European Cells and Materials Vol. 42 2021 (pages 154-155) DOI: 10.22203/eCM.v042a11 ISSN 1473-2262

EDITORIAL – INFECTIOUS-DISEASE RESEARCH DURING A PANDEMIC: THE IMPORTANCE OF GLOBAL UNITY

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Throughout history, infectious diseases have taken a devastating toll on the lives of people around the world. With the ongoing coronavirus disease 19 (COVID-19) pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), we are experiencing an overwhelming situation that has not been seen since the start of the influenza pandemic approximately one century ago (Morens *et al.*, 2021). The COVID-19 pandemic has reaffirmed the potential of infectious diseases to impart an enormous societal impact when adequate prevention or treatment strategies are not available. Against this background, scientific research has once again taken centre stage, with implications reaching far beyond the laboratory and even beyond the clinic. The scientific advances in infectious disease research that have provided many preventative and therapeutic solutions will surely again be needed not only to counter future outbreaks but also to address the ongoing threat of antimicrobial resistance (AMR) (Tacconelli and Pezzani, 2019).

The recent pandemic has brought extra attention and funding to certain areas of infectious-diseases research; however, there are several challenges. One such challenge is that the COVID-19 pandemic threatens to absorb available funding, extending beyond the immediate short-term situation. For example, funding of major programmes (*e.g.* cancer) has been disrupted due to a diversion of resources to COVID-19 research (Sohrabi *et al.*, 2021). Furthermore, the closure of laboratories and universities during the pandemic means that researchers face challenges in completing projects by their deadlines and grant completion dates (Stoye, 2020). The prospect of a long-term economic downturn also means science funding could face longer-term impacts (Stoye, 2020). While tremendous efforts are appropriately deployed to rapidly adapt programmes and avoid catastrophic scenarios, basic infectious-disease research should be part of the future strategy and protected as such, rather than facing cutbacks. Additionally, and maybe even more important, the current pandemic became a worldwide reality check confirming the fact that controlling infectious diseases is necessary not only to sustain human health, but also to protect the global economy and our social system as a whole (Bloom and Cadarette, 2019; Metsemakers *et al.*, 2021). Whether the global health system as currently constituted can provide effective protection against an expanding and evolving array of infectious disease threats has been called into question by recent outbreaks of Ebola, Zika, Middle East respiratory syndrome (MERS) and the present COVID-19-pandemic as well as due to the looming spectre of AMR (Bloom and Cadarette, 2019). AMR is widely regarded as one of the global public health challenges of the 21st century (Ardal *et al.*, 2020). In recent years, the U.S. Centers for Disease Control and Prevention (CDC) (Web ref. 1), the World Health Organization (WHO) (Web ref. 2) and the World Bank (Web ref. 3) have recognised that AMR is one of the most serious public health and economic threats of the future. The current situation is alarming. A study conducted to estimate the incidence of infections due to antimicrobial-resistant pathogens analysed data from 2015 related to the European Antimicrobial Resistance Surveillance Network (EARS-Net) and showed a substantial increase in infections with antibiotic-resistant bacteria since 2007 (Cassini *et al.*, 2019).

Despite a realisation of the threat posed by AMR, substantial progress has not been made over the past decades in addressing this issue. Although knowledge of the molecular mechanisms

of AMR and factors involved in dissemination of AMR pathogens has improved, new antimicrobial discovery and development has remained low on the priority list of many policymakers and research funding has lagged behind other areas of medicine (*e.g.* cardiovascular disease). The situation is exacerbated by the challenging business case for new antimicrobial development in the pharmaceutical industry. The need for expensive clinical trials and the risk of AMR rendering any new antibiotic ineffective within a short time frame means it is challenging for industry to get an adequate return on investment for the development of new antibiotics (Metsemakers *et al.*, 2021). Furthermore, as older, out-of-patent antibiotics are still effective for treating most infections, the primary value of new antibiotics is to treat the comparatively less frequent multidrug-resistant bacteria. As the development of resistance is hastened by use, new antibiotics are stewarded as a last resort therapy, which results in low unit sales, rendering them unattractive for development (Ardal *et al.*, 2020).

With the current pandemic running at full force on a global scale, the research community (*i.e.* scientists, physicians, governmental institutions, pharmaceutical companies) acknowledged that collaboration is key to address not only COVID-19 but also infectious diseases in general. It is this spirit of global solidarity and unity that is crucial to defeat this 'new' threat but also to prepare the world for future pandemics and focus the public eye on the importance of continuing research in the field of infectious diseases and AMR.

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