VIABILITY, ULTRASTRUCTURE, AND MIGRATION ACTIVITY OF NEUTROPHILS AFTER PHAGOCYTOSIS OF SYNTHETIC MICROCAPSULES

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Neutrophils are the most abundant leucocyte population, which is a part of the innate immune system that provides antimicrobial host defense. Neutrophils' phagocytosis and chemotaxis capacity makes them a suitable potential carrier for targeted drug delivery to the sites of inflammation. In the existing cellular systems of targeted transportation, a drug placed inside a cells can alter the carrier cell metabolism and change biological activity of the substance. These complications can be avoided or minimized by loading cells with encapsulated drugs. Here, we studied interactions between synthetic microcapsules (potential "cargo containers") with isolated human neutrophils, including phagocytosis, ultrastructural changes and migration capacity of the cells after phagocytosis. The results showed that neutrophils internalized microcapsules proportionately to the number of microcapsules in the extracellular space and partially retained viability and the migration activity. However, during incubation with microcapsules the population of neutrophils was reduced and their migration capacity was lowered, indicating unfavorable effects of the microcapsules on the cells. In addition, the internalization of microcapsules was accompanied by alterations in the ultrastructure of neutrophils, which manifested as a shape change of nuclei, partial destruction of the plasma membrane, compaction of the cytoplasm, and sometimes even full disintegration of the cells. Thus, neutrophils are potentially suitable for the transfer of encapsulated substances; however, further development of the neutrophil-based targeted drug delivery systems with the use of synthetic microcapsules requires further examination.

Keywords: neutrophils, synthetic microcapsules, phagocytosis, chemotaxis, electron microscopy, flow cytometry