Poster

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[P27-7-8] Drug sensor using molecularly imprinted polymer grafted on graphite paste electrode

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Background

A molecularly imprinted polymer (MIP) is a synthetic polymer which binds target molecule specifically. MIP can be obtained by economical and simple procedure. The MIP of a drug is feasible as a molecular recognition element for drug and promising to simplify the procedure of TDM. We developed a sensor using MIP grafted on graphite particle which can detect heparin in blood with high sensitivity and high reproducibility and quick response, which are important feature for clinical use as a disposable sensor.

Methods

Surface of graphite was coated with initiator of radical polymerization and fluidized in a solution of heparin, methacryloxyethyltriammonium chloride, acrylamide, methylenebisacrylamide under UV-irradiation in order to proceed graft polymerization. The heparin was extracted from the graphite by 1 M brine in order to obtain MIP-grafted graphite particle. The particle was pasted by mixing with oil and was packed in end of glass capillaries in order to fabricate electrodes. A traditional cyclic voltammetry was performed with the electrode in physiological saline or bovine whole blood containing 5 mM ferrocyanide and 0-8 units/mL heparin. The relation between the oxidative current at the grafted electrode and heparin concentration was evaluated.

Results

The current intensity increased with the increase of heparin concentration. There was no significant difference in the sensitivity of the current to heparin among electrodes. The sensitivity in the whole blood was similar to that in saline. It takes only 30 s to stabilize the current. The current was sensitive to low molecular weight heparin but insensitive to chondroitin sulfate C, which is analogue of the heparin. The electrode prepared with heparin as the template was insensitive to heparin.

Conclusions

A MIP-grafted graphite electrode of heparin-template can work as a heparin sensor with high sensitivity in blood, with quick response, with high selectivity and with high reproducibility. The electrode is feasible as a disposable heparin sensor for realtime monitoring. MIP-technology can apply many kinds of templates, then MIP-electrodes are feasible for monitoring of drugs which require TDM (eg. antibacterials or anticoagulants).