The isolated porcine heart has become more frequently used over the last decade as a nearly full scale model for evaluating changes in cardiac pathologies as well as developing and testing equipment and interventions designed for human patients. For example, it is well-known that human cardiac electrical disturbances such as ventricular fibrillation are much better modeled using larger hearts, as compared to those of rodents and other small animals. Detection of changes in the renin-angiotensin system caused by acute ischemia that alter gene regulation and protein production has been made possible through the use of the porcine heart to acquire more biological material than that capable of being isolated from smaller hearts. Cardiac pacing systems, MRI viability studies, and changes in heart valve motion have been evaluated using isolated porcine hearts. The isolated porcine heart is also a source for large amounts of isolated myocytes.

The obvious advantages of the porcine heart compared to human heart are its ready availability, low biohazard potential and large amount of healthy tissue when compared to the limited sources of viable human heart tissues. The chief limitation of using the porcine preparation has been the lack of a full-sized system that can deal with supplying the larger heart with adequately aerated perfusate, as well as effectively controlling temperature, while permitting ready access to the preparation.

In the Radnoti systems, perfusate is prewarmed and aerated in two 5 liter water-jacketed reservoirs prior to delivery to the heart. The perfusate is effectively delivered via high flow pumps to a heart chamber and cannulae designed for the larger hearts. Oversized oxygenating chambers permit the large volumes of recirculated perfusate to be regassing and warmed rapidly. The experimenter may chose to perform Langendorff constant pressure or constant flow preparations, or to run in the full working heart mode. Because of the size and weight of the system it is recommended that it be secured to a wall.

References: