



Jim O'Neill presents final international recommendations for the world to defeat superbugs

Lord Jim O'Neill's global Review on AMR will set out its final recommendations, providing a comprehensive action plan for the world to prevent drug-resistant infections and defeat the rising threat of superbugs – something that could kill 10 million people a year by 2050, the equivalent of 1 person every 3 seconds, and more than cancer kills today. Building on eight interim papers, this is the final report from Lord O'Neill's Review, established by the UK Prime Minister David Cameron in 2014 to avoid the world being “cast back into the dark ages of medicine”.

The costs of AMR

The report sets out why AMR is such a huge problem and that it must be tackled. AMR is a problem that is getting worse. Antimicrobial drugs are becoming less effective and the world is not developing enough new ones to keep up. The global costs if we do not take action now could be 10 million people dying every year by 2050, and a cumulative economic cost of around 100 trillion USD.

How AMR can be tackled

It then sets out 10 areas where the world needs to take action to tackle AMR. Many of these measures focus on how we can reduce the unnecessary use of antimicrobials, and so the rate at which resistance increases, making our current drugs last longer. Others look at how we can increase the supply of new antimicrobial drugs because, even if we reduce unnecessary use, our arsenal to defeat superbugs is running out and needs to be replenished. All 10 areas are important, and the full list is available in the executive summary of the attached paper, but four are particularly important and are outlined in more detail here:

1. **A global public awareness campaign** to educate all of us about the problem of drug resistance. This must be an urgent priority and the Review urges international campaign developers, industry experts, and non-governmental organisations to consider how they could help to support such a campaign. This should begin this summer if we are to really make progress, and could be launched formally by heads of state at the UN General Assembly in September.
2. **The supply of new antibiotics needs to be improved** so they can replace existing ones as they become ineffective. A truly new class of antibiotic has not been seen for decades because the lack of incentives for investment has led to reduced R&D, and many of the 'low hanging fruit' in terms of development have already been picked. We need a group of countries such as the G20 to reward new antibiotics after they are approved for use. These **market entry rewards**, of

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around one billion USD each, would be given to the developers of successful new drugs, subject to certain conditions that ensure they are not 'over-marketed' but are available to patients who need them wherever they live.

3. **We need to use antibiotics more selectively through the use of rapid diagnostics**, to reduce unnecessary use, which speeds the incidence and spread of drug resistance. To do this, we need a step change in the technology available. Doctors in most countries around the world still prescribe important medicines like antibiotics based only on their immediate assessment of a patient's symptoms, just like when antibiotics first entered common use in the 1950s. Governments of the richest countries should mandate now that, by 2020, all antibiotic prescriptions will need to be informed by up to date surveillance and a rapid diagnostic test, wherever one exists. This would encourage investment and innovation, by showing developers that they will find a market for their products. Once the technology has improved, markets in developing countries should be supported with a system we have called a **diagnostic market stimulus**, which would provide top-up payments for successful products once they are purchased or used - not dissimilar to the great work that Gavi, the vaccine alliance, have done to improve global child vaccination.
4. **We must reduce the global unnecessary use of antibiotics in agriculture**. In the US, for example, of the antibiotics defined as medically important for humans by the US Food and Drug Administration (FDA), over 70 percent (by weight) are sold for use in animals. A number of other countries are also likely to use more antibiotics in agriculture than in humans but many do not even hold or publish the information. Firstly, surveillance needs to be improved in many parts of the world, so we know the extent of antibiotic use in agriculture. Then targets need to be set by individual countries for this use, enabling governments to have the flexibility to decide how they will reach lower levels. Alongside this, we need to make much quicker progress on banning or restricting antibiotics that are vital for human health from being used in animals.

How solutions can be paid for

The paper then discusses how these solutions would be paid for. The costs of action are dwarfed by the costs of inaction: the proposals made by the Review on AMR would cost up to 40 billion USD over 10 years. However, the cost of AMR between now and 2050 could be as much as 100 trillion USD, that's 100,000 billion USD. The economic case for action is clear, as well as the tragic human consequences of inaction. The solutions could be paid for by one or more of the following:

- a) Allocating a very small percentage of G20 countries' existing healthcare spending to tackling AMR
- b) Reallocating a fraction of global funding from international institutions to AMR
- c) Apply an antibiotic investment charge to pharmaceutical companies who do not invest in research for AMR
- d) Implementing a tax on antibiotics
- e) Introducing transferrable 'vouchers' to reward new antibiotics

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Different countries can choose different ways to pay for global action on AMR.

Next steps

International collaboration for real action via the World Health Assembly, G7, G20 and the UN is needed to deliver these policy proposals and turn discussions on AMR into action. This needs to build on promising steps made by governments, and by industry recently affirming its commitment to tackle AMR with a landmark declaration at Davos. Here, over 85 companies, including vaccine developers, large pharmaceutical companies, diagnostic developers and biotechs, committed to further action to reduce drug resistance, increase research and improve access. With this momentum, and 700,000 people already dying every year from AMR, 2016 is a crucial year.

Quotes about the report

Lord Jim O'Neill, Chairman of the Review on AMR, said:

"My Review not only makes it clear how big a threat AMR is to the world, with a potential 10 million people dying each year by 2050, but also now sets out a workable blueprint for bold, global action to tackle this challenge. The actions that I'm setting out today are ambitious in their scope – but this is a problem which it is well within our grasp to solve if we take action now. I call on the governments of the G7, G20 and the UN to take real action in 2016 on the ten proposals made by my Review, to avoid the terrible human and economic costs of resistance that the world would otherwise face."

Narendra Modi, Prime Minister of India, said:

"The discovery of antibiotics had dramatically revolutionised the treatment of communicable diseases in the 20th century, but their indiscriminate use is now leading the world into a situation where life-saving formulations are progressively losing their efficacy. India recognizes anti-microbial resistance as one of the major global threats to public health. We are committed to prevent, contain and combat anti-microbial resistance.

India has taken a number of steps to combat anti-microbial resistance. A national programme on containment of anti-microbial resistance is being implemented. The National Centre of Disease Control and the Indian Council of Medical Research are engaged in anti-microbial resistance surveillance. We have placed restrictions on the sale of antibiotics by making necessary statutory changes. A campaign has been launched to increase awareness regarding anti-microbial resistance, along with national treatment guidelines for antibiotic use.

The prevention and containment of anti-microbial resistance requires multi-sectoral and multi-stakeholder action. India is committed to fully support global efforts to prevent and contain anti-microbial resistance."

George Osborne, Chancellor of the Exchequer of the UK, said:

"Lord O'Neill's Review provides a stark warning that unless we take global action, antimicrobial resistance will become a greater threat to mankind than cancer currently is.

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"It is not just a threat to health, but also to the world economy. Apart from the moral case for action of the sort Lord O'Neill proposes, the economic cost of failing to act is too great to contemplate.

"So I am calling on other finance ministries to come together this year and, working with industry leaders and medical experts, agree a common approach.

"I also want to thank Lord O'Neill for his tireless work on this subject. He has helped to propel it to the top of the global agenda, for which he deserves great credit."

Mario Monti, President of Bocconi University, former Prime Minister of Italy and former European Commissioner, said:

"Antimicrobial Resistance (AMR), an insidious and particularly devastating phenomenon, is definitely worth the urgent attention of global leaders. But it is unlikely to actually reach the leaders' agenda as a key priority unless it is pushed up there by a compelling exercise of awareness-raising, policy-advocacy and coalition-building, strong enough to overcome the short-term bias of current politics. In my view, this is exactly what Lord O'Neill's Review on Antimicrobial Resistance is about to achieve. The UK government and the Wellcome Trust deserve credit for having launched an initiative which is so crucial for the life and well-being of future generations, and for having entrusted it to Jim O'Neill, a personality deeply respected by global leaders. The solid analysis underlying the Review, as well as the fact that Jim has never been regarded as a gloomy economist, make it even more credible that AMR really is a daunting challenge."

Dr Margaret Chan, Director-General, World Health Organization, said:

"WHO warmly welcomes this thorough and compelling review so brilliantly overseen by Lord O'Neill. Its 10-point platform for responding to antimicrobial resistance takes forward many issues raised in the WHO Global Action Plan on Antimicrobial Resistance. Importantly, the review tackles the burning need to find incentives that can get new products into the pipeline. If not, the scenario it paints for 2050 will surely jolt the last remaining sceptics into action."

Professor Dame Sally Davies, Chief Medical Officer for England, said:

"Lord O'Neill's final report makes a number of challenging recommendations for the world to adopt if we are able to tackle the growing threat of drug resistant infections. In every international forum, including the G7, G20 and the UN, we must work with our international partners to ensure global action. At present around 7% of deaths are due to infections. If we do not act, this could rise to 40% - as it was before we had antibiotics."

Yasuhisa Shiozaki, Minister of Health, Labour and Welfare for Japan, said:

"We welcome launch of the final report of the Review on Antimicrobial Resistance (AMR) chaired by Lord Jim O'Neill in such a timely manner. The series of reports, for the first time, overviewed the threat and current situation of AMR in plain language and provided us gourmet food for thought on potential solutions for this most emergent global crisis. I emphasize again that AMR is truly a global health concern that should be tackled by global collaboration involving various sectors, namely multi-sectorial "One Health" approach. As mentioned in the report, I also put emphasis on importance of addressing market failure and incentivizing research and development of new antimicrobials. We greatly appreciate the review team and the U.K. for their continuous efforts to enhance political momentum on AMR. Japan stands ready to shed light on this critical issue in the coming G7 Ise-

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Shima Summit which will be held a week later, and Japan, as the presidency of G7 meetings this year, will tackle the issue further in the G7 Kobe Health Ministers' Meeting and the following High Level Meeting on AMR during the United Nations General Assembly both in September."

Nicholas Stern, Kt, PBA, FRS, Baron Stern of Brentford, President of the British Academy, IG Patel Professor of Economics and Government at the LSE and former Chief Economist of the World Bank, said:

"Early in its work the O'Neill Review identified, clearly and convincingly, the huge risks to the health and health systems of the world from anti-microbial resistance. In this final report they have shown, again convincingly, what we can and must do. We should welcome strongly the lead that the UK and Jim O'Neill have given. Now is the time to bring the world together around their recommendations and to act. Delay is dangerous".

Lawrence H. Summers, Charles W. Eliot University Professor and President Emeritus at Harvard University, said:

"To stop resistance becoming a major threat to the world, we need new incentives to reduce the overuse of antibiotics and to replenish their supply. As long as microbes are able to travel between countries, antimicrobial resistance will not be an issue that any country can take control of on its own. I welcome the workable global solutions that Lord O'Neill has put forward and hope the world takes note to implement this impressive array of policies."

Dr. Eric P. Goosby, UN Special Envoy on Tuberculosis, said:

"Jim O'Neill's Review helps bring TB out of the shadows and recognizes it as the severe global health threat that it is. TB is truly the cornerstone of the global AMR challenge. As the review notes, of the 10 million total deaths that might be associated with drug resistance each year by 2050, approximately one-quarter will come from drug-resistant strains of TB. This is unacceptable. We urgently need new drugs and better diagnostics, which would significantly save lives and prevent countless people from suffering needlessly. In addition, we need political will from all parties to make fighting TB a priority now and pre-empt increases in the transmission of drug-resistant TB."

Sir Andrew Witty, Chief Executive of GSK, said:

"As a company with a long heritage and expertise in antibiotics, we welcome today's report as a helpful step towards identifying the key challenges in this area, and commend Jim O'Neill and his team for exploring ways to address these. But the journey is far from over. Governments, industry and other relevant groups must now work together to develop these ideas into practical steps that encourage and reward further research and ensure a supply of effective new antibiotics for future generations."

Angel Gurría, Secretary-General of the OECD, said:

"Jim O'Neill's AMR Review shows that global and coordinated action on Leaders level is needed to face the challenge of growing drug-resistant infections. The OECD welcomes the report and agrees with the report's assessment that AMR is a threat to global health and prosperity. OECD's own work highlights that countries can reduce unnecessary use of antibiotics in the health and animal sectors, and promote research and innovation into new antibiotics at a low cost. We look forward to working with the UK on these issues, and hope that this report will help drive international action at the G20 and other international bodies."

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Gordon Brown, United Nations Special Envoy for Global Education and former Prime Minister of the United Kingdom, said:

“Jim O’Neill’s excellent review has shown that antibiotics for conditions like pneumonia, and E. coli, are losing their effectiveness over time and in some treatments we are down to our last lines of defence. Jim O’Neill’s proposals to solve the problem of drug resistance start by recognising that antibiotics are not a commodity like any other and set out how starting with the Fleming Fund government and companies can work together to plan for the future, and develop new treatments and save lives.”

Dr Aaron Motsoaledi, Minister of Health for South Africa and Chair of the Stop TB Partnership, said:

“Antimicrobial resistance is one of the greatest health threats of this generation. This report sets out the definitive case for governments, pharmaceutical companies, and politicians to take action. I commend Lord Jim O’Neill and the AMR High-Level Review for this report, which will help drive greater action against AMR and therefore tuberculosis (TB), the world’s leading infectious killer.

Drug-resistant TB is responsible for almost 1 out of every 3 deaths from AMR and is transmissible through air. Like other AMR infections, the relative neglect of research into new TB medicines is both a market and a moral failure resulting from putting profits over people in the global R&D industry. As the Chair of the Stop TB Partnership and Minister of Health for South Africa, I am committed to advancing action on AMR and TB and hope the G20 amongst other stakeholders will take concrete measures to avoid the ten million deaths a year predicted by 2050 from AMR if we fail to take action.”

Sir Venki Ramakrishnan, President of the Royal Society, and Nobel Prize-winning biologist, said:

“The emerging global problem of antimicrobial resistance is one of the most serious health concerns we face today. The problem can only be tackled by combining a variety of measures, including appropriate use of existing antibiotics, public awareness and public health measures. It is equally important to solve the problem of the current lack of market incentives for the development of new antibiotics. This thoughtful review is a very welcome first step towards addressing these issues. I hope very much that its suggestions are considered seriously.”

Ngozi Okonjo-Iweala, Senior Advisor at Lazard and ex-Finance Minister of Nigeria, said:

“For those not yet aware of the potentially devastating impact of AMR on our societies and economies, this Review is a must read! I shudder to think of the consequences of inaction on poor countries with weak health systems. The world must come together to tackle this new global threat.”

Dr. Olivier Brandicourt, Chief Executive of Sanofi S.A., said:

“Resistance to antimicrobials is a major challenge that requires the reflection and input of multiple stakeholders at local to global levels. The O’Neill Review on Antimicrobial Resistance presents possible concrete interventions to change the stewardship, discovery and business model of antimicrobials in order to bring a solution to this major crisis. Sanofi is fully committed to this effort through its unique activities in the fields of anti-infective drugs and vaccines and its footprint in established and emerging markets. The O’Neill Review offers tangible ways forward and Sanofi looks forward to taking this reflection to the next level.”

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Michel Sidibé, Executive Director UNAIDS, said:

“Each time a first-line of treatment stops working due to resistance, the world loses a powerful option to heal and help people. Second line replacements are often more expensive and less accessible. The Review of Antimicrobial Resistance brings to light these and other important issues that challenge our daily way of thinking. From the food we eat to the medicine we need or in fact don’t need, Lord O’Neill has brought forward a clear and pragmatic approach on Ten Fronts to deal with this looming crisis.”

Dr Jeremy Farrar, Director of the Wellcome Trust, said:

“Over the past two years Jim O’Neill and his team have raised the global profile of drug-resistant infection to its rightful place as one of the most pressing economic and health security issues of our time. These recommendations offer a road map for stopping growing resistance to our best drugs from claiming millions of lives. It is now up to world leaders, business and civil society to respond to this vital call for action, and create the incentives for preserving existing drugs and developing new ones that we need to address this critical challenge.”

Professor Christian Bréchet, President of Institut Pasteur, said:

“The Institut Pasteur welcomes Jim O’Neill’s excellent Review on AMR and acknowledges the importance of the studies and recommendations, especially the reference to an intersectorial and interdisciplinary approach. We support the idea to bring the discussion to the higher level. We also recognize the need for development of more appropriate diagnostics, necessary vaccines, or new or re-purposed antimicrobial agents, as well as the importance of networks of surveillance, activities to which the Institut Pasteur International Network is particularly contributing to, in the spirit of the coalition called for by the Review.”

Dr Seth Berkley, CEO of Gavi, the Vaccine Alliance, said:

“This thorough review underlines the increasingly important role vaccines will play as a front-line defence against antimicrobial resistance, not just in terms of preventing illness and reducing the opportunity for bugs to develop resistance, but also in reducing the unnecessary prescription of antibiotics, through the prevention of viral infections. Solutions developed over the last decade to help overcome vaccine market failures provide an important precedent for comparable global initiatives to help trigger the development of new antibiotics. Fresh incentives are needed to tackle the lack of innovation and development in the antibiotics market, addressing the issues outlined today.”

Professor Nigel Gibbens CBE, UK Chief Veterinary Officer, said:

“The impact of antimicrobial resistance is already serious and is a growing threat to human health and the global economy. We must take action in all the areas identified in the comprehensive report and that includes restricting the use of antibiotics to where it is both unavoidable and effective. There can be no question that we now have more than enough evidence to take decisive action on antibiotic use in animal husbandry as well as in human health.”

I welcome the framing of the report’s targets in terms of a progressive, monitored process. This will allow the world’s livestock systems to adapt - reducing disease challenges and, as a result, the over-use of antibiotics. However we must minimise the threats to human health as soon as possible. This

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includes assessing how far the use of certain antibiotics in animals consequently poses a risk to human health - and restricting or even prohibiting such use in animals when necessary.”

Dr Monique Eloit, Director General of the World Organisation for Animal Health (OIE), said:

“The OIE welcomes this final report reflecting an economist point of view. To make progress in the fight against antimicrobial resistance in various countries throughout the world a realistic assessment of the local situations and variety of production systems is required. Strengthening national capabilities, in particular regarding legislation and control of antimicrobial use through the-oversight by veterinarians will be the cornerstone to success in our fight against antimicrobial resistance.”

Notes for Editors

1. AMR or ‘antimicrobial resistance’ is the term used to describe drug-resistant infections, sometimes referred to as ‘superbugs’. Antimicrobials include antibiotics (which act only on bacteria), antivirals, antiparasitics and antifungals.
2. The Report, *Tackling Drug-Resistant Infections Globally: Final Report and Recommendations*, will be published on the Review’s website at www.amr-review.org on Thursday 19 May.
3. The UK Prime Minister, David Cameron, commissioned the Review on Antimicrobial Resistance in July 2014 to address the growing global problem of drug-resistant infections. It is Chaired by Lord Jim O’Neill and backed by the Wellcome Trust and the UK Government.
4. Lord Jim O’Neill is the current Commercial Secretary to HM Treasury, as well as the Chairman of the Review on AMR. He is an internationally published economist and until 2013 was Chairman of Goldman Sachs Asset Management, having previously been the organisation’s Head of Economic Research. Before chairing the Review on Antimicrobial Resistance, he led the Cities Growth Commission which played a central role in the Government’s decision to devolve significant new powers to large urban centres in the UK starting with Manchester and the Northern Powerhouse project. He is particularly well known for his work in relation to developing and middle-income economies, having coined the BRIC (Brazil, Russia, India, China) acronym – meaning that he is especially well-placed to understand the broad range of international interests raised by antimicrobial resistance.
5. Before this final report, the Review published a series of interim papers covering different parts of the AMR problem, all of which are available on our website [here](#).
6. The Wellcome Trust is a global charitable foundation that spends more than £700 million a year on advancing human and animal health. It is the second highest-spending charitable foundation in the world, after the Bill & Melinda Gates Foundation, investing principally in biomedical science, the medical humanities and public engagement. The Trust is providing part-funding for the work of the Review, and hosting the team at its London headquarters.
7. The Review will be tweeting about the report via its official account, @ReviewonAMR

This press release will also be available on Thursday 19 May at www.amr-review.org.

Media enquiries should be addressed to the AMR team on: info@amr-review.org and 020 7611 5722.

Additional quotes

Richard Bergström, Director General of the European Federation of Pharmaceutical Industries and Associations (EFPIA), said:

With the Industry Declaration in January 2016, EFPIA and its member companies have shown that the biopharmaceutical industry stand ready to play a new role in combatting AMR. The report from Jim O'Neill shows the need for new approaches to collaboration, for stewardship, and for complimentary business models. EFPIA will support national governments and international organisations in delivering on the proposals from O'Neill's review.

Lelio Marmora, Executive Director of UNITAID, said:

"The invention of antibiotics in the mid-twentieth century was one of the greatest medical breakthroughs of the modern era. Future generations will judge us harshly if we fail to halt and reverse the spread of antimicrobial resistance. I therefore wholeheartedly applaud the AMR Review's proposals to incentivize the introduction of new drugs to replace ones that are failing as a result of mounting resistance."

Professor Liu Peilong, Director of Department of Global Health, School of Public Health, Peking University, said:

The responsibility of tackling Antimicrobial Resistance (AMR) is global. Lord Jim O'Neill's final report sets out detailed proposals for new interventions to support global action. The global community should seize the historic opportunity of the G20 and the UN General Assembly to make a breakthrough in combatting drug-resistant infections in the year of 2016.

Takuko Sawada, Senior Executive Officer and Member of the Board of Directors, Shionogi & Co. Ltd.

"The World is running out of treatment options for the most resistant bacteria, and this situation is going to get substantially worse unless we take action. Congratulations to Lord O'Neill and his team at the Review on Antimicrobial Resistance for raising the visibility of this critical issue and proposing actionable solutions. As one of the few pharmaceutical companies still developing new antibiotics we are committed to our efforts to deliver new treatment options, and hope that governments and regulators will align around the recommendations in this report."

Paul Stoffels, M.D., Chief Scientific Officer and Worldwide Chairman, Pharmaceuticals, Johnson & Johnson, said:

"We are pleased that the efforts of the UK AMR Review have brought further visibility to the public health threat posed by antimicrobial resistance and have highlighted that global collective action is needed. Antimicrobials are the backbone of modern medicine, and they have played a key role in increasing life expectancy globally. At Johnson & Johnson, our long-standing commitment to innovation in antimicrobial R&D is evident in our medicines and surgical technologies, and our

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efforts to support ongoing research. In addition to antibiotic stewardship, we need new antibiotics and vaccines which will require commitments from all stakeholders: governments, academia, healthcare providers and the innovation-based healthcare industry. All parties have to be able to share the risk of investments in basic science and support novel incentive models.”

Karl Rotthier, CEO of DSM Sinochem Pharmaceuticals, said:

“I am glad to see the final recommendations of the AMR Review! It is imperative that we address the issue of AMR on a global scale, using the ‘one-health’ approach as put forward. Only by addressing human use, veterinary use and the role of the industry, we have a chance against microorganisms that increasingly become drug resistant. In the case of antibiotics production, both regulators and the industry must take urgent action. Mechanisms for higher standards and transparency through the supply chain need to be established, something we have seen successfully happen in other industries. At DSM Sinochem Pharmaceuticals, we believe the industry should stop buying, selling and making dirty antibiotics. We are committed to sustainable antibiotics production and hope everyone in the industry will follow suit.”

Freda Lewis-Hall, Chief Medical Officer, Pfizer Inc., said:

“More than ever, the world needs new approaches to preventing and fighting infections. Pfizer commends the AMR Review for increasing awareness that the frontline tools of microbial infection control—antibiotics, vaccines and diagnostics—are undervalued by the very society that needs more of them. In keeping with the Industry AMR Declaration, we call on governments to align their policies with the value of these therapies, encouraging R&D and providing novel IP mechanisms and market-based incentives to increase humanity’s storehouse of new therapies, while safeguarding the effectiveness of current ones.”

Ilaria Capua, DVM PhD, Member of the Italian Parliament, said:

“It is unethical and unfair that our generation doesn’t manage and resolve the issue of antimicrobial resistance, expecting that our children and grandchildren suffer the costs in terms of lost lives, ill health and financial exposure. Jim O’Neill and his group have presented the scientific community and stakeholders with an outstanding synopsis of intervention strategies which need to be implemented, which embrace the “One Health” vision. At this point we have no more excuses, it is our responsibility and a moral imperative to follow these guidelines and leave the younger generations with the world they deserve. Healthier.”

Florence Séjourné, CEO of DA VOLTERRA and Biopharmaceutical companies from Europe innovating in Anti-Microbial resistance (BEAM) Alliance Representative, said:

“Biotech companies such as members of the BEAM Alliance are strongly supportive of the vision and pragmatic solutions proposed by the UK Review on AMR. We, as actors of innovation in the field, face every day the funding needs, path to market and other healthcare payers issues well raised by the Jim O’Neill team, which limit and even sometimes prevent us from translating potential great innovative ideas to products on the market. We are hopeful that worldwide leaders will not only acknowledge conclusions of this report, but actually decide to join forces and act now to win the battle against resistance to antibiotics.”

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Dr Sanjeev Chaudhry, Managing Director of SRL Limited (India's largest diagnostics network) said:

"India, South Asia and most of the developing world needs to be fully aligned and alive to the monumental risk posed by rampant misuse and abuse of antibiotics. These lifesaving innovations of medical world face the risk of becoming inconsequential, if the state policy does not pledge itself to responsible use of antibiotics with strict surveillance and exemplary penalties for misuse and abuse."

Duncan Sinclair, Waitrose Agriculture Manager, said:

"At Waitrose we fully support the conclusions of this report, and the findings that the use of antibiotics in agriculture needs to be carefully considered and properly measured. Antibiotics should only ever be used in the livestock supply chain when welfare would become a serious concern if not prescribed and only after preventative measures and non-antibiotic interventions have been exhausted."

Professor Bo Zheng, Professor at the Institute of Clinical Pharmacology, Peking University First Hospital, and Deputy Director of Academic Committee, China Antimicrobial Resistance Surveillance System, said:

"Lord O'Neill and his team's hard work over the past two years has crystallised into this comprehensive final report. Its central message is very clear: we must act now, and we must act together. Now is the time when the momentum is greatest, and togetherness is the basis of meaningful actions. AMR is a "global" crisis: it has both global and local dimensions. With the effective actions as illuminated by this report, we can transform the AMR crisis into an opportunity of equal magnitude."

Professor Jonathan Cooke of Imperial College London and the University of Manchester, said:

"As there is a direct relationship between the use of antimicrobials and the development of resistance, governments should consider any practice that reduces the inappropriate use of these agents. Lord O'Neill's report recognises the importance of point-of-care diagnostic testing, especially in primary and community care, which should be available to help prescribers and their patients to more easily decide when and when not to use antimicrobials."

Dr Catharina Boehme, CEO of Foundation for Innovative New Diagnostics (FIND), a Swiss non-profit focused on increasing access to affordable diagnostic tests in developing countries, said:

"Diagnostic tests are the foundation for guiding appropriate therapy decisions, and critical in the fight against antimicrobial resistance. A replenished drug pipeline alone will not be sufficient. It is imperative to move to a test and treat approach to confirm the need for an antibiotic – not only in North America and Europe but globally. The development and introduction of these new tools will require the level of support the Review is advocating. With targeted funding for innovation, a big difference can be made quickly in the fight against AMR."

John Bishop, Chairman and CEO of Cepheid, a molecular diagnostics company in the US, said:

"The final AMR report notes that 'rapid diagnostics could transform the way we use antimicrobials in humans and animals' – we agree, and indeed think in many ways they already are, as indicated by the widespread adoption of rapid TB testing performed in over 100 countries around the world. Our 'Diagnostics First' campaign similarly stresses the value of rapid diagnostics to guide antibiotic treatment decisions. When coupled with the highly-portable testing platforms now available, it is

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possible to bring infectious disease testing to the patient whether that patient is in Nairobi or Nashville.”

Giovanni Monti - VP, Director of Healthcare Innovation, Walgreens Boots Alliance, said:

"We firmly believe that strong awareness, prevention and tight medicine and therapy management are effective ways to improve outcomes and reduce costs for the healthcare system. Walgreens Boots Alliance supports the Review's recommendations. As the first global pharmacy-led health and wellbeing enterprise, we strive to provide a more convenient access to vaccinations. We are also committed to work, together with the other healthcare professionals and regulators, on adopting rapid diagnostics that enable evidence-based prescribing".

Jeremy Collier, Founder and CIO of Collier Capital and Founder of the Farm Animal Investment Risk & Return (FAIRR) Initiative said:

"The stakes could not be higher. On the line are millions of lives and billions of dollars. Many global investors are now looking closely at whether the world can prevent further antimicrobial resistance; the rise of drug-resistant infections will ultimately threaten the value of all our pensions and savings. Only last month a trillion dollar coalition of investors wrote to ten of the largest global food companies asking them to curb antibiotic use. This is likely to be just the tip of the iceberg of investor action on this issue, and this Review is a welcome step in the right direction."

Dr. Julie Gerberding, Executive Vice President, Strategic Communications, Global Public Policy and Population Health, Merck & Co., Inc, Kenilworth, NJ, USA:

We commend the Review team for their role in advancing the dialogue on antimicrobial resistance, highlighting the societal value of antimicrobials, and encouraging greater collaboration to combat this global public health threat. As a company actively investing in research and development of new investigational medicines and vaccines designed to overcome AMR, Merck is committed to working with governments, healthcare providers, patients, and others to address the economic challenges of developing needed antibiotic innovation, promote appropriate use, and enhance access for patients.

Doris-Ann Williams MBE, Chief Executive of the British In Vitro Diagnostics Association (BIVDA), said:

"The importance of in vitro diagnostics (IVDs) in tackling the AMR challenge cannot be overstated. BIVDA welcomes the Review on Antimicrobial Resistance's acknowledgement that diagnostics are key to preventing the unnecessary use of antibiotics. Urgent action is required to halt AMR and we strongly urge healthcare professionals in the UK to make use of the quick, accurate and effective IVDs already available to them. We hope that the Government will support these recommendations to help the IVD industry continue to play its part in protecting human health from the threat of AMR".

Dr Virginia Acha, Executive Director, Research, Medical & Innovation, Association of the British Pharmaceutical Industry, said:

"Lord O'Neill and his team have successfully focused the attention of us all – governments, healthcare professionals, industry, the research community and the public – to address one critical challenge: how can we prevent and eradicate drug-resistant infections and defeat the rise of the superbug. This will be a defining challenge for our generation, and one that if we do not meet together, threatens to rewind the clock on modern medicine. This Final Report maps the destinations we need to reach to address drug resistance; the details of how we get there will be our work for the coming months in partnership with everyone involved. Addressing drug resistance is everybody's

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responsibility. There are a range of initiatives described in the Final Report to address the need to value these therapies, encourage greater R&D and better stewardship. We look forward to discussing these with the AMR Review Team and working alongside all partners to move forward and deliver an effective and sustainable global response."

David J. Ecker, Ph.D, Divisional Vice President, R&D, for Abbott's Ibis Biosciences business, said:

"Abbott is encouraged that the O'Neill Review recognizes the role of diagnostics in its recommendations to address AMR. Innovative diagnostic tools are emerging that are designed to help physicians rapidly and optimally treat infectious diseases. Financial incentives, governmental collaboration and policy level mandates will be necessary to adopt these tools into clinical practice, which could help enable responsible antimicrobial use."

Avi Pelossof, Global President of Infectious Diseases, Alere Inc., said:

"Alere is delighted that rapid diagnostics have been recognised as an integral part of the overall AMR global strategy - highlighting the need for medical professionals to make better use of existing evidence-based and cost-effective technologies, such as CRP point of care tests, enabling all countries (regardless of their income) to have improved access to diagnostics and stimulating the development of new and innovative alternatives."

Steve Bates, BIA Chief Executive, said:

"The BIA welcomes this comprehensive and thorough Review. The UK has a vibrant life science ecosystem of companies with the capabilities and ambition to make a real difference in tackling the global challenge of antimicrobial resistance. The new market incentives identified by the Review are key for life science entrepreneurs to deliver the next generation of antibiotics we all need."

Neil Murray, CEO, Redx Pharma Plc, said:

"There can be no excuses from this point on - the health catastrophe unfolding around AMR has been set out clearly by the O'Neill Review team. There has been talk of the industry's moral duty to address this issue but the responsibility falls on all members of society to ensure that we avoid the drastic consequences of antibiotics failing. Lord O'Neill's recommendations are profoundly insightful and are about achieving fundamental change. The pharma industry knows the challenges it faces and the recommendations around the Innovation Fund and new commercialisation models are a significant step forward. Critically, however, there is also a route map here for governments and the agencies governing both human and animal health around the world. Post-O'Neill, it is only with a new and collective sense of responsibility that we will have any chance of securing a safer future."

John Rex, Chief Strategy Officer, AstraZeneca Antibiotics Business Unit, said:

"We applaud the UK AMR Review for drawing global attention to the urgent need for a mixture of actions to address the rapid spread of antibiotic-resistant infections and we believe that financial support for the required work must be funded broadly by society. An important element of this will be creation of novel commercial models that effectively incentivize sustained development of novel therapies. Such models should recognize antibiotics as the healthcare equivalent of the fire extinguisher: they must be available on the wall at all times and have value even when used only infrequently. We are actively seeking to implement such models in partnership with local governments and in alignment with the Industry Declaration on Combatting Antimicrobial Resistance released at the 2016 World Economic Forum (<http://amr-review.org/industry-declaration>)."

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Dr David Williams, CEO, Discuva, said:

“We welcome the O’Neill Review on Antimicrobial Resistance as an important contribution to the fight against drug-resistant superbugs. In recognising and quantitating the social and economic factors preventing threat eradication, a critical step forward has been made in the international debate for solutions. Inventive suggestions for re-establishing a financially viable ecosystem in this area were also made, which should be considered along with other ideas to invigorate and sustain the development of new antibiotic drugs. The Prime Minister in commissioning this review has started a vital initiative and, whilst recognising there needs to be global support from the G20 group, there is an opportunity for the UK to continue the lead in this area by implementing unilateral actions and we look forward to this response in due course.”