Research & Services | Studying the Cytoskeleton in Health and in Disease Conditions Such as Cancer and Inflammation (Yissum)

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IMRIC	Institute for Medical Research Israel-Canada

Scientific Background

- The cytoskeleton that is found in every cell in the body is made up of protein filament and serves to support the correct shape of the cell and maintain the organization of the various cell compartments.
- It also acts like a tiny muscle to allow the cells to change their polarity and shape and to move around in a complex process called cell migration.
- Cell migration is critical in wound healing when cells migrate into the wounded tissue.
- Adopting correct shape and migration to the correct place are important processes in every stage of life in almost all body tissues and these processes are therefore highly regulated.
- When regulation is lost, cells migrate into the wrong place or at the wrong time causing deformations during embryo development or allowing tumors to invade and form metastases in other parts of the body..
- In addition, body cells interact with each other to form tissues. The cytoskeleton is highly involved in forming these cell-to-cell interactions in a timely fashion and at specific locations. Such cytoskeleton-dependent cell-to-cell interactions are also essential for efficient immune response to pathogens and cancer by allowing the formation of the “immune synapse”. Pathogens use toxins that manipulate the functions of the host cytoskeleton to subvert the immune response, leading to public health problems and bioterrorism threats.

Research Hub Goals and Activities

- To make a significant contribution to the understanding of the mechanistic details responsible for the regulation of the cytoskeleton dynamics in both normal and disease situations.
- To elucidate the regulation of the cell-to-cell interaction in normal tissue development, in cancerous tissues, and in inflammation responses of the immune system.
- To decipher the molecular mechanisms utilized by pathogenic bacteria to manipulate the cytoskeleton and thus the immune system.
- To benefit research and allow for faster progress in these important issues by combining the expertise of members of the research hub, together with the opportunity of sharing reagents, technologies, facilities, and information.

Hub Members and Focus

- Dr. Ilana Ariel: Diseases associated with defective trophoblastic invasion into the placental implantation site and its vessels. Has access to the Pathology Department archives of a large collection of tumoral , fetal, and placental paraffin embedded tissues.
- Prof. Michal Baniyash: Involvement of the cytoskeleton in the execution of T cell function based on specific cell-to-cell interactions and cell migration properties dictated by the immune cell cytoskeleton under normal and pathological conditions.
- Rachel Bar-Shavit: Molecular mechanisms that control cell-to-cell contact disassembly and PAR1

expression. Activation of PAR1 accompanies cytoskeletal reorganization toward a migration-favoring morphology.

- Dr. Sharon Eden: Proteins of the WAVE complex and their role in regulating the cytoskeleton during cell migration and metastasis, in cytoskeletal response to stress, in regulating cell polarity and fate, and in correct localization of other cellular factors inside the cell.
- Prof. Chaya Kalcheim: Regulation of inter-cellular adhesion and cytoskeletal assembly in emigration and migration of neural crest cells, and in determining cell fate during embryonic development.
- Prof. Shulamit Katzav: Role of Vav1, a protein that controls cytoskeleton organization, in the formation of the immunological synapse as well as in human cancer.
- Michal Lotem: Pivotal role of the cytoskeleton in the immune synapse and in the lytic capacity of immune cells.
- Prof. Shoshana Ravid: Role of the cytoskeletal tumor suppressor protein Lgl1 in polarization of directed cell migration and in cell proliferation, in relation to the spread of metastatic cells.
- Prof. Ilan Rosenshine: Bacterial toxins affecting the cytoskeleton of the host cell. Holds an array of bacterial toxins that can be used as tools to study basic aspects of the host cell biology.
- Oren Shibolet: Role for the cytoskeleton-modulating protein AKAP13 in the function of cell-to-cell junctions in the intestinal epithelial cells and in intestinal inflammation.
- Dr. Joel Yisraeli: VICKZ proteins regulating the intracellular localization of many RNAs encoding cytoskeleton regulators. Deciphering how these proteins affect the cellular cytoskeleton and cell movement, and developing therapies based on targeting neoplastic cells expressing these proteins.

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