

New Data Science in Nucleic Acids Chemistry (11): Transcriptional regulation in cancer cells induced by formation of G-quadruplexes and i-motifs

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Formation of non-canonical DNA structures in response to the environment can regulate the expression of disease-related genes. It is known that the cell shape changes during with malignant transformation (Figure 1).¹ In addition, because of the increased expression of the cytoskeleton (F-actin), the environments in malignant cancer cells are more crowded than those in normal cells (Figure 1).¹ The changes should alter the intracellular molecular environments, affecting biological reactions responses to the structure and stability of nucleic acids. We have reported that G-quadruplexes are stabilized in normal and mild cancer cells and destabilized in a malignant cancer cells,² and that these changes regulate transcription although the detailed mechanism is still unknown. In this study, we investigated the effects of the intracellular environments on nucleic acids associated with malignant transformation of cancer. As results, the malignancy of the cancer cells is higher, the expression level of the cytoskeleton, which creates an intracellular crowding condition, was markedly increased. Moreover, we found that G-quadruplexes formed in normal cells, while, i-motifs were shown to form in malignant cancer cells. In the presentation, we will explain the effects of formation for G-quadruplexes and i-motifs on the transcriptional mutation.

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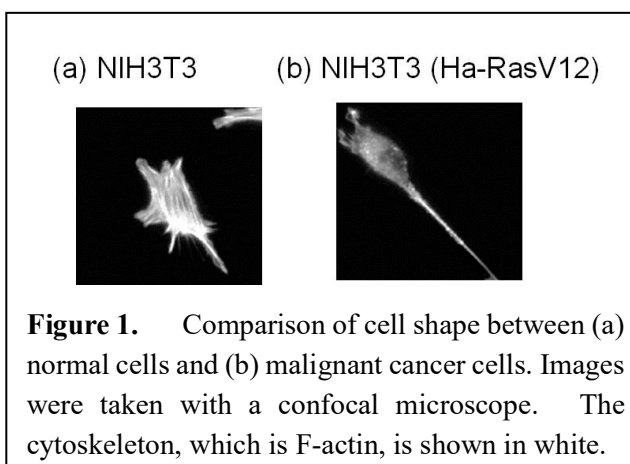


Figure 1. Comparison of cell shape between (a) normal cells and (b) malignant cancer cells. Images were taken with a confocal microscope. The cytoskeleton, which is F-actin, is shown in white.