VitaMins Health
Antimicrobial resistance – AI to the rescue?

Antimicrobial resistance remains in the World Health Organization's (WHO) top 10 global public health threats facing humanity – could AI help us in dealing with this existential risk?

As described in our previous article VitaMins Health: Antimicrobials – don't take them for granted!, the emergence of superbugs resistant to antibiotics and other antimicrobials poses a significant threat to the longevity of people across the globe. Antimicrobial resistance could end up costing the global economy 100 trillion USD by 2050 and a complete failure of antibiotics could result in global life expectancy dropping by around 20 years.

Finding needles in the haystack

A key concern with antimicrobial resistance is the speed at which we can develop new antibiotics to combat resistant superbugs as they emerge; the WHO recently expressed significant concern in the pipeline of new drugs. However, researchers have recently started making significant advances in this area with the help of Artificial Intelligence (AI).

In May 2023, researchers from the US and Canada published research detailing a new antibiotic effective against *Acinetobacter baumannii*, one of the most problematic antimicrobial resistant bacteria around.

The discovery was made possible by AI: the researchers first lab-tested the effect of around 7500 active ingredients of known drugs on *Acinetobacter baumannii* and measured whether they inhibited growth. They then trained a neural network on the results, essentially teaching it to predict whether new molecules it was shown would be effective against *Acinetobacter baumannii*. They then used the AI to shortlist around 200 potential new antibiotics from a field of around 6000. The researchers then went back to the lab to test this shortlist, eliminating those deemed dangerous to humans or too close to existing antibiotics.

The most promising new compound found is known as *abaucin*, and interestingly, compared to other known antibiotics, it seems to work against the bacteria in a completely new way. It also results in a very targeted effect on *Acinetobacter baumannii,* in contrast to most other antibiotics which work on a broad spectrum of bacteria. Maybe AI is identifying effective compounds overlooked by previous research methods.

This is the latest in a growing line of exciting developments using machine learning to increase the pipeline of potential new antimicrobials. The main technologies being used are summarized here; there is real hope that new discoveries like *abaucin* and *halicin* (another antibiotic previously identified using similar methods) will increase as these techniques become more widely used.

Wider applications to help reduce antimicrobial resistance

In addition to developing new drugs, there are high hopes that AI can improve Infection Prevention and Control (IPC), reducing both the use of antimicrobial treatments and the exposure of individuals to resistant superbugs. A recent literature review highlighted the potential for AI to:

- Detect transmission events during outbreaks: AI can analyze large datasets of patient data to identify patterns of infection, identifying outbreaks early and preventing further spread.
- Predict high-risk patients: AI can use data on patient demographics, medical history, and other factors to identify patients who are at high risk for infection. This information can be used to target prevention efforts and improve patient outcomes.
- Development of tailored IPC interventions: AI can be used to develop customized IPC plans for different settings, focusing on the specific risks and challenges of each setting.
- Enhance diagnostics: AI can be used to develop more accurate and rapid diagnostic tests for infections, allowing doctors to identify infections early, when they are more easily treatable.
- Standardize the diagnosis of infections: AI can be used to develop standardized criteria for diagnosing infections, ensuring that patients are diagnosed and treated consistently.
- Facilitate the dissemination of IPC expertise: AI can be used to create educational resources and tools that can help to spread IPC knowledge and best practices.

What does this mean for pension plans and insurers?

As discussed in our previous article on antimicrobial resistance, a future where we can no longer rely on antimicrobials would be bleak, with a dramatic decrease in life expectancy and a significant hit to the global economy. It is a welcome development that Artificial Intelligence is giving us some reasons to be cheerful on this subject. Stakeholders in the long-term longevity of pensioners or insured lives will still want to monitor the ongoing developments in this area to see whether the promise of the AI toolkit really helps treatments keep pace with the emergence of antimicrobial resistant superbugs. At Club Vita we very much hope that it does.

What do you think?

- Will the identification of new potential antibiotics using AI improve the pipeline of new drugs sufficiently?
- Will AI identify new treatments that humans would never have found on their own?
- Are there any other applications of AI that might help with antimicrobial resistance?

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