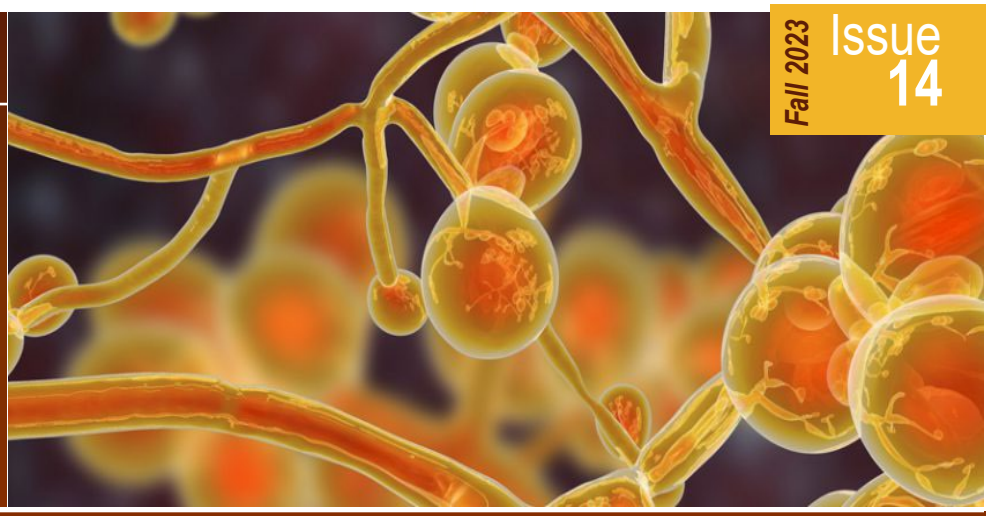
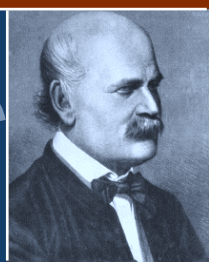


Fall 2023 Issue 14

A Quarterly Insight into Kansas Healthcare Associated Infections, Antimicrobial Resistance and Antimicrobial Stewardship Efforts with a One Health Take

Semmelweis Times



Educational Activities >>>>

Midwest Antimicrobial Stewardship Collaborative (MASC) Noon – 1:30, Nov. 30

Regional gathering of stewardship clinicians, pharmacists and other leaders aiming to improve antibiotic use through education, sharing, and promotion of best practices. In Nov. we explore whole genome sequencing and how it can be integrated into your stewardship program.

For more information and to sign up:

MidwestASC@gmail.com

Antibiotic Roots in the Midwest, Recorded webinar

Kicking off Antibiotic Awareness Week, we will review how Midwest antibiotic discoveries shaped global health: from penicillin's mass production in Peoria, Illinois to the discovery of lincosamides (clindamycin) in a Lincoln Nebraska field.

For more information and to sign up:

khconline.org/initiatives/hiin/education/upcoming-events

Antibiotic Roots in the Midwest

Landmark Antibiotic Discoveries Happened Here

Kellie Wark, MD, MPH
Asst. Prof. Infectious Diseases, KUMC
Antimicrobial Stewardship Lead, KDHE

Penicillin's Path to Production

We know the landmark discovery that set off the golden age of antibiotics was set in motion when pathologist Alexander Fleming returned from vacation in 1928 to find a Petri dish covered in *Staphylococcus* except for the area where penicillium grew. But did you know that the reason we were able to actually use antibiotics is related to Midwest USA? Fleming identified the fungus in the Petri dish as *Penicillium chysogenum and* published his findings[1]. Unfortunately, he was unable to progress his work into a clinically useful product due to the difficulties of growing and fermenting penicillium.

Two decades later Oxford scientists, Howard Florey and Ernst Chain, revived Fleming's efforts. Five years were spent attempting to mass produce the mold for use as a medication, but sufficient quantity for even a single treatment course was unsuccessful[1,2]. In hopes of finding success in this effort, the scientists travelled across the pond to Peoria, IL for assistance. Florey was so terrified that his mold would be stolen during the trip by the Germans, that he smeared his coat with mold instead of storing it in his luggage. Located a few hours north of St. Louis, Peoria, IL was home to USDA mycology expert Dr. Andrew Moyer. Upon arrival in their fungal-coated coats, Florey and Chain presented Dr. Moyer with their mold. Moyer recognized it had been misidentified and was actually *Penicillium notatum*. He also identified this mold was not ideal for their purposes. He recommended they use *P. chysogenum* because it produced exponentially more mold. Moyer then began a search, including an international

Landmark Discoveries (cont'd) >>>

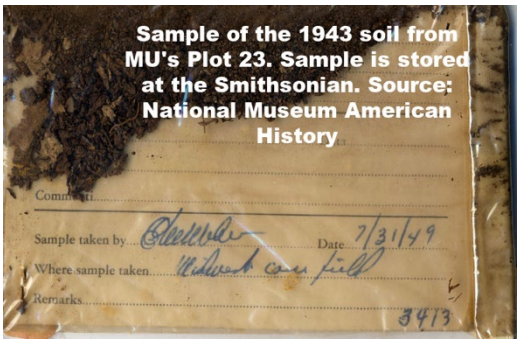
call for mold samples, looking for the ideal specimen. Ironically, the isolate that was chosen came from a moldy cantaloupe was found in a local Peoria market. Dr. Moyer tinkered for a year with this new mold, tailoring the substrate that would allow for best growth (corn-steep liquor) and mass production in deep vats.

Penicillin's next step was Brooklyn, New York where Pfizer mass produced the drug in time to help save thousands of infected World War II soldiers.

Tetracycline: Discovered in a Missouri Field

After penicillin's success, there was a call for soil samples around the world in hopes of finding more mold that could result in new antibiotics. In 1945 Benjamin Duggar, a former Missouri University (MU) botanist known as the "mushroom man", asked his colleague, William Albrect, for samples from MU's Sanborn Field[3].

Opened in 1888, Sanborn Field was an agricultural experiment test station with soil archives dating to 1915[3,4]. The fields are covered in Timothy Grass, a very hardy,



Sample of the 1943 soil from MU's Plot 23. Sample is stored at the Smithsonian. Source: National Museum American History

cold and drought tolerant grass, which was grown at the test station for use as animal feed. Twelve soil samples were collected by Dr. Albrect and sent to Duggar's lab in New York. After testing over 10,000 soil samples, including international, only one sample prevented both gram negative and positive growth. This soil came from Sanborn's plot 23 which had spent 55 years without application of fertilizer or manure. The mold that grew from it had a golden aura. Because of this it was called Aureomycin (aurum is Latin for gold). This was the first of a new antibiotic class called tetracyclines which eventually were used for food animal growth promotion, a well-known practice that antimicrobial stewardship efforts are trying to reverse.

Bob Dole as the First Aminoglycoside's Patient

The word "antibiotic" was first coined by Ukrainian American microbiologist Selman Waksman, who discovered over 20 antibiotics in his lifetime. In 1943 Waksman's grad student, Albert Schatz, discovered streptomycin[5]. This would be the first antibiotic called a "broad-spectrum" because of its ability to kill both gram positive and negative bacteria and was the first effective treatment for tuberculosis. In 1945 while fighting in Northern Italy, Bob Dole was injured with mortar during the final leg of WW2[6]. Evacuated stateside he was rattled with infection requiring removal of his kidney, his spleen, and mangling his right arm.

Transferred to Winter General Army Hospital in Topeka he developed septicemic pneumonia and was transferred to Percy Jones Battle Creek Hospital in Michigan. Streptomycin had just entered into clinical trials. Bob was the third person to receive this drug and the first person to live.


Bob Dole enlisted after completing his first year at KU
Source: Washington Post

Staff Highlight >>>

Stephanie Lindemann, MPH

Zoonotic & Vector-borne Disease

Advanced Epidemiologist

Stephanie Lindemann is an Advanced Epidemiologist with the Infectious Disease Epidemiology and Response (IDER) Section at KDHE. Her area of focus is zoonotic and vector-borne diseases. Previously Stephanie served as an antimicrobial resistance epidemiologist with the HAI/AR Section at KDHE. She earned her MPH in Epidemiology from the Richard M. Fairbanks School of Public Health at Indiana University and worked at the Indiana Department of Health as a rabies epidemiologist prior to joining KDHE in 2019. Her appreciation for the concept of One Health (the interconnectedness of animal health, human health, and the health of the environment), interest in disease ecology, and desire to help others led her to find her career passion in using data to inform public health actions to prevent zoonotic and vector-borne diseases.

Healthy Humor >>>

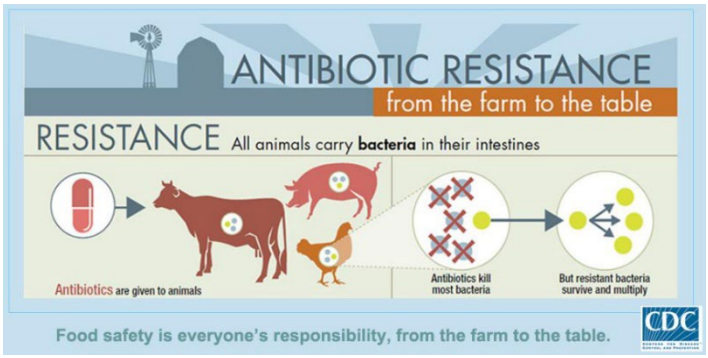
"One Small Step for Mold, One Giant Leap for Medicine"

Antimicrobial Resistance in Food Animals <<<< One Health

A Call To Action: Tackling Resistance in All Sectors

Erin Petro, DVM, MPH
State Public Health Veterinarian
Bureau of Epidemiology and Public Health Informatics, KDHE

One Health, as defined by the World Health Organization, is "an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems" and recognizes that human, animal, and environmental health are inextricably linked.[7] Antibiotic awareness and antimicrobial stewardship (AS) are areas in which taking a One Health approach leverages resources across many different sectors to produce the best health outcome for all domains in the One Health triad. One area that is frequently targeted in the effort to fend off antimicrobial resistance (AR) is the use of antibiotics in food-producing animals. Indeed, those in veterinary medicine recognize this concern, and thus the use of antimicrobials in food-producing animals is heavily regulated and subject to strong oversight by multiple government agencies including the Food and Drug Administration (FDA) and United States Department of Agriculture Food Safety and Inspection Service (USDA-FSIS).



In order to provide a safe food supply that is free from antimicrobial residues, drug withdrawal times have been established for pharmaceuticals that are used in food-producing animals. These withdrawal times establish a minimum period from which the animal(s) treated with the drug must be withheld from the food supply so that the drug and its metabolites have cleared the animal's system and will not adulterate the food-producing animals. These withdrawal times establish a minimum period from which the animal(s) treated with the drug must be withheld from the food supply so that the drug and its metabolites have cleared the animal's system and will not adulterate the food product (meat, milk, eggs). Because of these systems, antibiotic residue in meat is uncommon in the US; however, it is a major problem globally, where less restrictions are in place and compliance with regulations is highly variable. With the recognition of the growing problem of AR, engineering controls have been put in place to lessen the enabling environment that once existed for antimicrobial misuse and overuse. Due to changes such as requiring a Veterinary Feed Directive (VFD) for antimicrobials administered through feed, restricting the sale of OTC antimicrobials, and limiting the indications for use of certain drug classes of human medical importance (e.g., tetracyclines, cephalosporins, etc.), the use of medically important antimicrobials (MIAs) in food-producing animals has decreased by 38% from 2015 to 2021.[8]

A common misconception is that MIAs are used as growth promotants in food-producing animals. However, this practice has not been legal since 2017, and extra-label use of antimicrobials is also strongly regulated in the food animal industry through the FDA Animal Medicinal Drug Use Clarification Act (AMDUCA), which helps ensure that antibiotics are not misused, and residues do not reach the food supply.[9] Certainly there is still plenty of room for improvement, which is why the conversation cannot stop here.

The veterinary industry recognizes the critical importance of preserving antimicrobial efficacy in food-producing animals and is committed to responsible antimicrobial use. While some may tout the benefits of producing and consuming animals that were raised without the use of antibiotics, these parties fail to realize the implications of such practices. To protect the health and welfare of livestock species, veterinarians need access to safe and effective antibiotic treatments when indicated. Purchasing animals raised without the use of antibiotics is praised as "responsible meat purchasing", but the value of animal welfare and animal health is often not even a part of the discussion.4 To truly tackle the growing problem of AR in humans and animals, a One Health approach is paramount. Food animals provide an important source of protein for many, and livestock losses due to widespread AR would create a global food security problem. The human healthcare industry, advocacy groups, legislators, and regulators must work with veterinarians and agricultural producers to understand the regulations and safeguards that are already in place to reduce the use of MIAs and help remove barriers to AS in veterinary medicine, including access to diagnostics, affordability and timeliness of diagnostics, alternate therapeutic options, and managing owners' expectations to receive an antibiotic prescription in scenarios where it might be unnecessary.[11] To preserve the effectiveness of antimicrobials for humans and animals, we need a One Health understanding of antimicrobial use, the drivers of AR, and viable solutions for AS, not simply the elimination of antibiotic use in an entire class of animals.

ask the experts >>>>

Health Inequities in Healthcare Associated Infections and Infection Prevention and Control Programs

Casey Cristini, BS, MSc
KUMC Infection Preventionist

Q: *What is health equity?*

A: Health equity is defined in many ways; a commonly used definition is the "opportunity to attain their full potential" and no one is "disadvantaged from achieving this potential because of their position or other socially determined circumstances." Ensuring everyone achieves health equity requires valuing everyone equally, regardless of race or ethnicity, cultural believes, language, and other socioeconomic determinants, by dedicating societal and healthcare resources to address unavoidable inequalities.

Q: *What are some examples of inequities in healthcare associated infections?*

A: There are many. Certain types of people are at greater risk of community or hospital-acquired infections. For example, African Americans were found to have 1.6 times the risk of CA-BSI as compared to white patients, and Hispanics have 1.3 fold increased risk of CA-UTI than whites.[12] In the outpatient setting, early access to COVID-19 treatments was found to be significantly lower for Black, Hispanic and Asians as compared to White Americans.[13] There is also quite a bit of evidence that certain groups receive more inappropriate antibiotic use. For example, kids in rural KY were 9% more likely to receive antibiotics as compared to their urban peers.[14]

Q: *How can IPaC programs focus on equity?*

A: One way is by forming a group dedicated to systematically looking into the issues in your facility. Every institution is different and there are varied factors that may be affecting your population (for example, rurality, extremes of age, insurance status, racial or ethnic minorities, English as secondary language). Another method is by IPaC partnering with other programs such as: quality/risk, community leaders, pastoral services, transportation services. Encompassing a wider representation of the population served is critical.

We want to help with HAI/AR and AS! Contact us at:

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Do you have topic suggestions for future issues? Send them to us!

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