chorionic regions and are associated with HLA-G and cytokeratin-7 confirming their trophoblast identity. CDX2 cells demonstrated the potential to form a capillary network akin to endothelial cells. Placental samples from healthy (n=6) and preeclampsia (n=8) patients revealed higher levels of CDX2 expression in preeclampsia. Within preeclampsia CDX2 cells, Natriuretic peptide receptor 1 (NPR1), RET oncogene, and Homeobox D10 (HOXD10) were significantly differentially regulated, including a unique long-non-coding anti-sense RNA (KANSL1-AS1) that affected the function of CDX2 and trophoblast cells in invasion and normal vasculogenesis. DISCUSSION/SIGNIFICANCE: In sum, based on these observations, the present study postulates that CDX2 cells present in a healthy human placenta may serve as a prospective cellular reservoir for angiogenesis. Conversely, altered gene programs within CDX2 cells cause aberrant vascular function that could contribute to the progression of preeclampsia.

63

Allogeneic Recellularized Lung Orthotopic (ARLO) Transplant Research

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OBJECTIVES/GOALS: As of 2021, the lung transplantation waiting list has a mortality rate of 7.6 deaths per 100 patient-years. Bioengineered human organs is an emerging field of tissue engineering with a goal of developing suitable organs for transplantation. The focus of the project is to evaluate the efficacy of bioengineered lungs using a human-to-swine model. METHODS/STUDY POPULATION: This project will involve designing and assessing the bioengineered lung by establishing a human-to-pig xenotransplantation survival model. The project aims to evaluate how well the bioengineered lung functions within a living model. The bioengineered lung is constructed using swine connective tissue scaffolding, which has been recellularized with human cells. Anatomically, the lung will resemble a swine lung but will possess the immunological and cellular markers of human tissue. The proposed model will initially assess the immunological response of swine to human lung tissue. Lung function will be assessed during surgery using pulmonary vein gas samples and tissue sampling. Following the end of the study, additional tissues samples will be taken to evaluate the immunological response to the tissue. RESULTS/ANTICIPATED RESULTS: Xenotransplantation and bioengineered organs are two new emerging fields of research that have just begun to enter the large animal testing phase. This model will provide a novel human-to-pig xenotransplant survival model that will be used to test the efficacy of bioengineered lungs function in a dynamic living organism. The design has taken the principles of immunology learned from the current clinical and xenotransplant research and has incorporated this knowledge into the known pig-to-pig transplant models. We anticipate that this model design will be easily reproducible and can be expanded to other bioengineered organs as an effective means to test functionality. DISCUSSION/SIGNIFICANCE: The COVID-19 pandemic's aftermath may lead to an increased demand for lung transplants. Bioengineered lungs could provide an additional source of organs to supplement current availability. This novel approach has the potential to offer a means to test several different types of bioengineered organs in the future.

64

Detecting and monitoring Salmonella infection and chronic carriage in living mice using bioluminescent in vivo imaging

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OBJECTIVES/GOALS: SalmonellaTyphi primarily persists in human chronic carriers by forming biofilms on gallstones in the gallbladder (GB). We developed a mouse model of GB chronic carriage, and using this model, aim to detect Salmonella in living mice and track the progression of GB carriage with bioluminescent S.Typhimurium and in vivoimaging. METHODS/STUDY POPULATION: S.Typhimurium 14028 (WT) was transduced with the lux operon from the S. Typhimurium Xen33 strain from Perkin Elmer©, creating 14028lux. 129X1/SvJ mice were fed a lithogenic diet for 6 weeks to induce gallstone formation. After cessation of diet, these mice were infected with 5x103-1x104 colony forming units (CFU) of either the 14028lux isolate, WT (non-luminescent) isolate, or an equal volume of sterile saline. Mice were serially imaged (IVIS SpectrumCT) every 2-3 days for up to 63 days. Images were quantified by measuring average radiance over selected regions of interest. The presence of bioluminescent bacteria in specific organs was confirmed by imaging the abdominal cavity post-mortem. Organs were homogenized and CFUs per mg of tissue were quantified and compared between each group. RESULTS/ANTICIPATED RESULTS: Compared to the controls, mice infected with 14028lux showed luminescence in the abdomen as early as three days post-infection. Within 15 days, the resolution was sufficient to discriminate signal in specific organs, notably the gallbladder, liver, spleen, and cecum. The presence of bacteria was confirmed in these organs via direct imaging and by quantifying CFUs in the tissues. At 63 days post-infection, we identified >103 CFUs and significant luminescence in the GB of a portion of 14028lux-infected mice. For all days post-infection, 14028lux-infected mice that lacked observable luminescence had <100 CFUs/mg tissue. DISCUSSION/SIGNIFICANCE: We have developed a technique using bioluminescent S.Typhimurium and in vivo imaging that, without sacrificing infected mice, enables us to reliably distinguish between mice that have maintained gallbladder chronic carriage >60 days and those that have cleared infection.

65

Testing the effects of rigid encapsulations on bovine primordial follicle quiescence versus growth

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OBJECTIVES/GOALS: There is an interest in developing a bioprosthetic ovary for ovarian tissue transplantation. The properties of the ovarian extracellular matrix need to be better understood in order to replicate the human ovary. We tested the effects of an encapsulating hydrogel at different rigidities on bovine primordial follicle activation, growth, and survival. METHODS/STUDY POPULATION: Bovine primordial follicles were isolated from ovarian cortex. A mean of 9.9 follicles (range 3-24) were encapsulated per bead in either 1% or 5 % alginate across 4 experiments. The encapsulated

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