

# Targeting Antimicrobial Resistance (AMR) with Innovative Vaccine Therapies

CarboMet

## Relevance and problem

Antimicrobial resistance (AMR) is one of the biggest threats to global health and food security today. The improvident use of antibiotics in clinical settings and animal husbandry has been the major cause for the emergence of AMR and is a major concern for both developed and developing countries. The number of deaths due to infections resistant to antibiotics is projected to reach to 10 million deaths annually by 2050 – more than cancer. The increased resistance and infection rate equates to healthcare and hospital costs of EUR 1.5 billion per year and will surpass EUR 1 trillion by the year 2050.<sup>1</sup> As a result, several initiatives have been introduced by the World Health Organization (WHO) to raise awareness and to promote investments in the development of new treatments.

## Challenges and solution to tackling AMR

The increasing prevalence of AMR can be attributed to three key factors; the lack of public awareness, misuse of antibiotics and the enormous investment gap in the discovery and development of new interventions. It has been more than 30 years since the last class of antibiotics was discovered with many of the 'new' drugs being second and third generation antibiotics without a novel mechanism of action. Even these last resort antibiotics will be inefficient as new resistant strains emerge. The high cost of R&D and low return on investments is one of the major bottlenecks in the discovery process. Investments in fundamental research, new collaborative business models to share costs and incentives for companies are required to develop new innovative therapies to tackle the AMR issue. Carbohydrate based vaccination offers a highly promising alternative solution for the treatment of infectious disease and have several advantages over antibiotics. Vaccines are very specific with minimal side-effects, they are not prone to resistance and can be used to either prevent or fight off infections.

Under the 'One health' philosophy, both human and veterinary health should be prioritised, adopting the same programme and technologies with targets chosen from the global priority pathogens list (Global PPL) published by WHO in 2017. To accelerate the discovery process we identified several areas for investment to address this challenge.<sup>2</sup>

- **Advance sequencing of pathogens and carbohydrate**
- **Vaccine production**
- **Optimising vaccine design and improved robustness**
- **New regulations, IP and ISO standards**
- **Metrology, informatics and data integration**
- **New business models**

## Social and economic impact of AMR

Without the investments and funding required to tackle AMR, the adverse effect will be felt across the European and Global economy. A recent study showed a loss of >10 million working age people per year in the EU/EEA member countries if AMR continues to rise in the next 40 years.<sup>3</sup>

### World Bank estimates of Global AMR impact:<sup>4</sup>

**GDP:** Annual GDP will fall between 1.1-3.8 % by 2050.

**Healthcare costs:** A global increase of upto EUR 1 trillion by 2050.

**Livestock:** Between 2.6-7.5% decrease on global livestock production.

**World trade:** This will decrease by 3.8% if AMR continues to rise.

## References

1. Rappuli, R.; Bloom, D. E.; Black, S. Nature, 2017, 552, 165-166.
2. Carbohydrate Vaccine briefing paper— Carbomet.eu
3. RAND Europe, Estimating the economic costs of AMR, Report 2014.
4. World Bank data, Drug-Resistant Infections: A Threat to Our Economic Future, Report 2017.

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