ABSTRAK

PENGARUH PAPARAN LOGAM MERKURI TERHADAP TERJADINYA BAKTERI *Escherichia coli* RESISTEN MERKURI DAN *Escherichia coli* ESBL In Vitro

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Latar belakang: Tingkat pencemaran di Indonesia masih sangat tinggi baik berupa pencemaran air, pencemaran udara dan pencemaran tanah. Merkuri adalah salah satu logam berat yang mencemari perairan laut, *Escherichia coli* yang terpapar merkuri akan berusaha mempertahankan diri dengan melakukan detoksifikasi merkuri sehingga dapat hidup di lingkungan yang mengandung merkuri. *Escherichia coli* yang berusaha mempertahankan diri dari paparan merkuri di lingkungan hidup akan mengalami perubahan gennya menjadi *Escherichia coli* resisten merkuri. Di plasmid atau transposon mungkin juga merangsang terbentuknya gen pengkode resistensi beberapa antibiotik, salah satunya yaitu pada bakteri penghasil enzym ESBL, Sehingga dapat merubah *Escherichia coli* menjadi ESBL.Oleh karena itu, penelitian ini bertujuan bertujuan membuktikann bahwa pemberian paparan logam merkuri secara berulang kepada bakteri *Escherichia coli* sensitif mercuri non ESBLakan menyebabkan perubahan dari bakteri *Escherichia coli* sensitif merkuri non ESBL tersebut menjadi bakteri *Escherichia coli* yang resisten merkuri dan *Escherichia coli* ESBL

Metode: Penelitian ini merupakan penelitian eksperimental dengan sampel penelitian berupa 27 isolat *Escherichia coli* non ESBL yang sudah teridentifikasi dari mesin Phoenix. Pada isolat klinik *Escherichia coli* non ESBL dilakukan pengujian dengan memberikan paparan HgCl2 dengan konsentrasi 0,02 ppm, 0,10 ppm, 0,20 ppm selama 1-14 hari sampai terbentuk *Escherichia coli* resisten merkuri selanjutnya dilakukan pengujian screning ESBL dengan memberikan paparan *Cefotaxim* terhadap hasil paparan paparan HgCl2 dengan konsentrasi 0,02 ppm, 0,10 ppm, 0,20 ppm.

Hasil penelitian: Dari penelitian pada hari pertama paparan merkuri didapatkan ada 9 isolat *Escherichia coli* yang resisten HgCl2 0,02 ppm, 9 isolat *Escherichia coli* yang resisten HgCl2 0,10 ppm, 9 isolat *Escherichia coli* yang resisten HgCl2 0,20 ppm. Selanjutnya pada isolat *Escherichia coli* tersebut dipapar dengan *Cefotaxim* sebagai screening ESBL. Hasil paparan HgCl2 0,02 ppm didapatkan 3 ((33,3))%) isolat yang masih sensitif Cefotaxim dan 6 (66,7%) isolat yang resisten cefotaxim. Hasil paparan HgCl2 0,10 ppm tidak didapatkan (0%) isolat yang masih sensitif Cefotaxim dan 9 (100%) isolat yang resisten cefotaxim. Hasil paparan HgCl2 0,20 ppm didapatkan 2 (22,2)%) dan 7 (77,8%) isolat yang resisten cefotaxim.

Kesimpulan: Bakteri *Escherichia coli* di urine didalam tubuh manusia sudah mengalami perubahan fenotif menjadi *Escherichia coli* resisten merkuri dan paparan merkuri dengan konsentarasi 0,02 ppm, 0,10 ppm, 0,20 ppm selama 1 hari secara invitro pada isolat *Escherichia coli* resisten merkuri non ESBL menyebabkan perubahan 22 isolat *E coli* di urine.

Kata kunci : *Escherichia coli,* sensitif, resisten, merkuri, ESBL.

ABSTRACT

THE EFFECT OF MERCURY METAL EXPOSURE TO MERCURY RESISTANT *Escherichia coli* AND ESBL *Escherichia coli* IN VITRO

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Background The level of pollution in Indonesia is still very high, consist of water pollution, air pollution and soil pollution. Mercury is one of the heavy metals that pollutes the waters of the sea, while *Escherichia coli* is exposed to mercury will try to defend itself by doing mercury detoxification so that it can live in an environment that contains mercury. *Escherichia coli* that tries to defend itself from mercury exposure in the environment will experience a change in its genes into mercury resistant *Escherichia coli*. In plasmids or transposons, it might also stimulate the formation of resistance genes for some antibiotics, include producing the ESBL enzyme, so that it can convert non ESBL *Escherichia coli* into ESBL *Escherichia coli*. Therefore, this study aims to prove that the repeated exposure of mercury will change non ESBL-mercury sensitive *Escherichia coli* into ESBL- mercury resistant *Escherichia coli*.

Method This was an experimental study with 27 non-ESBL *Escherichia coli* isolates as identified from Phoenix. Non-ESBL *Escherichia coli* clinical isolates were tested by giving exposure to HgCl2 with concentrations of 0.02 ppm, 0.10 ppm, 0.20 ppm for 1-14 days until mercury resistant *Escherichia coli* was formed, and then ESBL screening was tested by giving Cefotaxim exposure to them.

Results On the first day of mercury exposure, there were 9 isolates of 0.02 ppm HgCl2 resistant *Escherichia coli*, 9 isolates of 0.10 ppm HgCl2 resistant *Escherichia coli*, 9 isolates of 0.20 ppm HgCl2 resistant *Escherichia coli*. Furthermore, this *Escherichia coli* isolate was exposed to Cefotaxim as ESBL screening. The final results of post-exposure HgCl2 0.02 ppm was obtained 3 (33.3%) isolates were still sensitive to Cefotaxim and 6 (66.7%) isolates that were resistant to Cefotaxim. The final results of post-exposure HgCl2 0.10 ppm was obtained all 9 (100%) isolates that were resistant to Cefotaxim. The final results of post-exposure HgCl2 0.20 ppm obtained 2 (22.2%) isolates were still sensitive to Cefotaxim and 7 (77.8%) isolate were resistant to Cefotaxim

Conclusion *Escherichia coli* in urine had the phenotive change into mercury resistant *Escherichia coli*. Mercury exposure of 0.02 ppm, 0.10 ppm, 0.20 ppm for 1 day in vitro on isolates of non ESBL-mercury resistant *Escherichia coli* caused changes in 22 isolates of *Escherichia coli* in urine.

Keywords: *Escherichia coli,* sensitive, resistant, mercury, ESBL