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NEOVACC: A personalised DNA vaccine for patients with advanced lung cancer

Submission date
11/02/2025

Recruitment status
Recruiting

Registration date
08/05/2025

Overall study status
Ongoing

Last Edited
14/11/2025

Condition category
Cancer

[X] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol

Background and study aims
Personalised cancer vaccines (PCV) are a new approach for training a person's immune system to attack the cancer. In this trial for patients with non-small cell lung cancer (NSCLC), each person receives a unique vaccine, made from their own genetic information (DNA), called a doggybone vaccine. The vaccine will be added to a common therapy for NSCLC, a drug called pembrolizumab. Pembrolizumab is used on its own to treat NSCLC if at least 50% of the cancer cells show a molecule called PDL1 (programmed-death ligand 1). A key aim of the study is to work out if the vaccine can train the immune system in the desired way and if this links to an improvement in the cancer.

Who can participate?
Adult patients with histologically proven advanced or recurrent NSCLC with PDL1 expression ≥50% and where anti-PD1 immunotherapy is licensed as standard of care treatment

What does the study involve?
Pembrolizumab is given for up to 2 years but may be stopped early if it does not work or if it causes side effects that make it unsafe to continue. A small sample of the cancer tissue (biopsy) will be taken to look at the genetic differences in cancer cells compared to normal cells. This genetic information will be used to make the vaccine. Participants will continue pembrolizumab treatment at the same time. When the vaccine is ready, participants will receive their own vaccine every 3 weeks for 24 weeks and every 6 weeks for the remainder of the time the participant is in the trial. The vaccine will be given into a muscle, using a needle-free injector called the PharmaJet. Pembrolizumab and vaccine treatment will continue at the same time for up to a maximum of 2 years. PCVs have been safe in other trials but every participant will be followed carefully for side effects. The cancer will be monitored carefully, a second cancer biopsy will be collected during treatment, as well as blood samples over time and on two occasions a larger sample of some blood cells (white blood cells) in a process called leukapheresis. These samples will be used to see whether the vaccine has trained participant cells to recognise and fight the cancer.

What are the possible benefits and risks of participating?
The expected benefit from the NEOVACC trial is the training of a person's immune system to

fight their cancer. It is unknown how well the vaccine will work and it is being investigated in humans for the first time. It is hoped that this trial will help show how the immune system responds to the NEOVACC personalised cancer vaccine. In the future, this may then help patients with NSCLC or many other types of cancer.

The expected risks:
Blood samples: Where possible, these will be taken at the same time as routine blood sampling. Risks include some discomfort and bruising.
Leukapheresis: Risks include bruising, numbness to hands and feet from a drop in blood calcium levels. It will be performed by highly trained staff. Participants are closely monitored and staff are present to treat any side effects. Research leukapheresis is a safe, effective way of obtaining large numbers of white blood cells required for translational research.

Research bronchoscopy/EBUS/Navigational bronchoscopy: Risks of bronchoscopy include sedation, bleeding, discomfort, pneumothorax (<1%) and a small risk of death (1¬2 in 10000). Sedation risk will be minimised by using the least amount of sedation necessary with full monitoring and having reversal agents present for use if required. Bleeding risk is minimised by ensuring platelet counts and clotting are within safe parameters and use of cold saline or adrenaline to achieve haemostasis if necessary. Discomfort will be minimised by using anti¬tussives and local anaesthetic. There is a small risk of pneumothorax (<1%) if transbronchial biopsies/lymph node biopsies are performed, the participant will have a chest radiograph prior to discharge to ensure they do not have a pneumothorax if necessary. The risk of death is minimised by an experienced bronchoscopist reviewing the participant to ensure they are fit to undergo the bronchoscopy. Serial research bronchoscopies are well tolerated and are an established common investigation for many lung diseases. Having research bronchoscopies entails coming to the hospital for a few hours each time, which can be inconvenient to the participant.

Research CT/USS guided biopsy: Risks are similar to any CT or Ultrasound guided biopsy. Risks include bleeding and a 5-7% risk of a collapsed lung that requires a chest tube. Bleeding risk is minimised by ensuring the participant's platelet count and clotting are within safe parameters. Discomfort will be minimised by using local anaesthetic. The risk of pneumothorax is managed by careful participant selection and involvement of specialist interventional radiologists in a tertiary specialised Heart and Chest hospital. Having research image-guided biopsies entails coming to the hospital for a few hours each time, which can be inconvenient for participants.

Surgical research biopsy: Risks include pain, bleeding, infection, risk of a collapsed lung, small risk of death and risks associated with a general anaesthetic. The surgeon will detail the specific risks. Standard measures will be taken to minimise risks of pain, bleeding and infection. Risks are minimised by involving the thoracic surgeons' significant experience and expertise. Having research surgical biopsies entails coming to the hospital for up to a few days each time, which may be inconvenient to the participant.

Trial drug (NeoVACC): This is the first clinical trial of personalised doggybone DNA cancer vaccination (NeoVACC) in participants, therefore it is not known if there will be any side effects in humans. Participants will be carefully screened to ensure they are suitable for the trial and will be monitored carefully for side effects throughout the trial and treated as required. This will include regular reviews with examinations and blood tests. There is a dedicated 24-hour phone number for participants to contact the hospital if they feel unwell or to seek advice during treatment.

To minimise the burden of additional hospital visits on participants, most of the follow-ups will take place alongside standard of care visits.

The effects of the vaccine on an unborn foetus or a breastfeeding infant are unknown. As a result, women who are pregnant, breastfeeding or thinking of becoming pregnant will not be able to take part in the trial. To minimise this risk, if there is a chance a participant could become pregnant, they must have a negative pregnancy test at Screening and Baseline visits and before each treatment cycle to be able to take part in the trial. During the trial, all participants must agree to use a highly effective method of contraception and for 4 months after the final vaccination.

Radiation risk: Participants in this trial will have CT scans as part of their standard care. They may have up to 2 further research CT scans or cone beam CT scans (+/- fluoroscopy) to guide biopsies with CT guided biopsy or navigational bronchoscopy. These procedures use ionising radiation which may cause cancer many years or decades after exposure. In participants with this type of cancer, the chances of this happening as a consequence of taking part in this study are less than 1%.

Participants may also undergo non-ionising radiation from ultrasound used in bronchoscopy with endobronchial ultrasound or an ultrasound guided biopsy.

Where is the study run from?
University of Liverpool, UK

When is the study starting and how long is it expected to run for?
February 2025 to November 2027

Who is funding the study?
1. United Kingdom Research and Innovation (UKRI)
2. Medical Research Council

Who is the main contact?
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Contact information

Type(s)
Scientific, Principal investigator

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Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

Integrated Research Application System (IRAS)
1010332

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
UoL001847

Study information

Scientific Title
Targeting non-small cell lung cancer with Doggybone personalised cancer DNA vaccines (dbPCV)

Acronym
NEOVACC

Study objectives
The main objective of the trial is to test whether it is possible to produce the NeoVACC personalised vaccine (dbPCV) in a timely manner.

The secondary objectives are as follows:-
1. To assess whether the NeoVACC personalised vaccine (dbPCV), administered alongside

standard of care treatment with pembrolizumab, is safe and can be tolerated by participants.
2. To find out how many participants' cancer shrinks or disappears after receiving their NeoVACC personalised vaccine (dbPCV) and standard of care treatment with pembrolizumab.

There is also an exploratory objective:-
1. To look at the participant's immune system response to receiving the NeoVACC personalised vaccine (db-PCV).

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 19/06/2025, London – West London & GTAC Research Ethics Committee (2 Redman Place, Stratford, London, E20 1JQ, United Kingdom; +44 (0)207 1048171, 207 104 8124; westlondon.rec@hra.nhs.uk), ref: 25/LO/0177

Study design
Single arm non-randomized study

Primary study design
Interventional

Study type(s)
Efficacy, Safety

Health condition(s) or problem(s) studied
Non-small cell lung cancer (NSCLC) with PDL1 expression ≥50% which does not achieve tumour clearance with anti-PD1 treatment

Interventions
The NEOVACC doggybone personalised cancer vaccines (dbPCV) will be administered by PharmaJet Stratis Needle-free injection system. Participants will receive a 2mg/ml dose of dbPCV in 2 divided doses of 0.5ml every 3 weeks for the first 24 weeks of treatment and then every 6 weeks for the remainder of participation in the trial. The dbPCV will be given on the same day and prior to SOC anti PD1 treatment for a maximum total of 18 vaccinations over 24 months. Any dose delays in anti-PD1 treatment will be followed by dose delays in administration of the vaccine. There are no dose modifications.

Intervention Type
Drug

Phase
Phase I

Drug/device/biological/vaccine name(s)
NEOVACC Doggybone Personalised Cancer Vaccine (dbPCV) [dbDNA drug substance]

Primary outcome(s)
Feasibility of making and delivering the dbDNA vaccines is measured by confirming whether the NEOVACC personalised vaccines (dbPCV) were delivered in a timely manner at the time of first vaccination.

Key secondary outcome(s))
Secondary outcome measures:
1. Safety and tolerability of vaccination in combination with anti-PD1 is measured using adverse event reporting and clinical, biochemical and radiological assessments from first vaccination to end of treatment (up to 2 years as standard of care anti-PD1 treatment).
2. Overall Response Rate is measured using CT scan chest/abdomen/pelvis at screening, baseline, week 12, week 24 and then every 12 weeks during treatment and at the end of trial, as per standard of care imaging.
3. Time to disease progression is measured using CT scan chest/abdomen/pelvis at screening, baseline, week 12, week 24 and then every 12 weeks during treatment and at the end of trial, as per standard of care imaging.
4. Overall survival is measured at the end of trial.

Exploratory Outcome Measure:
Vaccine induced T cell response is measured using ELISPOT on blood samples, ELISA on plasma samples, single cell RNA and TCR sequencing in blood and tissue samples; and immunofluorescence of protein expression in tissue. This will be measured throughout the trial using blood samples, tissue sampling after 6 doses of the dbDNA vaccine, and FPE tissue related to skin or bowel toxicities collected as part of standard of care and surplus to diagnostic requirement.

Completion date
30/11/2027

Eligibility

Key inclusion criteria
1. Written and informed consent obtained from the participant and agreement from the participant to comply with the requirements of the trial.
2. Aged ≥ 18 years old.
3. Histologically proven advanced or recurrent NSCLC with PDL1 expression ≥50% and where anti-PD1 immunotherapy is licensed as standard of care treatment.
4. Has completed at least 3 cycles of SOC IO and demonstrates partial response, stable disease or progression deemed to be such that can wait for production of PCV.
5. Tumour accessible for sufficient sample to be taken for research e.g. surgical biopsy or repeat core biopsies (6 passes) in the opinion of the treating oncologist and physician performing the biopsy.
6. Considered fit enough to undergo trial specific procedures.
7. ECOG performance status of 0-1.
8. Venous access sufficient for collection of the blood/apheresis samples.

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 years

Upper age limit
100 years

Sex
All

Total final enrolment
0

Key exclusion criteria
1. Demonstrated a complete response from previous treatments according to RECIST criteria.
2. In the physician's view are likely to have sufficient benefit from anti-PD1 treatment alone.
3. Evidence of rapid disease progression, who cannot wait for vaccine production and must seek alternative treatment options.
4. Active autoimmune disease likely to pose a risk for the safe administration of anti-PD1 or other immune activating agents; exceptions to this are atopic dermatitis and psoriasis not requiring systemic treatment. Topical and inhaled steroids are allowed.
5. Significant immune related adverse event requiring anti-PD1 to be stopped or necessitating ongoing systemic immunosuppressive treatment. Patients who have required mycophenolate or infliximab for management of IO related toxicities are not eligible.
6. Currently receiving any form of chemotherapy and have received chemotherapy in the previous 9 weeks prior to screening.
7. Any other experimental medications during trial participation and within 30 days of consent.
8. History of confirmed inflammatory bowel disease.
9. Previous organ transplantation.
10. Known brain metastases.
11. Greater than 10mg Prednisolone equivalent per day unless for replacement purposes (e.g. adrenal insufficiency).
12. Active or previous malignancies of other types, which in the Investigator's opinion would mean they are not a good candidate for the clinical trial; specifically excluded are patients with malignancies that even in the early stages carry a high immunosuppressive burden (for example CLL, Multiple myeloma).
13. Received anti-PD1 or anti-PD-L1 in prior line of treatment.
14. Other vaccination within a week of trial vaccination.
15. Known diagnosis of HIV or active hepatitis B or C. Participants who are HBV carriers and receiving anti-viral prophylaxis are excluded.
16. Any condition (e.g., known or suspected poor compliance, psychological instability, geographical location, etc.) that, in the judgment of the Investigator, may affect the participant's ability to provide informed consent and undergo trial procedures.
17. Women of child bearing potential (WOCBP) who are currently pregnant, lactating or breastfeeding.
18. WOCBP or participants with partners of child bearing potential who are unable or unwilling to use contraception during the trial.
19. Known allergy to any component of the IMP.

Date of first enrolment
30/09/2025

Date of final enrolment
31/05/2026

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Clatterbridge Cancer Centre
Clatterbridge Hospital
Clatterbridge Road
Wirral
England
CH63 4JY

Sponsor information

Organisation
University of Liverpool

ROR
https://ror.org/04xs57h96

Funder(s)

Funder type
Research council

Funder Name
UK Research and Innovation

Alternative Name(s)
UKRI

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Funder Name
Medical Research Council

Alternative Name(s)
Medical Research Council (United Kingdom), UK Medical Research Council, MRC

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Data sharing statement to be made available at a later date