University of Ferrara

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**Dottorato in Neuroscienze Traslazionali e Neurotecnologie**

***Seminario***

# *On the mechanics of nanosized vesicles: models, principles and applications*


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## Venerdì 27 maggio 2022, ore 11:00

**Sezione di Fisiologia Umana, aula F10**

Chiostro S. M. delle Grazie, primo piano, via Fossato di Mortara 19, FE

**n. 1 credito**

**Prof. Luciano Fadiga**
**Coordinatore del Dottorato in Neuroscienze Traslazionali e Neurotecnologie**


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# On the mechanics of nanosized vesicles: models, principles and applications

***Abstract***

The mechanical properties of extracellular vesicles (EVs) are known to influence their biological function, in terms of, e.g., cellular adhesion, endo/exocytosis, cellular uptake, and mechanosensing. EVs have a characteristic nanomechanical response which can be probed via force spectroscopy (FS) to single them out from nonvesicular contaminants. Nanomechanical characterization of individual EVs via FS is labor-intensive and time-consuming , thus confining this approach to specialists. In this talk, we are presenting in the first part the basic concepts required to understand the nano mechanical behavior of vesicles, then we will introduce a simple experimental procedure for the simultaneous nanomechanical and morphological analysis of several hundred individual nanosized EVs using basic AFM equipment and skills and only needing freely available software for data analysis. This procedure yields a "nanomechanical snapshot" of an EV sample which can be used to discriminate between subpopulations of vesicular and nonvesicular objects in the same sample and between populations of vesicles with similar sizes but different mechanical characteristics. We will show the applicability of the proposed approach to EVs obtained from very different sources (including human colorectal carcinoma cell culture, raw bovine milk, and Ascaris suum nematode excretions), recovering size and stiffness distributions of individual vesicles in a sample. EV stiffness values measured with this high-throughput method are in good quantitative accord with values obtained by FS techniques which measure EVs one at a time. We show how our procedure can detect EV samples contamination by nonvesicular aggregates and how it can quickly attest the presence of EVs even in samples for which no established assays and/or commercial kits are available (e.g., Ascaris EVs), thus making it a valuable tool for the rapid assessment of EV samples during the development of isolation/enrichment protocols by EV researchers.