Editorial

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Migrasomes: Novel Organelles of Cell Migration

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Cell migration is a vividly researched phenomenon in several physiological as well as pathological conditions.[1] A recent finding with relation to this multi-step complex process is the discovery of "migrasomes."[2] These are a distinct type of extracellular vesicles which aid in transmitting signals between the cells undergoing migration.[1] Extracellular vesicles are released from diverse cell types and are described as nano-sized (30 nm – few μm), membrane-bound structures. They primarily aid in cell-cell communication and transport of biomolecules such as DNA, RNA, and proteins. Various subpopulation of these extracellular vesicles has been recognized based on their biogenesis, including exosomes, ectosomes, apoptotic bodies, and large oncosomes.[3,4]

Exosomes originate from the endosomal component, gather into multivesicular bodies and fuse with plasma membrane before their release into the extracellular space.[5] Migrasomes have been described as exosome-like vesicles, but unlike exosomes, these arise from the disintegration of the retraction fibers of a migrating cell.[3] Biogenesis of migrasomes is a cell migration associated process. A migrating cell has a leading and trailing end. The process involves, lamellipodial protrusion at the leading end, followed by adhesion by integrin, formation of cellular tension, contraction of cell, and finally retraction of the trailing end (Figure 1).[1]

Electron microscopy studies have shown that during the retraction phase, long tubular structures appear which were later termed as the "retraction fibres." It is that at the tips of the intersection of these fibers, micro-vesicles (up to 3 μm) start developing, forming the "migrasomes." Further, these vesicles were found to contain <10-300 opened pomegranate-like structures (50-100 nm size) which were tetraspanin – 4 positive. Ultimately, these fibers disintegrate and the vesicles are released into the surrounding medium or taken up by neighboring cells.[2]

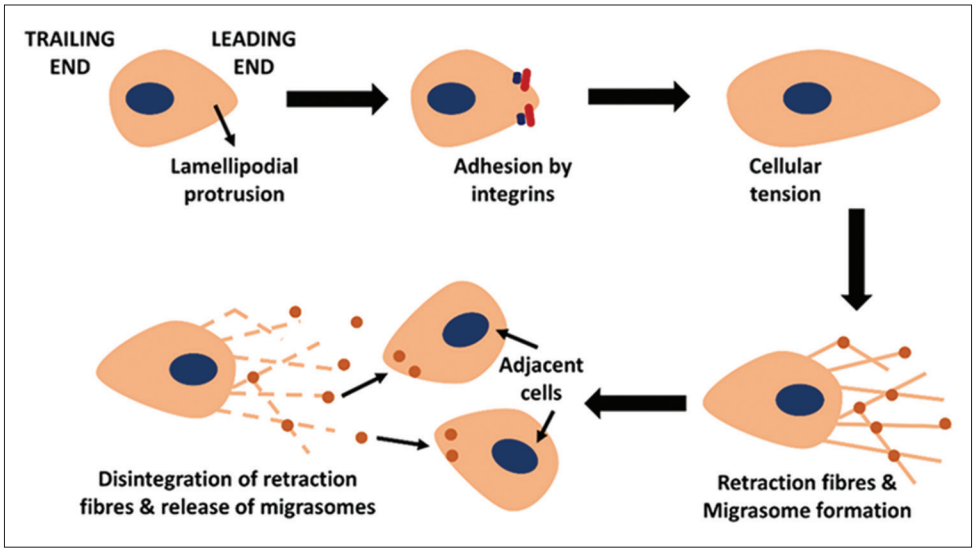

Figure 1: Steps of cell migration and migrasome formation.

The above findings raise queries such as are these structures produced by cells or are artefacts? If part of cell, then what are its functions and possible clinical applications? The cell culture study by Liang *et al*. proved that these structures are actual products of cells. They also suggested that their primary function could be to send spatial and biochemical signals to the other cells trailing behind to a specific location.[2] Hence, a potential clinical application could be in cancer metastasis detection.

Recent research in oncology has revealed that the cancer cells also communicate through these vesicles. These cancer-associated extracellular vesicles have been found in the tumor microenvironment. They have been termed as large oncosomes and characteristically carry substantial oncogenic cargo. Migrasomes are thought to belong to the above family of extracellular vesicles. Large oncosomes are principally present in destructive and highly migratory cancer cells. The uptake of these extracellular vesicles by the immune cells in the tumor microenvironment is believed to elicit various immunomodulatory effects such as escaping an antigenic response or activation of immune suppression. Further, they also might have significant contribution in tumor angiogenesis by transferring miRNAs.[3] All these aforementioned findings are in favor of recently proposed theory of carcinogenesis "tissue organization field theory" which is related to disruption of interaction of host cell with adjacent stromal tissue.[6]

Thus as research advances into the world of these nanovesicles, more depth of their structural and functional roles shall be unearthed, which in the impending time might aid in developing more selective and precise biomarkers. In future research, it is very important to consider the possible interaction of oncogenic viruses, inflammation, etc., with migrasomes in modulating their behavior in cancer progression.

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