies are arriving in that area that should be able to drive human health outcomes and economic improvements. There is better understanding of microbial pathogens and, linking up with the data you talk about and understanding the genomic data, if we can do that for bacterial pathogens, we can identify them better and understand and control them better. This will have human health outcomes that will help to drive through to the development of new technologies and on the human health side, which obviously drives the economy generally.

The Chairman: Do you feel that any of the scientific developments that may lead to improvements in human health are excluded in the wider context of the industrial life sciences strategy?

John Bassett: It is rather narrow, currently. It talks about human health and medical technologies but ignores the linkages that we have talked about—farm to fork and, my particular interest, how food is a common element of that—so it is missing something, yes.

Q264 **Lord Hunt of Chesterton:** All three of you have commented on the medical side and the farm-to-fork side of life sciences. You said that there were these two areas. My question is whether the relative trend of one rather than the other is increasing. Would you say that there has been an increase in the economic value in the non-medical side, or is it the other way round?

John Bassett: Can I comment on the sustainability side of things? Sustainability is a major theme and thrust for communities globally and

within the Government, and, yes, that is going to be a future economic powerhouse. That sustainable food system is part of the human health story and part of what we should do to drive the economy.

Dr Mark Downs: I do not think there is any doubt that some of these other areas are growing extremely fast and, although the balance may be in favour of medicine and traditional research at the moment, that is changing quite rapidly.

Lord Hunt of Chesterton: Is that documented?

Dr Mark Downs: I think it is. I can give you the example of Oxitec, which is based in Oxford. It has done work on dengue fever and modified mosquitos, which has had a massive impact on the reduction of the spread of dengue fever. Entomology and those sorts of things do not appear in the current industrial strategy. It does not preclude them, but the industrial strategy and documents such as that create a focus, and as soon as you create a focus in one area you risk moving away from other areas. It does not exclude them, but you risk moving away in a particular direction.

Q265 **Lord Oxburgh:** You have all made a very convincing case for saying that, in the broadest sense, the life sciences are fundamental to the way we live, to our environment and to our health, but part of the industrial strategy is to take areas where there are unrealised opportunities and to cash in on them for the national benefit. It is clear that the biomedical area is very strong in the universities and small start-up companies. Can you comment on the areas that you look after in that context? Is there an untapped set of inspirational young companies that really should be given a good push, or a leg-up anyway, which can contribute in a significant way to the national benefit?

Professor Paul Kellam: You can already see some of the examples coming at the interfaces of different disciplines. The industrial strategy also makes a point of that. It is the cross-fertilisation between disciplines within the biomedical arena that leads to innovation. That applies more broadly to the life sciences as a whole. You can see from particular examples, such as one that I have a particular interest in and knowledge about, infectious disease outbreaks and the use of genetics to track them, that this is a coming together of three or four strands of technology, from computer science, genomics, infectious disease and ecology. All impact directly on human health. It is not necessarily possible yet to say that there is one common company or opportunity at the moment that you could pick out and say, "This is the company that will resolve that", but you can see the component parts. I suppose the danger is that you can clearly label some of those as biomedicine and some as life science, but the innovation happens at the interface, and that is what we must preserve here.

The Chairman: Isn't the investment in a flu vaccine to try to produce a common generic vaccine for flu, exactly what you are talking about: developing one global company that uses all the things that you have just mentioned to produce a generic vaccine that will cover all strains of the influenza virus?

Professor Paul Kellam: There are many companies out there doing this.

The Chairman: That is an investment strategy of life sciences, is it not?

Professor Paul Kellam: Yes, and things such as CEPI for outbreak preparedness and what you do in an outbreak by way of intervention is beyond individual companies; it is a global initiative. The challenge is to reduce these large-scale important One Health aspects down to tangible and translatable aspects of a life science strategy. Pfizer is an example. There are many more examples that you could put into the vaccine space, I am sure.

Lord Kakkar: You provided a figure of the value of the agritech sector of £112 billion and alluded to other areas: plant sciences and veterinary medicine. Is that included in that £112 billion total figure, or do you have any figures for the value of those two elements in addition?

Dr Mark Downs: No, the agritech food chain is separate, and some of those areas will be outside that. I do not have the figures here, but we could happily write to the Committee with them if we can pull them out.

Q266 **Lord Hunt of Chesterton:** In their January 2017 Green Paper, *Building our Industrial Strategy*, the Government welcomed Sir John Bell's offer to lead the work. To what extent does Sir John's life sciences industrial strategy address that challenge of the UK being the best place in the world? If I could add to that, does the strategy also enable us to collaborate more with other countries around the world, or less? There seems to be a great focus on just the UK, UK, UK. To what extent will the strategy enable us to work on a broad global level?

Dr Mark Downs: The strategy per se makes a coherent case about adding value and how we can grow the economy, and that is all well and good, but unless we get the infrastructure right in the broadest sense, and get the skills agenda right, I do not think any strategy will work. I was struck by the fact that in a document written by Sir John Bell that is 60 to 70 pages long, about three pages focused on the skills and talent agenda. That is at the heart of what we need to do. Lots of things need to happen, but if you do not have the fundamental talent in place to deliver it, no strategy will be successful. It goes a long way.

There is a question mark, of course, about whether it will be implemented in the way described or in an effective way. Only time will tell. We have had industrial strategies in the past that have not necessarily been that effective. It is a good starting point, but there is quite a long way to go, and if we do not get the movement of talent right, particularly as we come into a new environment with the UK leaving the European Union, that could have a significant consequence, and that is a really important element.

Lord Hunt of Chesterton: Is there enough motivation for people to take up biosciences? Should the strategy deal with that?

Dr Mark Downs: Sir John picks up the importance of career advice and encouraging young people into all the sciences. There is a focus here on

post-11 education. I would go one step further and say that it should be before that. Most of us who have had kids know that the primary end of the spectrum is where they have real enthusiasm, and harnessing that should be seen as part of the programme. There is a lot to do, but it lays some good foundations.

Professor Paul Kellam: The life sciences strategy and the patient capital review both make excellent recommendations and are very well received. They make the very important point that these are not menus to select from but are to be implemented in full and in totality. They stand and fall by the fact that you implement across the two strategies and by not being selective. I tend to agree with that. Members of the Microbiology Society have also fed back on this. The emphasis on basic research and on the basic science should not be lost, and that is written in a number of places in the life sciences strategy. We forget that at our peril.

The aspect of documentation to implementation is now at the point where we need to focus and innovate. On the question of incentivising individuals, it is sometimes less clear how you move between different domains of your career, from basic research to industrial research and back again. Sir Paul Nurse made these points a number of years ago. The permeability of a scientist's career is important in a dynamic environment. You should be able to move seamlessly between these different domains of life science. I am not sure it is as easy as we would wish it to be. You have to be mindful of how you remain attractive to the different domains that you are from so that you can make those changes. There are values and metrics that you need to make in order to be an academic and, similarly, in your utility to industry.

I do not think we are as directive and educational in that to early-career scientists and undergraduates. Having STEM subjects linked to business and entrepreneurial aspects, while perhaps not for everybody, should be there for people who want to pursue this. That permeability and ability to move between the different domains is very important for making this life sciences strategy come alive. That was touched on in the skills to a certain extent, but perhaps it could be exemplified further.

John Bassett: IFST was pleased to see the focus on skills, access to talent, links with European research and those sorts of aspects of developing that core. We would also like to reiterate the importance of that early education in STEM subjects. It also seems very siloed where you have your three sciences. Recently, I was at a conference for science educators trying to talk about food. They did not want to talk about food. We had European people come to talk to us, because they have integrated education on science and food, whereas food to our science teachers is done in design and technology and is all about cooking. That sort of mentality keeps those subjects separated and is perhaps part of the mentality that feeds into some of what we are seeing here in the strategy.

Professor Paul Kellam: To add one point, I have a note that on page 22 there are some very interesting graphs about output. Clearly, the UK is not very good at publication output. We are not very good at patent output

normalized per publication. Among the choices of early-career scientists, in the choice between writing a patent and prosecuting it or submitting your work for a high-impact publication in a journal, it is clear where your career trajectory lies. Maybe we need to look at how we incentivise people to make those difficult choices, because there is value in the industrialisation aspect of the work.

The Chairman: Are there any lessons from other countries on this aspect that lead to success?

Professor Paul Kellam: I am sure there are. Rather than trying to think of them now, it might be better for me to think more soberly about them and to write back to you. I am sure there are lessons in the US.

The Chairman: In the US, the publications suggest that they prefer open access that builds a team rather than patenting that is not disclosed.

Professor Paul Kellam: I am not sure. The US has a large number of academic publications and, much like the UK, is very keen on open access to the data. That does not preclude you from protecting intellectual property and commercialising. Clearly, the might of the US biomedical sector is testament to the fact that they look after and protect their inventorships and industry and they can expand on it. It is probably more to do with the influx of readily available, deep pools of capital, and the patient capital review makes some reference to that.

Q267 **Lord Kakkar:** What do you think about the Government's response so far to the life sciences industrial strategy? Do you think this represents a new basis for the relationship between state, government and business, or is it just an extension, quite rightly, of the Government trying to help what is considered an important sector for the country?

Dr Mark Downs: Your latter point is very true. It is important, but I do not think it sets the whole agenda. As we described earlier, life sciences are incredibly wide, so we see this as one element. It is an important element, but it is only one element none the less. The Government's response has been largely supportive. We agree with a lot of Sir John's the recommendations.

A lot has been made of funding. The additional revenue that has been made available for science and research activities over the next two or three years is, of course, very welcome, but it is also important to note that it will take 10 years for the UK to reach the OECD average expenditure of 3.4% of GDP on research and development, and should we really be celebrating that? Of course, we want to move that way, but it is a 10-year trajectory. Sir John is saying that we should go a lot further than that and that we should be in the top quartile of expenditure on research and development. We would still like to encourage the Government to continue to look at this carefully to see if we can move more quickly. It is welcome, but we have a long way to go to catch up with our competitors.

Professor Paul Kellam: I do not have much to add to that. We may touch on this a bit later when we come to the subject of leaving the European

Union. With the backdrop of where we are now, we have to make sure not only that we preserve aspects of the funding stream and compensate for any changes and losses, but that, if we are ambitious, we overcompensate and make the environment incredibly attractive to people throughout the world. We need to create the environment in which, if you have an idea anywhere in the world, the first thing that comes into your mind is, "The best place for me to prosecute this and commercialise it and use the science base is the UK". If that is what we aspire to, we need to make sure that the Government's enactment and implementation of these reports live up to that vision. That is what the life sciences sector aspires to, and we need to make sure that we implement it in that direction.

Q268 Lord Renfrew of Kaimsthorn: Sir John Bell's report does not say very much about implementation. I would be interested to know who you think should be responsible for the implementation of the life sciences industrial strategy and where accountability should lie.

Dr Mark Downs: They are two separate issues, clearly. There ought to be a government champion who can take responsibility for the life sciences strategy, and I hope that, whoever that person is, they take account of the broader debate that we have been having here about the range of the biosciences.

Lord Renfrew of Kaimsthorn: At what sort of level do you think this champion should be?

Dr Mark Downs: If the champion in government is at ministerial level, you would hope that it would at least be a Minister of State in a department. That is probably the right sort of level.

Lord Renfrew of Kaimsthorn: We thought that perhaps it ought to be a champion at Cabinet level.

Dr Mark Downs: Having Cabinet-level representation would be extremely welcome, and, of course, Lord Willetts, when he was performing the role of the Government Science Minister, had the ability to attend Cabinet. It could be a Secretary of State role or otherwise, but the ability to attend Cabinet would be very welcome. Of course, Lord Willetts had that, and we would like to see that reintroduced.

Secondly, we would very much welcome a broad oversight group that could look at the life science strategies, reporting to whoever the government champion is. That group should not just be representative of the pharma and biotech sectors, which are very important, but should have ethical representation on it from professional bodies and perhaps even from patient groups or other consumer groups that have an interest in the agenda.

Professor Paul Kellam: The highest level of representation achievable is the most desired outcome. Cabinet level sounds ideal, but as a society we are not in a position to think of or name individuals. We can look at some of the principles behind it. When you have a complex life sciences strategy, with multiple independent domains of expertise, let alone the patient

capital aspect of how you finance this, the big danger is that there are multiple masters, and that should be avoided at all costs.

Single points of responsibility and clear devolution of governance and responsibility below that will be absolutely necessary. You need a strong person, a strong department and clarity of purpose. You certainly have to take advice and listen. The more broadly you bring this into life sciences as a whole, the more you have to listen. You need that focus of implementation and the metrics to assess progress. The life sciences report emphasises a number of these throughout. There are some very big headline ones. A £420 billion market cap for pharmaceutical or biomedical-type companies is a fantastic aspiration. It is very easy to measure that. Some of the things in between are perhaps less easy to measure, but they are not immeasurable, and we need to focus on that as well. Avoidance of multiple masters is important.

Dr Mark Downs: On the accountability issue, it is entirely appropriate to have a Minister responsible, but accountability has to be quite broad. The NHS, the private sector and the public sector need to work collectively and have targets that they can achieve to deliver this, under the guidance and supervision of some sort of advisory panel, with a report, as you say, to Cabinet.

John Bassett: We also agree that the accountability should be high up in government. The implementation board as it currently stands is as narrow as the strategy is. It would be worth looking at bringing in some of the other sectors and having a wider representation on the board itself. Perhaps you can explain the role of the UKRI to me, but I would have thought that they would have played a bigger role in the implementation of the strategy. That seems to be an uncertain space at the moment.

Lord Griffiths of Fforestfach: The words used in the industrial strategy might be considered by some people to be slightly on the vague side. It is very general. On the other hand, the White Paper puts a lot of emphasis on particular sector deals. If I am making a deal with somebody, it is really an exchange where I put something in to get something out, and I want to know what the terms of the deal really are. Public companies are accountable to their shareholders in doing this. Do you have any insights into how specific those sector deals should be, particularly in life sciences? What are the key elements to ensure that this is effective down the line and not just nice words from politicians and in the end a little on the vague side?

Dr Mark Downs: You are right; it is on the vague side, which is the nature, perhaps, of these sorts of documents. If we are to see it delivered effectively, it has to have real engagement. We can ensure that happens by making sure that the NHS and the Department of Health, BEIS, Defra—all those departments—and the private sector collaborate and work closely together in an open and transparent way, with some clear milestones along the way.

As I was saying, accountability is spread across those players. I do not think it is appropriate in a document such as the strategy to get down into the detail, but that will need to flow out of those collaborations. If that does not happen and if you do not get buy-in from those parties, it will not work. Buy-in is absolutely critical. Compared to others, this strategy has had more engagement from the NHS than previous ones, which is very much to be welcomed.

Professor Paul Kellam: I share your view that there is a direction of travel in the life sciences strategy documentation that perhaps has some vagueness, but there are some key points regarding industry's ability to flourish. First is the absolute preservation and enhancement of the basic science. The basic science is the lifeblood that underpins all this. There needs to be a clear set of words about clustering and focus. Industries cluster and focus, and we are aware of biomedical clusters. That can be supported by government and policy. Although some of these basic fundamental building blocks seem a bit vague, they are based on evidence, and perhaps that is how industry can look.

The other key point, of course, is talent. Talent cuts across all domains, and we should perhaps think of talent less in terms of the talented professors and more in terms of the talented research technicians and people who work in all domains of the life sciences and biomedical sciences. Microbiologists are in abattoirs and industrial manufacturing, et cetera. This is all talent and it contributes to the ecosystem. Perhaps that vagueness is necessary, but some of the fundamental principles are very clear.

Lord Hunt of Chesterton: We have had evidence from the industry—and I was thinking how a cynic might look at it as I listened to what you are saying—that, "Britain is great. We do all this fantastic fundamental research, but, by the way, if we want to deliver something commercially, we do that on the continent". Everybody keeps talking about the greatness of UK science, but when you ask for evidence from industry—"Are we so great at applying it and making money out of it?"—the answer is no, we are not. That is the change. Having another chap or chapess in the Cabinet is not going to solve that. You could you say that the industry has almost been taken for a ride because of the real business and motivations.

The third point is that nobody ever mentions catapults. We have to dig out the evidence for that. Is that one way of going forward? By the way, is there a catapult for the sciences that you represent?

Dr Mark Downs: There are several that cut across the areas, yes.

Professor Paul Kellam: Not to answer in any depth, but there is mention in the report of how you grow industrial activity, taking the examples of Singapore and Ireland. It comes down to incentivisation, to ready capital pools, to talent and the regulatory environment within the confines of the country or the regions of the country to make those things happen. It is quite hard to pick apart any one particular thing. There is an ecosystem, and the life sciences strategy probably identifies all the important

components of the ecosystem that you need to create. It is not that we do not have this. We have this in biopharmaceutical manufacturing where we have manufacturing plants. We may have missed out on some of the finer cell-based biologics, where perhaps Ireland and other countries have made more of an impact, but it is not unrecoverable and it is to do with intent and direction and the environment that we create. The levers are there; it is in the implementation.

Dr Mark Downs: We should not put down the UK's performance too much. There are many examples of businesses that have grown and done extremely well. A lot of international companies are investing in our research activity here because they see huge value in it. It is not that we cannot do it; it is that it does not happen as often as it does in other places. Perhaps we should look to the domestic successes, because the cultural environment in which innovation takes place is very important, albeit always in comparison with the United States or with China or wherever you want to compare us with.

Lord Hunt of Chesterton: Or places like Belgium, which is always being cited.

Dr Mark Downs: It is, but we have our own home-grown examples. Productivity in the biotech and pharma sectors is very good. We can learn from those examples. Of course we should also look at external examples, but not just at them.

Q269 **Baroness Young of Old Scone:** I would like to ask two questions. One is about Brexit. Is everything that needs to be in the strategy in the strategy to cope with Brexit? Should anything be emphasised more than it currently is?

Dr Mark Downs: I would pick up a couple of issues. The first is the European reference laboratories. They play an important role in a whole variety of areas, such as monitoring an outbreak of foot and mouth, and having reference material and data to look at. We need to make sure that we are still heavily engaged with the European reference laboratories, both here in the UK, and can retain some function, or the ones in the European Union.

The other area is talent, which has come up many times already. Again, I emphasise that, as Paul says, it is not just the outstanding professors who we want to attract to the UK. We need technicians and people working in the environment doing monitoring and people in the agritech sector. Those people, just as much as the eminent professors—important though those people are—have skills that we desperately need. The report does not pick up on that breadth quite as much. There is some reference to it, but it needs to come out. Technicians are incredibly important.

Professor Paul Kellam: Science across the board, from basic science to industrial translation, is a complex ecosystem. We are where we are, and with Brexit we are about to change aspects and parameters of that ecosystem. In complex ecosystems, it is often difficult to predict the results

when you mess around with them. We can identify, and the report has identified, many of the important components. It is about reducing those down to how you can mitigate them and enhance aspects that may look as though they are becoming less attractive.

Regulation, talent, financing and protecting basic science are interdependencies within the science ecosystem, so we need a sober assessment of the things that you can make changes to and how to mitigate some of the less attractive aspects of leaving the European Union. Regarding the movement of people, we should not forget about the people who are already working in the UK. From the society's point of view, we are already aware from our membership of people who are moving on and out of the UK. We need to get ahead of that rapidly before it becomes something that we cannot catch up on.

John Bassett: The IFST has made a number of statements on Brexit. The strategy focuses on many of the same concerns—my colleagues have also raised them—of skills, access to talent and links with the European research base. It is not just a question of that higher talent, as my colleagues have said. In the food industry, for example, people tend to think of people working in food service, but we also have a very strong base of scientists and technicians who support our food industries. It is not just the people who are serving behind the counter, who might have a low level of skill; there are also highly skilled individuals involved in that. We need to be cognisant of the diversity of people we need and of the supporting structures. We will lose the resource of the European Food Safety Authority when we leave the European Union. We have the Food Standards Agency here, which is in no way up to the same job as EFSA is.

Lord Hunt of Chesterton: Could you say that again?

John Bassett: The Food Standards Agency in this country is not up to the level of scientific expertise that the European Food Safety Authority has.

Lord Hunt of Chesterton: Really.

John Bassett: There will be a huge gap.

Lord Hunt of Chesterton: Will we leave that body?

John Bassett: We will lose the ability to task that authority to make scientific risk assessments for us. That will fall to the Food Standards Agency, which does not have that capability at the moment.

Lord Hunt of Chesterton: It is pretty important.

The Chairman: Is that not the same as for the European Medicines Agency, which is based in the UK? Our own Food Standards Agency plays a more subsidiary role to the European Food Safety Authority, just as the German medicines agency plays a more subsidiary role, because the European Medicines Agency is based in the United Kingdom? Of course, that will change with Brexit. Are you saying fundamentally and basically that our Food Standards Agency is flawed in the way it works?

John Bassett: No. When it is partnered with the European Food Safety Authority, it works, but if we are now to make our own scientific judgments on the risks of our food supply chain, we will need to build that capability internally.

The Chairman: Is that because we do not have the quality of science?

John Bassett: We have not invested in the quality of science in that agency, because, I guess, we rely on the European agency.

Q270 **Baroness Young of Old Scone:** You touched on this question in response to the Chairman's question. If the life sciences strategy is constructed around human health and the opportunities that are offered, are there any last things that you think are risks in your neck of the woods? Are there risks, apart from those you have already mentioned, that we ought to be aware from having a very narrow focus?

Dr Mark Downs: One of the areas we have not touched on at all is the impact on the environment. We know there are strong links between the environment and good health. That is a whole separate area of research and skills that we have in the UK and around the European Union, and I hope that we do not lose sight of those benefits. It was striking that in the report there is a focus on ageing, which seems entirely appropriate, but there is no mention at all that I could see of mental health, which is incredibly important for the UK and nations generally. The environment has an important role to play in that in all sorts of ways, whether it is the built environment, the countryside, biohabitats and so on. We must not lose sight of that.

Professor Paul Kellam: I would reiterate a point that we made at the beginning about the advances that happen at the edges of different disciplines rubbing up against each other. It would have been hard to predict 20 years ago that the ability to track Ebola as it moves from person to person would be a culmination of computer science, evolutionary biology, people on the ground taking samples in public health-type laboratories and computation happening in various parts of the world feeding back to the WHO. It is hard to keep those things rubbing together, but we must, and that comes from the implementation and the broad engagement with life sciences to make sure that you do not miss out on these world-changing advances that happen at the boundaries of disciplines.

John Bassett: The links extend to the physical sciences and engineering, particularly in the case of food. One thing I would like to highlight—the strategy has it, but perhaps we have not talked about it as much—is the data and the analytics capabilities. That is cross-cutting, and there should be a nod in the strategy to how that capability can be developed to work right across a number of industries and in a number of thematic areas. It is mentioned, but I emphasise that that should be looked at, not just in relation to the human genome but in relation to bacterial plants and animals. This area was pulled out in the UK Commission for Employment and Skills 2015 survey, which said that those data skills are lacking here

across the board. When you think of data and its future role for the benefit of consumers and our economy, that will be huge.

Baroness Morgan of Huyton: I am very struck by what you see as far too much of a silo. What should the role of UKRI be in all this?

John Bassett: That is my question.

Professor Paul Kellam: It should, and it does through its research councils, see a very diverse basic science base. With Innovate UK in the same space, you have clear pathways to translation. It seems to me that UKRI has a very important role in how we implement this. I have read Professor Sir Mark Walport's response to your Committee, and many of the points that he brought out seemed very sensible.

Dr Mark Downs: That is why UKRI is there—I hope—to create the integration and to break down some of those silos and boundaries. If it does not, it will certainly have failed in a big way.

The Chairman: The three of you represent different charities, and you made that point when you introduced yourselves. One of the points made about promoting science and funding for science is that the funding that comes from charities for science does not attract the same kind of research support as bona fides MRC, BBSRC, et cetera. Do you have a comment to make on whether that will be helpful to drive the strategy or not?

Dr Mark Downs: In a previous role I was very closely involved in charity research funding. The additional resources that were made available through government for the overhead provision were essential to allow universities to effectively implement their research programmes, and they would want to come to receive that money. If that were removed, and it is certainly disappearing quite rapidly now as an available funding source, it will have an impact. That is not welcome and we would all very much like to see it replaced and maintained.

Q271 **The Chairman:** If I were to ask each of you what one recommendation you would like to see this Committee make, what would that be?

John Bassett: We have talked about it. It is making sure that we have a broader definition, and maybe not just a definition, and that when it is implemented it brings in the other aspects that can add value. That is not just for the sake of being interconnected; there must be value to the economy and to human health outcomes, which is what is purported to be the focus of the strategy. You need to look at where the synergies can be built.

Professor Paul Kellam: Very straightforwardly and simply, it is the implementation of what the report recommends, not treating them as a menu but doing as they recommend and implementing them as a whole, and making sure that the governance and the structures that support that implementation are broad enough to capture all the other aspects of life sciences.

Dr Mark Downs: We are where we are. We would have preferred it to have been called a strategy for pharma and biotech or healthcare, or something like that. I do not think we need lots of other strategies. My request would be that we start from where we are, make sure that there is crossover with other areas of bioscience to maximise the opportunity, and have a champion and support process across our communities of industry, charities and so on that ensure that that happens.

The Chairman: Thank you. Do you think you might have missed an opportunity at the time of the consultation on the Green Paper to have made a stronger representation about other aspects of life sciences, particularly agri and animal science, that could have contributed to economic development?

Professor Paul Kellam: Hindsight is wonderful. You can always contribute more at a given time. From the Microbiology Society's point of view, we were aware of the antimicrobial strategy and the microbiome, but I guess you can always contribute more at any given time.

The Chairman: Your evidence has been very helpful. You made your points well. Thank you very much.