

TRANSPLACENTAL ANTIBIOTIC EXPOSURES IN NEWBORN INFANTS

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**Voice of the Trainee
NACCHD Council Open Session
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Penn Medicine

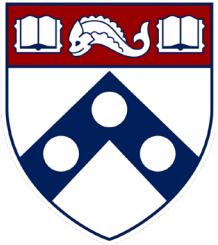
Education and Clinical Training



- Undergraduate: Vanderbilt University
- MD: Vanderbilt University School of Medicine



- Pediatric Residency: Children's Hospital of Philadelphia
- Neonatology Fellowship: Children's Hospital of Philadelphia



- Master of Science in Clinical Epidemiology: University of Pennsylvania
 - Post-doctoral training funded by NIH/NHLBI T32



- Attending Neonatologist, CHOP Newborn Care at Pennsylvania Hospital

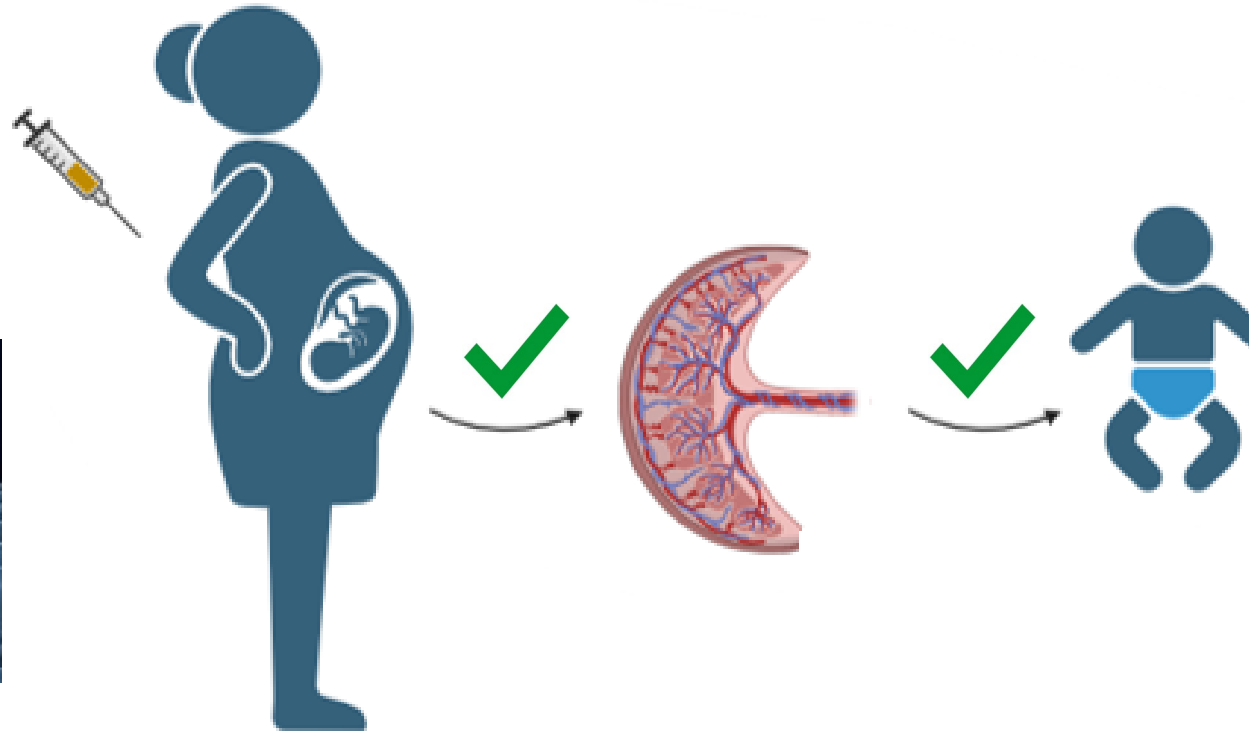
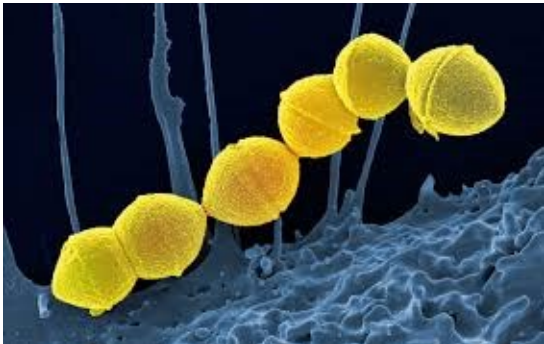
Research and Career Development

- I have already developed expertise in the epidemiology, risk-assessment, and clinical management of neonatal infections
- Limited neonatal PK data hampers progress in optimizing the efficacy and safety of antimicrobial prescribing, stewardship
- Distinct neonatal physiology prevents direct extrapolation from pediatric or adult drug dosing; dearth of neonatologists with pharmacology expertise
- With K23 funding, I aim to fill this gap by becoming an independent clinical scientist dedicated to neonatal antimicrobial pharmacology

Transplacental Antibiotic Exposures in Newborn Infants

- Approximately 50% of American newborns are exposed to maternally-administered intrapartum antibiotics

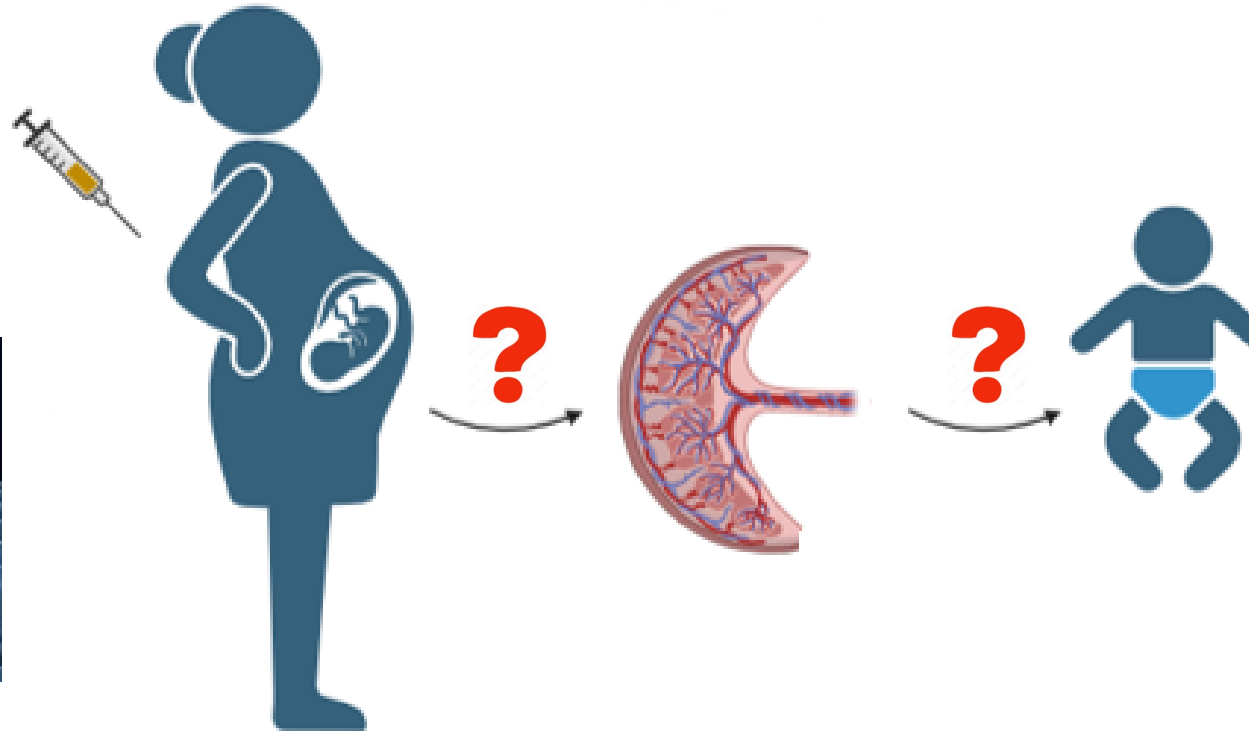
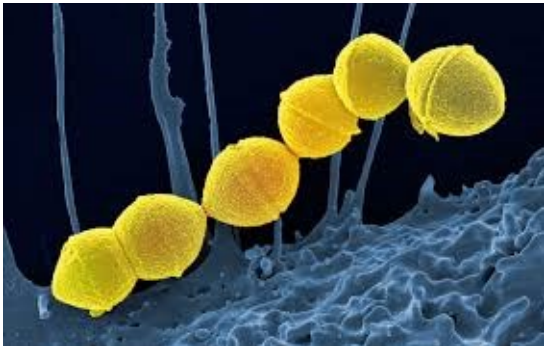
Penicillin G



Transplacental Antibiotic Exposures in Newborn Infants

- Lacking PK data matter: not all agents used for GBS prophylaxis are considered equal!

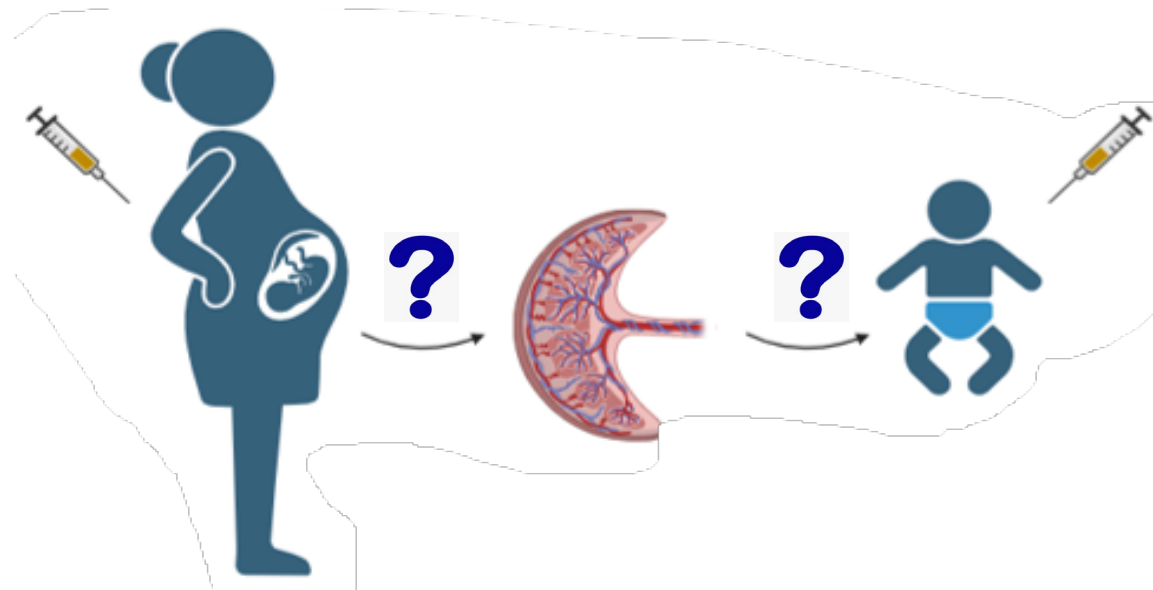
Vancomycin
Clindamycin



Transplacental Antibiotic Exposures in Newborn Infants

- Antibiotics are also the most common medications prescribed to newborns: >200,000 newborns at risk for early-onset neonatal sepsis annually
- Intrapartum exposures not integrated into neonatal dosing guidance

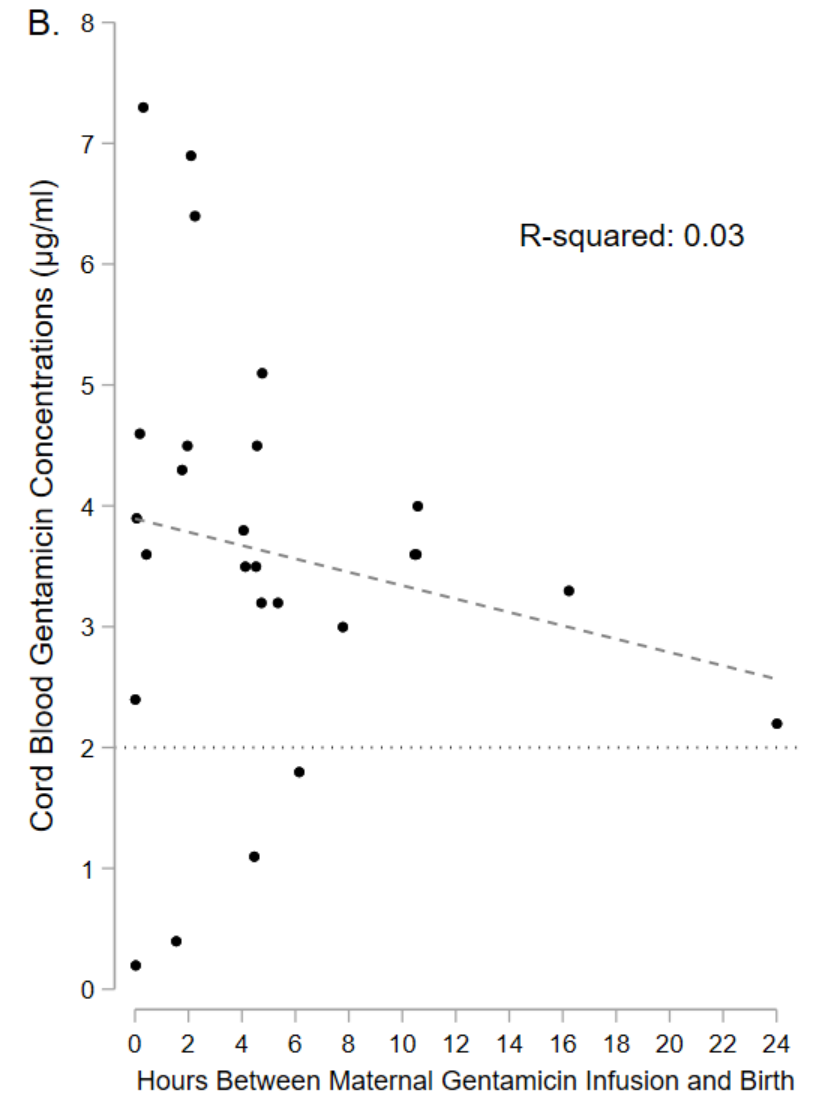
**Ampicillin &
Gentamicin**



**Ampicillin &
Gentamicin**

Intrapartum gentamicin exposures are substantial!

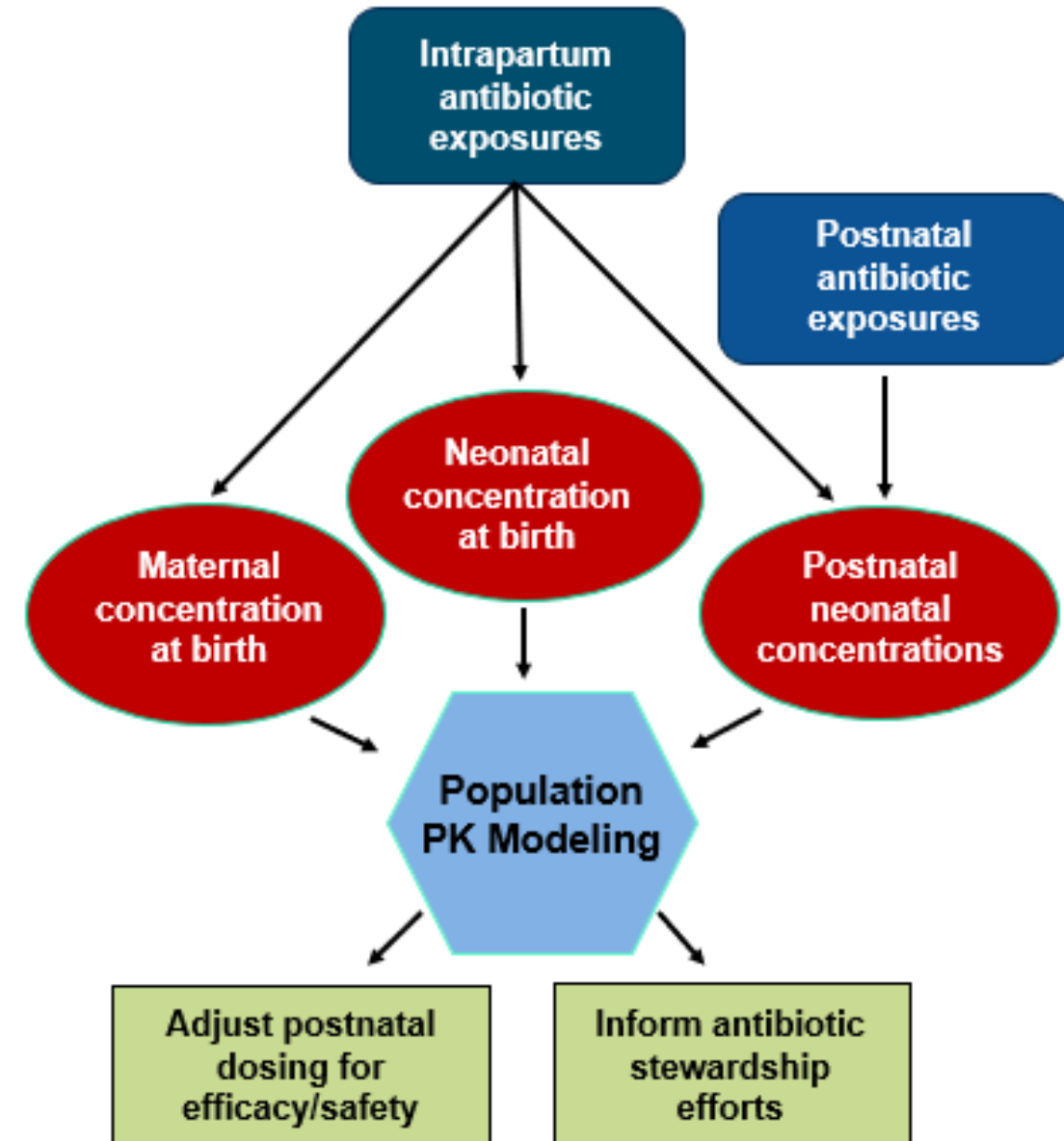
- Pilot study of gentamicin concentrations in umbilical cord blood
- Median concentration 3.6 µg/ml (range 0.2 – 7.3)
- 85% of infants had circulating levels above the <2 µg/ml redosing threshold!



Coggins *et al.*, *Pediatr Res* 2025
PMID 39478198

Transplacental Antibiotic Exposures in Newborn Infants

- Currently enrolling in a prospective PK study to goal of 200 mother-infant dyads
- Consented collection of maternal sera at delivery, cord blood sera, and postnatal infant sera
- Specific Aims:
 - Aim 1: Population PK modeling integrating intrapartum and postnatal **ampicillin and gentamicin** exposures to inform necessity, timing, and dosing of neonatal dosing
 - Aim 2: Quantify transplacental transfer of **vancomycin** and **clindamycin** to inform adequacy as GBS prophylaxis



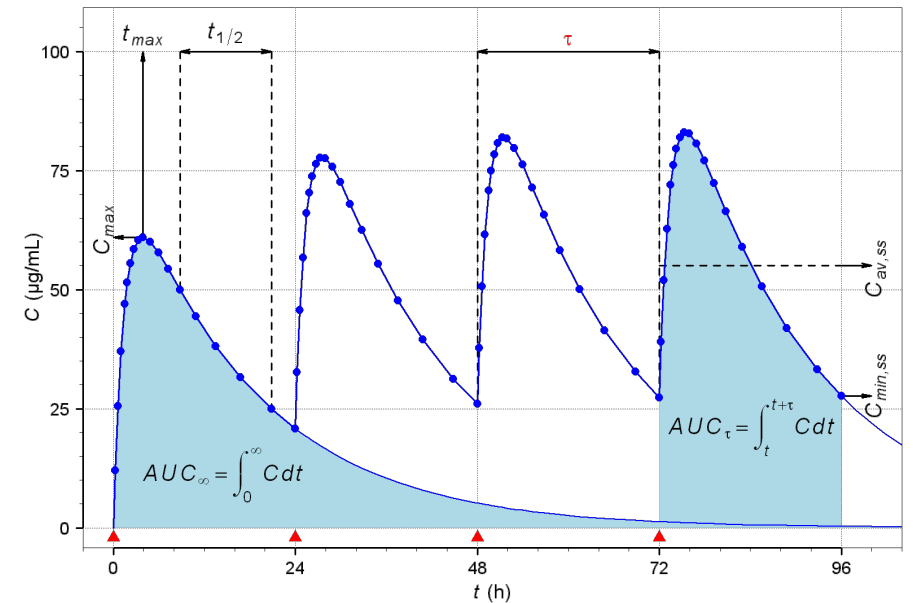
Impact of NICHD Support

- **Professional advancement: promotion to Assistant Professor**
- **Protected time from clinical responsibilities to focus on research efforts**
- **Access to NICHD-sponsored resources and networking**
- **Opportunities to disseminate research findings**



Future Directions

- PK study: actively enrolling!
- Mentored experiential training in PK analysis
- Complementary collaborative efforts in pharmacoepidemiology, infection risk assessment, and stewardship
- Ultimate aim: to obtain R-level grant funding to conduct prospective PK studies and RCTs evaluating neonatal antimicrobial dosing regimens



**BE
ANTIBIOTICS
AWARE**
SMART USE, BEST CARE