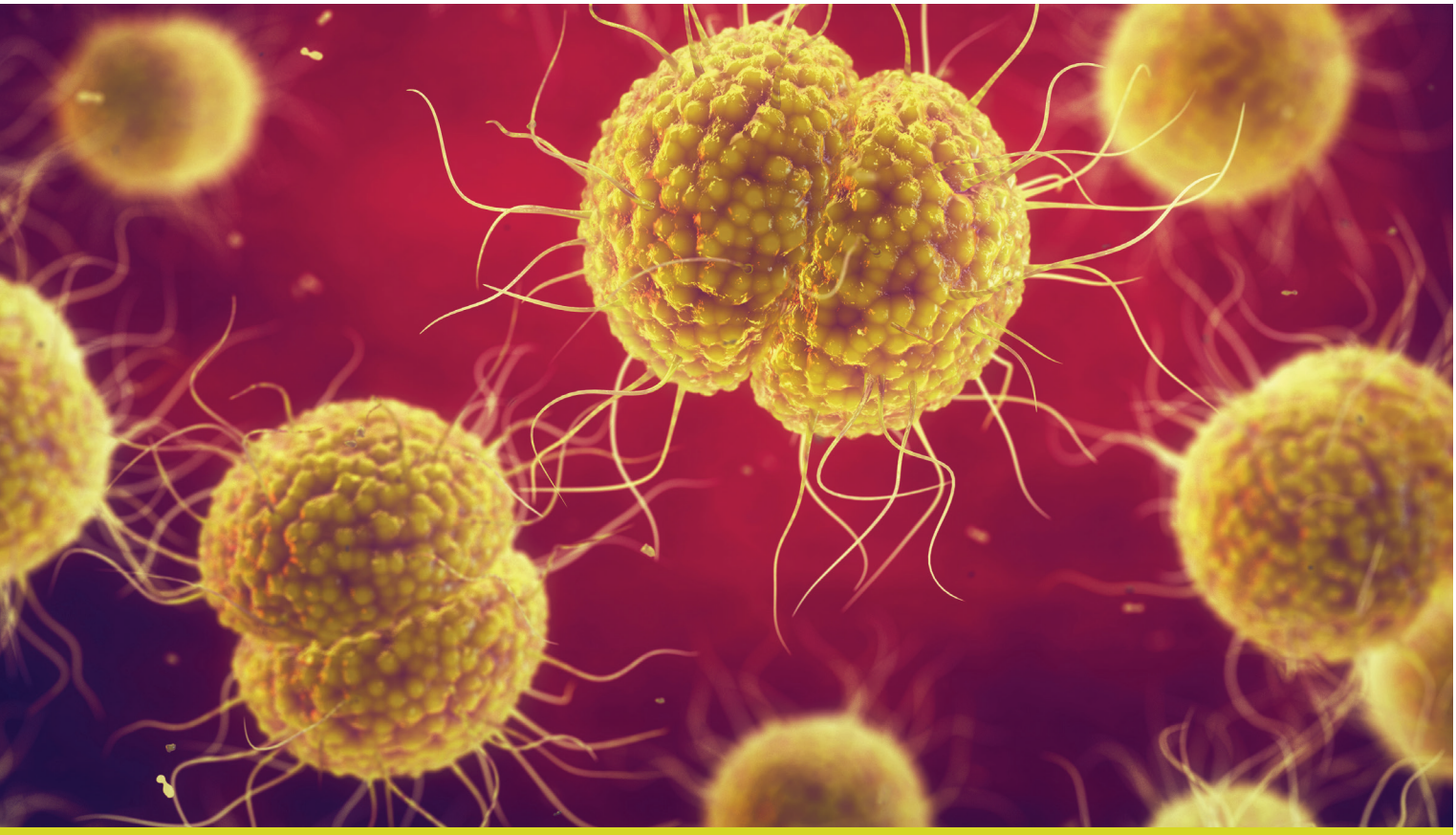
Vaccsheet

Avacc® 11: A first-in-class vaccine against gonorrhea based on *Neisseria gonorrhoeae* outer membrane vesicles and encapsulated IL-12



At a glance

Technology
Proprietary outer membrane vesicle (OMV) technology plus encapsulated IL-12 (Thera**pyx,** Inc.).

Status
Pre-clinical phase.

Unmet need
Estimated global annual incidence is 86.9 million adults. Highest rates in WHO regions Africa and Americas.[1]

Annual adult incidence
86.9 million

Target
Neisseria gonorrhoeae.

Route of administration & schedule
Intranasal spray; likely 2 doses.

Vaccsheet

Disease: Gonorrhea *(Neisseria gonorrhoeae)*

The second most common bacterial sexually transmitted disease (STD), gonorrhea, has been a public health concern for centuries. Today, roughly 86–88 million adults are infected worldwide every year.[1] Treatment consists of a single dose of systemic antibiotics. Nevertheless, the pathogen's rapid and repeated development of antimicrobial resistance, the lack of exposure-based immunity, and the stigma associated with STDs have made infection control elusive.[1] The World Health Organization (WHO) has highlighted the urgency for alternative therapies and a vaccine.[2]

Technology: A platform designed for infectious diseases

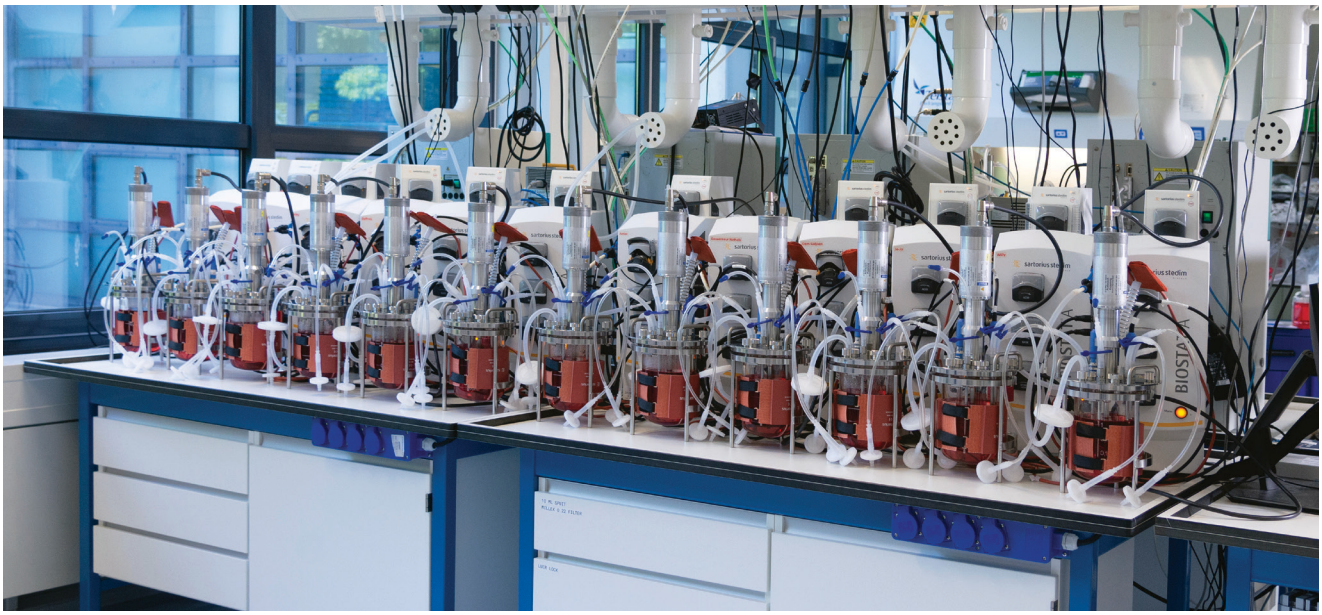
Intravacc's OMV platform, OMV-VaccT, is a highly versatile technology that has demonstrated efficient performance in prophylactic and therapeutic vaccines for bacterial and viral infections. The naturally secreted bacterial vesicles are safe in humans – even in risk groups – and carry multiple antigens that induce broad protection. OMVs enable flexible vaccine concepts and are highly stable, requiring only a standard cold chain. Avacc 11 consists of homologous OMVs produced in high yield directly from *N. gonorrhoeae*.

Therapeutic concept: an IL-12–armed homologous OMV of *N. gonorrhoeae*

Avacc 11 is an intranasal vaccine that elicits a local and systemic immune response for robust protection against initial infection. Outer membrane vesicles (OMV) of *N. gonorrhoeae* in the vaccine trigger the secretion of immunoglobulins A and G (IgA, IgG) from airway mucosal cells. Sustained-release microspheres with human interleukin-12 (IL-12) are co-administered to mitigate the suppression of Th1 /Th2 function commonly seen in *N. gonorrhoeae* infection. This armored vaccine concept was developed in collaboration with Thera**pyx**, Inc.

Current status: Pre-clinical studies demonstrate efficacy of Avacc 11 in clearing infection

Intravacc has been awarded an NIH/NIAID contract to develop Avacc 11 up to phase I clinical trials. Currently, pre-clinical data from mice show a significant increase in IgA and IgG titers after vaccination (Figure 1A), especially when administered intranasally. Vaccinated and control mice were challenged with *N. gonorrhoeae* 2 weeks later. Figure 1B illustrates the faster clearance of bacteria in mice that received the vaccine armed with IL-12 microspheres.[3]



High antibody response and faster bacterial clearance in mice vaccinated with Avacc 11

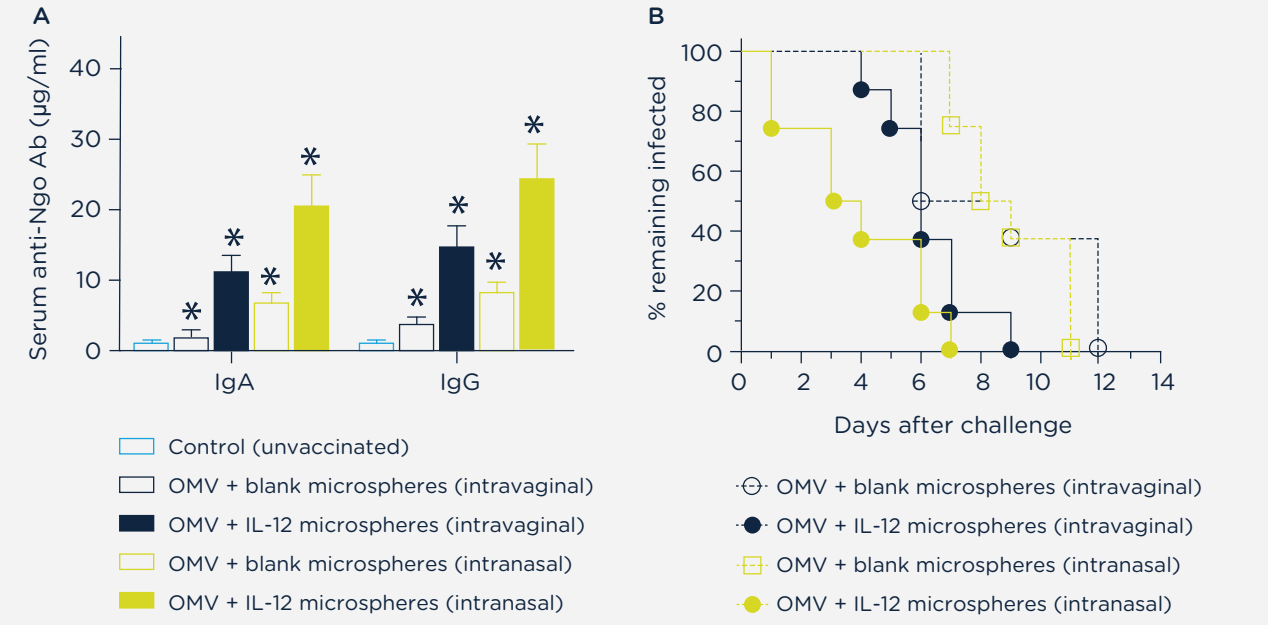


Figure 1. IgA and IgG titers are most elevated in mice administered the combination of *N. gonorrhoeae* OMV and IL-2 microspheres intranasally (filled green bar in A). The same treatment group (filled, continuous green line) also showed the quickest decline in infected individuals after challenge two weeks after vaccination (B).

Initial results from pre-clinical studies in non-human primates also show increased IgA and IgG titers in response to 2 vaccine doses administered intranasally (Figures 2A, 2B). The induced antibodies clear *N. gonorrhoeae* infection effectively (Figure 2C).

Elevated antibody levels in non-human primates vaccinated with Avacc 11

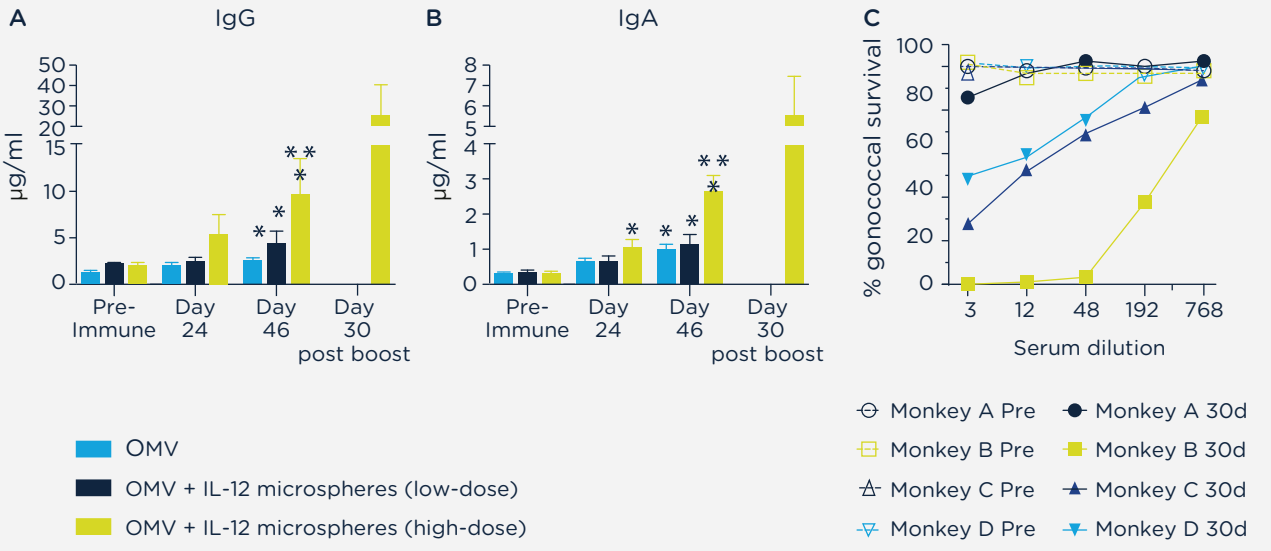


Figure 2. IgG (A) and IgA (B) titers in non-human primates increase significantly in response to Avacc 11. Antibody responses of non-human primates to high and low intranasal doses of *N. gonorrhoeae* OMV plus IL-12 microspheres were compared to just OMV. The high dose triggered significant IgG and IgA rises after a second booster dose. Induced antibodies showed effective bactericidal activity (C).

Further development steps include:

Manufacturing

Establish a GMP-compatible production process and corresponding analytical assays.

Characterization

Assess immunogenicity and efficacy. Subsequently, carry out GLP toxicity studies.

Regulatory affairs

A phase I clinical trial is planned for 2025, following completion of pre-clinical studies.

Other supportive data and structures for partnership or licensing are available and can be presented in a confidential follow-up meeting.

[1] Unemo *et al.* 2019. Nature. doi: 10.1038/s41572-019-0128-6

[2] WHO. 2021. Gonorrhoea: latest antimicrobial global surveillance results and guidance for vaccine development published. https://www.who.int/news/item/22-11-2021-gonorrhoea-antimicrobial-resistance-results-and-guidance-vaccine-development (accessed July 2023)

[3] Liu *et al.* 2022. mSphere 8: e00388-22. doi: 10.1128/msphere.00388-22

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