

# METHODS IN MOLECULAR BIOLOGY

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# Extracellular Vesicles

## Methods and Protocols

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## Preface

The study of extracellular vesicles (EVs), including exosomes and microvesicles, is an emerging field across many disciplines that involve many research and development efforts on their biogenesis, role in intercellular communication by transporting biomolecules between close and distant cells, and their role in normal and disease physiology.

In both healthy and pathological states, the functions of EVs are for removal of protein waste and communication across cells by way of immune response activation and/or deactivation, cellular proliferation, and, in cancer, tumor metastasis. More recently, in the era of Precision Medicine, the clinical utility of EVs is its minimally to noninvasive approach (liquid biopsy) to enable screening, assessing tumor heterogeneity, monitoring therapeutic responses, and minimal residual disease detection to EV-based therapeutics. About 25–50% of tissue biopsies have sufficient material for any downstream analysis (genomic or proteomic), which has made the EV field very attractive, hence the growing research interest in this space.

What makes EVs very interesting is that they are present in many biological fluids (blood (serum and plasma), urine, saliva, breast milk, CSF, follicular fluid, semen, lung lavage, and tears) and contain unique characteristics as nucleic acids (DNA, mRNA, miRNA molecules, noncoding RNA), proteins, and lipids identical to the original cell. Many researchers are also studying EVs derived from stem cells, cell cultures, and parasites, among many other areas. As this field grows, there is a demand for established methods and protocols to isolate and characterize EVs among other techniques including purification, imaging, biofluid-specific and cell-specific isolation, and downstream genomic, metabolomic and proteomic profiling approaches.

In this book, we have brought together an international group of leading scientists with domain knowledge/expertise in the area of EVs across many basic and clinical disciplines. We have attempted to include a variety of different techniques related to the growing EV applications, as at times; using only one technique or two is insufficient to address the question at hand.

We would like to express our greatest appreciation and gratitude to all the contributing authors, as without their time and effort in putting their chapters together along with their notes, this book would not be possible. In addition, we would like to give special thanks to Professor John M. Walker, Professor Emeritus, School of Life and Medical Sciences, University of Hertfordshire, for the invitation, as we wouldn't have thought to organize a book on methods and protocols related to extracellular vesicles.

*Shanghai, China*

*Winston Patrick Kuo*

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