Investigating the ecology of mobile genetic elements in beef feedlot cattle using high-throughput sequencing

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Mobile genetic elements are of interest because they facilitate horizontal transfer of genetic features between unrelated species. The bulk of research on these elements has focused on investigating single elements in a single genome. This approach makes studying the broader relationships between mobile genetic elements and antimicrobial resistance difficult as it does not consider the more ecological, metagenomic considerations. It is possible to evaluate changes in microbiomes by evaluating shotgun sequencing data for both mobile genetic elements and antimicrobial resistance. We hypothesize that evaluating mobile elements in a metagenomic context will provide greater insight into factors affecting the resistome. In order to evaluate this hypothesis, we created a comprehensive genetic database of mobile genetic elements named MEG-Mobile from published genetic sequences. MEGMobile is a comprehensive annotated database which utilizes a taxonomic structure designed for high throughput data analysis. MEGMobile sequences were obtained from online searches of all previously published sequencing data for insertion sequences, phages, transposons, integrons, plasmids and plasmid incompatibility markers. These major groups are shown in current literature to be elements of primary interest. We used MEGMobile to investigate the composition of mobile elements in beef feedlot cattle, and evaluated the response to mass medication for disease prevention. Results show future use of this bioinformatics tool will allow a broader understanding of the ecological drivers of antimicrobial resistance.

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Intravenous contrast-enhanced computed tomography: dosing and pharmacokinetics of iopamidol in *Cyprinus carpio*

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Koi carp (*Cyprinus carpio*) are a variety of common carp and are a species that has gained popularity as an ornamental fish. In a preliminary study, iopamidol, a contrast agent used for computed tomography (CT), was shown to be safe and effective for enhancing the visualization of vasculature and organs at a dose of 480mg of iodine per kg (mgI/kg). However, the efficacy of lower doses, distribution and elimination of the contrast agent in fish is unknown. The goals of this study were to determine if IV administration of iopamidol at a dose of 150mgI/kg is effective for CT imaging of adult carp, and to evaluate the pharmacokinetics and elimination of iopamidol at the effective dose(s). CT of carp (n=3) at doses of 150mgI/kg and 480mgI/kg were performed at ~5min and 1hr post-injection. Images were evaluated for objective parameters, including contrast distribution within organs using Hounsfield units, and qualitative parameters such as organ recognition and the ability to identify margins. The 150mgI/kg dose was not clinically effective, nor were the 1hr scans at either dose. Blood, bile, gills and kidney were collected after carp (n=6) were injected with 480mgI/kg IV at 5min, 1hr, 6hr, 24hr, 48hr. Samples were analyzed by liquid chromatography-mass spectrometry. Noncompartmental analysis for sparse data was performed on plasma iopamidol concentration using commercially available software. The total systemic clearance = 0.051mL/min/kg, volume of distribution at steady state = 79.9mL/kg, and the terminal phase half-life = 20.4hr. Our results suggest that diagnostic CT scanning using iopamidol as a contrast agent in carp is safe and effective and could be used to evaluate internal organs and diagnose coelomic diseases.

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