Title: Pharmacokinetic interactions Between quinine and vancomycin

Abstract

Bacterial and malaria co-infections are common in malaria endemic countries and thus necessitate co-administration of antibiotics and antimalarials. There have long been anecdotal clinical reports of interactions between penicillin and antimalarial agents, but the nature and mechanisms of these interactions remain to be investigated. Furthermore, during the period of the COVID-19 pandemic, the unregulated usage of antibiotics resulted in increasing cases of bacterial coinfection in COVID-19-infected patients in healthcare settings. The objective is to investigate the effect of co-administration of quinine (Qn) and vancomycin (Van) on their respective pharmacokinetics. We hypothesize that the reduction of the bioavailability of vancomycin might be attributed to the presence of quinine. Quinine plays a significant role in the treatment of complicated, cerebral, and resistant malaria. Malaria is immunosuppressive. As a result, patients with malaria often come down with other infections. Irrespective of how common actual co-infections are, Plasmodium and bacterial co-infections are often presumed, resulting in very common co-administration of these two classes of drugs in sub-Saharan Africa where malaria is endemic. Vancomycin is the most prominent clinically used glycopeptide antibiotic and exhibits potent activity against Gram-positive bacteria. Biophysical techniques such as infrared (IR), fluorescence, thermogravimetric analysis (TGA), and UV visible are employed. IR data show that the amide I group of Van at 1658 cm^{-1} is shifted to lower wavenumbers in the presence of a small amount of Qn, suggesting the formation of a complex Van-Qn, thus reducing the bioavailability of Van. These results are confirmed by TGA data. Fluorescence data also show a decrease in the fluorescence intensity of Qn in the presence of a small amount of Van. A significant decrease in the intensity of Van is also observed in UV-visible data. These results confirm the reduced bioavailability of Van in the presence of Qn. This project informs patients, physicians, pharmacists, and other healthcare

providers that a possible interaction between Van and Qn may occur if these two drugs are co-administered. The possible mechanism involved is also discussed. In the future, the effect of quinine on minimum inhibitory concentrations (MICs) of vancomycin will be determined against multidrug-resistant (MDR) pathogens.