

## OPPORTUNITY #22

WHAT IF EVERYTHING WE TOUCH HELPED TO KEEP US HEALTHY?

# DR SURFACE

Harnessing the power of novel materials to build healing environments that can also boost health and prevent infections



Penicillin alone is estimated to have saved

**200 million lives**

At least

**700,000**

people die each year due to drug-resistant disease

### WHY IT MATTERS TODAY

Our own immune systems are able to fight germs, but sometimes their response is not victorious over a harmful microbial or viral invader<sup>211</sup> – and this is where medicine comes in.

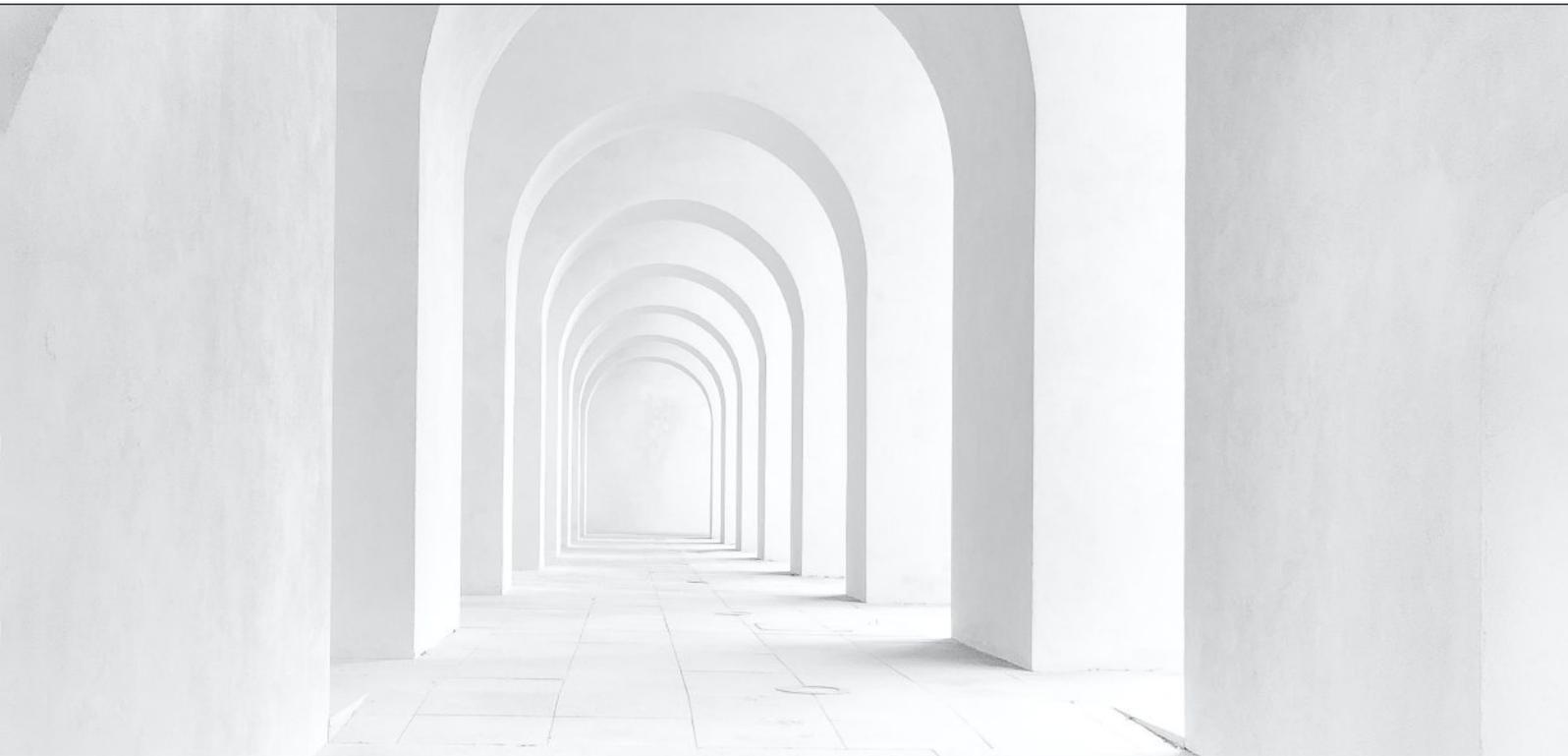
The battle against microbial infection through treatment started in 1796 with Edward Jenner's observation that cowpox vaccination protected against smallpox.<sup>212</sup> Since then, antibiotics have evolved and become widely used.

Penicillin alone is estimated to have saved 200 million lives. However, the list of bacterial strains that cannot be fought off with antibiotics is growing every year. Simultaneously, other disease-causing organisms – such as fungi, viruses and parasites – are developing drug resistance at an accelerated pace. At least 700,000 people die each year due to drug-resistant diseases; by 2050 such diseases could cause 10 million deaths annually.<sup>213</sup>

Available data suggests that the burden of infectious diseases generally leads to negative social and economic impacts due to absenteeism.<sup>214</sup> As an example, half of those who catch the common cold experience a 25% loss in productivity over the span of the illness and are absent for 1 or 2 days.<sup>215</sup>

In 33 OECD and EU/EEA countries, antimicrobial resistance (AMR) results in over 700 million extra hospital days annually, costing their health systems up to \$74 billion.<sup>216</sup>

### SECTORS



## THE OPPORTUNITY TOMORROW

New materials can be used to turn everyday surfaces that are conduits for infection into weapons against them, while aiding in the prevention and treatment of other diseases and mental health conditions.

Bioengineered surfaces can store and release substances in response to triggers from inbuilt sensors. This can not only ward off infection but enhance other aspects of health. For example, walls can be coated to emit stress-reducing pheromones or melatonin to improve sleep quality in minute doses that are absorbed when breathing or via the skin.

Biomimicry can be used to create self-cleaning surfaces to replicate nature's ventilation systems, such as those found in termite nests. Adaptive response materials, with properties such as heat regulation, can be used in flooring or linens to warm or cool homes for optimal temperatures. Naturally antimicrobial and antifungal plants can line indoor areas to prevent infections, and fermented vegetables can be used as coatings to release probiotics for better gut health.

## BENEFITS

These include improved individual health, well-being and longevity. At a societal level, these solutions offer greater access to treatments with lower healthcare spending and enhanced productivity.

## RISKS

Risks include making the human immune system less effective because of lower exposure to pathogens and the emergence of even more virulent drug-resistant pathogens. There is also a risk of malicious use of the technology to release harmful toxins.