Studi in vivo konsentrasi kurkumin di usus besar tikus setelah modifikasi ukuran kurkumin menjadi nanopartikel = In vivo study of curcumin concentration in colon of rats following modification into nano-sized particles

Serlie Fatrin, author

Abstrak

Pendahuluan: Berbagai penelitian terdahulu telah membuktikan kemampuan kurkumin untuk menghambat karsinogenesis pada kolorektal. Namun pengembangan kurkumin untuk aplikasi ini terbatas dikarenakan penyerapannya dan bioavailabilitas yang buruk, sifatnya yang kurang stabil, serta tingkat metabolisme, dan eliminasi zat yang cepat. Oleh karena itu, penelitian ini dilakukan untuk membuktikan apakah modifikasi ukuran kurkumin menjadi nanopartikel dapat meningkatkan konsentrasi kurkumin di dalam kolon. Metode: Penelitian ini merupakan studi eksperimental pada tikus Sprague-Dawley betina yang diberikan kurkumin konvensional dan nano-kurkumin secara oral
500mg/kg/BB. Sampel kolon diambil 3 jam dan 4 jam setelah pemberian kurkumin. Konsentrasi kurkumin diukur dengan menggunakan UPLC-MS/MS. Hasil: Setelah 3 jam dan 4 jam pemberian sampel, ditemukan bahwa konsentrasi kurkumin konvensional cenderung lebih tinggi dibandingkan dengan konsentrasi nano kurkumin, walau tidak ada perbedaan yang signifikan (p>0.05). Rata-rata konsentrasi kurkumin dan nanocurcumin pada usus tikus setelah 3 jam adalah 92,463 ± 10.836 ug/g kolon dan 60.931± 4.774 ug/g kolon masing-masing. Sementara itu, setelah 4 jam, rata-rata konsentrasi curcumin dan nanocurcumin di usus tikus adalah 113.560 ± 12.477 ug/g kolon dan 103.725 ± 12.951 ug/g kolon masing-masing. Kesimpulan/Diskusi: Modifikasi ukuran kurkumin menjadi ukuran nano tidak mempengaruhi tingkat konsentrasi kurkumin dalam jaringan kolon tikus. Beberapa penyebab potensialnya adalah agregasi nano-partikel kurkumin, kedua jenis kurkumin terperangkap di dalam mukus, penetrasi nano-partikel melalui transportasi transeluler di dalam epitelium usus, dan tingginya degradasi nanokurkumin di dalam saluran pencernaan (baik secara biologis maupun kimiawi). Hal ini menyebabkan penurunan kuantitas nanokurkumin yang dapat diserap oleh kolon.

Introduction: Various previous studies have proven the ability of curcumin to inhibit colorectal carcinogenesis. However, the development of curcumin for this application is limited due to its poor absorption and bioavailability, its unstable nature, metabolic rate, and rapid elimination of the substance. Therefore, this study was conducted to prove whether modification of the size of curcumin into nanoparticles can increase the concentration of curcumin in the colon. Methods: This study is an experimental study on female Sprague-Dawley rats given conventional curcumin and nano-curcumin orally. 500mg/kg/BW. Colonic samples were taken 3 hours and 4 hours after curcumin administration. Curcumin concentration was measured using UPLC-MS/MS. Results: After 3 hours and 4 hours of sample administration, it was found that conventional curcumin concentrations tended to be higher than nano curcumin concentrations, although there was no significant difference (p>0.05). The mean concentrations of curcumin and nanocurcumin in the intestines of rats after 3 hours were 92.463 ± 10,836 g/g colon and 60,931± 4.774 g/g colon, respectively. Meanwhile, after 4 hours, the mean concentrations of curcumin and

nanocurcumin in the rat intestine were 113,560 ± 12,477 g/g colon and 103,725 ± 12,951 g/g colon, respectively. Conclusion/Discussion: Modification of curcumin size to nano size did not affect the level of curcumin concentration in rat colon tissue. Some of the potential causes are aggregation of curcumin nano-particles, both types of curcumin trapped in mucus, penetration of nano-particles through transcellular transport within the intestinal epithelium, and high degradation of nanocurcumin in the gastrointestinal tract (both biologically and chemically). This causes a decrease in the quantity of nanocurcumin that can be absorbed by the colon.