

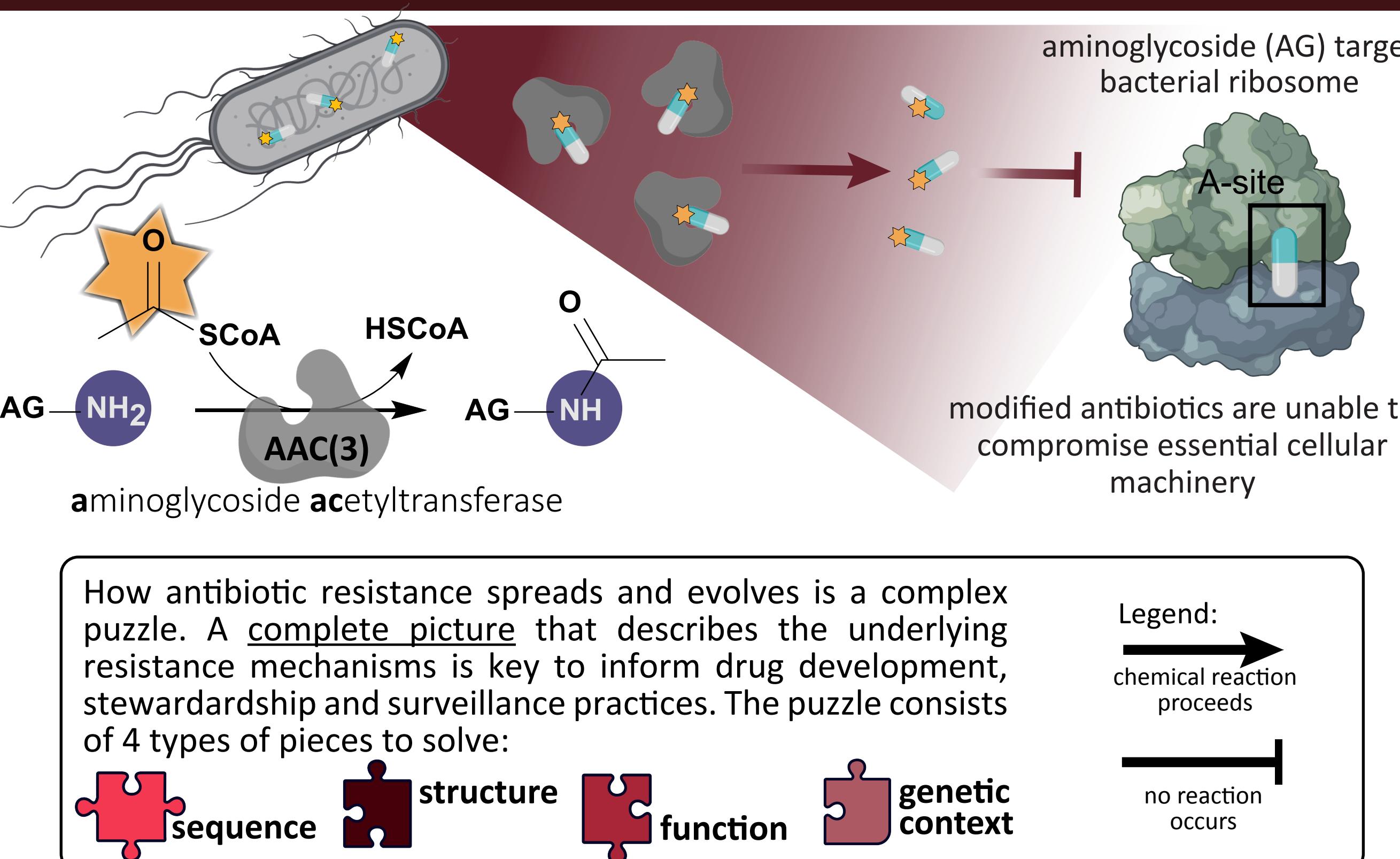
# Improving surveillance and stewardship efforts through harmonization of aminoglycoside inactivation nomenclature

(2) Michael Smith Laboratories, University of British Columbia, Vancouver Campus, BC, Canada. The UBC Vancouver campus is situated within the traditional, ancestral and unceded territory of the x̄məθək̄-aȳem (Musqueam)

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## Timeline of strategies to fight aminoglycoside resistance

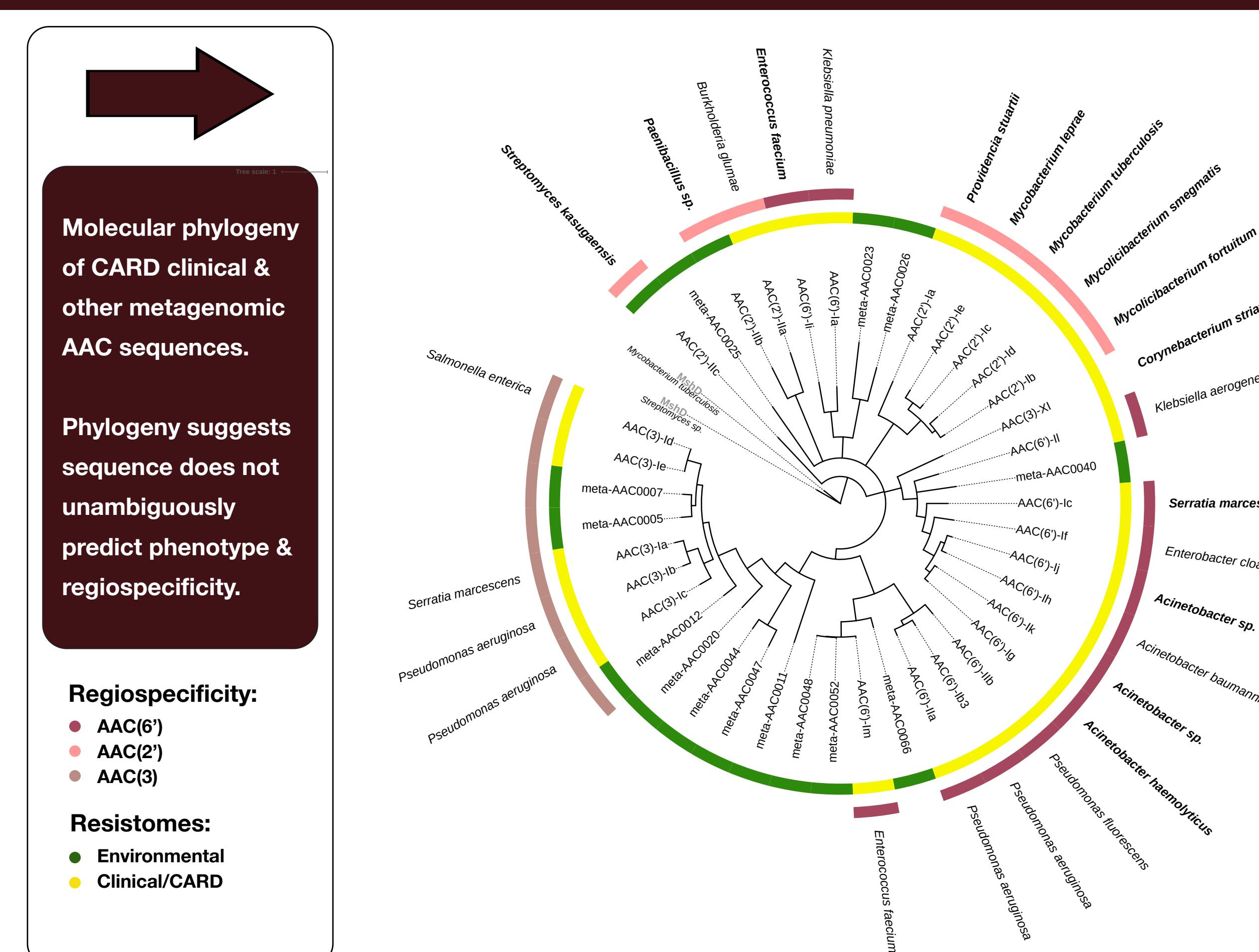


## AME Nomenclature & the Antibiotic Resistance Ontology

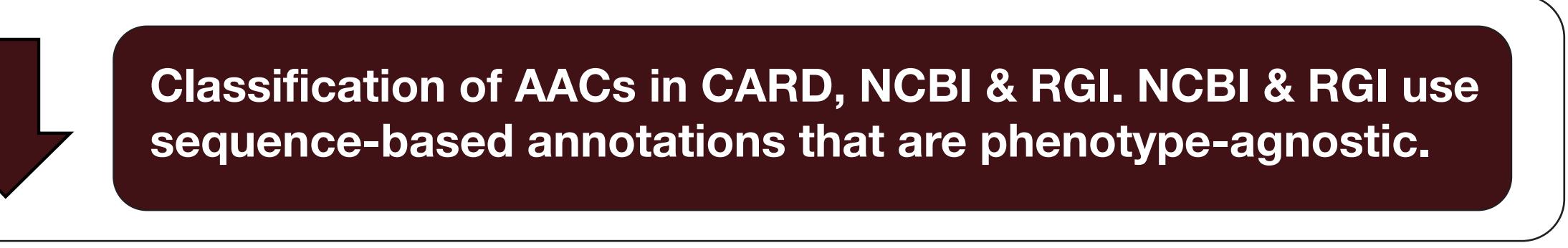
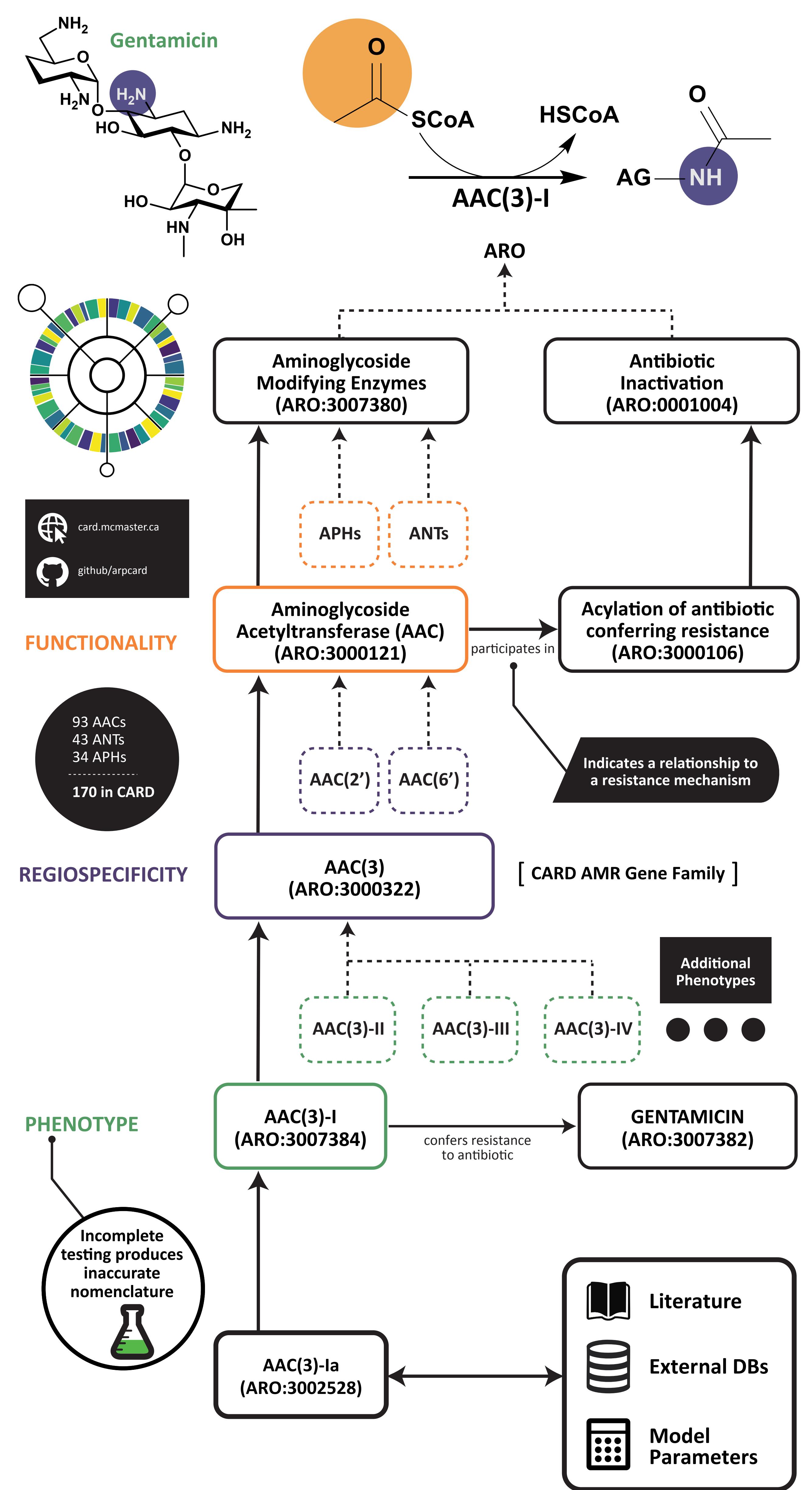
Functionality	Aminoglycoside N-Acetyltransferase					
	Regiospecificity	(3)	(6')	(2')		
Phenotype ►	I	II	III	I	II	I
Antibiotic						
Amikacin	x	x	x	✓	x	x
Dibekacin	x	✓	✓	✓	✓	✓
Gentamicin	✓	✓	✓	✓	✓	✓
Kanamycin	x	x	✓	✓	✓	✓
Tobramycin	x	✓	✓	✓	✓	✓

CARD will incorporate phenotypic testing information to develop the Aminoglycoside Resistance Classification System (ARCS). A snapshot of this information is illustrated in the table above. The full table is available at the CARD-ARCS GitHub: <https://github.com/ARCS-CARD/CARD-ARCS>

## Sequence divergence provides an incomplete picture



## The Comprehensive Antibiotic Resistance Database



Phenotype-based nomenclature is powerful but requires compliance for meaningful surveillance of novel, non-clinical, and/or predicted allele variants. Sequence similarity alone does not predict phenotype.

## Future Directions

CARD will enforce proper nomenclature of aminoglycoside-modifying enzymes published in peer-reviewed literature, and retire alternative nomenclature systems, by reviewing each publication for sufficient evidence of antibiotic-resistant phenotype testing.

- Review & determination of appropriately named published AMEs
- Development of software tools to suggest appropriate namespace based on evidence for novel AME variants
- Community engagement to promote nomenclature and solicit feedback for CARD

\*Alcock, B. P., et al. "CARD 2023: expanded curation, support for machine learning, and resistome prediction at the Comprehensive Antibiotic Resistance Database." *Nucleic Acids Research* 51.D1 (2023): D690-D699.  
†Shaw, K. J., et al. "Molecular genetics of aminoglycoside resistance genes and familial relationships of the aminoglycoside-modifying enzymes." *Microbiological Reviews* 57.1 (1993): 138-163.  
‡Xu, Z., et al. "Structural and functional survey of environmental aminoglycoside acetyltransferases reveals functionality of resistance enzymes." *ACS Infectious Diseases* 3(9) (2017): 653-665.  
§Letunic, I. & Bork, P. "Interactive Tree Of Life (iTOL) v5: an online tool for phylogenetic tree display and annotation." *Nucleic Acids Research* 49.W1 (2021): W293-W296.