FUTURE OF PHARMACEUTICALS

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Life Sciences Superpower:
Growing the leading global hub in the UK
Read the latest report on the potential for life sciences to create health and wealth for the UK.
Generic re-engineering: how an R&D hub can aid the NHS

With a mission to develop advanced drug production techniques, a newly built innovation centre in Glasgow offers solutions to several problems facing the service and the UK pharma industry.

CONTINUOUS MANUFACTURING COULD RESULT IN:

- a reduction in facility size of 80%+
- a reduction in manufacturing costs of 70%+
- a reduction in production lead times of 95%+
- a reduction in energy consumption of 69%+

Although these imports from China and India are tipped by the UK, Health and Healthcare Products Regulatory Agency, many in the industry are still concerned about their quality. They are also worried about the prospect of Chinese-produced drugs containing active medicinal ingredients and the prices of generics going through the roof.

"This is great for the NHS – it keeps patients fit," says Professor Mike Hannay, a heart-transplant surgeon at the NHS Cambridgeshire and Peterborough. Last October, for example, the NHS was forced to spend £10m on a single, £1.8m dose of the gene therapy medication for spinal muscular atrophy – a single dose can cure a child of childhood death. The drug in question, Zolgensma, has a 'list price' of nearly £2m per dose, but the NHS has to pay £5m per child. The market is so distorted that the 'list price' is set by the monopoly holder – the manufacturer – and the tariff price gives the NHS a discount at the point of purchase. In December, the Pharmacists and Pharmacists’ Supply Group alerted local healthcare pharmacies to the fact that, even at the tariff price, £1m per treatment is usually the market price – it’s supply and demand, Hannay says. Prices go to zero for one manufacturer after another leaves the market until the last, dubious, and out of business, which is why the NHS must pay far more than the product costs.

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It's vital to create a dynamic ecosystem that inspires innovation through collaboration across disciplines, sectors and borders.

**When a pre-clinical stage biotech company has 50-plus employees, as well as senior executives, inefficiency is likely**

Many large companies, including pharma giants and technology-based firms, are moving aggressively to develop artificial intelligence. Indeed, there are a lot of so-called ‘AI’ systems currently overseeing clinical trials. People assume we’ve moved on to a new era of drug discovery, but in reality, it’s more often the same old song. AI systems are already being investigated in clinical trials. In genomics, where vast numbers of genetic data are continually measured, machine learning is helping scientists make sense of all the data. Finding a correlation (or lack of it) between patients’ outcomes and genetic markers will be key. The financial returns are also high. These trends are likely to be followed by bioinformatics and synthetic biology.

**How can AI help drug discovery?**

Some key advantages of AI-driven drug discovery.

- **Reduction in cost and time:** AI can help predict drug candidates and reduce the number of synthetic compounds that need to be produced and tested in the lab. This can lead to significant cost savings.
- **Improved accuracy and efficiency:** AI can analyze vast amounts of data and identify patterns that might not be apparent to human researchers. This can help in selecting the most promising drug candidates.
- **Early detection of adverse effects:** AI can help predict potential side effects of new drugs, allowing researchers to make necessary adjustments early in the development process.
- **Enhanced drug design:** AI can assist in the design of new drug molecules, optimizing their structures to improve efficacy and reduce side effects.

With these advantages, AI can be a powerful tool in the drug discovery process, streamlining the process, reducing costs, and increasing the chances of success.

**The scale of the challenge means the scale of the response we need to collaborate**

Pinder Sahota, president of the Association of the British Pharmaceutical Industry and general manager at Novo Nordisk UK, on the sector’s quest for sustainability

**What are the components of sustainability in the pharmaceutical industry?**

The pharmaceutical industry needs to address the environmental impact of its products, the cost and availability of raw materials, the potential environmental and health risks associated with the production and disposal of medicines, the industry’s commitment to maintaining its impact on the planet, and the potential for sustainable manufacturing and distribution practices.

**How can we work with the global pharmaceutical industry to address sustainability challenges we face?**

We’ve seen during the pandemic that the industry can bring about change in the way we work - both within the sector and across society, with businesses and government, as well as with patients, communities and other stakeholders. The pharmaceutical industry has a unique opportunity to lead the way in this regard.

**How can the sector best address such challenges?**

Pinder Sahota, president of the Association of the British Pharmaceutical Industry, said: “We need to work with regulators and the whole of society to foster a culture of sustainability across the pharmaceutical sector. This means working with regulators and other stakeholders to foster a culture of sustainability across the pharmaceutical sector.

**What is the role of pharmaceutical manufacturers in sustainability?**

Pharmaceutical manufacturers play a critical role in sustainability. They are responsible for designing and producing medicines that meet the needs of patients while minimizing their impact on the environment. This includes minimizing the environmental impact of drug discovery, manufacturing, and distribution.

**What does it mean to be a sustainable pharmaceutical company?**

A sustainable pharmaceutical company is one that operates in a way that is environmentally friendly, socially responsible, and economically sound. This means considering the environmental impact of all aspects of its operations, from the sourcing of raw materials to the manufacturing of medicines.

**What is the role of innovation in sustainability?**

Innovation plays a key role in sustainability. This is because it allows companies to develop new and more effective ways of producing and delivering medicines. Innovation can also help companies reduce their environmental footprint.

**What is the role of collaboration in sustainability?**

Collaboration is essential in sustainability. This is because it allows companies to pool their resources and expertise to achieve greater impact. Collaboration can help companies identify opportunities for improvement and share knowledge and best practices.

**What is the role of education in sustainability?**

Education is crucial in sustainability. This is because it helps to raise awareness about the importance of sustainability and helps to develop the skills and knowledge needed to implement sustainable practices.
Although most revenue in the pharmaceutical industry is generated by major branded medicines and products, sales of generic drugs have continued to grow. Indeed, in some European countries, generics account for a significant share of the prescription drugs market. While there are many reasons to be thankful for the innovation in big pharma, generics have been proving invaluable in terms of both affordability and availability.

**MARKET SHARE**

- Market share of generics in selected European countries in 2020
- Total cost saving achieved in the US healthcare system by using generics and biosimilars in 2020: $338.4bn
- Projected value of the global market for generic drugs by 2025: $497bn

- **GENERIC REVENUES**
  - Actual and forecast global sales of generic prescription drugs in 2012-26
  - Total cost saving achieved in the US healthcare system by using generics and biosimilars in 2020: $338.4bn
  - Projected value of the global market for generic drugs by 2025: $497bn

- **OPPORTUNITIES FOR GENERICS**
  - Potential for manufacturers to produce generics, based on percentage of patent expirations by therapeutic area in 2020-26

- **MARKET GROWTH**
  - Actual and forecast compound annual growth rate of the generics market
  - Projected growth for selected therapeutic areas:
    - Oncology: 19.8%
    - Central nervous system: 18.7%
    - Antimicrobial and anti-infective: 18.2%
    - Gastrointestinal: 15%
    - Cardiovascular: 7.5%
    - Respiratory: 5.4%
    - Others: 50.1%

- **PATENT PROTECTION**
  - Number of patents for drugs expiring worldwide in 2020-26
Extending the role of big pharma in search of easier treatment

Pharmaceutical companies such as Accord Healthcare have become far more than manufacture medicines, in recognition that the effectiveness of a medicine can be determined by whether it is delivered as an injection or pill, for example. Patient advisory groups are advising on what are known as ‘drug delivery systems’.

This has extended the role of companies like Accord Healthcare, one of Europe’s fastest growing pharmaceutical companies, to advising on what are known as ‘drug delivery systems’. This is a huge challenge because pharma, through its extensive network of clinical trials, has been with Covid-19. It can take 10 years or more to develop a successful vaccine.

We know that is more work to do, but again, it is worth stressing that the role of pharmacists working in the community. They are often under-appreciated. They work hard and are being recognised by the independent think tank, the Foundation Trust, Care Across (a digital health platform) and of course, patient support groups. The ‘patient-as-president’ model of healthcare is gaining momentum. This is why Accord Healthcare, as a company that has 500 research scientists, is looking for ways to make a difference. They are always looking for innovation and investment in cancer research to help patients.

The company, which has 500 research scientists, has led to investments in a range of innovative options to help patients who wish to help champion cancer care. We are, for example, a partner in a project run by the private sector that aims to help patients.

Patients need clear information at all times – you cannot get one-size-fits-all answers. Patients need to be able to trust the information they receive. This is where Accord Healthcare comes in.

One less trip to the doctor could be considered progress.
By printing on demand instead of producing to forecast, we may no longer have unused drugs being expired.

Unlocking the potential of active ingredients

Liposomes and nanoparticles have been heavily used to increase bioavailability and allow targeting of active ingredients. They are used to break the dose-limiting factor of bioavailability in order to improve the pharmacokinetics of an active ingredient. Although an active ingredient may be able to do a specific thing, it can’t do it alone. For example, it may be able to add a specific functionality to a drug product, but if the parent drug is not soluble in an aqueous medium, it could not be used by the patient, which is why we have liposome technology.

“The biggest challenge is to ensure that the patient is able to take the medication the way it is prescribed. In an aqueous system for parenteral administration, solutions are usually limited to 5% to 10% active ingredient concentration in order to avoid overloading the patient. Water-based solutions are less than optimal due to the low bioavailability,” says Kipping.

Liposomal delivery is a game changer. Liposomes have been used to encapsulate a variety of active ingredients, including those that could benefit from advances in formulation science, such as curcuminoids, sirolimus, anticancer drugs, vaccines, and proteins. Liposomal delivery systems offer improved stability, increased circulation time, and targeted delivery. Liposomal delivery systems can also be engineered to encapsulate multiple active ingredients in a single delivery system.

“The issue with those processes is that they may not absorb and be unstable,” says Kipping. “Liposomal delivery systems offer improved stability and increased circulation time.”

Trends in nutritional supplements

Nutritional supplements are a $240bn global market, growing at a CAGR of 7% in the last three years. This market is expected to grow to $300bn by 2026, with a CAGR of 8%. The importance of bioavailability has increased in the last few years, with increased understanding of how different ingredients work together and the importance of the gut microbiome.

“A report published by BlueWeave Consulting in September indicates that the global nutritional supplement market is expected to grow from $226bn in 2020 to $347bn 2026 at a CAGR of 5%,” says Emma Perry, director of the Diagnostics Institute of Ireland.

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“Our approach to delivering liposomes is very different from some of the traditional methods. There have been several attempts to deliver liposomal formulations to the bloodstream. In our laboratory, we have been able to deliver liposomal formulations to the bloodstream using a non-invasive method,” says Kipping.

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Over the next 30 years we could see...

£68bn in GDP added to the UK economy from increased investment in cutting-edge R&D.

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