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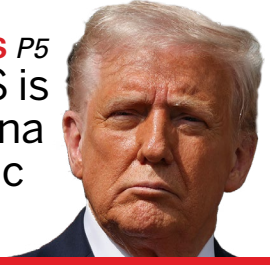

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# MoneyWeek

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# Healthy genes

## Profit from the future of medicine

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# Precision-engineered profits

Developments in genomics are enabling the rise of personalised medicine, with therapies tailored specifically for individuals. Smart investors should buy in now. Matthew Partridge reports

The return of the "dire wolf" from extinction to the land of the living thanks to the scientific wizardry of genetic engineering captured the headlines earlier this month. The magic going on behind the scenes may be less dramatic, but is no less impressive. Genomics, or the applied use of genetics in medicine, is changing the way we diagnose and treat disease by tailoring treatments to the individual. The development of gene therapies that directly treat diseases, rather than prevent their emergence, is also "rapidly advancing", says Daniel Lyons, a portfolio manager on the healthcare and biotechnology teams at Janus Henderson Investors. Early challenges in manufacturing and delivery have been overcome and research is ongoing with the aim of improving the potency and safety of treatments.

## Costs collapse and knowledge advances

The potential of these developments for investors has grown rapidly as costs have collapsed in recent years, says Geoffrey Hsu of the Biotech Growth Trust. It cost the Human Genome Project $2.7bn in 2003 to map the human genome (the base genetic material that provides a blueprint for our cells). Just four years later, the cost of sequencing an entire human genome had fallen to $1m. Laboratories are now able to do it for just a few hundred dollars. This has enabled the rise of several mega-projects that rely on the sequencing of a large number of individual genomes to "understand the underlying genetics of many diseases" better, says Neil Ward, vice president and general manager, EMEA, PacBio. His firm has itself been involved in sequencing the genome of 10,000 people who donated blood and tissue samples to Estonia's national biobank. This is only the start, says Ward. Researchers around the world have expressed interested in carrying out similar projects.

Perhaps the most ambitious scheme is Britain's Our Future Health project, a public-private partnership involving the NHS, drug companies and healthcare charities. The aim is to gain a better understanding of the risk factors behind various diseases – whether they have their roots in genetic, lifestyle, or environmental factors – by tracking the health of a large sample of people over time, says the project's CEO and chief medical officer, Raghib Ali. The project will rely on the genetic sequencing of blood samples given by the 2.4 million participants, with the aim of advancing our knowledge of the links between our genes and illness (Our Future Health is still recruiting, see ourfuturehealth.org.uk/get-involved).

*"The cost of mapping a human genome has collapsed from $2.7bn in 2003 to a few hundred dollars today"*

## Rapid improvements in diagnosis

The plummeting cost of sequencing is giving clinicians an important tool for detecting rare genetic diseases, says Ward. There are many such conditions, but they often affect only a handful of patients in any given year and years can pass after a patient shows up with symptoms before they get a definite diagnosis. Genetic sequencing diagnostic tests can speed up the process substantially. Our knowledge of the genetic basis of illness is still incomplete, so we're not yet at the stage where we can rapidly diagnose every individual. And most current tests are designed to identify one condition at a time, so there can often be a frustrating and time-consuming process of trial and error. But researchers at Radboudumc in the Netherlands are looking to consolidate the various genetic tests available so clinicians can screen for multiple conditions at the same time and deliver definitive results in as little as a week.

Cheaper tests are also starting to make it cost effective routinely to screen entire populations for more common conditions, say Ailsa Craig and Marek Poszepczynski, portfolio managers at the International Biotechnology Trust. Just a decade ago, the idea of routinely screening newborn children for genetic conditions was unheard of, but now many countries have some sort of programme in place. An example is screening for spinal muscular atrophy (SMA), which can now be treated before symptoms develop.

In fact, SMA is just one of a long list of genetic conditions that are now routinely screened for immediately after birth, says Hsu, including sickle-cell disease, cystic fibrosis and congenital hyperthyroidism. The number of diseases that are screened for as a matter of course will only grow, says Hsu, as our knowledge of genetics improves. The development of new treatments for these conditions will also galvanise screening programmes – "knowing that someone has a disease becomes more important once you can actively do something useful with that knowledge".

There is also increasing interest in the potential of genetics to predict whether someone has an increased risk of getting a certain condition in the future that they don't currently have. Screening programmes are already in place for those genes that have the strongest link to a particular disease. Women with a family history of breast cancer, for example, are now offered screening for the BRCA1 and BRCA2 genes, which raise the lifetime risk of getting breast cancer from 12.5% to around 70%, and also greatly increase the risk of ovarian cancer.

Soon we may be able to detect in more subtle ways the genetic factors that increase the risk of developing a particular disease, says Ward. The aim in Estonia, for example, is to use the information from the biobank to identify those who should be prioritised for cancer screening at an earlier age, as well as those who should be screened a bit later. Getting the timing right in this way should improve detection rates and save money. Within five to ten years, there will be genetic tests to give an indication of people's propensity for certain types of cancers and their chances of developing conditions such as Alzheimer's, says Ali.

## The rise of personalised medicine

Genomics is also starting to help doctors tailor treatments to the individual. It has long been known that treatments that work for one patient might not necessarily work for everyone with the same condition, as Paul Major, portfolio manager with Bellevue Healthcare Trust, points out. Until recently, the medical profession resigned itself to this luck of

Take care of the DNA, and the rest will take care of itself

the draw, knowing that some patients would fare better than others. Genetics should help us eliminate this element of chance and enable doctors to give individuals the drugs that will work best based on their genetic profile. This can be incredibly important for conditions such as cancer. One drug may have similar overall effectiveness as another, for example, but be particularly effective in a certain subgroup of patient, says Major. Similarly, patients with a particular genetic profile may be at a much higher risk of side effects from a particular drug than from others. Such considerations may rescue useful drugs from elimination in clinical trials – those that would have been discarded due to side effects or low effectiveness in the overall patient group, for example, could be repurposed if they show promise for a subset of patients.

Personalised healthcare can also zoom in on factors other than the genetic profile of the patient. An advance in the understanding of the genetics of the tumour, for example, is perhaps the most important factor in determining the best course of cancer treatment. "As recently as 30 years ago, doctors tended to consider all cases of lung cancer as basically similar," say Craig and Poszepczynski. "Today they realise that there are multiple types of lung cancer depending on the particular mutation contained in the genetic code of the patient's tumour." As a result, it is increasingly common for doctors to take a biopsy of the tumour and send it to a laboratory to determine which type it is and hence which type of treatment is most likely to be effective. The falling cost of genetic screening means that this is now increasingly common and the process can be repeated multiple times so that therapies can be adjusted as the disease progresses.

## Redesigning the genome

Genomics is also giving rise to gene therapies that directly treat conditions. The method currently in vogue is that of using a modified virus to introduce a correct version of a faulty or missing gene into someone's genome, as Craig and Poszepczynski point out. This technique has been around since the 1990s, but at that time we "didn't know much about where (or how) to insert the gene, which resulted in genes ending up in random places, leading to patients getting cancer rather than being cured". More recently the science has progressed and the result is a better targeting of genes and a higher rate of success.

Gene therapies are also becoming much more durable. Just as in organ transplants, where the danger is that the immune system will see the organ as foreign and hence fight and reject it, over time our bodies can recognise that a gene has been inserted and try to get rid of it, say Craig and Poszepczynski. The inserted gene then begins to work less well, which can lead to the return of the condition. Scientists are making progress at dealing with this problem and increasing the effective lifespan of genetic therapies.

Such advances are important because the industry is built on the idea that healthcare systems will be willing to pay a large amount of money upfront for a one-off course of therapy in the hope that this will save

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*"Even genetic therapies that cost in the millions can be cost-effective compared with treating the disease with drugs"*

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them from having to pay large amounts in the future for drugs to treat the condition, says Hsu. Given that it can otherwise cost as much as $500,000 to treat someone in the US with severe haemophilia each year, even genetic therapies that cost in the millions can be cost-effective compared with treating the disease with drugs, but only assuming the disease does not recur.

Other types of genetic therapies are also starting to emerge, says Andrew Craig, author of *Our Future is Biotech: A Plain English Guide to How a Tech Revolution is Changing Our Lives and Our Health for the Better*. Crispr (clustered regularly interspaced short palindromic repeats) therapy holds out the prospect of better and more precise gene editing, which should in theory give us the ability to treat any genetic disease at its source. The process is currently expensive, but a Crispr treatment for sickle-cell disease was approved in 2023 and means that "what was previously considered a... life-threatening condition is now effectively cured".

CAR-T therapy also promises to transform medicine. This involves genetically re-engineering the T-cells in patients' immune systems so that they can better fight cancer. This has already produced some "pretty incredible results" in treating conditions such as acute lymphoblastic leukemia, which primarily affects children, with a "remarkable" response rate of around 80%. Other treatments are also in development.

## A strong pipeline of new therapies

There are some clouds on the horizon for the subsector. The recent departure of Peter Marks from the Centre for Biologics Evaluation and Research division of the US Food and Drug Administration (FDA) seems to have spooked some investors as Marks was seen as a "champion of innovative therapies, such as cell and gene therapy", says Alex Hunter, global equity analyst at Sarasin & Partners. Redundancies at the FDA and US National Institutes of Health also suggest that the environment for the development and approval of gene therapies may become "slower and temporarily more problematic".

In the future, medicine will no longer treat us all as just one from a pack

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But these concerns are overblown, reckon Craig and Poszepczynski. New US health secretary Robert F. Kennedy Jr may have been "very vocal about vaccines", they note, but he "hasn't really said anything negative about gene therapies". In any case, the strength of the patient advocacy groups that campaign for those suffering from rare diseases such as Duchenne muscular dystrophy or Huntington's means that "there would be a massive public outcry in the United States if the FDA tried to prohibit or limit access to gene therapy".

The US is likely instead to accelerate and streamline regulatory pathways, and new gene therapies will continue to come to market, says Karin Hyland, a partner and deputy head of co-investments at Patria Private Equity Trust. This in turn will lead to "material advances in gene therapy in the coming years, alongside improved affordability and availability". Given that there are now 38 gene therapies currently approved by the FDA, compared with just five in 2000 when Hyland started investing in this area, and with more than 1,200 gene therapies now in clinical trials around the world, it's clear that the only way is up for gene therapies.

*"Crispr therapy holds out the prospect of better and more precise gene editing"*

# The best investments to buy now

One company with promise in precision medicine is **CareDx (Nasdaq: CDNA)**. Its genetic testing is the "gold standard" for surgeons wanting to match donated organs with patients in order to cut the chances of post-transplant organ rejection, says Paul Major of Bellevue Healthcare Trust. Its tests also inform clinicians that the body is starting to reject an organ so doctors can adjust medications, which is important given the scarcity of donated organs. The stock currently trades at only 18 times 2026 earnings, despite revenue more than doubling between 2019 and 2024.

With the field of personalised medicine changing every day, it is "difficult and expensive" for hospitals and clinics "to keep up with this continually evolving technology", says Paul Major. It therefore makes sense for them to outsource the genetic testing of tumours and blood to **NeoGenomics (Nasdaq: NEO)**. The firm receives tissue and blood samples from hospitals, decides which machines and which tests to run on them, then sends the information back to doctors about the type of cancer, say, the stage at which it has reached, and the best treatment. The stock trades at 26 times 2026 earnings.

Two years ago, **Krystal Biotech (Nasdaq: KRYS)** had its gene therapy for dystrophic epidermolysis bullosa approved by the US regulator, say Ailsa Craig and Marek Poszepczynski. This genetic skin disease of children raises the chances of developing skin cancer. What's particularly striking about the firm's treatment is that it is applied in the form of a cream. Krystal has other gene therapies in the pipeline, including ones for other skin diseases and cystic fibrosis. Its stock trades at 14.5 times 2026 earnings.

Biotechnology firm **UniQure Biopharma (Nasdaq: QURE)** is currently losing money, making it a relatively riskier investment than the others tipped here. But as well as a treatment for haemophilia (in partnership with CSL Behring) that has already been approved, its gene therapy for Huntington's disease is in late-stage trials, and the firm could potentially file for approval from the regulator in as little as 12 months, say Craig and Poszepczynski. This "could be a game-changing solution for a devastating disease". Gene therapies for Fabry disease, epilepsy, ALS and Alzheimer's disease are also in development.

Another high-risk, potentially high-reward option is **MeiraGTx Holdings (Nasdaq: MGTX)**. The company is currently losing money, but Karin Hyland of the Patria Private Equity Trust thinks it could benefit from the move among regulators to accelerate approval of gene therapies, especially following its successful trials in the UK, which saw its gene-therapy treatment for blindness in children succeed in restoring their sight. It is also working on gene-based therapies for other conditions, including ALS, genetic obesity and Parkinson's. The Parkinson's treatment in particular showed promise in early clinical trials.

**Oxford BioMedica (LSE: OXB)** is particularly admired by Andrew Craig. The company was spun out of Oxford University in the 1990s, and it has developed a lentiviral vector used in CAR-T therapy. What makes it "such a good example of British scientific innovation" is that it has managed to bring the cost of making the vector down by 90%, "and has said that it expects to bring down the cost by another 80%-90% over the next few years", says Craig. If it manages to achieve this it could not only start to make money, but also turn a significant profit.