

## OPPORTUNITY #24

CAN WE EXPLOIT NANOSCIENCE RESEARCH  
TO TARGET SPECIFIC DISEASES?

# MICROSCOPIC MIRACLES

Bringing nanomedicine from  
research to reality in areas that are  
most beneficial to society

### WHY IT MATTERS TODAY

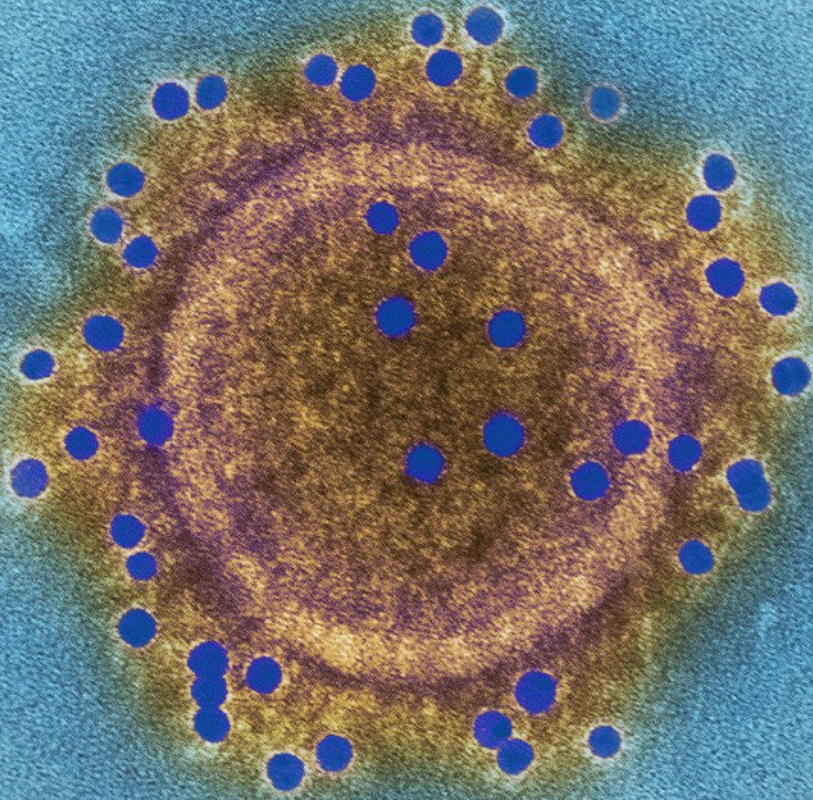
Consider this: DNA is 2.5 nanometers wide. By comparison, a human hair is about 90,000 nanometers in diameter.<sup>227</sup> Researchers are getting closer to being able to work on such a minuscule scale in order to treat diseases from cancer to obesity in a growing field known as nanotechnology.

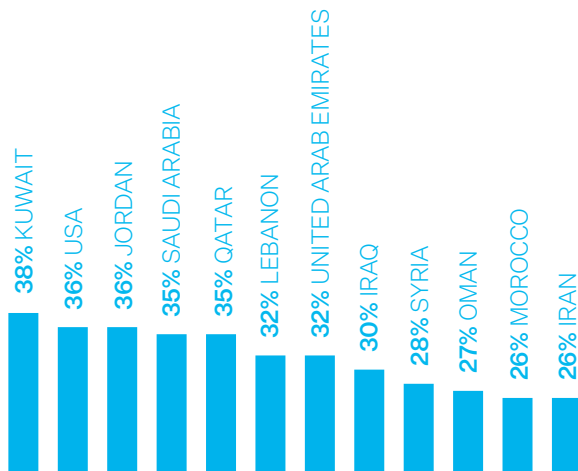
Nanotechnology refers to an engineering activity applied to structures at the nanoscale, which is 1–100 nanometers, each nanometer being one-billionth of a meter.<sup>228</sup> The concept was first introduced by American physicist Richard Feynman in 1959, while Japanese scientist Norio Taniguchi coined the term in 1974.<sup>229</sup>

Nanomedicine, the application of nanotechnology to medicine, encompasses detection, diagnostics, drug delivery,<sup>230</sup> treatment and recovery.<sup>231</sup> Nanomedicine is still in its infancy. With growth led by start-ups and small and medium-sized enterprises (SMEs),<sup>232</sup> the field has rapidly advanced in the last few decades, supported in some ways by advanced intelligence and quantum computing. The market for nanomedicine is expected to grow from around \$190 billion in 2020 to around \$360 billion in 2025 at an annual growth rate of 13%.<sup>233</sup>

### SECTORS

ADVANCED MATERIALS & BIOTECHNOLOGY · EDUCATION · HEALTH & HEALTHCARE ·  
INFORMATION & COMMUNICATION TECHNOLOGY · INSURANCE & REINSURANCE





Based on data from the WHO's Global Health Observatory, **obesity continues to be a burden in some countries around the world.**

Meanwhile, two major global public health challenges continue to elude cures or treatments: cancer and obesity.

Cancer is one of the major causes of mortality and morbidity worldwide, with 10 million cancer-related deaths in 2021 and a total annual economic cost estimated at \$1.16 trillion.<sup>234</sup> By 2030, current projections suggest that there will be a 180% increase in cancer incidence in the Gulf States and the eastern Mediterranean.<sup>235</sup>

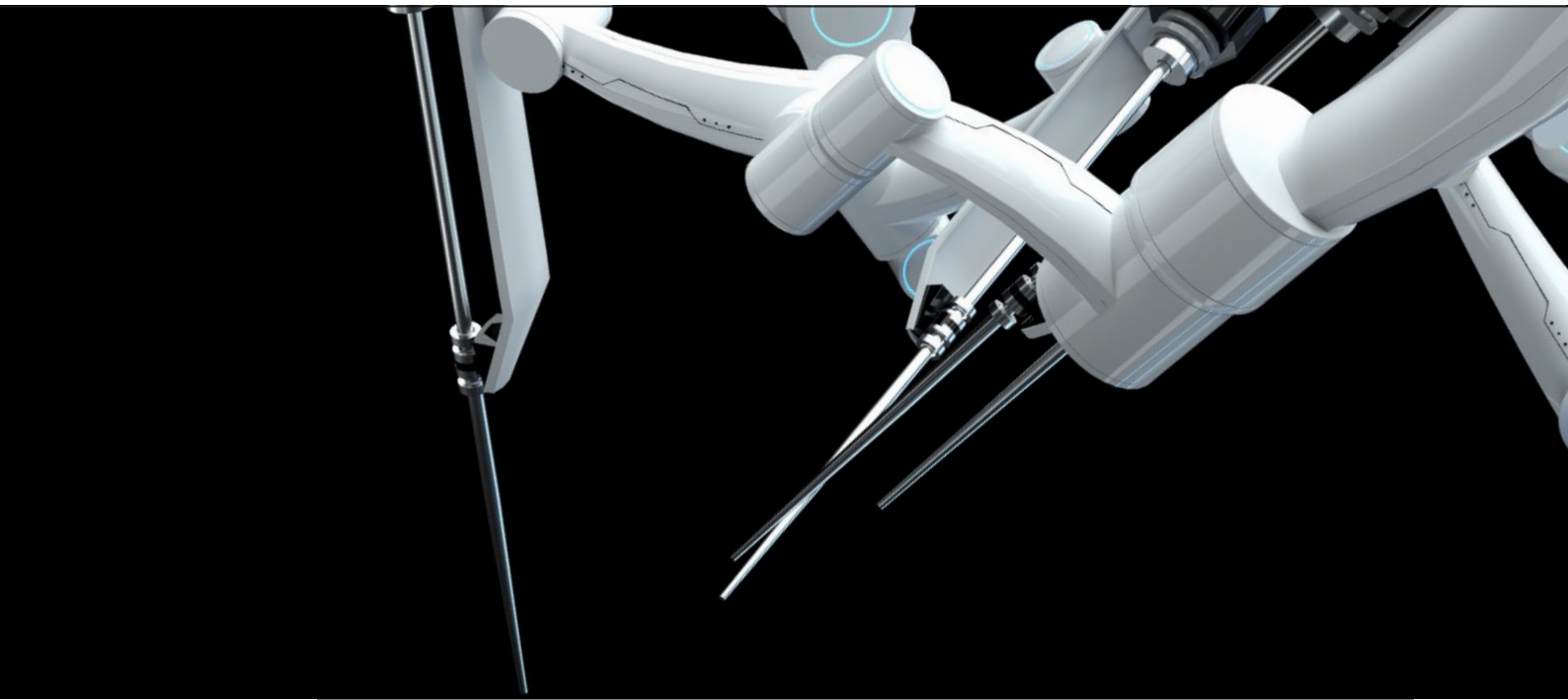
Based on the latest facts reported by the World Health Organisation (WHO), almost 2 billion adults (39% of the adult population) are overweight and 650 million obese.<sup>236</sup> Over 340 million children and adolescents worldwide were overweight or obese.<sup>237</sup> Obesity is estimated to cost health services globally \$990 billion per year or around 13% of healthcare expenditure.<sup>238</sup>

Based on data from the WHO's Global Health Observatory, Kuwait has an obesity rate close to the global average for adults (38%) and was the 11th most obese nation in the world.<sup>239</sup> The United States is ranked 12th with an obesity rate for adults of 36%.<sup>240</sup> The next eight positions (13–20) were occupied by Middle Eastern countries: Jordan (36%), Saudi Arabia (35%), Qatar (35%), Lebanon (32%), the United Arab Emirates (32%), Iraq (30%), Bahrain (30%), Syria (28%), Oman (27%), Morocco (26%) and Iran (26%) for adults.<sup>241</sup>

## THE OPPORTUNITY TOMORROW

Nanomedicine's applications for cancer and obesity could help to reduce the human and financial toll of both conditions.

Nanobots and nanoparticles can be used to analyse conditions and deliver treatments in a much less invasive and more responsive way than conventional practices, reaching all areas of the body, from the skin and internal organs to the brain. Therefore, the technology offers many possibilities, from the potential to diagnose cancer or delivering targeted medical treatments for diabetes to optimising brain development before birth and combatting obesity.



But it has been challenging to transform research advances in nanomedicine into cost-effective commercialisation.<sup>242</sup> Concerns over ethics, safety, intellectual property, scale of investment,<sup>243</sup> manufacturing, quality and government regulations have all hampered scaled advancement in the field.<sup>244</sup>

A greater understanding of the most effective strategies for growth is therefore needed. This can be met by establishing a multi-stakeholder group from the public and private sectors, research entities, future consumers and those leading projects in nanomedicine to set an agenda for the most promising proof-of-concepts.<sup>245</sup> Matching these concepts to needs can establish what would bring the greatest benefit for society. This then helps to target the specific safety, social and ethical issues that need to be assessed to establish specific regulations or control mechanisms.

#### BENEFITS

Nanomedicine can be applied to a wide range of health challenges, including cancer and obesity. A childhood ‘nano-vaccination’ could enable individuals genetically predisposed to obesity to maintain their optimal weight, enabled by nanotechnology, as well as genetics and understanding of metabolic, viral and microbiome profiles. The results of well-deployed nanotechnology could include better lifelong health, prosperity, socialisation and fulfilment.

#### RISKS

Risks include poor-quality nanomaterials, human error causing adverse reactions, deliberate sabotage and social divisions arising from unequal access. Unintentional toxicity may occur in the organs to which nanoparticles move.