

Immunological Similarities Between Poly-N-acetyl Glucosamine (PNAG) from *Staphylococcus* spp. and *Escherichia coli*

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Background: *Staphylococcus epidermidis* and *S. aureus* cause serious nosocomial infections, due, in part, to the ability to form a biofilm. The major biofilm constituent is PNAG, synthesized by enzymes encoded in the *icaADBC* locus. Recently, it has been demonstrated that the *Escherichia coli* locus *ycdSRQP* (renamed *pgaABCD*) has homology to the *Staphylococcal icaADBC* locus, and also encodes enzymes that direct the synthesis of a molecule nearly identical to PNAG that also promotes biofilm formation in *E. coli*. The aim of this work was to evaluate the immunological similarities between PNAG and the *E. coli* polysaccharide.

Methods: Nineteen isolates of *E. coli* from urinary tract infections were used in this study. We also cloned the *pgaABCD* locus into an IPTG inducible plasmid, for over expression of the polysaccharide by *E. coli*, as well as made a *pgaABCD* mutant. Different growth conditions were tested in order to determine those that promoted polysaccharide production in *E. coli*. An immunoblot was performed using EDTA extracts from all the 19 *E. coli* strains that was probed with rabbit IgG raised against *Staphylococcal* PNAG. *E. coli* strains were also tested for susceptibility to phagocytosis using affinity-purified IgG's raised against a poorly acetylated form of *Staphylococcal* PNAG that induces good opsonic antibody to *S. aureus* and *S. epidermidis*.

Results: A polysaccharide reactive with antibody to *staphylococcal* PNAG was detected in about 50% of *E. coli* strains. Polysaccharide production was enhanced when glucose was included in the growth medium and elaborated primarily in stationary phase. The *E. coli* strain with the *pgaABCD* genes induced by IPTG elaborated high levels of the PNAG polysaccharide and the *pga*-deleted strain had no detectable PNAG. Rabbit IgG against the deacetylated *Staphylococcal* PNAG was able to kill some of the *E. coli* strains in an opsonophagocytosis assay.

Conclusions: In *E. coli*, PNAG production is dependent on environmental conditions and growth phase. The *E. coli* polysaccharide is produced in low amounts by clinical isolates, but this was still sufficient for PNAG-specific IgG to effectively kill some of these strains.