



# A Pathogen Subunit Display Platform, to Generate Immuno Responses and Vaccines

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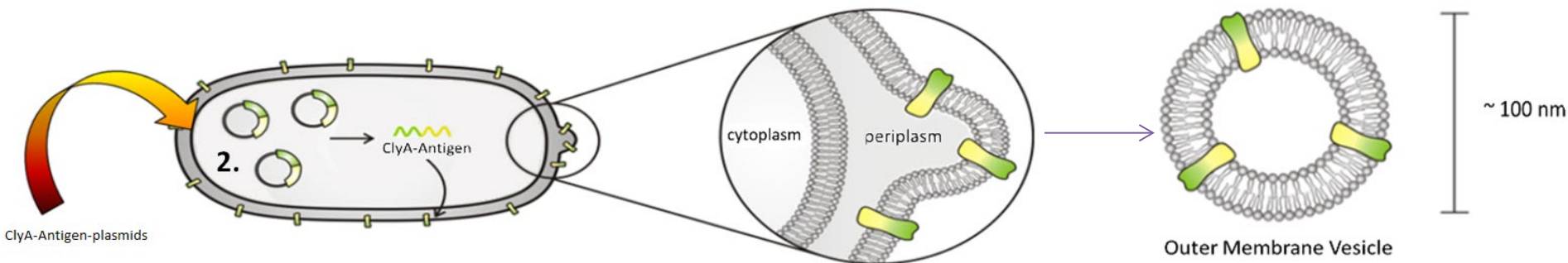
# Protein Surface Display Platform (4048)

## • Technology

- A ClyA-delivery platform that displays and enriches protein on the outer membrane vesicles (OMV).
- The enterobacterial cytotoxin ClyA is expressed on OMV.
- ClyA has an invasive phenotype in bacterial and mammalian cells.

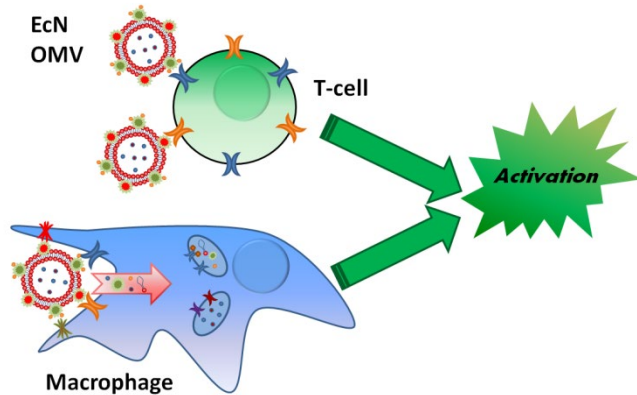
## • Advantages

- Creation and screening of combinatorial libraries
- Effective system for vaccine delivery, drug delivery, and protein surface display
- Overcomes the lack of complete immune response associated with subunit vaccines



# Pathogen-like Subunit System for Vaccine and Drug Delivery (5861)

- Technology: recombinantly engineered Pathogen-like Particles (PLPs) composed of:



1. OMV alone, a potent adjuvant and carrier system for poorly immune subunit antigen
2. *Escherichia coli* Nissle, EcN, probiotic strain and highly immunomodulatory, immunosuppressive strain of *E. coli*.

- Advantages

- Addresses limitations of subunit vaccines by inducing both **robust humoral** and **Th1-dominated cellular** immunity
- Vaccine solution for intracellular pathogens (viruses, intracellular bacterial pathogens, and cancers)
- Lower risk compared to vaccination with whole bacteria or viruses
- Economical to produce and easier to purify

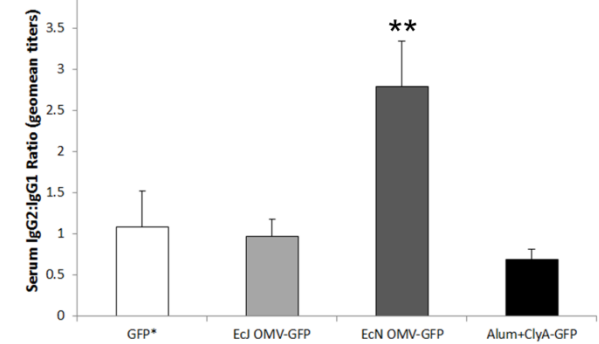
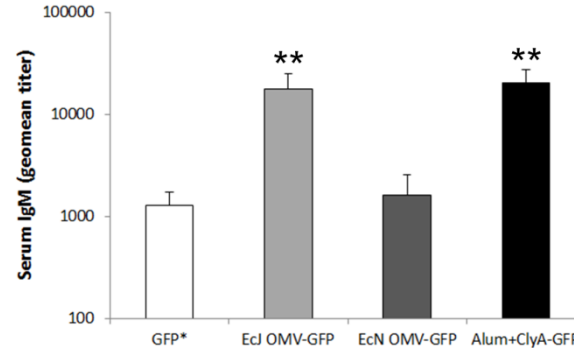
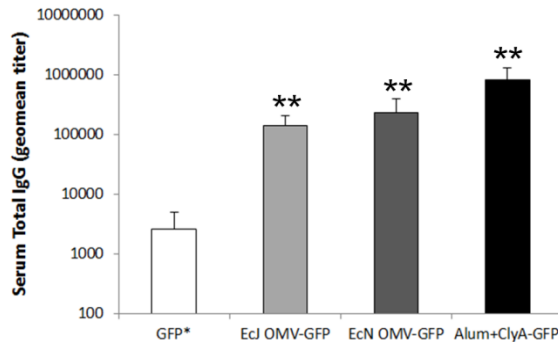
# In vivo proof of concept studies – PLP subunit vaccines

## ● Humoral Immunity

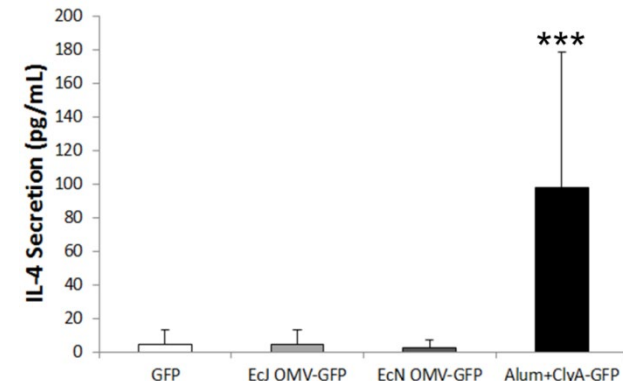
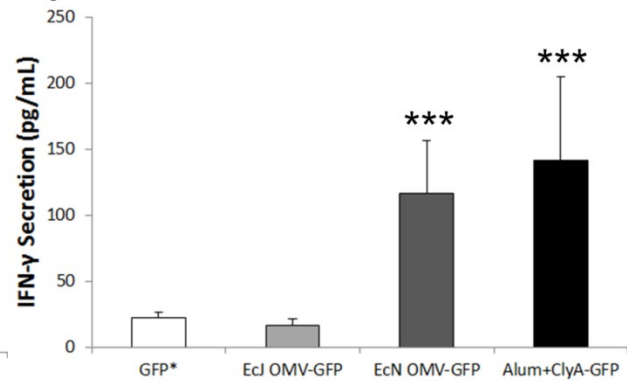
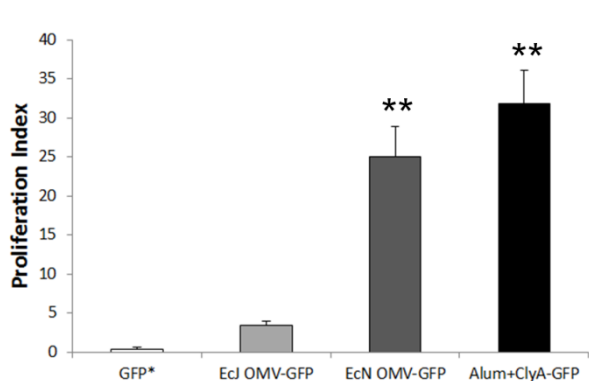
EcJ, non-probiotic K12 *E. coli* strain JC8031

EcN, probiotic *E. coli* Nissle 1917 bacteria

EcJ and EcN OMV both present ClyA-GFP at their surface at a comparable content



## ● Cellular immunity



**EcN-OMV platform generates robust humoral and cellular immune response in BALB/c mice vaccinated and boosted once with antigen-normalized.**

Rosenthal JA, Huang C-J, Doody AM, Leung T, Mineta K, Feng DD, Wayne EC, Nishimura N, Leifer C, DeLisa MP, Mendez S and Putnam D. [Mechanistic insight into Th1-biased immune responses to recombinant subunit vaccines delivered by probiotic bacteria-derived outer membrane vesicles](https://doi.org/10.1371/journal.pone.0112802). doi:10.1371/journal.pone.0112802

# Vaccine Market Overview

- \$33 billion worldwide Vaccine market in 2013
- Projected growth to \$85 billion by 2022
- Major segments: Infectious Disease, Cancer, Allergy, Others (includes physiological diseases such as diabetes and Alzheimer's, as well as smoking cessation)
- Key Market Gaps
  - Pricing
  - Production: Manufacturers face bulk production constraints including process restrictions, technology lags, and purification procedures,
  - Technology for vaccine supply: effective cold chain distribution

Source: Analysis of the Global Vaccines Market. Frost & Sullivan, October 2014

- Cornell's Technology addresses these key market gaps.

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**Cornell Ref.:**

D4048 - <http://cornell.flintbox.com/public/project/21596> & D5861 - <http://cornell.flintbox.com/public/project/20270/>