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Publications

“Loss Differentiation: Moving onto High-Speed Wireless LANs” Ruwaifa Anwar, Kamran Nishat, Mohsin Ali, Zahaib Akhtar, Haseeb Niaz and Ihsan Ayyub Qazi IEEE INFOCOM 2014, Toronto, Canada, April 2014 (To Appear)

“BLMon: A Loss Differentiation Scheme for 802.11n” [[PDF]](file:///Users/yumnazahid/Desktop/sb_page_v3%202/public_html/infocom_poster.pdf) Zahaib Akhtar, Kamran Nishat, Haseeb Niaz, Ruwaifa Anwar, Mohsin Ali, and Ihsan Ayyub Qazi IEEE INFOCOM 2013, Turin, Italy, April 2013 (poster paper)

Projects:

# Conditioned medium prepared from immortalized mouse embryonic fibroblasts supports culture of trophoblast stem (TS) cells

Trophoblast stem cells (TS) are the precursors of the differentiated cells of the placenta. TS cells are used as a model system to study placental development and function. TS cell cultures require fibroblasts conditioned medium to maintain their phenotype. Generally, primary mouse embryonic fibroblasts (PMEF) are used to prepare conditioned medium. But PMEFs are harder to derive as primary cells have slow growth and require extraction of 10-12 days old embryos from pregnant mice. In this project, we tried to eliminate these problems and tested immortalized PMEFs to prepare conditioned media for TS cell culture. Immortalized PMEFs were produced by transfecting PMEFs with a proto-oncogene SV-40 large T antigen. They were better than PMEFs as they proliferated significantly faster, which was observed in comparative cultures of both cell lines. Immortalized PMEFs were also easier to derive because they are not primary cells and did not require dissection of pregnant mice once the cell line was established. We tested growth of TS cells on both conditioned media and showed immortalized PMEF conditioned media also supported TS cell growth in cultures. For further analysis, feeder layers of both cell types were used to show comparative growths of TS cell colonies. TS cells grown in both media were then differentiated into TG cells for comparative morphology analysis of differentiation.

# Production of induced pluripotent stem cells

Induced pluripotent stem cells (iPSCs) are a new type of pluripotent cells that can be obtained by reprogramming animal and human differentiated cells. The aim of this project was to induce pluripotency in human adult fibroblasts, derived from patient biopsies so they can be used in personalized regenerative medicine. To optimize and develop the protocols, mouse induced pluripotent stem cells were established from primary mouse embryonic fibroblasts (PMEFs), derived from 10-12 days old pregnant mouse. To produce human iPS cells, human fibroblasts were derived from a patient skin biopsy. Reprogramming factors, Oct4, Sox2, c-Myc and Klf4, were used to induce pluripotency in human fibroblasts.

**Role of human lung epithelial cells in fibrosis and wound healing**

Fibrosis involves an inappropriate and unnecessary wound healing response in a tissue, resulting in scarring and dysfunctiuon of the tissue. Fibrosis is associated with 45% of deaths in the US. In wound healing and fibrosis, immune system cells leave the blood, enter the tissue, and become activated to orchestrate the scar tissue formation. Blood contains a protein called Serum Amyloid P (SAP) which by deactivating immune system cells inhibits fibrosis in animal models and human clinical trials. SAP binds a C-type lectin receptor called DC-SIGN. DC-SIGN was intially found on monocyte-derived dendritic cells, but it was previously observed that lung epithelial cells also express DC-SIGN. Immunfluorescence studies show after exposure of lung epithelial cells to a DC-SIGN ligand, DC-SIGN becomes more prominently expressed in the plasma membrane and the cytoplasm near the membrane. In response to treatment with DC-SIGN ligands, epithelial cells exhibit various morphological and physiological changes. To determine what these effects, human lung epithelial cells were treated with SAP and its synthetic analogue and subjected to proteomics. To determine what else SAP might affect, human lung epithelial cells were treated with SAP and its synthetic analogue, and subjected to proteomics. Many proteins were consistently up- or down-regulated in response to the treatment. These results indicate that epithelial cells respond in several ways to SAP, and suggest new regulatory connections between the immune system and epithelial cells.

**Identification of signal transduction pathway components mediating the sensing of secreted factors that regulate cell density in *Dictyostelium discoideum:***

Regulation of cell density or tissue size is a poorly understood yet fundamental concept in developmental biology. For example, when sections of liver or spleens are transplanted into appropriate host environments, they regenerate and reach the equivalent size of a normal individual organ and stop proliferating. One hypothesis that has been under consideration is that proliferating cells start secreting a diffusible tissue-specific factor called chalone. As the cell proliferation increases, the local concentration of secreted chalone increases, until it reaches a point where it halts the cell cycle. Our lab has shown that Dictyostelium Discoideum cells secrete a growth inhibitor/chalone that senses cell density, as they proliferate in culture. The aim of this project is to identify the components of signal transduction pathway of this chalone that regulates cell density. In order to do that, reverse genetics were employed. Random insertions were made in the Dictyostelium genome to screen for cells that become insensitive to growth inhibitors. Genomic DNA was extracted from these mutants to identify the regions where insertions were made via inverse PCR. Cloning was also done to eliminate the possibility of multiple mutants within each cell line.