OPPORTUNITY 1

SCOPE VISIONARY

UNCERTAINTIES

Technology, Systems

MEGATRENDS

Advanced Health and Nutrition

TRENDS

Artificial Intelligence
Biotechnology
Genomics
Open Data
Personalised Medicine

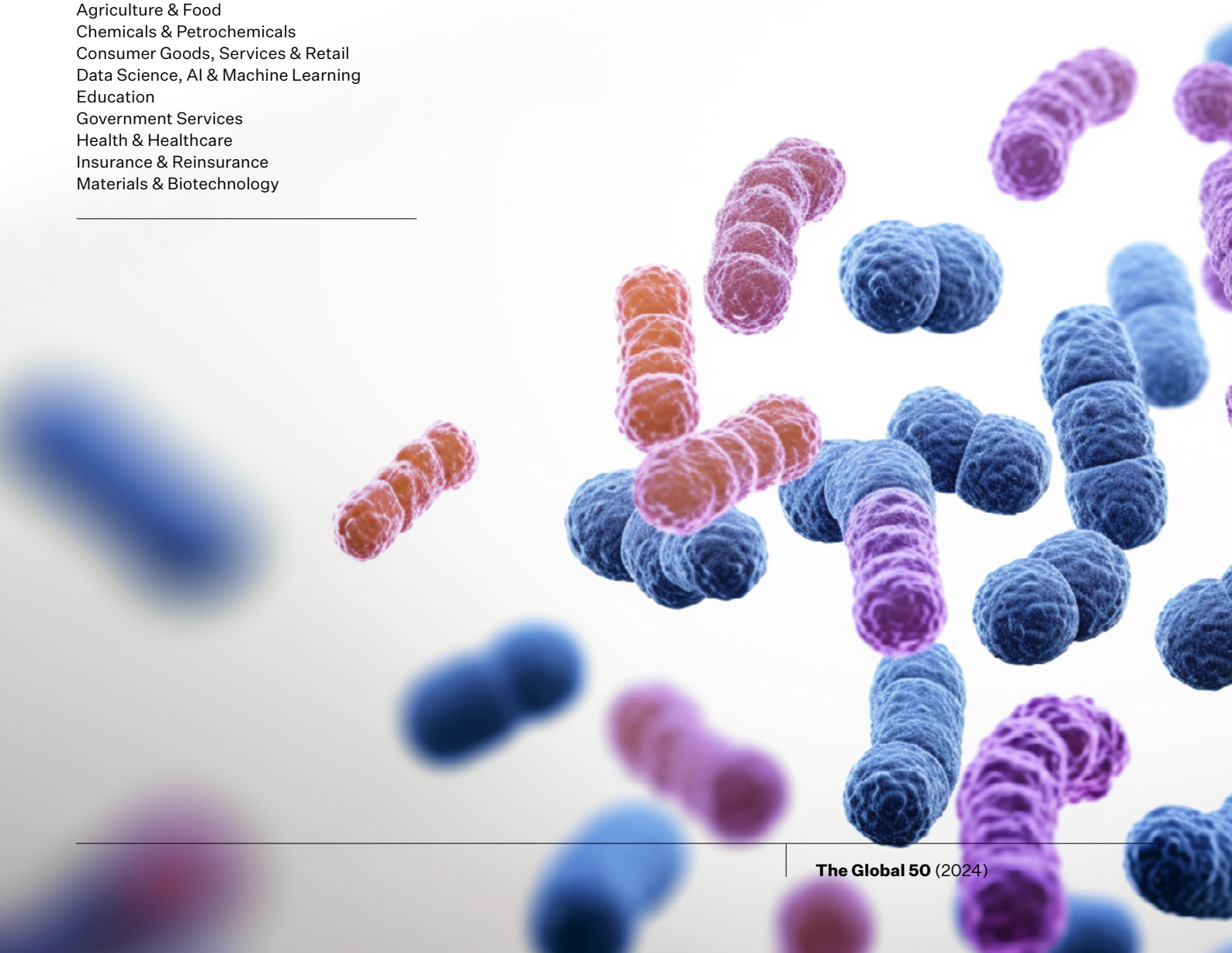
SECTORS IMPACTED

Agriculture & Food
Chemicals & Petrochemicals
Consumer Goods, Services & Retail
Data Science, AI & Machine Learning
Education
Government Services
Health & Healthcare
Insurance & Reinsurance
Materials & Biotechnology

What if bacteria was a cure?

GERMINATING TREATMENT

A global databank of bacterial strains from humans and the environment aids personalised treatments and novel therapies for various diseases.



WHY IT MATTERS TODAY

The 2019 landmark Global Burden of Disease Study found that over 10% of deaths worldwide, and nearly 60% of sepsis-related deaths, were caused by only 33 types of bacteria,[180] guiding possible prevention strategies, better antibiotics, and possible vaccines.[181]

Beyond just bacteria, numerous studies highlight the critical role of microbiota in health and disease.[182] Microbiota includes fungi, yeast, and viruses living in various areas in the human body, including the gut, mouth, lungs, and skin.[183] Microbiota tells us a lot of information about how these organisms interact within specific environments and play a role in health and disease.[184] As a diverse ecosystem, microbes interact with various bodily systems, perform essential biological functions, and contribute to metabolic, immunological, and other functions.[185] The composition of the microbiota can protect or harm health and an imbalance could potentially lead to autoimmune diseases, chronic inflammation, diabetes, obesity, atherosclerosis, neurological disorders,[186] cardiovascular diseases, cancers, and respiratory illnesses.[187]

More extensively studied than others, the gut microbiome – which more broadly refers to genetic microbial structures and environmental conditions[188] – is known to comprise trillions of microbiota and to host up to 1,000 bacterial species, each with a unique role, contributing significantly to health or potentially causing disease.[189] A healthy gut microbiome – of which bacteria are the foundation – is important for both physical health and cognitive function and mental well-being.[190] Certain species of intestinal bacteria can synthesise key neurotransmitters, including serotonin,[191] which is a vital regulator of cognitive health (learning and memory), mood stability, and sleep.[192] In addition to studying the interactions with other microbiota, current bacterial mapping efforts for the human gut are already revealing new species of bacteria[193] with the potential for new disease indicators and treatments.[194]

60%

of sepsis-related deaths, are caused by only

33 types of bacteria

OPPORTUNITY

A global bacterial strain databank – including both human samples and bacterial DNA from a network of nanosensors in soils and oceans – would enhance our understanding of the human microbiome and how microorganisms interact with the surrounding environment. Powered by advanced machine intelligence, known and new bacterial strains and their properties would be mapped and modelled to identify potential treatments for chronic illnesses and diseases.[195]

Mapping the unique bacterial make-up of individuals[196] across different geographies, ages, and geno- and pheno-types (genetic and physical features of microorganisms), together with genetic mapping, would enable the development of personalised treatments informed by an individual's unique bacterial and genomic profile, enhancing efficacy and bacterial survival within the body. Bacterial transplants would modify the microbial environment in the human body to restore healthy microbial function and balance, thereby addressing the root cause of some diseases.

BENEFITS

Once identified, bacteria that contribute to improving physical and mental health are cultured (grown) for use in treatments or prevention. Better understanding of bacteria supports personalised nutrition, the development of new antibiotics, and more targeted use of antibacterials.

RISKS

The identification of new bacterial pathogens with the potential to cause harm. Unintended consequences of introducing novel or engineered bacteria into humans.

Gut microbiome – which more broadly refers to genetic microbial structures and environmental conditions – **is known to comprise**

trillions of microbiota and to host up to 1,000 bacterial species