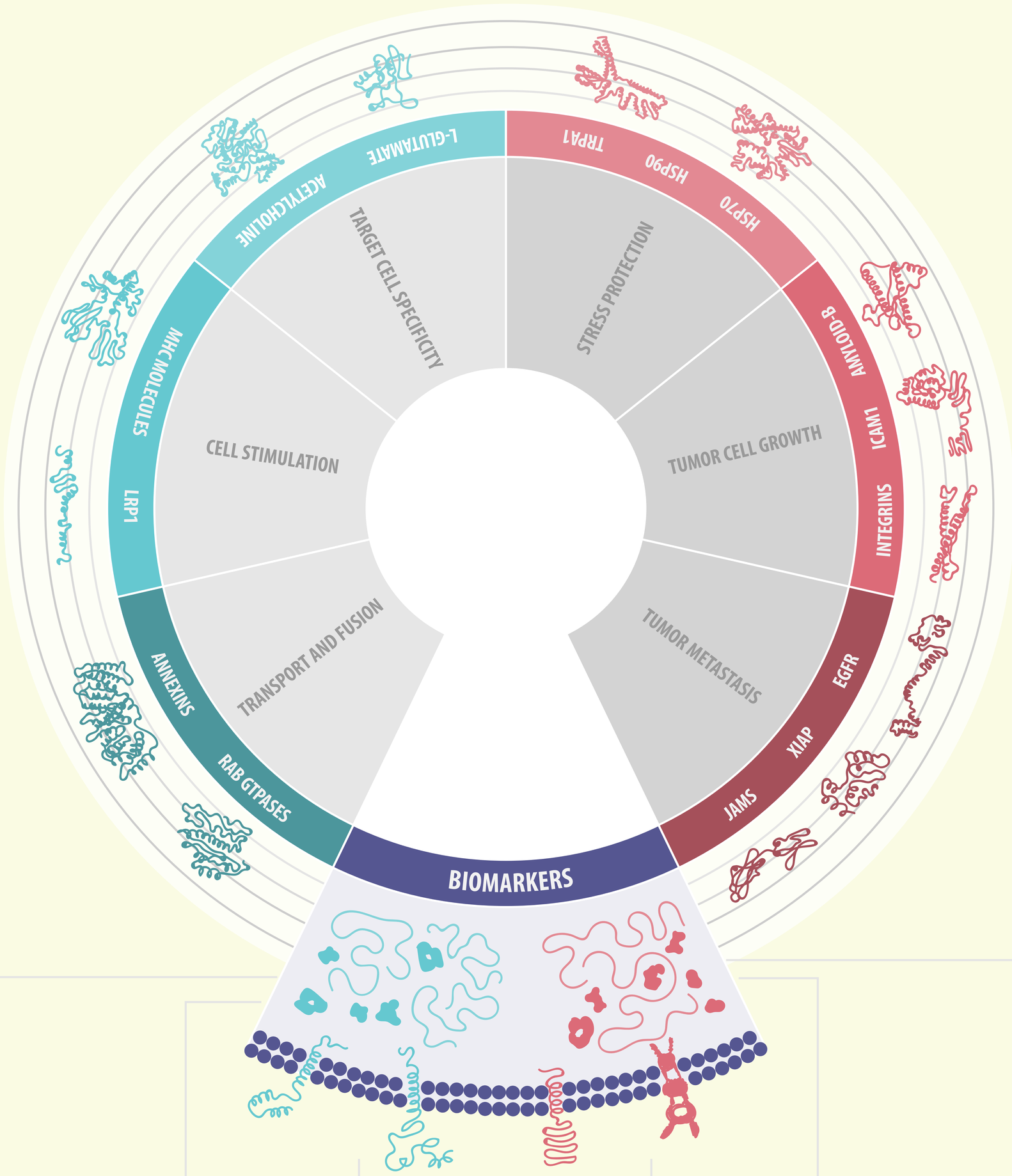
MICROVESICLE CARGO: BIOMARKERS FOR THE FUTURE

Leonie Herson[1], Nham Tran[3], Valery Combes[1], Jaye Lu, Heba Alkhamici[1], Bruce A Cornell[4], Deborah Szapiro[2], Stella M Valenzuela[1]

1 School of Life Sciences, University of Technology Sydney, Broadway, 2007, Sydney, Australia
2 Faculty of Design, Architecture and Building, University of Techonology Sydney, Broadway 2007, Sydney, Australia
3 Faculty of Engineering and Information Techonology, University of Techonology Sydney, Broadway 2007, Sydney, Australia
4 Surgical Diagnostics, Roseville 2069, Sydney, Australia



MV Nucleic Acids
Non-tumor specific DNA can become elevated in a variety of lymphomas, hence could have the potential as a tumor-specific biomarker.

MV Proteins
Healthy individuals and those with diseases still contain circulating MPs in their plasma.
TCMVs are known to contain tumor-specific biomarkers (E.g. Membrane bound proteins) as well as enzymes associated with healthy cell derived MVs

TCMV Proteins
Proteolytic enzyme activity serves as an indicator of the metastatic potential of tumor cells.
E.g. MPP2 activity levels from ovarian benign and malignant serous cyst fluid correlates with the tumor stage and aggresiveness.

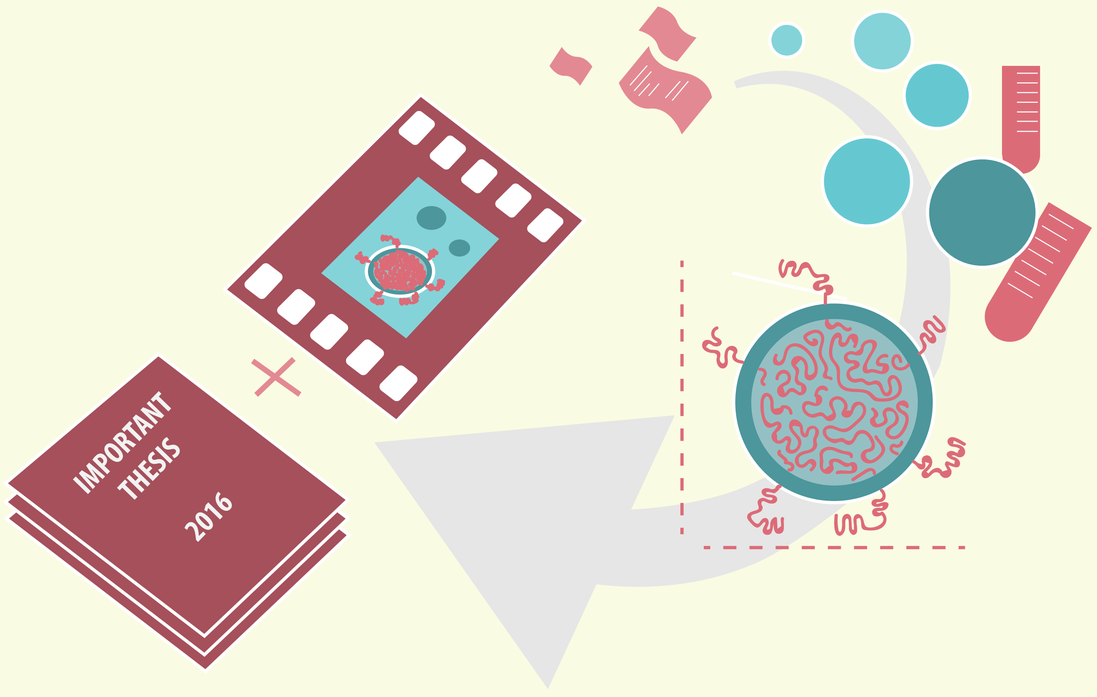
TCMV Nucleic Acids
The NIH Extracellular RNA Communication Consortium have successfully identified candidate ExRNA biomarkers in hepatocellular, gastric, neuro-degenerative and renal diseases

BACKGROUND

Cell-derived microvesicles (MVs) play a key role in intercellular communication and regulation of biological processes. Once regarded as cellular 'trash' by multiple research groups, the utilisation of these particles and their bioactive cargo in clinical studies has generated worldwide popularity both as a biomarker and as a mediator of infection, cancer metastasis and other biological processes. Proteomic studies of the MVs cargo have identified over 100 proteins including ion channel proteins which may provide a clue for MV function and the origin of their healthy or diseased cell parent.

The heightened interest surrounding MVs and their subtypes Exosomes (EXs)(50-100nm) and Microparticles (MPs)(0.1-1.0um) has also encouraged the development of scientific communication and visualisation as a form of reinforcement, education and increasing public awareness towards research. By aiming to condense quantitative and qualitative data, scientific visualisation and data communication can excel in translating key discoveries for the public eye.

The present study amalgamates elements of research and design to develop a highly accurate account of the structure, function and interactions of MVs and their bioactive cargo with cell membranes. The outcome of this work will be the production of a short biomedical animation detailing the processes and importance of cell-derived MVs and their cellular interactions.



Voloshin et al., Cancer Microenviron., 2014, 7(1-2):11-21
Burger et al., Arterioscler Thromb. Vasc. Bio., 2011, 31(8):1898-907
Dolo et al., Clin. Exp. Metastasis, 1999, 17(2):131-40
Ginestra et al., Anticancer Res., 1998, 18(5A):3433-7
Patiño et al., Sci. Rep., 2013, 5:11371
Singh et al., Res. Pharm. Sci., 2010, 5(2):65-77

SDx TETHERED MEMBRANES

Molecular Biosciences Research Team

UTS UNIVERSITY OF TECHNOLOGY SYDNEY