RINGKASAN

Kematian dan insiden akibat kanker kolon masih tinggi. Penggunaan tanaman obat seperti *Curcuma zedoaria* yang mempunyai khasiat sebagai obat anti kanker. Namun penggunaan efek *Curcuma zedoaria* terhadap peningkatan apoptosis sel mukosa kolon masih diperdebatkan.

Curcumin merupakan salah satu komponen utama *Curcuma zedoaria*. Curcumin mempunyai efek potensial di media lipopolysakarida yang akan merangsang aktivasi makrofag & mengaktivasi bax sehingga akhirnya dapat memicu apoptosis. Penelitian ini untuk mengetahui efek ekstrak *Curcuma zedoaria* terhadap apoptosis sel mukosa kolon mencit BALB/C jantan yang dipapar *9,10-Dimethyl-1,2-benz-(a)anthracene* (DMBA) dalam rangka membuktikan peningkatan apoptosis sel mukosa kolon.

Tujuan penelitian ini adalah membuktikan penurunan jumlah sel mukosa kolon yang mengalami apoptosis pada mencit yang dipapar DMBA dan peningkatan jumlah sel mukosa kolon yang mengalami apoptosis pada mencit yang tidak diberi ekstrak *Curcuma zedoaria*, diberi *Curcuma zedoaria* ekstrak 0,2 %, dan 0,6% setelah dipapar DMBA.

Jenis penelitian ini adalah penelitian eksperimental yang menggunakan mencit BALB/C jantan umur 12 minggu, dengan berat badan 25-35 gram. P1 = mencit tidak dipapar pelarut DMBA dan tidak diberi ekstrak *Curcuma zedoaria*, P2 = mencit dipapar pelarut DMBA dan tidak diberi ekstrak *Curcuma zedoaria*, P3 = mencit dipapar pelarut DMBA dan ekstrak *Curcuma zedoaria* 0,2 %, P4 = mencit dipapar pelarut DMBA dan ekstrak *Curcuma zedoaria* 0,6 %. DMBA diberikan selama 30 hari kemudian diberi ekstrak *Curcuma zedoaria*. Mencit dikorbankan setelah 60 hari setelah dipapar ekstrak *Curcuma zedoaria*. Kolon diambil untuk dilakukan pemrosesan dan pewarnaan dengan teknik *TUNEL Assay* dengan *apoptag detection kit*. Perbedaan jumlah apoptosis sel mukosa kolon mencit pada P1 dan P2 dapat diketahui dengan Uji

t 2 Sampel Bebas, sedangkan perbedaan jumlah apoptosis sel mukosa kolon mencit pada P2, P3, dan P4 diketahui dengan uji A*nova* yang dilanjutkan LSD.

Hasil uji t didapat t = 8,355 p = 0,000 (p<0,05) menunjukkan perbedaan nyata jumlah sel mukosa kolon yang mengalami apoptosis pada mencit yang dipapar DMBA dan yang tidak dipapar DMBA. Pada mencit yang dipapar DMBA, jumlah sel mukosa kolon mengalami penurunan. Penurunan ini menunjukkan bahwa cidera DNA pada sel tersebut tidak dapat diperbaiki dan juga tidak dapat diapoptosiskan sehingga cidera DNA menjadi permanen. Hasil LSD f = 181.025 p=0,000 (p<0,05) juga menunjukkan perbedaan nyata dimana pemberian ekstrak *Curcuma zedoaria* 0,6 % lebih tinggi jumlah sel mukosa kolon yang mengalami apoptosis dibandingkan dengan pemberian ekstrak *Curcuma zedoaria* 0,2 %. Peningkatan ini menunjukkan bahwa sel yang DNAnya mengalami cidera dapat diapoptosiskan sehingga mencegah karsinogenesis.

Kesimpulan dari penelitian ini adalah pemaparan DMBA dapat menurunkan jumlah sel mukosa kolon mencit jantan yang mengalami apoptosis, pemberian ekstrak *Curcuma zedoaria* pada mencit jantan dapat meningkatkan jumlah sel mukosa kolon mencit yang mengalami apoptosis setelah dipapar DMBA, pemberian ekstrak *Curcuma zedoaria* 0,6 % lebih efektif dibandingkan dengan pemberian ekstrak *Curcuma zedoaria* 0,2 % untuk meningkatkan jumlah sel mukosa kolon mencit yang mengalami apoptosis setelah dipapar DMBA

SUMMARY

Death and incidence of colon cancer remains high. An effort to overcome the disease is by the use of medical herbs, such as *Curcuma zedoaria*, which has an anti-cancer effect. However, the effect of this plant on the apoptosis if colon mucosal cells is still controversial.

Curcumin is one of the primary components of *Curcuma zedoaria*. It has a potential effect in lypopolysaccharide media, which will stimulate macrophage activation and activate bax, leading to the triggering of apoptosis. This study was intended to identify the effect of *Curcuma zedoaria* extract on the apoptosis of colon mucosal cells of male BALB/C mice exposed to *9,10-Dimethyl-1,2-benz-(a)anthracene* (DMBA) to prove the increase and decrease of colon mucosal cell apoptosis.

The objective of this study was to prove the reduction of apoptotic colon mucosal cell number in mice exposed to DMBA and the increase of apoptotic colon mucosal cell number in mice receiving *Curcuma zedoaria* extract of 0%, 0.2 %, and 0.6% after being exposed to DMBA.

This was an experimental study using male BALB/C mice aged 12 weeks, with bodyweight of 25 - 35 grams. P1 = mice were not exposed to DMBA, and received 0% *Curcuma zedoaria*, P2 = mice were exposed to DMBA, P3 = mice were exposed to DMBA and 0.2% *Curcuma zedoaria* extract, and P4 = mice were exposed to DMBA and 0.6% *Curcuma zedoaria* extract. DMBA was given for 30 days, and then *Curcuma zedoaria* extract was given. The mice were sacrificed after 60 days exposure to *Curcuma zedoaria*. Colon was removed to be subjected to processing

and staining using *TUNEL Assay* with *apoptag detection kit.* The difference of apoptotic colon mucosal cell number in P1 and P2 could be found using Independent 2 Sample t test, while the difference of apoptotic colon mucosal cell number in P2, P3, and P4 was identified using anova test, followed with LSD test.

The result of t test showed t = 8.355 p = 0.000 ($p < 0.05$), indicating significant difference in apoptotic colon mucosal cell number between mice exposed to DMBA and those not exposed to DMBA. In DMBA-exposed mice, the number of colon mucosal cells reduced, indicating that DNA injury in those cells were irreparable and unapoptosized, so that it became permanent. The result of LSD test was as follows: f = 181.025 p=0.000 ($p < 0.05$), also indicating significant difference. In the administration of 0.6% *Curcuma zedoaria* extract the number of apoptotic colon mucosal cells was higher than that in groups receiving 0.2% extract. Such increase indicated that it was only cells with injured DNA that can be apoptosized to prevent carcinogenesis.

As a conclusion, DMBA exposure can reduce the number of apoptotic colon mucosal cells in male mice. The administration of *Curcuma zedoaria* extract to male mice can increase the number of apoptotic colon mucosal cells after being exposed to DMBA. The administration of 0.6% *Curcuma zedoaria* is more effective than the administration of 0.2% *Curcuma zedoaria* to increase the number of apoptotic colon mucosal cells after being exposed to DMBA.

ABSTRACT

One of main components of *Curcuma zedoaria* is curcumin. It has a potential effect in lypopolysaccharide media, which will stimulate macrophage activation and activate bax, which finally leads to the triggering of apoptosis. The objective of this study was to prove the reduction of apoptotic colon mucosal cell number in mice exposed to *9,10-Dimethyl-1,2-benz-(a)anthracene* (DMBA) and the increase of apoptotic colon mucosal cell number in mice receiving *Curcuma zedoaria* extract of 0%, 0.2 %, and 0.6% after being exposed to DMBA.

This study used male BALB/C mice aged 12 weeks, with bodyweight of 25 - 35 grams. P1 = mice were not exposed to DMBA, and received 0% *Curcuma zedoaria*, P2 = mice were exposed to DMBA, P3 = mice were exposed to DMBA and 0.2% *Curcuma zedoaria* extract, and P4 = mice were exposed to DMBA and 0.6% *Curcuma zedoaria* extract. DMBA was given for 30 days, and followed with *Curcuma zedoaria* extract. The mice were sacrificed after 60 days exposure to *Curcuma zedoaria*. Colon was removed to be processed and stained using *TUNEL Assay* with *apoptag detection kit*. The difference of apoptotic colon mucosal cell number in P1 and P2 could be found using Independent 2 Sample t test, while the difference of apoptotic colon mucosal cell number in P2, P3, and P4 was identified using anava test, followed with LSD test.

The result of t test $p = 0.000$ ($p < 0.05$), indicating significant difference, in which there was a reduction in the number of apoptotic colon mucosal cells in DMBA-exposed mice. The result of LSD test was as showed $p=0.000$ ($p < 0.05$), also indicating significant difference, in which the administration of 0.6% *Curcuma zedoaria* extract the number of apoptotic colon mucosal cells was higher than that in groups receiving 0.2% extract.

DMBA exposure can reduce the number of apoptotic colon mucosal cells in male mice. The administration of *Curcuma zedoaria* extract to male mice can increase the number of apoptotic colon mucosal cells after being exposed to DMBA. The administration of 0.6% *Curcuma zedoaria* is more effective than the administration of 0.2% *Curcuma zedoaria* to increase the number of apoptotic colon mucosal cells after being exposed to DMBA.

Key words : *Curcuma zedoaria*, colon cancer, apoptosis