Efek Mangiferin dalam Nanopartikel Kitosan-Alginat Terhadap Jantung Tikus yang Diberi Zat Besi Berlebih: Fokus pada Kadar MDA = Effects of Mangiferin in Chitosan-Alginate Nanoparticles on Hearts of Rats with Iron Overload: Focus on MDA Levels

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Abstrak

Latar belakang: Kelebihan besi akibat transfusi darah terus-menerus dapat dialami penderita penyakit hemoglobinopati seperti talasemia. Di Indonesia, prevalensi penderita talasemia terbilang cukup tinggi. Untuk mengatasi kondisi tersebut, dibutuhkan terapi kelasi besi namun, terapi kelasi yang tersedia memiliki banyak kelemahan. Oleh karena itu, dilakukan studi terhadap mangiferin yang memiliki efek kelasi besi. Oleh karena bioavailabilitas mangiferin rendah, perlu dibentuk sebagai nanopartikel kitosan-alginat. Pada studi terdahulu, efek mangiferin dalam nanopartikel kitosan-alginat terhadap kadar MDA pada jantung tikus dengan kelebihan besi belum pernah dibuktikan Tujuan: Penelitian ini bertujuan untuk menilai kemampuan mangiferin dan mangiferin dalam nanopartikel kitosan-alginat terhadap kadar MDA organ jantung tikus dengan kondisi kelebihan besi Metode: Sebanyak 25 ekor tikus Sprague-Dawley dibagi dalam 5 kelompok: kontrol (N), tikus kelebihan besi (IO), dan kelompok terapi per oral yaitu tikus IO yang diberi mangiferin dosis 50 mg/kgBB (IO + M50), mangiferin nanopartikel kitosan-alginat dosis 50 mg/kgBB (IO + MN50), dan mangiferin nanopartikel kitosan-alginat dosis 25 mg/kgBB (IO + MN25). Tikus kelebihan besi diinjeksikan iron dextran intraperitoneal 15 mg, dua kali seminggu selama empat minggu. Kadar MDA organ jantung diukur menggunakan spektrofotometer. Hasil: Rerata kadar MDA jantung tikus pada kelompok N, IO, MN, MN50, dan MN25 secara berurutan adalah 7,36, 2,53, 5,64, 4,80, dan 9,36 nMol/mg. Tidak ditemukan penurunan kadar MDA pada kelompok terapi terhadap kelompok IO. Meskipun begitu, terdapat perbedaan signifikan kadar MDA jaringan jantung tikus Sprague-Dawley pada setiap kelompok (ANOVA, p = 0,048). Ditemukan juga perbedaan bermakna antara kelompok IO dengan MN (P= 0,03) dan MN 50 (P=0,041). Kesimpulan: Mangiferin dan mangiferin dalam nanopartikel kitosan-alginat tidak mampu menurunkan kadar MDA pada jantung tikus dengan keadaan besi berlebih.
.....Introduction: Iron overload due to continuously blood transfusions is a problem that must be faced by people with hemoglobinopathy such as thalassemia. In Indonesia, the prevalence of patient with thalassemia is fairly high. To overcome the conditions of iron overload, iron chelator is needed. However, the available iron chelator therapy has many weaknesses. Therefore, a study of Mangiferin that has an iron chelator effect, has been conducted. However, the bioavailability of mangiferin is low so it needs to be formed as nanoparticles and wrap in chitosan-alginate. In previous studies, the mangiferin effect on MDA levels in the heart of rats with excess iron has not been measured Objective: This study aims to assess the ability of mangiferin and mangiferin in chitosan- alginate nanoparticles on MDA levels in the heart of rats with iron overload conditions. Method: Twenty-five Sprague-Dawley rats were divided into five groups: control (N), iron overload rats (IO), and an oral therapy group, IO rats treated with mangiferin 50 mg/kg/day per oral (IO+M50), mangiferin chitosan-alginate nanoparticle 50 mg/kg/day (IO+MN50), and mangiferin chitosan-alginate nanoparticle 25 mg/kg/day (IO+MN25).The rats were given Iron Dextran 15 mg intraperitoneal, twice a week for four weeks. MDA levels are measured in heart organs using a spectrophotometer. Result:

The MDA concentration in heart at N, IO, MN, MN50, and MN25 groups were 7,36 nMol/mg, 2,53 nMol/mg, 5,64 nMol/mg, 4,80 nMol/mg, and 9,36 nMol/mg. There was no decline in MDA levels in the IO group compare to therapy group. However, there was a significant difference in MDA levels of the Sprague-Dawley mouse heart tissue in each group (ANOVA, P = 0.048). It was also found a significant difference between the IO group and MN ($p = 0.03$) and MN 50 ($p = 0.041$). Conclusion: Mangiferin and mangiferin in chitosan-alginate nanoparticles could not reduce MDA levels in the heart of mice with iron overload.