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## Our Goal

Improve the **underrepresentation of ethnic minorities** in vaccine development

Build an **interdisciplinary research platform** (LEGACY) to study vaccine immune responses in tissues and blood

### What are vaccines?

- ✓ **Safe and effective** method to protect from disease
- Stimulate immune protection **without serious infection risk**
- Underpin global health security by **preventing and controlling** disease outbreaks
- One of the **best** health investments

### How can vaccines be improved?

- 🕒 **Longevity and impact** of vaccine response can be improved
- 🌍 **Ancestral and age variation** may explain differences in vaccine response
- 🧬 Immunological memory is generated in **lymph node tissue** but most commonly collected data is blood

### What are lymph nodes?

Pea-sized structures acting as meeting places for white blood cells all over the body. A human adult has ~700 lymph nodes.

### Why are lymph nodes important during vaccine responses?

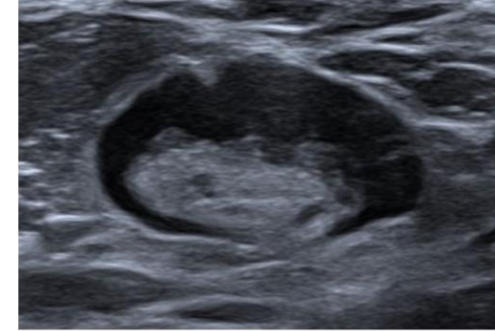
Immunological memory starts here—affecting vaccine effectiveness

### How do we collect lymph node samples?

We use an ultrasound-guided technique called **fine-needle aspiration**, similar to a blood test.

### What information can lymph nodes provide?

**Ultrasound images**  
Lymph node swelling



**Millions of immune cells**  
Three types of data per single-cell

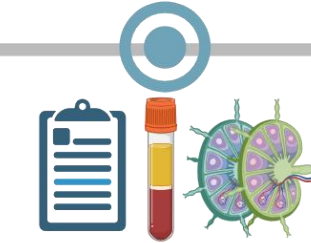
- 1 **Bacteria/virus recognising component** (T cell repertoire)
- 2 **Cellular machinery** (Proteome)
- 3 **Active cell instructions** (Transcriptome)

## Study Design



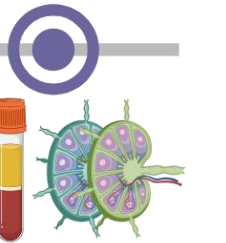
Black and Asian ancestry healthy participants from West London area

**Before vaccination**



**Influenza Vaccination**

**After vaccination**



## Interdisciplinary Approach

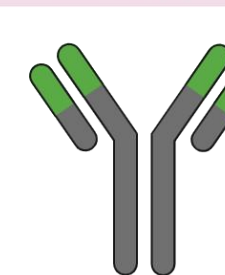
Participant questionnaires



Ethnicity related genes in blood



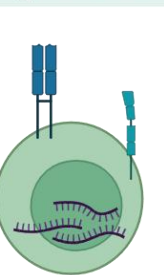
Vaccine response in blood



**Lymph node ultrasound images**



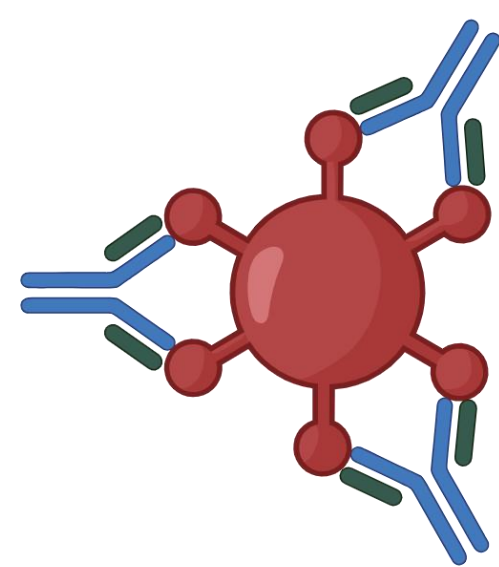
**Lymph node single-cells**



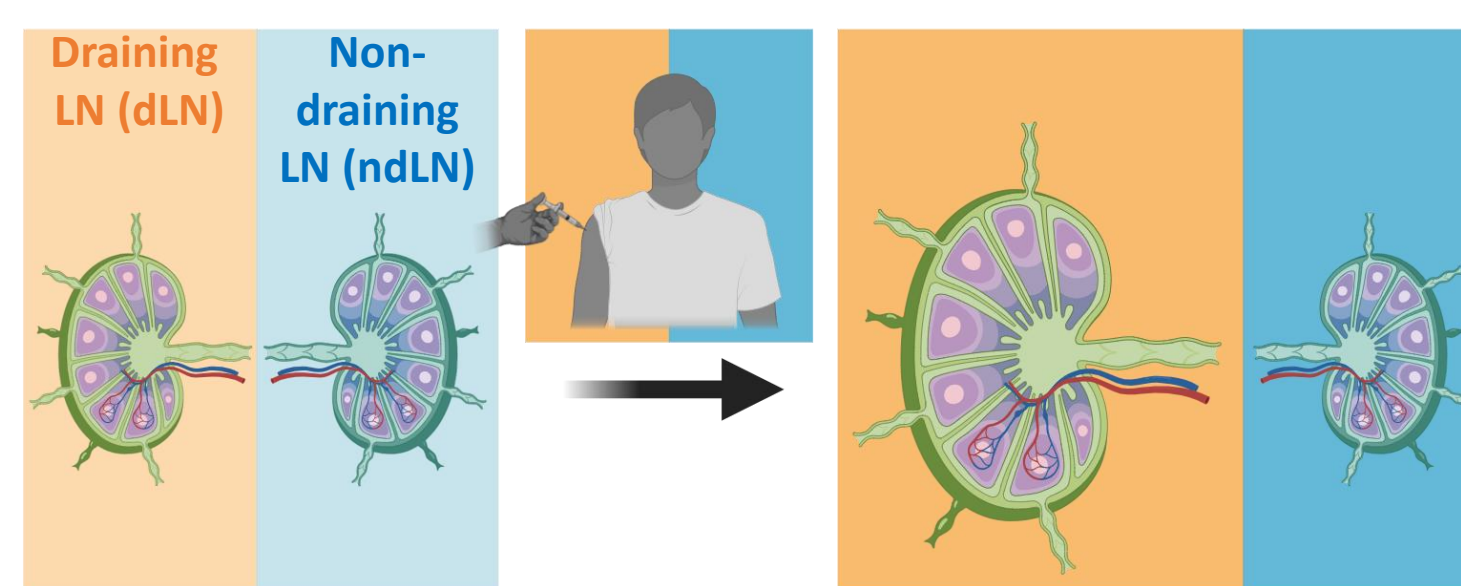
## Our Impact



Increased the **ancestral representation** and **longitudinal lymph node** data available for future machine-learning vaccine design applications



Overall immune response **transcends ancestral variation** of young healthy adults with African or Asian ancestry

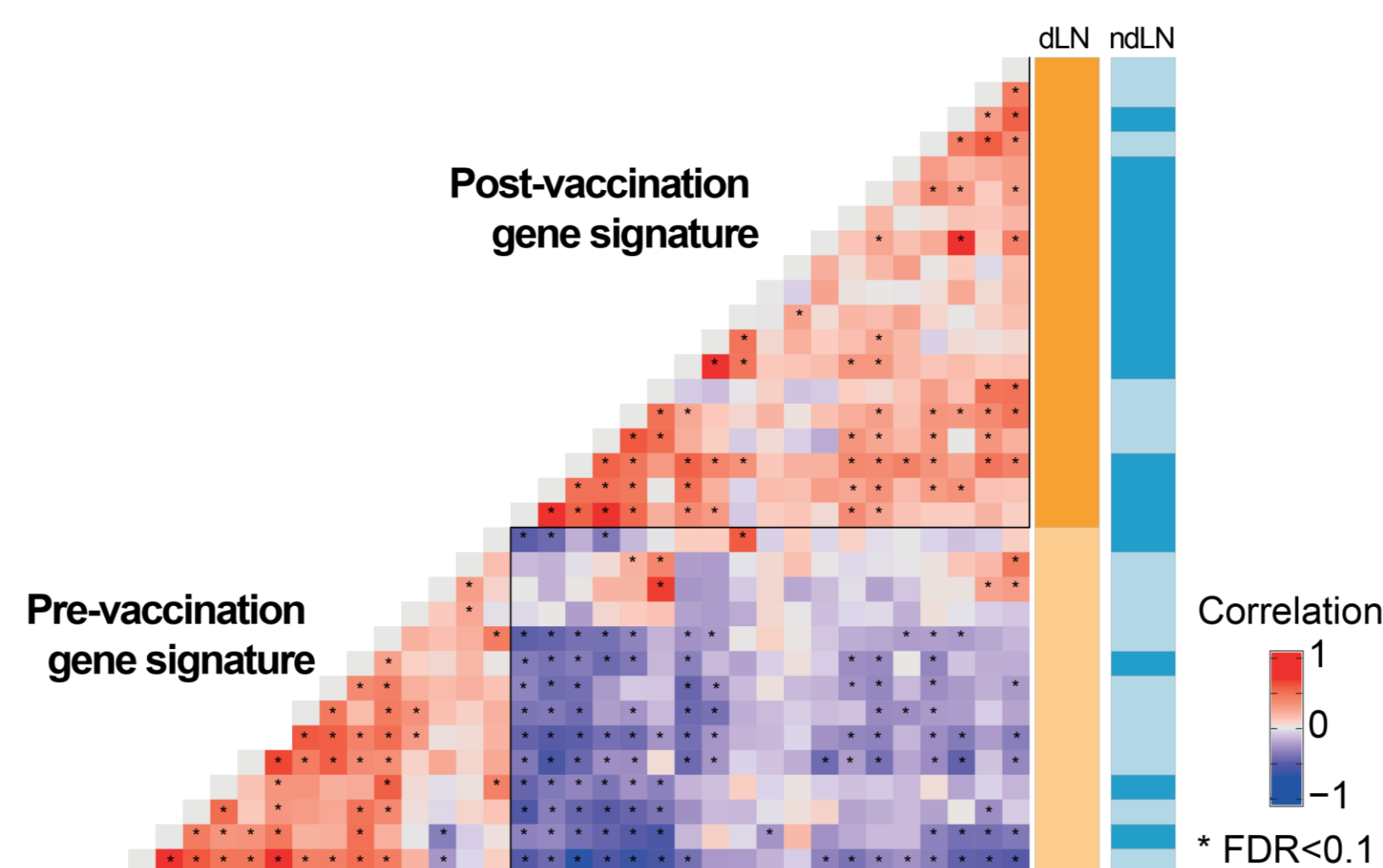
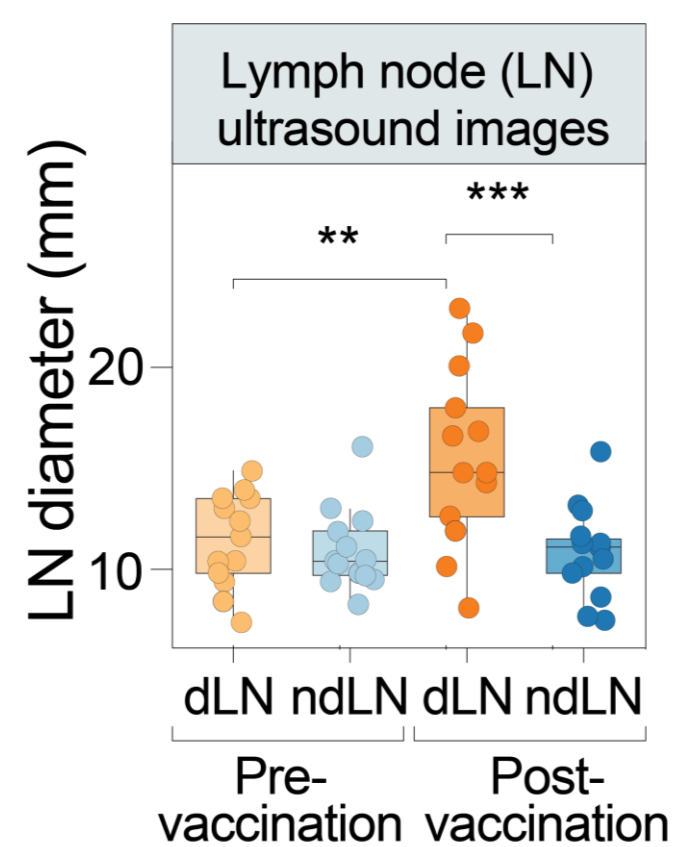
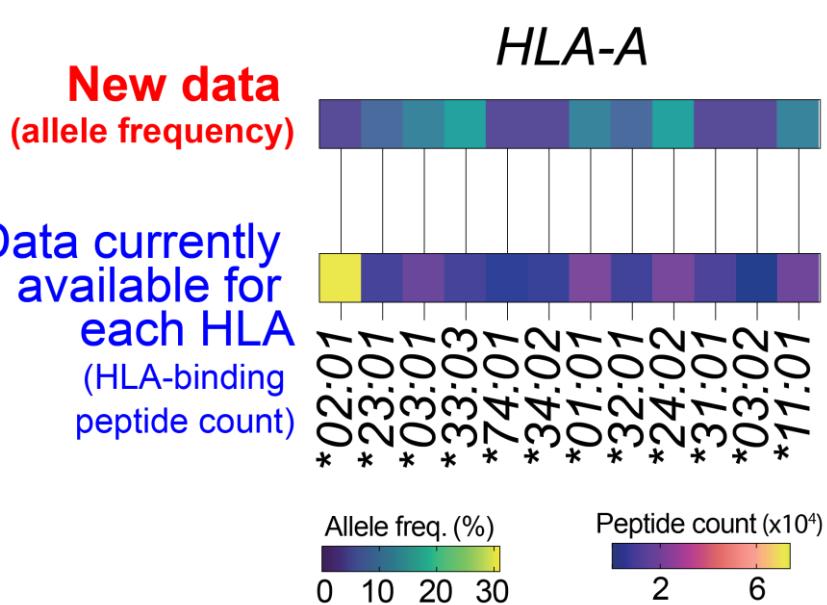
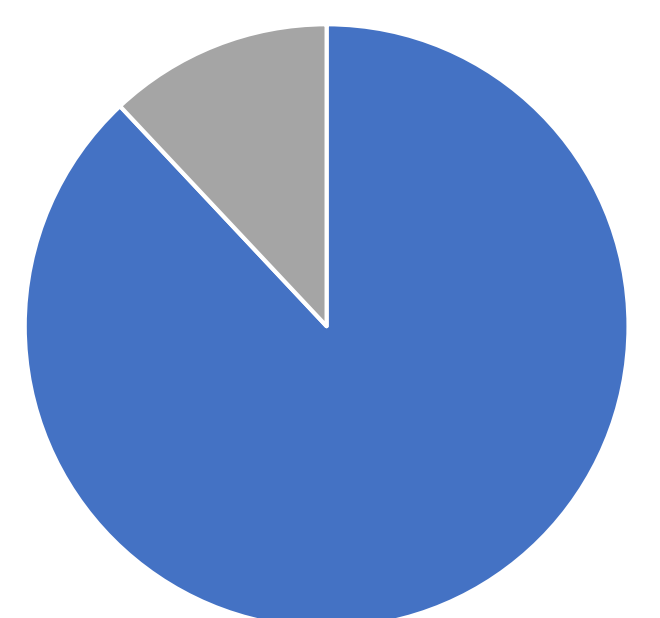


Robust vaccine immune responses are elicited through **temporal, anatomical, and cellular coordination** with specific gene signatures.



Established a robust **research platform** to explore tissue vaccine responses

88% of participants would agree or strongly agree to take part in research again



## Future Outlook

- Support global efforts to curate **diverse and representative** datasets
- Deeper understanding of immune responses in **tissues** can unlock better vaccines

