Heat shock response regulates proinflammatory NF- κ B signaling in cancer cells

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Video Byte

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Abstract

Cancer is among the leading causes of death worldwide. Although effective treatments are available in some cases, cancer cells can become resistant to therapeutic intervention. A new strategy, therapeutic hyperthermia, exploits cancer cells' heat shock response to make them more sensitive to treatment. In combination with treatments such as radiotherapy and chemotherapy, heat is applied to patients' tissues to sensitize cancer cells to treatment. Unfortunately, although this treatment is promising, our understanding of how cells sense and adapt to elevated temperature is limited. Recently, researchers used live-cell microscopy and mathematical modeling to examine a human breast cancer cell line after exposure to a range of temperatures. Their results showed that elevated temperatures affected a major signaling pathway, NF- κ B, which regulates cell proliferation, apoptosis and the immune response. Interestingly, hyperthermia inhibited NF- κ B signaling to different extents for different cytokines, key signalling molecules secreted by cells during an inflammatory response. IL-1 β signaling adapted more rapidly to temperature change, while TNF α signaling was more sensitive. These effects were mediated through a complex of signaling proteins called IKK, which acted as a temperature sensor in the cell. Although further work is needed to determine the effect of hyperthermia in vivo, the results will help optimize therapeutic hyperthermia protocols, offering hope to those struggling with treatment-resistant cancer.