**Background**

- Currently, in the United States, there are not enough organ donors to fill the needs of the near 120,000 people in dire need of a transplant.
- The current method of preservation, cold storage, allows for damage to the organ.
- A new method of storage, normothermic perfusion, where organs are kept alive by running blood through them before transplant, has shown great potential for organ transplantation.
- Normothermic perfusion has been shown to preserve organs for a longer period of time before transplant while also improving their function.

**Methodology**

- **Design:** Experiment using porcine livers to test the outcomes of productivity of the liver when placed in a cold storage unit and while being normothermically perfused.
- **Execution:** Livers from 20 pigs were divided into 4 groups:
  - One group received cold storage. The other 3 received normothermic perfusion with whole blood.
  - The livers were preserved for 10 hours, then placed in a perfusion machine for 24 hrs to simulate transplantation.
- **Data collection:** Bile production as well as levels of AST and ALT in the blood were used as factors in determining the productivity of the organ in both normothermic and cold storage settings.

**Results**

- **Bile production**
  - Normothermic perfusion had a mean level of bile production closer to physiologic levels than cold storage.
- **ALT**
  - ALT levels after normothermic perfusion were closer to physiologic levels than cold storage.
- **AST**
  - AST levels after normothermic perfusion were closer to physiologic levels than cold storage.
  - Physiologic values of AST, ALT, and Bile show that the perfused liver has better function than the liver which experiences cold storage.
  - These results so much promise for use of normothermic perfusion before organ transplantation.

**Conclusions**

- **Recommendations**
  - Further studies should be performed to test this method of organ procurement in a few areas:
    - Perfusion with human livers
    - Clinical trials, where human livers are perfused on pump prior to transplantation
    - The amount of time the liver can be kept on a pump
    - Using marginal donors, such as those from cardiac rather than brain death

**Future Directions**

- The positive effects of the results of the experiment show great potential for future organ banking.
- Other studies performed in the UK have shown that livers, while being perfused, can be kept alive for 3 days before being transplanted.
  - This is a drastic improvement over the current 10-12 hour period in which the liver must be transplanted.
- Normothermic perfusion has also shown much promise as a way to improve the function of organs other than the liver as well.
  - Kidneys have been shown to stay alive, while being perfused, for 108 hrs.
  - Organs being perfused also can be treated for different ailments that couldn’t be treated while they remained inside the donor.
    - Tumors located on donor organs, that could not be removed while the organ was inside the body, have been able to be removed when it is perfused.
    - Treatment of organs when they are perfused allows for the use of damaged organs for transplantation, which could help shrink the waiting list.

**Acknowledgments**

Thank you to my mentors for their guidance through this research project. Also thank you to my fellow interns, the Cleveland Clinic OCEI, and my parents.