The potential impact of vaccination on the prevalence of gonorrhea

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Introduction

• Gonorrhea, one of the most common STIs worldwide, can lead to serious sequelae, including infertility and increased HIV transmission. In the absence of new antibiotics, and given the rapid emergence of resistance to all previously used antibiotics, development of a vaccine would be the ideal solution to this public health emergency.

• Understanding the desired characteristics, target population, and expected impact of an anti-gonococcal vaccine is essential to facilitate vaccine design, assessment, and implementation.

• The modeling presented aims to fill these conceptual gaps and inform future gonococcal vaccine development.

Methods

• Using an individual-based, epidemiological simulation model, gonococcal prevalence was simulated in a heterosexual population after the introduction of various hypothetical vaccines.

• The model was adapted from Gray et al., JID, 2009, and is fully described in Craig et al., Vaccine, 2015. An overview of the model (1) and a subset of parameters used (2) are shown.

• A vaccine is considered to have constant protective efficacy until its duration is reached, after which it has no efficacy.

• A 50% efficacious vaccine would halve the probability of infection after sex with an infected partner.

• Simulations were run until prevalence becomes stable or infection disappears from the population.

Results

What would be the impact of vaccines with varying efficacy?

• Does a vaccine need to induce sterilizing immunity?

• Would a modest decrease in transmission have an impact?

• What duration of protection is needed?

Prevalence of gonorrhea with coverage of either males or females with vaccines of:

- 100% efficacy & 20 yrs duration
- 50% efficacy & 20 yrs duration

Model simulations predicted that:

• The sex of those vaccinated was unimportant as long as 50% of the eligible population are vaccinated.

• Vaccinating 75% of incoming core group individuals is about as effective, at a population level, as vaccinating 50% of all 13-year-olds.

Conclusion

• A vaccine of moderate efficacy and duration could have a substantive, and rapid, impact on gonococcal prevalence and disease sequelae, if coverage is high and protection lasts over the highest risk period (i.e., most sexual partner change) among youths.

• Targeting specific groups (e.g., high risk ‘core’ groups, or males/females only) would also have a substantive impact on gonococcal prevalence.

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