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Penilaian Risiko Bakteri Escherichia coli dan Enterococci Pada Air Bersih Nonperpipaan di Kawasan Perkotaan = Risk Assessment of Escherichia coli and Enterococci in Non-piped Clean Water in Urban Areas

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Abstrak

Air tanah merupakan sumber air minum utama bagi 73,7% masyarakat Indonesia. Pencemaran tinja pada air tanah berpotensi menimbulkan dampak buruk bagi kesehatan manusia, di mana ditandai dengan ditemukannya bakteri E. coli dan Enterococci pada air tanah. Penelitian ini dilakukan untuk menganalisis konsentrasi E. coli dan Enterococci pada sampel air tanah di Kota Depok, serta menganalisis risiko kesehatan yang ditimbulkan akibat paparan mikroorganisme tersebut. Kandungan E. coli dan Enterococci pada air tanah diidentifikasi menggunakan kultur bakteri, sedangkan penilaian risiko menggunakan metode Quantitative Microbial Risk Assessment (QMRA). Hasil penelitian menunjukkan rata-rata konsentrasi E. coli dan Enterococci berkisar antara 0–1716,67 CFU/100 mL dan 0–266,67 CFU/100 mL, di mana hanya 1 dari 6 sampel yang memenuhi baku mutu kesehatan. Hasil uji korelasi menunjukkan terdapat hubungan yang berbanding terbalik antara konsentrasi bakteri pada air dengan jarak sumur terhadap pencemar (rEc= -0,142; rEn= -0,120) maupun dengan kedalaman sumur (rEc= -0,561; rEn= -0,896). Penilaian risiko menggunakan metode QMRA dilakukan menggunakan rasio E. coli O157:H7 serta Enterococcus faecalis dan Enterococcus faecium sebagai strain dan spesies yang paling umum dijumpai yang dapat menyebabkan penyakit diare pada manusia. Beban penyakit (DB) diare akibat E. coli dan Enterococci adalah sebesar 0,00137 DALY/orang/tahun, dan 0,000986–0,00109 DALY/orang/tahun, di mana nilai ini belum sesuai dengan health outcome target dari WHO untuk negara berkembang (0,0001 DALY/orang/tahun). Penelitian ini menunjukkan bahwa konsumsi air yang terkontaminasi bakteri E. coli dan Enterococci akibat tangki septik dan lindi dapat berbahaya bagi kesehatan. Sehingga perlu dilakukan intervensi, seperti perbaikan dan perawatan tangki septik sesuai SNI 2398:2017, peningkatan efektivitas praktik pengolahan air di rumah tangga, serta peningkatan manajemen lindi oleh TPA Cipayung Depok.

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Groundwater is the main source of drinking water for 73.7% of Indonesian population. Fecal contamination in groundwater has the potential to cause adverse impacts on human health, which is characterized by the presence of E. coli and Enterococci in groundwater. This study was conducted to analyze the concentration of E. coli and Enterococci in groundwater samples in Depok City, and to analyze the health risks posed by exposure to these microorganisms. The concentration of E. coli and Enterococci in groundwater was identified using bacterial culture. While risk assessment was conducted using the Quantitative Microbial Risk Assessment (QMRA) method. The results showed that the average concentration of E. coli and Enterococci in groundwater samples ranged from 0-1716.67 CFU/100 mL and 0-266.67 CFU/100 mL, respectively, where only 1 of 6 samples met the health quality standards. The correlation test showed that there is an inversely proportional relationship between the concentration of bacteria in the water with the distance of the well to the pollutant (rEc = -0.142; rEn = -0.142) as well as with the depth of the well (rEc = -0.868; rEn = -0.904). Risk assessment using the QMRA method was conducted using the ratio of E. coli

O157:H7 and Enterococcus faecalis and Enterococcus faecium as the most preavelent strains and species that can cause diarrheal disease in humans. The disease burden (DB) of diarrhea due to the exposure of E. coli and Enterococci were 0,00137 DALY/person/year and 0,000986–0,00109 DALY/person/year, respectively, which exceeded the WHO health outcome target for developing countries (0,0001 DALY/person/year). This study showed that consumption of water contaminated with E. coli and Enterococci from septic tanks and leacheate could be harmful to human health. Thus, interventions need to be taken, such as repairing and maintaining septic tanks as specified in SNI 2398:2017, increasing the effectivity of water treatment practices in households, and improving leachate management by TPA Cipayung Depok.