

Studi Pengaruh Ion Kalsium (Ca^{2+}) Terhadap Struktur Kromosom Limfosit Manusia Menggunakan Mikroskop Cahaya = The Effect of Calcium Ions (Ca^{2+}) on Chromosome Structure of Human Lymphocyte using Light Microscope

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Abstrak

Kromosom merupakan untai DNA yang mengalami penebalan akibat kondensasi. Kondensasi struktur kromosom sangat mempengaruhi segregasi kromosom saat fase mitotik. Penelitian sebelumnya telah melaporkan bahwa kondensasi kromosom sel HeLa dipengaruhi oleh ion kalsium (Ca^{2+}), namun pengaruh Ca^{2+} pada kromosom manusia normal belum diketahui. Penelitian ini bertujuan untuk mengetahui pengaruh terhadap struktur kromosom limfosit manusia dengan pemberian 1 mM 1, 2-bis(2-aminophenoxy)ethane-N-N',N'-tetraacetic acid (BAPTA, chelator Ca^{2+}), 1 mM ethylenediaminetetraacetic acid (EDTA, chelator kation), dan PBS (kontrol) yang diamati menggunakan mikroskop cahaya. Sampel darah dikultur selama 72 jam, kemudian kromosom limfosit diisolasi dan diberi perlakuan 1 mM BAPTA, 1 mM EDTA, dan PBS. Kromosom diwarnai dengan Giemsa dan diamati dengan mikroskop cahaya. Hasil yang diperoleh menunjukkan struktur kromosom kontrol lebih pendek, padat, serta memiliki intensitas pewarna yang pekat dibandingkan dengan kromosom yang diberi perlakuan 1 mM BAPTA dan 1 mM EDTA yang memiliki struktur yang lebih panjang, lebih berongga, serta intensitas pewarna yang kurang pekat. Hasil analisis kuantitatif menunjukkan panjang, lebar, dan luas rata-rata kromosom kontrol sebesar $1,73 \pm 0,73$ m, $0,55 \pm 0,43$ m, dan $3,5 \pm 2,17$ m², sedangkan panjang, lebar, dan luas rata-rata kromosom yang diberi 1 mM BAPTA sebesar $2,91 \pm 1,3$ m, $1,43 \pm 0,43$ m, dan $4,17 \pm 2,75$ m². Rata-rata panjang dan lebar kromosom yang diberi 1 mM EDTA sebesar $2,26 \pm 0,52$ m dan $0,93 \pm 0,29$ m. Hasil tersebut memperlihatkan bahwa Ca^{2+} berperan penting dalam kondensasi struktur kromosom limfosit.

.....The Chromosome is a DNA strand that undergoes thickening due to condensation. Condensation of chromosomal structure affects the segregation of chromosomes during the mitotic phase. Previous studies have reported that chromosomal condensation of HeLa cells is affected by calcium ions (Ca^{2+}). Nevertheless, the effect of Ca^{2+} on human normal cells has yet to be investigated. This study aims to determine the effect of Ca^{2+} on the chromosomal structure of human lymphocyte by the treatments of 1 mM 2-bis(2-aminophenoxy)ethane-N-N',N'-tetraacetic acid (BAPTA, a Ca^{2+} chelator), 1 mM ethylenediaminetetraacetic acid (EDTA, a cation chelator), and PBS (control), using a light microscope. The blood sample was cultured for 72 hours, followed by lymphocyte chromosomes isolation. After that, the samples were treated with PBS (control), 1 mM BAPTA, and 1 mM EDTA. Chromosomes were then stained with Giemsa and observed using a light microscope. The qualitative analysis showed that control chromosomes have shorter, and more condensed structures with a high dye intensity compared with those treated with 1 mM BAPTA and 1 mM EDTA which showed a longer and fibrous structure with low dye intensity. The quantitative analysis showed that the average length, width, and area of the control chromosome was 1.73 ± 0.73 m, 0.55 ± 0.2 m, and 3.5 ± 2.17 m², respectively. while those treated with 1 mM BAPTA were 2.91 ± 1.3 m, 1.43 ± 0.43 m, and 4.17 ± 2.75 m². Then, the average length and width of 1 mM EDTA chromosome was 2.26 ± 0.52 m and 0.93 ± 0.29 m. These results showed that Ca^{2+} plays an important

role in the lymphocyte chromosome structure.