

## **Retention of sensitivity of a disposable sensor using molecularly imprinted carbon paste to vancomycin in human serum.**

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**Introduction.** Optimal dosing design of vancomycin (VCM), a highly nephrotoxic antimicrobial agent, is strongly recommended through therapeutic drug monitoring (TDM) based on total blood concentration over time (AUC). Many hospitals depend on both internal and external laboratories for analyzing blood concentrations of VCM, but data availability often isn't frequent enough to obtain accurate AUCs. This laboratory is developing a VCM sensor chip that enables real-time measurement using a carbon paste (MIP-CP) with an immobilized Molecularly Imprinted Polymer (MIP) with specific binding properties. In this study, we fabricated a sensor with MIP-CP coated on the substrate of a carbon screen-printed electrode and verified the sensitivity of VCM in human serum.

**Methods.** Three monomers, one of which has an affinity for VCM, another with crosslinking ability, and the third serving as the electron mediator in the presence of VCM as the template, were used for grafting onto the surface of carbon particles. The polymer-grafted particles were washed to remove the template and were kneaded with oil to obtain the VCM-imprinted carbon paste. The paste was painted on the wired base to complete the disposable VCM sensor. Human serum specimen containing VCM (0-40 µg/mL) was dropped onto the sensor and output current was plotted against the VCM concentration in the specimen.

**Results and Discussion.** The output current of the sensor has high linearity ( $R^2 > 0.98$ ) with the concentration of VCM in the human serum. The calibration curves for standard serum samples from different serum donors are almost same, indicating that the interference of serum components is negligible. In addition, the results of measurements at one month and two months after the sensor was fabricated, showed no significant difference in sensitivity (slope of the regression line), although the intercepts of the line at the two month later was smaller than that at the one month later. This indicates that the background current, which is unrelated to the VCM, changed during storage. The sensor appears to be practical for use, provided that the obtained data are calibrated using a standard serum sample.

**Keywords:** Vancomycin, Molecularly imprinted polymer, electrodes, Disposable sensor, Point-of-care