

# Future biological threats and mitigation



**White Paper**  
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## **FOREWORD**

Though hopefully nearing its end, Covid has been a two-year long world war, killing hundreds of thousands of innocent people and severely damaging our economies. Whatever its cause, we cannot afford to be as badly prepared next time, not least because a similar pathogen could be deliberately deployed against us. Bio security is now as vital as conventional defence.

We should not wait for the official inquiry into who did what in Whitehall: its report may be years away. As this important paper explains, there is much that we can do now to improve global early warning systems and make countries follow stricter rules in their research laboratories. Strengthening our domestic resilience is equally urgent: because of our population density and our vulnerability as an international hub, Covid hit the UK hard.

So we need to upgrade our biological protection from backward-looking “Test and Trace” systems to real-time autonomous DNA sequencing that can give our national and local agencies actionable intelligence to head off the next pandemic before it gets rooted. The technology is already here, developed by cutting-edge bio security companies such as Kromek. Deploying it at our airports and ports and in our urban centres would better protect us against the next pandemic.

**SIR MICHAEL FALLON**

**UK Defence Secretary 2014-17**

## **KROMEK THOUGHT LEADERSHIP – BIO SECURITY**

*If Covid were a terror event, it would be the most disruptive terror event in history. It may have caused the biggest disruption to the planet since World War 2.*

*Biological weapons are morbidly brilliant and if you have no morals or scruples you would use them all the time. Most of our State and Non-State adversaries appear to have no morals or scruples.*

### **OBSERVATIONS/RECOMMENDATIONS**

- Global and national governance and regulation require review
- Time to revamp and invest in the Biological and Toxin Weapons Convention
- Global and national pandemic early warning systems are key to preventing future pandemics
- The UK Government's bio security strategy and procurement plans should be developed to ensure future resilience

James Bond's mission in 'No Time to Die' is worryingly close to the real-life developing threat of genetically modified pathogens, and the ease of synthetic biology in basic laboratories opens up this spectre to a wide range of bad actors. Covid is our wakeup call because it is significantly more contagious than other recently emerged viruses such as SARS. We are still some way from knowing for sure the origins of the virus, but it is crucially important that we do, in order to be resilient to the next pandemic. Covid appeared to emerge in a form already infectious to humans, unlike SARS which mutated gradually. How this virus became prevalent has been subject to many theories and speculations, however the effect of this is felt all round the globe.

The Chemical Weapons Convention (CWC) policed by the Organisation for the Prohibition of Chemical Weapons (OPCW) has removed most proscribed chemical weapons from the globe and is well-funded and well supported by most members of the UN. Conversely, the Biological and Toxin Weapons Convention (BTWC), is poorly funded and supported at the UN and has no organisation to regulate and police it. It is possible that Covid was caused by a laboratory accident, a key vulnerability which the BTWC should regulate and police.

## **BIOLOGICAL THREATS**

The explosion in synthetic biology technology and the 3000+ bio secure labs around the world, working on pathogens, creates a massive vulnerability in this area. Covid is showing what impact a not very virulent pathogen can have on global stability, and this will not go unnoticed by State and Non-State actors.

Covid has shown that even low-virulent pathogens can have strategic impact and create a massive terror effect. The area of bio security in the food production sector could also be a target area in future.

Viruses and bacteria aimed at the food chain have the potential for massive disruption and destabilisation.

### **SO WHAT?**

Covid has highlighted the potential destructive power of pandemics and biological weapons. The opportunity for 'terror', whether deliberate or accidental, is legion; how do we become more resilient in future?

**Governance** – The need to consider future resilience. Perhaps a "World Health 20" could be established to sit alongside the G20. The lack of support for President Obama's red line on chemical weapons allowed them to proliferate. Their successful use to keep Assad in power in Syria has put us all in greater danger. There needs to be a body equivalent to the IAEA or the OPCW. An extension of the OPCW's remit to cover biological threats would be the quickest, simplest and most cost effective. In the UK, an extension of "CONTEST", the UK Government counter terrorism strategy, might be appropriate – it is an example of 'joined-up' working but needs to go further and connect with health authorities to map and manage bio-threats. The pandemic has revealed the UK's interdependence on the world.

**Regulation** – Regulation and policing in this area is thin at best, non-existent at worst. The BTWC is currently not fit for purpose as it is poorly supported and funded at the UN. A body like the OPCW or extending the remit of the OPCW to include Bio regulation and policing would seem a logical step? Regulation in the food production area seems better and DEFRA reacts quickly to bio security events like bird flu and foot and mouth disease which perhaps provides ideas for wider bio security?

**Detection** - In the bio detection area, MOD and HMG capability is marginal and requires review, as the threat in this area has increased significantly since the current systems were conceived. Test and Trace produces latent intelligence which is days or even weeks old. Advances in DNA sequencing and collection now allows almost real time detection, providing actionable intelligence to commanders and decision makers which was hitherto inconceivable.

Britain is at high risk because of population density, because it is an international travel hub, and internationally co-dependent. A global real-time monitoring system through national and international networks, to provide decision makers with actionable intelligence, is key to any future system to for comprehensive pandemic resilience and prevention. Although it would not identify all infections (because of the time lag caused by incubation periods), it would provide valuable near real time data and the ability to track and monitor virus emergence and spread nationally and globally. Governments must both quickly identify and then control outbreaks and aim to prevent epidemics becoming pandemics. To use the bomb disposal vernacular, 'we need to be left of the bang', and a pandemic early warning system is key to achieving this.

Kromek, supported by the UK and US governments, is developing the technology for military and security purposes, but such technology is also ideally suited to form the backbone for global and national early warning systems. Kromek innovations include the capability for near real-time, autonomous DNA-sequencing of both known and novel airborne and waterborne pathogens, both synthetic and organic.

This is an area where the UK government could lead the world given our home-grown experience and technologies.

**Forensic Trigger and Confirmation** - The envisaged surveillance capability is scalable by being automatous and will provide the forensic trigger to allow the established government and commercial laboratory networks to provide confirmation of threats, pathogens and variants. This will deliver actionable intelligence (which is currently scarce) and is key to preventing future pandemics and terror attacks.

**Innovation** – "Innovation doesn't exist in a vacuum." There has been little innovation in bio security as the incentive to do so pre-Covid was minimal. In the light of the pandemic, innovation is required to develop resilience and mitigation capabilities in the future. We must aim to prevent the next pandemic or bio terror event rather than just react to it. Sources of funding are needed in order to encourage

innovation in bio security, and this is most effective with a government lead. In tandem, regulation is required to produce a comprehensive bio security strategy to enable capability development through government procurement.

**Challenges in government** - Hypothetical crisis management is often not a ministerial priority and local resilience bodies do not always have a voice and vary widely in competence. The Joint Bio-Security Centre's mission is the response to Covid 19; unless this is updated there is nothing in place for resilience and the mitigation of future pandemics. The government review into Covid response could take several years; the next threat may not wait for the review to conclude. Many lessons – some identified in this paper – require action now. To wait for the conclusions of the government review is likely to be too late in order to be fully resilient for the next pandemic. The reliance on scientists, medics, modelling data, but with little real-time information to support their hypotheses, or security and planning experts to turn this information into actionable intelligence, could again skew our approach to the next bio security event. There does not appear to be a single government agency or person responsible for bio security. Hitherto this was a key factor in the food chain resilience, and UK as a nation have reacted well to 'foot and mouth' and bird flu. A DEFRA lead with such experience, might be advisable especially in the short term.

## **Conclusion**

The Covid-19 pandemic must be considered a wake-up call by the global community given the shockwaves of its humanitarian and economic ramifications. In an age of increasingly democratised gene-editing capabilities alongside continued international turbulence, the world must be prepared for the next biological event, whether synthetic or natural, deliberate or accidental. The world cannot wait for endless inquiries into the handling of the pandemic, immediate action is essential.

The UK Government has the capacity to lead the way in developing the technology to prevent the next pandemic and it must exercise its global credentials, setting an example of how to restructure governance and regulation to deliver innovation-led solutions. The business community is ready and willing to support.



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