

Pengaruh peningkatan kadar CO₂ terhadap ekspresi manganese superoxide dismutase dalam peripheral blood mononuclear cell = Effect of elevated CO₂ on peripheral blood mononuclear cells' manganese superoxide dismutase expression

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Abstrak

Perubahan iklim telah merubah konten atmosfer. Salah satu bentuk perubahan iklim adalah meningkatnya gas rumah kaca, karbon dioksida. Peningkatan karbon dioksida bisa memberikan perubahan metabolic kepada sel-sel organisme. Sel imun, PBMC, bisa terpengaruh melalui perubahan ekspresi gen. MnSOD, sebuah antioksidan, komponen penting saat stres oksidatif, akan diteliti guna mengetahui adaptasi sel. Untuk melihat perubahan PBMC pada hiperkapnia, kami membuat model dimana pertama, PBMC diinkubasi pada konsentrasi CO₂ di 5% dan 15%, selama 24 dan 48 jam. Kemudian, RNA diisolasi dengan TriPure Isolation Reagent dan ekspresi gen diukur secara kuantitatif dengan RT-qPCR untuk melihat ekspresi MnSOD. Hasil penelitian menunjukkan penurunan ekspresi yang signifikan saat 15% CO₂ dibandingkan dengan 5% CO₂ selama 24 jam. Selama 48 jam, terdapat penurunan yang tidak signifikan. Hasil pada 24 jam bisa karena beberapa faktor, seperti menambahnya aktivitas diikuti dengan ekspresi gen yang rendah karena cukupnya protein untuk mendorong balik stress oksidatif, atau mungkin karena kerusakan DNA karena stres oksidatif, dan juga pengaruh factor transkripsi NF-κB. Sementara, pada 48 jam, terdapat penambahan tidak signifikan dari 24 jam dikarenakan oleh panjangnya waktu. Untuk rekomendasi, kami sarankan membuat riset dimana kadar protein diukur.

.....Climate change has changed the atmospheric contents. One of the main features of climate change is the rise of greenhouse gas carbon dioxide. Carbon dioxide elevation give out metabolic changes occurring to organisms' cells. Immune cells, PBMC, may be affected by it, through gene expression changes. MnSOD, an antioxidant, a crucial component in oxidative stress, is observed to know the cell's adaptation. To observe PBMC changes in hypercapnia, we constructed a model where firstly, the PBMCs are incubated in 5% and 15% of CO₂, for 24 and 48 hours, resulting in four treatments. Then, we isolated the RNA from PBMC with TriPure Isolation Reagent and measure the quantitative gene expression using RT-qPCR to observe MnSOD expression. The result of PCR will be compared between 15% and 5% using the Livak method. The result shows a significant decrease in gene expression at 15% CO₂ compared with 5% CO₂ at 24 hours, and at 48 hours, there was insignificant decrease. The result in 24 hours may be due to several factors, such as the increasing activity followed by low expression as the cells has obtained enough MnSOD proteins to tackle back oxidative stress, or perhaps because of DNA damage due to oxidative stress, and also NF-κB as transcription factor influence. Meanwhile there's 48 hours, the insignificance increases from 24 hours level is due to timespan. In recommendation, we suggest doing a research where we observe the protein activity.