The Resistome: What is it, and why should I care? Part 2

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Last week, we talked about the resistome – what it is, and what it could mean for livestock production and public policy. If you need a quick reminder, check back to last week's MSHMP report before continuing.

This week, we continue our list of five emerging trends about the resistome:

3. ***Growing animals experience dramatic changes in their resistome, even in the absence of antibiotic drugs***. This is also true for human babies and children. In fact, the scientific literature is clear on this: the resistome (and also the microbiome!) of rapidly growing livestock animals is dynamic. For the swine world, this means that most of our antibiotic treatments are being given to animals whose resistance (and microbiome) profiles are already in a baseline state of flux. Contrast this to human medicine, where we have the luxury of studying resistance in very mature, stable populations; not so in swine medicine. While that means that our task might be more challenging, I am optimistic that it also presents exciting opportunities. Given that the microbiome (and resistome) of growing animals is already changing dramatically, do we have an opportunity to "nudge" it in one direction or the other? There is some evidence that the microbiomes of adult humans are surprisingly resilient, i.e., they may shift transiently but often return to their "normal" state. This resilience might be a good thing for most of us, but it makes it challenging to change our microbiomes permanently if we need to. Perhaps because growing animals' microbiomes are not so stable, we can more easily nudge them towards a beneficial state, i.e., with more metabolically- and inflammatory-friendly microbes and fewer resistance genes? We don't know yet, but it's an intriguing question.

4. ***Resistance is even more complex than we realize, and this is a good thing***. Given everything I've outlined above, it should be no surprise that some of our assumptions about antibiotic resistance are being challenged. This is a good thing, and I'm hopeful that eventually this newfound knowledge will allow us to protect antibiotic efficacy in the long-term. Bacteria will always find a way to resist our treatments, and therefore the antibiotic pipeline must run continually to keep up. If there are ways that we can manipulate bacterial populations to slow down their evolution towards resistance, this prolongs the efficacy of antibiotics that are already on the market. I think that the complex resistome dynamics that we can now leverage are likely to hold some solutions in this regard.

5. ***Resistome (and microbiome) data is exploding – faster than we can keep up***. Given the relative ease with which we can now generate DNA sequence data, we are experience a "data deluge". While data generation is a necessary step towards knowledge discovery, it is not a sufficient step. We need to make sure that we are taking the laborious and resource-intensive measures needed to turn this data into information, and then finally into applied benefit. This transformation requires a dedicated team of extremely diverse skillsets – and that team includes producers and veterinarians who can help us ask the right questions of the data, and can then help us turn the resulting information into on-farm benefit.

I'm sure this science report is a bit different than what you expected to read, but I hope it was a helpful essay on the resistome and all of its complexities. If you want to read some of our livestock-related scientific literature that utilizes a resistome approach, I would encourage you to read the following research summaries:
https://meg.colostate.edu/wp-content/uploads/2016/08/MEG_Take-Home_Summary_-_eLife_04MAR2016.pdf
https://meg.colostate.edu/wp-content/uploads/2016/08/MEG_Take-Home_Summary_-_AEM_07MAR2016.pdf

There are also some podcasts and blogs about our work, which can be found here:
http://www.feedstuffs.com/story-shotgun-metagenomics-pretty-face-commentary-173-139638
https://www.thenakedscientists.com/articles/interviews/following-food-chain
And finally, you can always see our latest research publications and activities at our website and Twitter accounts:
www.thenoyeslab.org and @noelle_noyes

Thanks for reading!