An *ex vivo* study measuring antibiotic adsorption to cardiopulmonary bypass circuitry

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Introduction: Cephazolin and vancomycin are commonly used for antibiotic prophylaxis during cardiac surgery supported by cardiopulmonary bypass (CPB). These antibiotics may adsorb to the CPB machine circuitry causing decreased antibiotic concentrations with consequent reduced prophylactic effectiveness[1]. The aim of this study was to develop a PK model to quantify cephazolin and vancomycin adsorption to CPB circuitry.

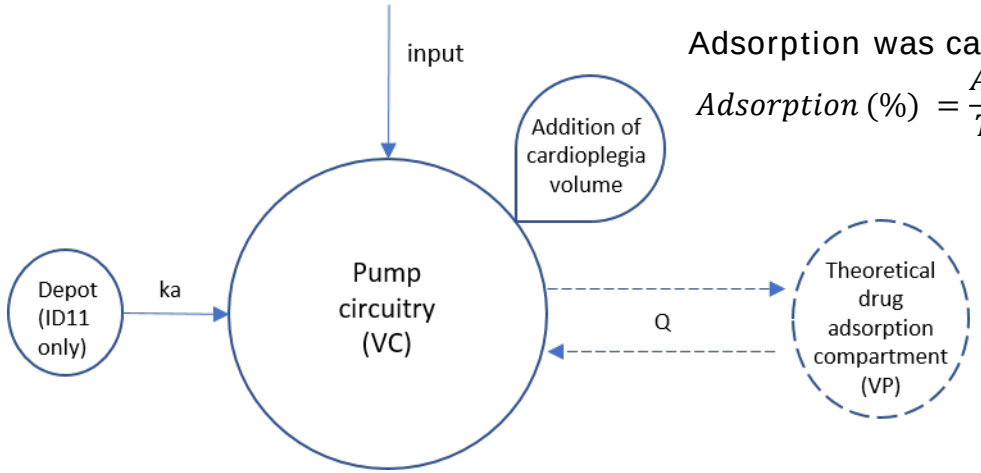
Methods:

Ex vivo experiment
- Enclosed CPB pump
- 12 experimental runs, 1 h duration

Lab analysis
- Unbound concentrations
- HPLC-UV

PK modelling
- 2 compartment distribution model
- NONMEM 7.4.3

PK model and results:



Adsorption was calculated by:

$$Adsorption\ (\%) = \frac{Amount_{adsp}(mg)}{Total\ dose\ (mg)} \times 100$$

Table 1: Average drug amount remaining in adsorption compartment at end of the experimental run for each circuit size

Circuit size	Cephazolin	Vancomycin
Neonate	22.3%	9.6%
Infant	12.1%	-
Child	7.8%	0.8%
Adult	3.1%	0.3%

Conclusion: The amount of drug remaining in the adsorption compartment at the end of the experimental run indicates that cephazolin shows some adsorption whereas vancomycin does not. The model for cephazolin adsorption can be incorporated into a population PK model in patients supported by CPB.

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Reference: 1. Shekar, Kiran, et al. "Protein-bound drugs are prone to sequestration in the extracorporeal membrane oxygenation circuit: results from an ex vivo study." *Critical Care* 19.1 (2015): 164.