Deteksi neuraminidase melalui reaksi inhibisi zanamivir pada elektroda berbasis platina = Detection of neuraminidase based on inhibition reaction of zanamivir using platinum based electrodes

Jenny Ariani, author

Abstrak

Virus Influenza A dan B telah menarik perhatian dunia karena dampak buruknya pada kesehatan manusia dan pada akhirnya dapat mempengaruhi perekonomian dunia secara umum. Pendeteksi virus yang sederhana, cepat, dan murah sangat dibutuhkan untuk memperlambat laju penyebarannya.Sementara itu, Zanamivir dikenal sebagai antivirus influenza A dan B. Zanamivir bersifat nonelektroaktif pada permukaan Pt dan diamond terdoping boron (BDD), namun memiliki kemampuan mengkatalisis reaksi H+ menjadi H2 sehingga mempengaruhi respon arus oksidasi Pt. Pada penelitian ini, sensor Neuraminidase dikembangkan melalui reaksi inhibisi Zanamivir menggunakan elektroda berbasis platina. Pada pH 7, dengan mengamati arus puncak Pt(OH)2 pada potensial -0,46 V, kurva kalibrasi linier dapat diperoleh pada rentang kosentrasi 7,5x10-6 M ? 1,5x10-4 M pada elektroda platina dan rentang konsentrasi 1,5x10-5 M ? 3,0x10-4 M pada elektroda BDD termodifikasi Pt (Pt-BDD). Limit deteksi Zanamivir pada Pt sebesar 6,360x10-5 M sedangkan pada Pt-BDD sebesar 9,396x10-6 M. Reproduksibilitas yang baik diperoleh dengan persentase RSD 1,702% dan 1,636% berturut-turut pada elektroda Pt dan Pt-BDD. Pt-BDD kemudian digunakan pada aplikasi sebagai sensor Zanamivir, konsentrasi Zanamivir 2x10-5 M dapat dengan tepat menginhibisi 20 mU Neuraminidase dengan batas deteksi 0,515 mU. Kondisi optimum pengukuran adalah pada pH 6,8 dengan waktu inkubasi 30 menit. Selektivitas sensor diuji dengan penambahan mucin (lendir). Dengan penambahan 0,011 mg/mL mucin Porcine Stomach, terjadi penurunan arus 0,856 %, sedangkan pada penambahan 0,011 mg/mL mucin Bovine Submaxillary Glands, respon arus turun sebesar 0,577 % mengindikasikan sensor yang dikembangkan cukup menjanjikan.

.....

Influenza viruses have attracted a great attention due to it?s harmful effects to human health and in time can also economy in general terms. Therefore, an efficient, low cost, and fast detection method is required. Zanamivir itself known as an antivirus for Influenza A and B. Zanamivir works as an inhibitor of Neuraminidase, an enzyme which found in the viruses of Influenza A and B. Zanamivir is not electroactive at Pt and Boron-doped diamond (BDD) electrodes. However, it electrocatalyzes the reduction reaction of H+ to be H2, affects the oxidation reaction of Pt. In this study, a Neuraminidase sensor was developed based on inhibition reaction of Zanamivir at platinum-based electrodes. At pH 7,oxidation current of Pt(OH)2 at potential of -0.46 V was found to be linear at the concentration range of 7.5x10-6 M ? 1.5x10-4 M and 1.5x10-5 M ? 3.0 x10-4 M at Pt and Pt-modified BDD (Pt-BDD),respectively. Limit of detections (LODs) of 6.360x10-5 M and 9.396x10-6 M can be achieved at Pt and Pt-BDD,respectively. Excellent reproducibility with RSDs of 1.702% and 1.636% were found at Pt and Pt-BDD,respectively. Application of Pt-BDD as sensor for Neuraminidase showed that the maximum concentration of Neuraminidase can be inhibited by 2x10-5M zanamivir was 20 mU.LOD was 0.515 mU Neuraminidase. The optimum pH for the inhibition was 6.8 with incubation time of 30 minutes. Selectivity of the sensor was examined with the presence of mucin . A concentration of 0.011 mg/mL of mucin Bovine Submaxillary Glands and 0.011

mg/mLof mucin Porcine Stomach decreased the oxidation current response of 0.577 % and 0.856 %,respectively,suggesting that the sensors is promising to be applied.