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

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

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

59 of bacterial infection are given empiric antibiotic medication (broad spectrum antibiotics) to ensure
60 that the disease does not progress [15]. Clinical samples from the infective site are transported to
61 hospital laboratories, either from GP surgeries or from hospital wards, which can affect sample
62 stability and reliability of results. Laboratory testing consists of microbiological culture, antimicrobial
63 susceptibility disc testing and rapid PCR testing in algorithm, all of which require resources and time
64 (2-3 days) to generate accurate results [6][16][17]. In the UK, 70% to 80% of all antibiotics are
65 prescribed in the community and 23% of these are thought to be unnecessary [18][19].

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

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

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

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

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

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

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

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

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122 **Conflicts of interest**

123 The author declares that there are no conflicts of interest.

124

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