Studi aktivitas material kitosan-magnetit setelah penggunaan kembali sebagai support enzim kolesterol oksidase untuk aplikasi biosensor = Activity study of chitosan-magnetite material after usage repetition as cholesterol oxidase enzyme immobilization support for biosensor

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Abstrak

Enzim kolesterol oksidase merupakan enzim yang dapat membantu mempercepat reaksi oksidasi kolesterol. Salah satu pemanfaatan enzim kolesterol oksidase adalah biosensor kolesterol. Metode enzimatis lebih unggul karena memiliki spesifitas tinggi dan tidak berbahaya. Namun metode enzimatis memiliki kelemahan yaitu enzim yang mudah terdegradasi sehingga perlu dilakukan imobilisasi. Penambahan material imobilisasi dapat menambah biaya karena material imobilisasi yang terbilang cukup mahal, sehingga studi aktivitas material imobilisasi perlu dilakukan. Imobilisasi enzim kolesterol oksidase dilakukan pada material kitosan-magnetit. Penelitian ini dimulai dengan memproduksi enzim kolesterol oksidase dari Streptomyces sp., yang hasilnya kemudian akan diimobilisasi dan digunakan dalam reaksi oksidasi kolesterol. Penelitian ini dilakukan dengan variabel bebas yaitu konsentrasi enzim (0,5;1;2 mg/mL), konsentrasi substrat (0,75;1,25;2,5 mg/mL), waktu oksidasi (5,30,60,120,180 menit), serta bentuk enzim (ekstrak kasar enzim kolesterol oksidase dan enzim kolesterol oksidase terimobilisasi). Hasil uji oksidasi dikuantifikasi dengan menggunakan HPLC. Material imobilisasi akan dicuci dengan menggunakan buffer agar dapat digunakan kembali dalam proses imobilisasi. Dari penelitian dihasilkan konsentrasi substrat yang optimum adalah 2,5 mg/mL, konsentrasi enzim yang paling efektif adalah 2 mg/mL. Reaksi oksidasi kolesterol dengan kondisi optimum dapat mereduksi kolesterol sampai 10%. Sedangkan uji penggunaan kembali material kitosan-magnetit dalam proses imobilisasi menghasilkan bahwa material dapat digunakan kembali saat digunakan sebanyak 2 kali penggunaan.

.....Cholesterol oxidase enzyme is an enzyme which can be the catalyst for cholesterol oxidation reaction. One of the cholesterol oxidase utilizations is cholesterol biosensor. Enzymatic method has more advantages which highly substrate specific, and non-toxic. However, the enzymatic method has some weakness which are easily-degraded and loss its activity which makes enzyme immobilization needs to be done. Immobilization can add additional cost because the material is expensive in average, so the material repeatability study is important. In this research, cholesterol oxidase enzyme will be immobilized in Chitosan-Magnetite. Novelty of this research is the usage of Chitosan-Magnetite material for cholesterol oxidase immobilization, and material repeatability test. This research started with enzyme production from Streptomyces sp., The enzyme will be immobilized and used for the cholesterol oxidation reaction. The independent variables of this research are enzyme concentration (0.5; 1; 2 mg/mL), substrate concentration (0.75; 1.25; 2.5 mg/mL), oxidation time (5; 30; 60; 120; 180 mg/mL), and enzyme forms (crude cholesterol oxidase and immobilized cholesterol oxidase). The immobilization material was washed with buffer, so it can be used in repetition. The research resulted the optimum substrate concentration in cholesterol enzymatic oxidation was 2.5 mg/mL, and enzyme optimum concentration was 2 mg/mL. With the optimum condition of cholesterol oxidation reaction, immobilized cholesterol oxidase can reduce substrate up to 10%. The repeatability study of the chitosan-magnetite material with 2 times repeatability test resulted the

material can be used to immobilize cholesterol oxidase enzyme without losing its ability for immobilization.