Title:	Macromolecular Crowding Effect on the Activity of Liposome-Bound Alkaline Phosphatase: A Paradoxical Inhibitory Action
Authors:	Deshwal, Akshi (/jspui/browse?type=author&value=Deshwal%2C+Akshi) Maiti, Subhabrata (/jspui/browse?type=author&value=Maiti%2C+Subhabrata)
Keywords:	Phosphatase Paradoxical
Issue Date:	2021
Publisher:	ACS Publications
Citation:	Langmuir, 37(23), 7273–7284.
Abstract:	The cytoplasm of a cell is extremely crowded, with 20–30% being large biomolecules. This crowding enforces a significant amount of the physical and chemical barrier around biomolecules, so understanding any biomolecular event within the cellular system is challenging. Unsurprisingly, enzymes show a diverse kind of catalytic behavior inside a crowded environment and thus have remained an area of active interest in the last few decades. The situation can become even more complex and exciting in the case of understanding the behavior of a membrane-bound enzyme (almost 25–30% of enzymes are membrane-bound) in such a crowded environment that until now has remained unexplored. Herein, we have particularly investigated how a membrane-bound enzyme (using liposome-bound alkaline phosphatase) can behave in a crowded environment comprising polymer molecule-like poly(ethylene glycol) (PEG) of different weights (PEG400, PEG4000, and PEG9000) and Ficoll 400. We have compared the activity using a polymer microbead conjugated enzyme and have found that liposome-bound alkaline phosphatase had much higher activity in crowded environments, showing the importance and superiority of soft-deformable particles (i.e., vesicles) over hard spheres in macro-molecularly crowded media. Interstingly, we have found a paradoxical behavior of inhibitors in terms of both their extent and pathway of inhibitory action. For instance, phosphates, known as competitive inhibitors in buffer, behave as uncompetitive inhibitors in liposome-bound enzymes in crowded media with an ~5-fold less inhibitory effect, whereas phenyl alanine (an uncompetitive inhibitor in buffer) did not show any inhibitory potential when the enzyme was membrane-bound and in crowded media containing PEG9000 (30 wt %). Overall, this demonstration elucidates aspects of membrane-bound enzymes in crowded media in terms of both catalytic behavior and inhibitory actions and can lead to further studies of the understanding of enzymatic behavior in such complex crowded environments having a dampening effect in regular diffusive transport.
Description:	Only IISERM authors are available in the record
URI:	https://pubs.acs.org/doi/10.1021/acs.langmuir.1c01177 (https://pubs.acs.org/doi/10.1021/acs.langmuir.1c01177) http://hdl.handle.net/123456789/4788 (http://hdl.handle.net/123456789/4788)
Appears in Collections:	Research Articles (/jspui/handle/123456789/9)

Files in This Item:

File	Description	Size	Format

Need To Add…Full Text_PDF (/jspui/bitstream/123456789/4788/1/Need%20To%20Add%e2%80%a6Full%20Text_PDF)	15.36 kB	Unknown	View/Open (/jspui/b

Show full item record (/jspui/handle/123456789/4788?mode=full)

(/jspui/handle/123456789/4788/statistics)