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## Changes in the Fluorescence Characteristics of Quantum Dots Based on InP/ZnS during the Interaction with Cells

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Semiconductor quantum dots (QDs), due to their unique spectral-luminescent properties, are attractive for visualizing biological objects in biological and medical research. The main methods for registering luminescent QDs in the cells are various types of scanning microscopy. It is important to note that during the use of QDs, they are delivered into different extracellular and intracellular environments, which can affect the surface integrity of QDs and, as a result, the photophysical characteristics of QDs. In this connection, changes in the characteristics of the luminescence signals of non-target QDs based on InP/ZnS, coated with polyethylene glycol with COOH-groups, were studied, which can reduce the risk of toxic effects in the process of biological and medical research. In this work, QDs-InP accumulated in endosomes of A549 cultured cells. Analysis of the photophysical properties of QDs showed that the average intensity of QDs in endosomes was lower than the intensity of clusters outside the cells, which can be explained by a lower concentration of QDs in intracellular clusters. However, the QDs luminescence lifetime in clusters, independent of concentration, was also 5–10 ns lower. Analysis of the QDs solution showed that a decrease in the quantum yield and QDs luminescence lifetimes is observed in solution with pH 4.0, but not with pH 7.4–8.0. Also, the process of significant formation of QDs aggregates in such solutions was not revealed. In this connection, changes in the photophysical properties of QDs interacting with cells, can be associated with the entry into endosomes with a low pH level. Thus, the analysis of the luminescence lifetimes of QDs allows to obtain additional information about their state in comparison with the determination of the fluorescence intensity. Our results are important for an adequate interpretation of data concerning both the efficiency of QDs uptake and analysis of the properties of intracellular compartments in which QDs accumulate.

**Keywords:** InP/ZnS quantum dots, luminescence intensity, FLIM, luminescence lifetime, endosomes, pH, A549 cells