Single Factor Stress Response Studies of Mcf-7 Breast Cancer Cells by FTIR Spectroscopy

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The response of cells to various growth factors *via* the biochemical composition is well known and has been studied by FT-IR spectroscopy. Lately there has been an increase of studies of nanoparticlesas promising agents for targeted therapy. It also has been shown that cell cultivation under hypoxic conditions enhancesthe uptake of nanoparticles. Despite propitious prospects, the stress response of cells cultivatedin presence of nanoparticles or under hypoxic conditions remains poorly understood.

In this study breast cancer cells MCF-7 were used to evaluatethe single factor stress response. Three stress factors were used:pure BSA, BSA-encapsulated photoluminescent gold nanoclusters (Au-BSA NCs) [1], and hypoxic conditions. FT-IR spectra of ~200'000 cells were acquired by HTS-XT microplate reader (Bruker optics, Ettlingen, Germany). Quantitative analysis of macromolecular composition was carried out as in [2].

MCF-7 cells showed little response to the presence of BSA or Au-BSA NCs. Compared with control, the content of carbohydrates in cells incubated with BSA or Au-BSA NCs was slightly lower - 10.12% and 9.52% of dry weight (dw) compared to 12.7% in control. The content of nucleic acids and proteins was slightly increased – from 7.92% and 63.42% to 9.02% and 64.64% dw, respectively. Lipid content increased from 5.96% to 6.21% dw for BSA, and 6.83% dw for Au-BSA NCs incubated cells. Hypoxic conditions induced stronger stress response. The content of carbohydrates, nucleic acids and proteins all slightly decreased to 12.14%, 7.58% and 61.07% dw, respectively. Whereas the lipid content increased 1.54 times from 5.96 to 9.21% dw.

Results showed minor difference in themacromolecular composition of cells incubated with BSA or Au-BSA NCs thus suggesting that Au-BSA NCs have no significant stress effect on cells and are relatively safe to use. However enhancing of nanoparticle uptake by hypoxic conditions needs further studies due to the remarkable effect on the total lipid content in cells.

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References

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