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EDITORIAL

Advancing Cancer Vaccines: The UK's Strategic Approach to Research and Innovation

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Introduction

Cancer remains one of the most significant global health challenges, with an urgent need for new treatment approaches that improve survival and quality of life. Traditional modalities—surgery, chemotherapy, hormonal treatments and radiotherapy—have transformed patient outcomes, yet many cancers recur or become resistant to treatment. Immunotherapy has revolutionised oncology, and within this domain, cancer vaccines represent a promising new frontier.

Cancer vaccines aim to train the immune system to recognise and eliminate tumour cells by enhancing existing immune responses. Prophylactic viral vaccines target viruses known to cause cancer; for example, the national human papillomavirus (HPV) vaccination programme in England treats 12–13 years old aiming to eliminate cervical cancer (Falcaro et al, 2021). Therapeutic cancer vaccines are designed to combat known malignancies, either after surgery (adjuvant) or in established disease settings (palliative). These cancer vaccines can be either personalised to the individual's cancer (personalised cancer vaccines) or alternatively target abnormalities that are likely to be present in most patients' tumours ('off the shelf' vaccines). The first mRNA vaccine licensed for use in humans was actually a cancer vaccine, sipuleucel-T (Provenge) which targets prostatic acid phosphatase (PAP) (Graff and Chamberlain, 2014). However, sipuleucel-T was not approved by the National Institute for Clinical Excellence (NICE) as it was not cost-effective. Newer vaccines target a broader range of abnormalities and are hoped to give superior results. Promising data have been shown for many different cancer indications; from those in which we expect the immune system to be active, such as melanoma (Weber et al, 2024), to those which are felt to be more immunoresistant, such as pancreatic cancer (Sethna et al, 2025).

The UK's National Cancer Vaccines Research Programme is at the forefront of cancer vaccine trial development, leveraging the infrastructure and collaborative ways of working developed during the coronavirus disease 2019 (COVID-19) pandemic. This is a partnership between the Vaccine Innovation Pathway (VIP: https://www.nihr.ac.uk/support-and-services/industry/spotlights/uk-vaccine-innovation-pathway), Cancer Vaccine Launchpad (CVLP: https://www.england.nhs.uk/cancer/nhs-cancer-vaccine-launch-pad/), National Institute for Health and Care Research

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(NIHR), UK Government, scientific and clinical researchers, and pharmaceutical companies.

Building on Strategic Partnerships and the COVID-19 Response

The rapid development and deployment of COVID-19 vaccines demonstrated the power of strategic partnerships between government, academia, and industry. The VIP has adapted this model to accelerate the delivery of cancer vaccine trials, drawing on established networks with industry leaders in this field, such as Moderna and BioNTech.

The VIP provides a framework for clinical trials adoption and activation, aiming for faster set up, enhanced recruitment, regulatory alignment, and efficient use of NHS resources by minimising duplication of effort. By leveraging data infrastructure and real-world evidence methodologies developed during the pandemic, the programme can optimise trial design and execution, addressing previous bottlenecks in cancer research. The VIP also allows sponsors the early opportunity to receive rapid feedback on their protocols to ensure alignment with UK standard of care and identify potential conflicts.

Expanding the Cancer Vaccine Trials Portfolio

A robust clinical trial pipeline underpins the VIP. The number of cancer vaccine trials in the UK is increasing rapidly, with the greatest impact expected in high-risk, early-stage cancers. For example, ongoing studies are evaluating personalised mRNA vaccines for colorectal cancer such as Jones et al (2023), head and neck cancer, and lung cancer, following promising early data from melanoma trials. These trials will assess the efficacy and safety of cancer vaccines, providing reassurance to patients, doctors and the general public.

One of the key mechanisms driving recruitment and pre-screening for trials is the NHS England CVLP, which integrates patient identification at non-trial sites with trial pipelines. The CVLP aims to identify suitable patients early in their cancer journey across a wide range of sites, ensuring timely access to investigational vaccines. Increased genomic and biomarker pre-trial analysis will refine patient selection. The CVLP is designed as a company- and trial-agnostic programme so it can be flexible to the needs of cancer vaccine trials in multiple cancer types. The first clinical trial supported by the CVLP is a colorectal cancer vaccine trial. Between September 2023 and February 2025, 55 CVLP sites screened 3125 patients, resulting in 432 eligible patients being referred to the clinical trial. To date, 97% of tissue samples have been prepared in the required time frame, with the average time for preparation 2.5 days. We now estimate that 60% of patients in England undergoing colorectal surgery have access to the trial through CVLP, resulting in the UK screening over three times the global average for the trial. The CVLP is now onboarding further cancer vaccine trials in other cancer areas.

Infrastructure and Support Services

Delivering cancer vaccines at scale requires a well-integrated infrastructure network, including:

• Rapid contracting and site set up: Streamlined pathways to ensure rapid trial initiation while maintaining high safety and efficacy standards.

• Pharmacy Services: Specialised handling, storage, and preparation of mRNA-based vaccines within the NHS infrastructure. Collaborative working for sites not familiar with Advanced Therapy Investigational Medicine Products (ATIMP) trials (the classification under which mRNA vaccines fall) to ensure shared oversight and governance and maximise speed and efficiency.

• Apheresis Facilities: This involves separating out components of the blood and returning the main blood volume to the body. It is essential for therapies requiring personalised immune cell processing.

• Logistics and Cold Chain (temperature controlled) Management: Ensuring vaccines reach patients safely and efficiently, particularly in decentralised and remote trial settings.

The VIP plays a pivotal role in diagnosing barriers and developing innovative solutions to streamline the delivery of cancer vaccines. By working closely with the NHS and regulatory bodies, the VIP establishes standardised pathways that ensure investigational cancer vaccines progress efficiently from research to clinical use. This includes streamlining contracting and setup processes, addressing workforce capacity challenges, and integrating digital solutions for patient monitoring and data sharing.

Furthermore, VIP facilitates cross-sector collaboration through the UK Cancer Vaccines Research Forum, bringing together oncologists, surgeons, nurses, pharmacists, R&D teams, and radiologists. This multidisciplinary forum fosters knowledge-sharing, enables joint problem-solving, and strengthens engagement with industry partners. By ensuring that all stakeholders contribute to the development and implementation of cancer vaccine trials, the forum supports a cohesive approach that aligns scientific innovation with practical clinical application.

VIP's initiatives also extend to workforce development, ensuring that the breadth of NHS staff is adequately trained to deliver cancer vaccines. Through targeted educational programmes and partnerships with professional bodies, VIP helps build the necessary expertise to integrate these therapies into routine clinical practice.

The Role of the Vaccine Innovation Fund

The VIP, in partnership with Moderna, have also developed the Vaccine Innovation Fund (VIF), which plays a fundamental role in the development and delivery of cancer vaccine trials. By funding infrastructure improvements, workforce training, and regulatory innovations, VIF enables the acceleration of novel therapies. Its vision is to create a research environment where advanced therapies, including cancer vaccines, can transition seamlessly into routine clinical practice.

Future Directions

The trajectory of cancer vaccines extends beyond treatment into adjuvant and preventive settings. Current research focuses on three primary areas:

(1) Advanced Disease Treatment: Ongoing trials targeting metastatic and high-risk cancers to improve survival.

(2) Adjuvant Therapy: Using vaccines post-surgery to reduce recurrence, such as in high-risk colorectal cancer patients.

(3) Cancer Prevention: Exploring the potential of vaccines to prevent cancers in individuals with hereditary cancer syndromes, such as Lynch syndrome.

A well-defined pathway is needed to integrate these innovations into the NHS, addressing regulatory streamlining and establishing reimbursement models that ensure equitable access.

Conclusion

Cancer vaccines are poised to revolutionise cancer treatment. By building on the successes of the COVID-19 response, investing in infrastructure, and expanding trial pipelines, this novel UK initiative has the potential to shift oncology towards a more personalised and preventative approach. However, achieving this vision requires sustained effort, investment, regulatory agility, and continued collaboration across sectors. As trials advance, the integration of cancer vaccines into routine care will be a defining moment in the future of oncology.

Key Points

- Cancer vaccines represent a promising advance in personalised oncology, with the potential to significantly improve patient outcomes.
- The UK VIP provides an effective mechanism for accelerating cancer vaccine trials, building on pandemic era ways of working and research partnerships.
- The NIHR-hosted VIP strengthens the UK's position as a global leader in vaccine research by attracting commercial investment, accelerating trial delivery, and supporting faster access to innovative vaccines—driving economic growth, creating high-value jobs, and reinforcing the UK's life sciences sector as a key contributor to the economy.
- There is a strong pipeline of clinical trials in progress, bolstered by strategic developments like the CVLP, which has substantially broadened access to vaccine trials across the NHS.
- Delivering these therapies requires investment in pharmacy, sampling (e.g., apheresis), and logistics infrastructure to support trial execution and adoption in the NHS.
- The long-term vision includes transitioning from advanced-stage treatments to adjuvant use and ultimately to preventative vaccines, requiring a seamless pathway from research to standard of care.

Availability of Data and Materials

Not applicable.

Author Contributions

SD and MK conceived the concept. RJ, MH, and GR contributed substantially to the refinement of the concept. SD and MK wrote the first draft. All authors contributed to revising the manuscript critically for important intellectual content. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

Sarah Danson, Robert P. Jones, Matthew Hallsworth, and Maria Koufali have roles in the UK VIP and Gillian Rosenberg is affiliated with NHS England. Moderna and BioNTech have strategic partnerships with the UK Government to progress mRNA vaccines; the VIP works with pharmaceutical companies, including Moderna and BioNTech, to deliver the cancer vaccine clinical trial portfolio. The VIP is open to approaches by all companies and is transparent in its interactions, so current roles or affiliations minimally impact the objectivity or impartiality of the article.

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