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The G7 Summit 2021: Time for our world leaders to step up to the challenge of Anti-Microbial Resistance

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In June 2021, I wrote a strongly worded opinion piece published in the New Statesman about the G7 Summit and Anti-Microbial resistance (AMR) [1]. The piece highlighted that AMR should be addressed in the G7 Summit agenda and that our World leaders must recognise that research and investment into feasible solutions is urgently needed. This personal view adds to that original article.

The G7 Summit took place in Carbis Bay, Cornwall on the 11th-13th June 2021 and the UK took Presidency of the G7 group of nations [2]. , The G7 comprises seven member countries including UK, USA, Canada, Japan, Germany, France, Italy & the EU. The summit represented over 60% of people living in the democratic world i.e. over half the World's economy [3]. In numbers, that is 2.2 billion people being represented by 11 leaders making serious decisions around one table in Cornwall. The theme was "Build Back Better". The main priority during the UK's presidency is "leading the global recovery from coronavirus while strengthening our resilience against future pandemics" [4].

Antimicrobial resistance [AMR] (or "antibiotic resistance" when referring to bacteria) is an insidious and silent pandemic that is already happening. It is not a future pandemic and the microbiology community are well aware of this. For those unfamiliar with AMR, it is one of the most urgent global healthcare challenges for the human species alongside Climate Change. Microorganisms such as fungi, parasites, bacteria and viruses which can cause infections have and are evolving to become resistant to the antimicrobial drugs that we use to treat them. Overuse of antimicrobials in healthcare, animals and the environment has significantly accelerated AMR globally [5]. The latest figures suggest AMR will cause over 10 million deaths per year by 2050 which is more than deaths from cancer and diabetes combined, and more than the current COVID19 death toll of 4.5 million deaths worldwide since 2019 [6,7].The issue of AMR was covered in depth at the G7 Summit specifically

in the G7 Carbis Bay Health Declaration and in detail within the G7 Communique by the Health ministers released on 4th June 2021 [8] [9]. The Communique in particular makes frequent reference to tackling AMR specifically in a “One Health” Context and is generally a progressive and positive policy document acknowledging AMR and highlighting potential solutions [9] This is a “must read” for those interested in AMR developments, solutions and policy. The importance of a “One Health” approach to AMR is paramount to implementing effective solutions, which include (but are not limited to) antimicrobial discovery, vaccines, diagnostics, stewardship and infection control & prevention (IPC) [6].

The main approach to tackle AMR has relied on antimicrobial discovery and development. While there is merit to this approach, the antibiotic discovery economic pipeline is *still* broken and this requires investment and long term planning to address effectively, a recent WHO report did indicate that “none of the 43 antibiotics in development target the most antibiotic resistant bacteria” which is worrying long term [10]. However, the G7 Health ministers have discussed the importance of subscription models for antibiotic use as being a possible solution [9]. The UK is currently trialling this subscription model for antimicrobial use, with highly anticipated results [11]. Microbial evolution of resistance to antimicrobials does not appear to be acknowledged in documents, however. This is important to note as we must stay ahead of microorganisms which are developing antimicrobial resistance by producing more new antimicrobial drugs. Alternative approaches include looking at Vaccines as a targeted solution to prevent AMR infections [10]. However, if we are truly learning lessons from the COVID19 pandemic then there is the obvious topic of overcoming Vaccine Hesitancy and increasing Vaccine Confidence, which the G7 have also acknowledged [9,12].

Diagnostics, however, are a feasible alternative solution to tackle AMR by enabling clinicians to rationalise critical antimicrobial use and increase antimicrobial stewardship. However, there has been limited global funding to accelerate diagnostics development for AMR infections [13] Development of innovative technologies to detect antibiotic resistant infections is critical to help preserve our last lines of working antibiotics. Improving antibiotic prescribing practice by encouraging development of new innovative diagnostics is key within the UK Five Year AMR National Action Plan and the AMR review written by Lord Jim O’ Neill in 2014 [6, 14]. Currently, patients who show signs

of bacterial infection are given empiric antibiotic medication (broad spectrum antibiotics) to ensure that the disease does not progress [15]. Clinical samples from the infective site are transported to hospital laboratories, either from GP surgeries or from hospital wards, which can affect sample stability and reliability of results. Laboratory testing consists of microbiological culture, antimicrobial susceptibility disc testing and rapid PCR testing in algorithm, all of which require resources and time (2-3 days) to generate accurate results [6][16][17]. In the UK, 70% to 80% of all antibiotics are prescribed in the community and 23% of these are thought to be unnecessary [18][19].

Current diagnostic tests employed at point-of-care often rely on detection of inflammatory markers, such as C-reactive protein, for indication of bacterial and viral infections [20][21]. While these are now becoming widely adopted across the NHS, there are issues with the appropriateness of using non-specific inflammatory markers (which do not differentiate between co-morbidities, such as arthritis) to specifically detect bacterial infection and aid stewardship [22].

Hence, investment into novel diagnostics for AMR, ideally for use at point-of-care, could help to rapidly diagnose patients with AMR infections without relying on empiric methods, assist in tailoring effective antibiotic treatment regimens and promote antibiotic stewardship. Rapid identification of the AMR infection would reduce patient mortality, transmission of infection, and reduce costs to healthcare providers. The benefits of diagnostics as an alternative approach are huge. There is also an urgent need to develop low-cost and portable diagnostics for use in LMICs (low to middle income countries) where access to medical care is limited and patient suffering/mortality is high [17].

Another approach is Infection Prevention and Control (IPC). IPC solutions in the context of AMR appears to have been overlooked in recent years despite its obvious important links to water sanitation and hygiene (WASH) [23]. However, in the G7 Health Ministers' Communique, IPC is noted as being essential to addressing AMR effectively "*The pandemic also highlighted the importance of infection prevention and control (IPC) measures to tackle AMR, targeting both healthcare-associated and community-associated infections*" [9]. IPC is at the core of preventing pathogens from transmitting to patients, thus preventing acquisition and subsequent infection in healthcare settings and within the community. Education surrounding hand hygiene has increased

in relation to the COVID19 pandemic, however, there appears to be a public misconception that hand sanitiser is the main way of preventing transmission of infections. There is still a gap in public understanding that hand washing with soap and water is the best way of removing microorganisms to prevent infection [24]. There are several reasons that IPC has previously been overlooked; partly due to assumptions that current IPC are fit for purpose for decontamination of all AMR microorganisms; that biocides/disinfectants are working effectively in healthcare settings; assuming that emerging biocide resistance is not an issue and placing hygiene and sanitation as larger infrastructure issues to be dealt with by policy makers/governments [24][25].

In LMICs the burden of AMR is high due partly to the lack of access to healthcare facilities, infrastructure and WASH. If we consider the world population is predicted to increase to 9.7 billion by 2030 that also puts additional strain on sanitation infrastructure in highly populated countries [26]. The majority of faeces/sewage produced by human populations is released into water without treatment [5]. This has led to increased persistence of AMR genes across the environment and has contributed to AMR gene movement across ocean currents. This gene dissemination has been further impacted by Climate Change and global temperature rise; AMR genes have even been found in the artic [27, 28]. The key thing for our World leaders to realise is that these Global Health Challenges impact one another significantly.

An important point to note here is that UK Overseas Development Aid cuts have severely impacted the AMR research community globally, and many collaborative UK research projects in LMICs have had to be abandoned [29]. Finally, education still presents as the most obvious way of preventing over use of antimicrobials. By informing the public, healthcare professionals and world leaders, we can highlight that antimicrobials are a finite, precious resource that need to be protected and used sparingly.

The outcome of the 2021 G7 Summit has actually been hopeful for AMR. While we still have significant hurdles to overcome in developing sustainable solutions to tackle AMR long term, the acknowledgement of AMR within the G7 documents is an important step forward. Investing in multiple solutions is perhaps the best strategy to ensure we stay ahead of the microbes. Solutions such as antimicrobial development pipelines, subscription models and alternatives such as AMR

stewardship, vaccines, clinical education, diagnostics and IPC all require research and development. It is colloquially said that "*the proof is in the pudding*." Well I, amongst others in the AMR sphere, am pretty interested in what that pudding looks and tastes like! Will the resilience strategy survive the true test of AMR? Only time will tell.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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