

Synthesis of fluorescent derivatives of short-chain polyamines for monitoring of intracellular processes

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Such polyamines as spermine and spermidine are widely known as the important substances in life cycle of many organisms including mammals and microbes. Methylated polyamines have been founded in siliceous frustules of diatom algae and in siliceous sponges. Physiological role of the biogenic polyamines is not clear enough, especially in the case of silicifying organisms. New fluorescent-tagged polyamines are urgent as agents for tracking the natural polyamines and also for visualization of amine-conjugated processes in living cells.

Our synthetic procedures are based on the previously developed step-wise approaches to methylated oligopropylamines bearing one or two terminal NH-groups. We have obtained a collection of dyes with 7-nitro-2,1,3-benzoxadiazole, fluoresceine and rhodamine moieties. Polyamine chains contain 1-4 nitrogens. Fluorescent-tagged polyamines having one terminal NH-group are useful agents for synthesis of more complicated structures, e.g. fluorescent polymers.

The following results were obtained using new fluorescent derivatives of polyamines:

- first stage of silicic acid assimilation by diatom *Synedra acus* was studied and formation of submicrometer silicon-containing particles in the cytoplasm was found for the first time. These particles exist during the initial stage of siliceous valve growth and they are not observed during further valve maturing;
- *S. acus* growth in the presence of fluorescent-tagged poly(acrylic acid) resulted in fluorescent siliceous valves. This is the first experimental evidence of hypothesized pinocytosis mechanism supposed for silicon assimilation from the environment;
- cultivation of siliceous sponges with the addition of fluorescent-tagged polyamines is accompanied by staining of growing siliceous spicules. This finding opens new ways for study of bio-silica formation by sponges;
- fluorescent diatom valves and sponge spicules are promising fluorescent materials obtained by biotechnology.

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