

**STUDI INTERKONEKSI SUNGAI CODE DAN AIRTANAH
SEKITARNYA DENGAN MENGGUNAKAN APLIKASI ISOTOP ALAM
UNTUK MENGETAHUI PENCEMARAN BAKTERI *ESCHERICHIA COLI***

Oleh

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INTISARI

Sungai Code terletak membelah pusat Kota Yogyakarta. Hasil pengujian yang dilakukan oleh Badan Lingkungan Hidup (BLH) provinsi DIY menyebutkan bahwa Sungai Code memiliki kandungan bakteri E.coli melebihi baku mutu yang ditetapkan. Air sungai dapat mengalir menuju airtanah penduduk sekitar sungai apabila tipe interaksi antara sungai dan airtanah adalah *losing stream*. *Losing stream* mengakibatkan airtanah penduduk dapat tercemar bakteri E.coli dari sungai. Penelitian ini bertujuan untuk menentukan tipe interaksi dan interkoneksi antara Sungai Code dengan airtanah (sumur) di sekitar bantaran Sungai Code, menentukan pencemaran E.coli pada airtanah yang disebabkan oleh sungai, dan menentukan genesis airtanah. Isotop alam deuterium (^2H) dan oksigen-18 (^{18}O) digunakan dalam penentuan interkoneksi sungai dengan airtanah dan genesis airtanah. Uji kandungan ^2H dan ^{18}O pada penelitian dilakukan dengan LGR DLT-100.

Hasil analisis menunjukkan bahwa air sungai memiliki tipe interaksi *losing stream* pada lokasi pengambilan sampel airtanah A1 (07°46'55,80"LS; 110°22'15,96"BT), A2 (07°46'54,84"LS; 110°22'16,38"BT), A3 (07°46'54,59"LS; 110°22'16,31"BT), A4 (07°46'53,88"LS; 110°22'16,14"BT), dan A6 (07°46'53,82"LS; 07°46'53,82"BT). Sampel airtanah A7 (07°46'54,12"LS; 110°22'15,54"BT), A8 (07°46'56,46"LS; 110°22'14,1"BT), dan A9 (07°46'56,11"LS; 110°22'15,45"BT) memiliki genesis yang sama yaitu berasal dari air hujan. Pada sampel airtanah A1, A3, A4, dan A6 terjadi intrusi air sungai, yang mengakibatkan nilai $\delta^2\text{H}$ dan $\delta^{18}\text{O}$ mengalami pengkayaan. Sampel air sungai S1T (07°46'55,79"LS; 110°22'16,43"BT) tidak memiliki interkoneksi dengan sampel airtanah sedangkan sampel air sungai S2T (07°46'53,58"LS; 110°22'16,98"BT) memiliki interkoneksi dengan sampel airtanah A2.

Kandungan bakteri E.coli air sungai dan airtanah melebihi baku mutu yang ditetapkan. Sampel air sungai S1T dan S2T memiliki nilai kandungan bakteri E.coli yang sama dengan sampel airtanah A1, A2, A3, A4, A6, dan A7 yaitu lebih besar dan sama dengan 2400 MPN/100 mL. Kandungan bakteri E.coli pada A1, A2, A3, A4, dan A6 diduga berasal dari intrusi air sungai. Sampel airtanah A8 dan A9 memiliki kandungan bakteri E.coli sebesar 1100 MPN/100 mL.

Kata kunci : Sungai Code, ^2H , ^{18}O , *Escherichia coli*, interkoneksi, *losing stream*

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**STUDY OF CODE RIVER AND SURROUNDING GROUNDWATER
INTERCONNECTION USING NATURAL ISOTOPE APPLICATION IN
DETERMINATION OF *ESCHERICHIA COLI* BACTERIA POLLUTION**

by

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ABSTRACT

*Code River is located splitting the center of Yogyakarta City. The results of tests conducted by the Environment Agency DIY province mentioned that the Code River had *E.coli* bacteria content exceeding the established quality standard. River water can flow toward the groundwater of the people surrounding the river if the type of interaction between the river and groundwater is the losing stream. Losing stream lead the population groundwater to be contaminated by *E.coli* bacteria from the river. The objectives of this research were to determine the type of interaction and the interconnection between Code River and groundwater (wells) around Code River, to determine *E.coli* contamination on groundwater caused by river, and to determine groundwater genes. The deuterium (^2H) and oxygen-18 (^{18}O) isotopes were used in the determination of river interconnection between river and groundwater and groundwater genes. The ^2H and ^{18}O contents were performed by LGR DLT-100.*

The results of the analysis showed that river water had the type of losing stream interaction at the location of groundwater sampling of A1 (07°46'55,80"S; 110°22'15,96"E), A2 (07°46'54,84"S; 110°22'16,38"E), A3 (07°46'54,59"S; 110°22'16,31"E), A4 (07°46'53,88"S; 110°22'16,14"E), and A6 (07°46'53,82"S; 07°46'53,82"E). Groundwater samples of A7 (07°46'54,12"S; 110°22'15,54"E), A8 (07°46'56,46"S; 110°22'14,1"E), and A9 (07°46'56,11"S; 110°22'15,45"E) had the same genesis that came from rain water. The intrusion of river water occurred in groundwater samples of A1, A3, A4, and A6, which caused enrichments of $\delta^2\text{H}$ and $\delta^{18}\text{O}$. The sample of river water of S1T (07°46'55,79"S; 110°22'16,43"E) had no interconnection with groundwater samples while the samples of river water of S2T (07°46'53,58"S; 110°22'16,98"E) had interconnection with groundwater sample of A2.

*Escherichia coli bacteria contents in river water and groundwater exceeded the established quality standard. Samples of river water of S1T and S2T had the same value of *E.coli* bacteria as A1, A2, A3, A4, A6 and A7 groundwater samples of over 2400 MPN/100 mL. *Escherichia coli* bacteria contents in A1, A2, A3, A4, and A6 were predicted derived from river water intrusion. Groundwater samples of A8 and A9 contained *E.coli* bacteria of 1100 MPN/100 mL.*

Keywords: *Code River, ^2H , ^{18}O , Escherichia coli, interconnection, losing stream*

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