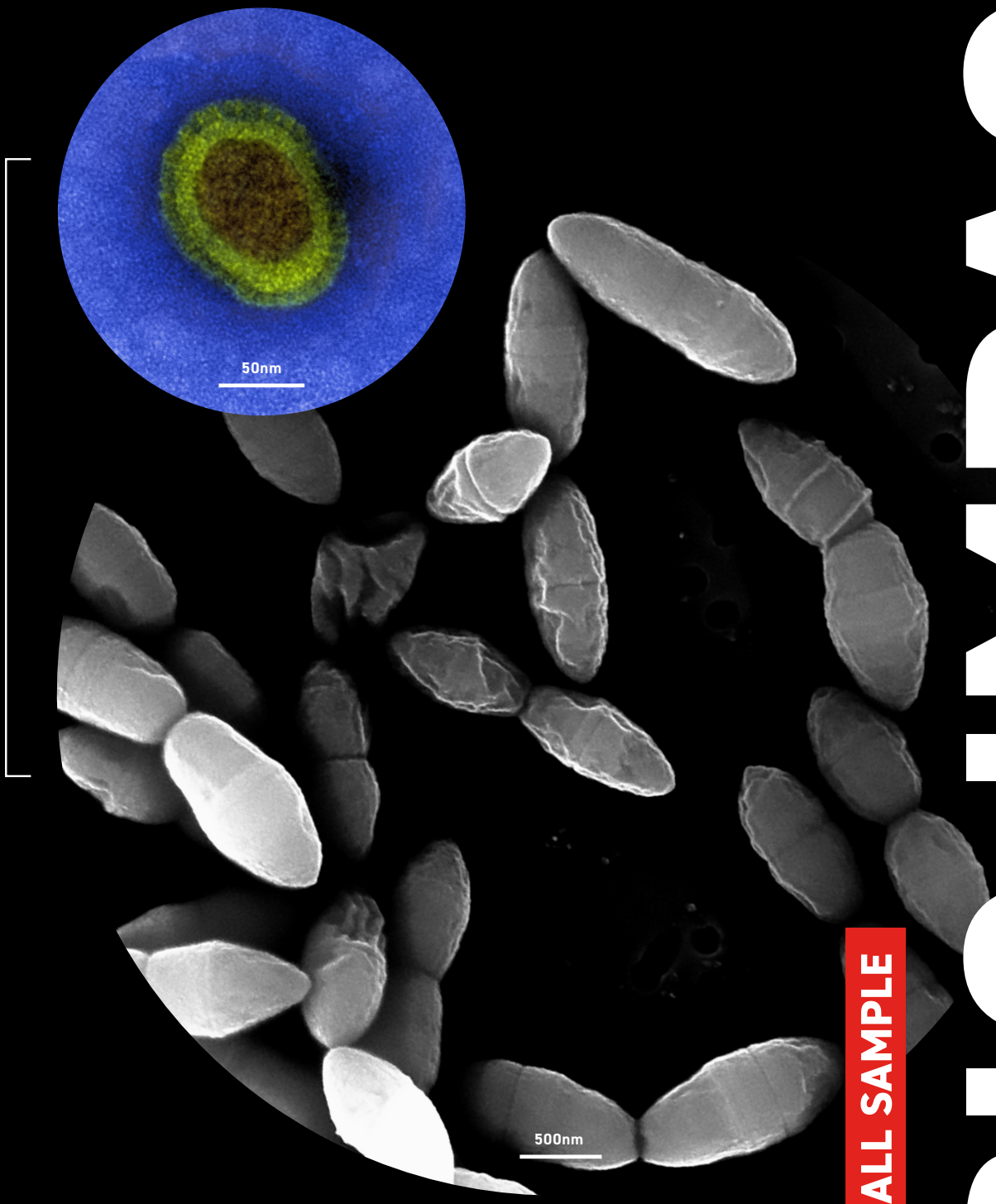
FIGHTING THE BIGGEST BACTERIAL KILLER

MICROSCOPY AUSTRALIA

BIG IMPACT

SMALL SAMPLE

Each year pneumococcal disease kills more children than AIDS, malaria and tuberculosis combined. A novel pneumococcal vaccine that protects against all 100 strains, given with a novel influenza vaccine, may increase the efficacy of both.



Top image: TEM was used to show that influenza virus treated with dry-ice retains is structural integrity after inactivation with gamma irradiation, an indicator of success for clinical trials. Bottom image: Scanning electron micrograph of whole inactivated pneumococcal vaccine.

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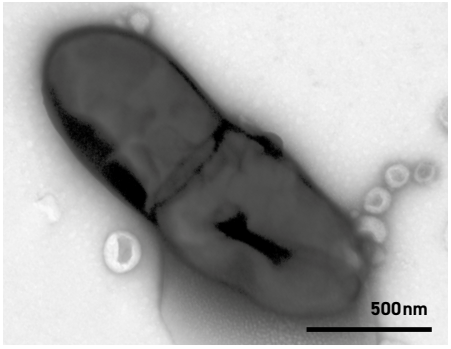

Irradiated influenza vaccine bound to the surface of the irradiated pneumococcal vaccine, the discovery of this binding mechanism was published in Nature.

CHALLENGE

***Streptococcus pneumoniae*, or pneumococcus, is the biggest bacterial killer on the planet and accounts for an estimated 1-2 million deaths a year.**

It is the leading cause of pneumonia, meningitis, sepsis, and sinus and ear infections. These are treated with antibiotics, which in turn contribute to antibiotic resistance, one of the biggest threats to global health. Current pneumococcal vaccines only protect against a small subset of the 100 identified strains.

Influenza predisposes patients to invasive pneumococcal disease, with very high mortality rates. The influenza virus and pneumococcus worked together to cause up to 100 million deaths during the great 'Spanish flu' pandemic of 1918-1919. Despite this well-known synergism, current vaccination strategies continue to target the individual pathogens.

RESEARCH

Dr Mohammed Alsharifi, previously at the Australian National University and now at the University of Adelaide, discovered the potential of gamma-irradiated influenza viruses as universal flu vaccines. Gamma Vaccines Pty Ltd was formed to commercialise this technology, which gives broader protection than the current annual vaccines.

In collaboration with Prof. James Paton, the Gamma Vaccines team then developed a gamma-irradiated pneumococcal vaccine that is designed to protect against all 100 pneumococcal strains. GPN Vaccines, a subsidiary of Gamma Vaccines, was established to commercialise this vaccine. Existing pneumococcal vaccines target the outside coat of complex carbohydrates that are unique to each pneumococcal strain. The GPN Vaccines team removed this coat to expose the underlying surface proteins, common to all pneumococcal strains. GPN Vaccines has completed successful preclinical trials and scaled up to clinical grade manufacture of the vaccine ready for a Phase 1 clinical trial in 2021.

Working together, these researchers are continuing to explore the most effective approaches to vaccination and have tested the simultaneous delivery of the influenza and pneumococcal vaccines. In preclinical studies, they found that giving a combination of the two vaccines enhanced the effectiveness of both.

Transmission and scanning electron microscopy at our University of Adelaide facility were used to enable this research.

IMPACT

- Building business: Two companies formed – Gamma Vaccines Pty Ltd in 2009 to commercialise GammaFlu®, and GPN Vaccines Ltd in 2017 as a subsidiary of Gamma Vaccines to commercialise the broad-spectrum pneumococcal vaccine. GPN Vaccines has recently raised $7 million in a Series 2 investment round and received a $1 million grant from the SA State Government's Research, Commercialisation and Startup Fund for clinical trials.
- Creating jobs: expanding local research and development and supporting Australia's biotechnology ecosystem.
- Cost savings to the public healthcare system
- Reducing the need for antibiotics, reduces the risk of antibiotic resistance
- Healthier populations

FUNDED BY

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