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Germ Cell-Depleted Ovaries Improve Metabolic Health in Post-Reproductive Mice

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Introduction

Reproductive senescence is correlated with many deleterious health conditions. In human females, the decline of health associated with reproductive function is termed “menopause.” One of the declining health factors is metabolism.

In order to understand how ovaries contribute to metabolic health, we further studied the structure of ovaries. Within ovaries, there are two main types of cells:

Germ Cells (oocyte)

Play a central role in reproduction (egg)

Somatic Cells

Supporting cells for germ cells

This study aimed to understand the relationship between germ cells and somatic cells and how this relationship influenced metabolism.

Methods

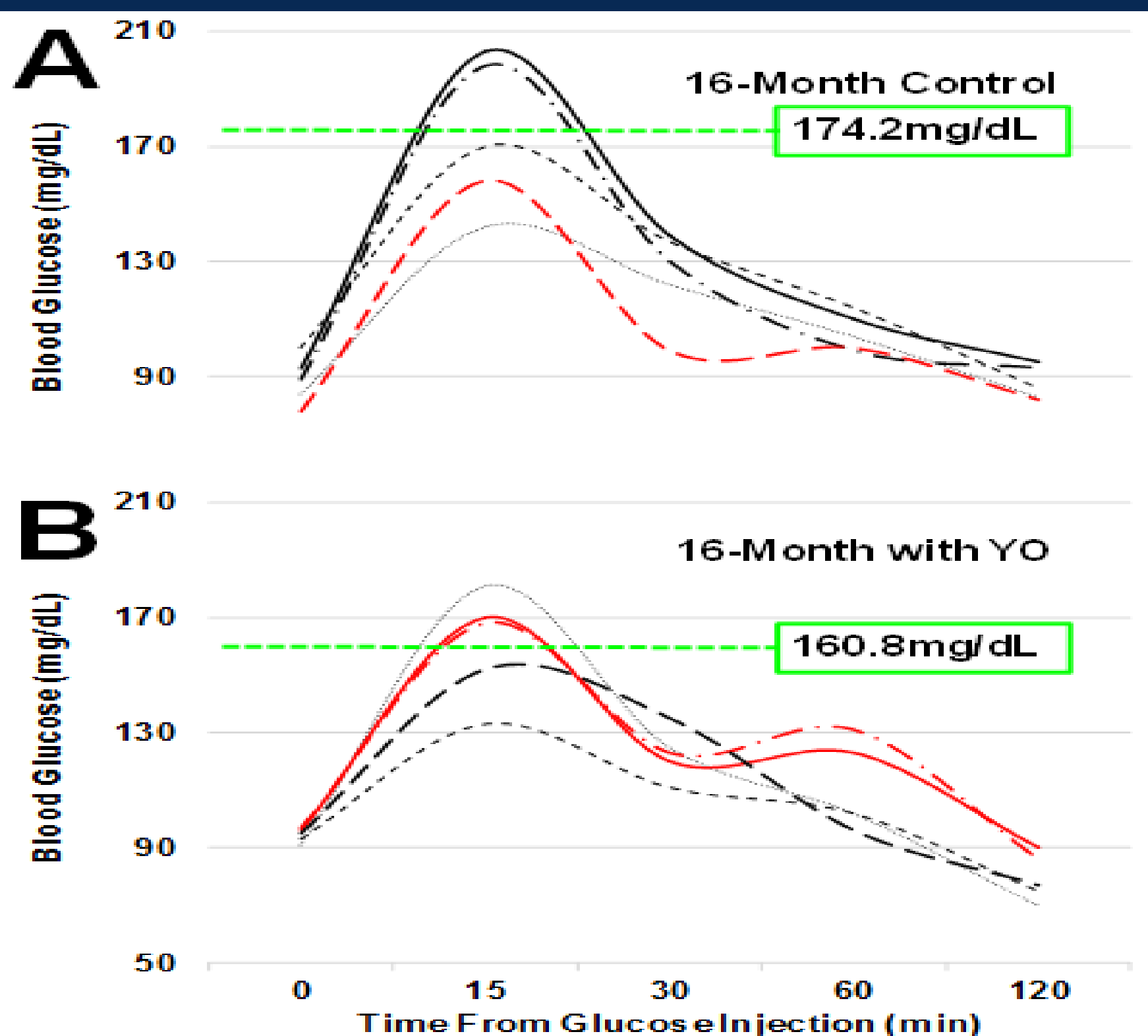
1. Female mice of the CBA/J strain were used in this experiment.
2. Mice that did not undergo surgery served as controls.
3. Germ cell-containing and germ cell-depleted ovaries from 60-day-old mice were transplanted into 13-month-old post-reproductive recipient females.
4. A glucose tolerance test was conducted. After receiving a bolus of intraperitoneal dextrose, blood glucose levels were measured every 30 minutes for 120 minutes.

Results

Mice were evaluated at 16 and 25 months. The area under the glucose curve (AUC) increased with age and decreased with new ovaries regardless of germ-cell status. Germ cell depletion decreased this benefit by only 13% as seen in Figure 1.

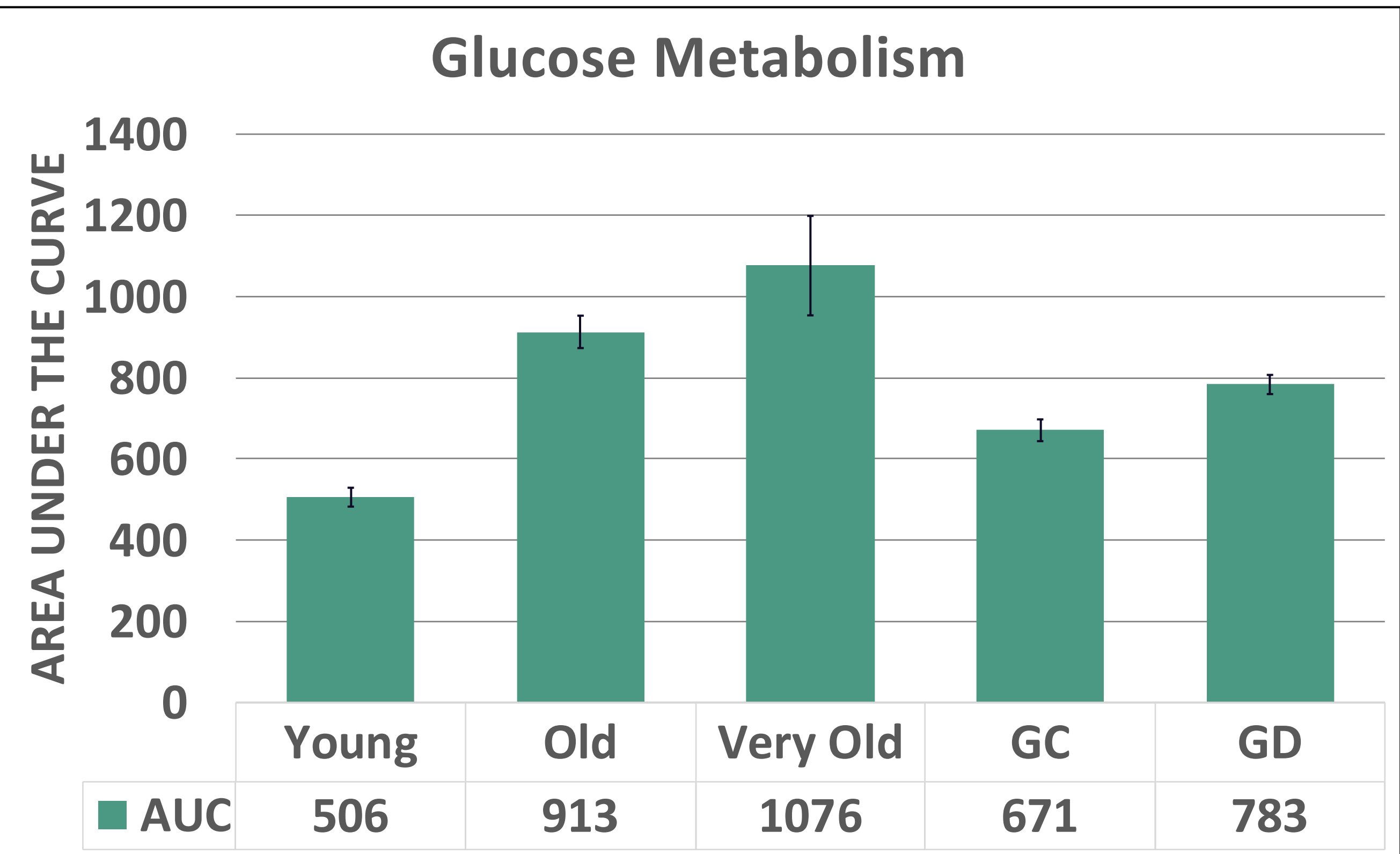
Additionally, the bimodal curve and lower peak blood glucose levels in Figure 2 suggests a more effective metabolism in ovary transplant recipients over age-match controls. The ovary transplant curve resembles that seen in young mice (YO=young ovary).

Figure 2 - Blood Glucose Curve

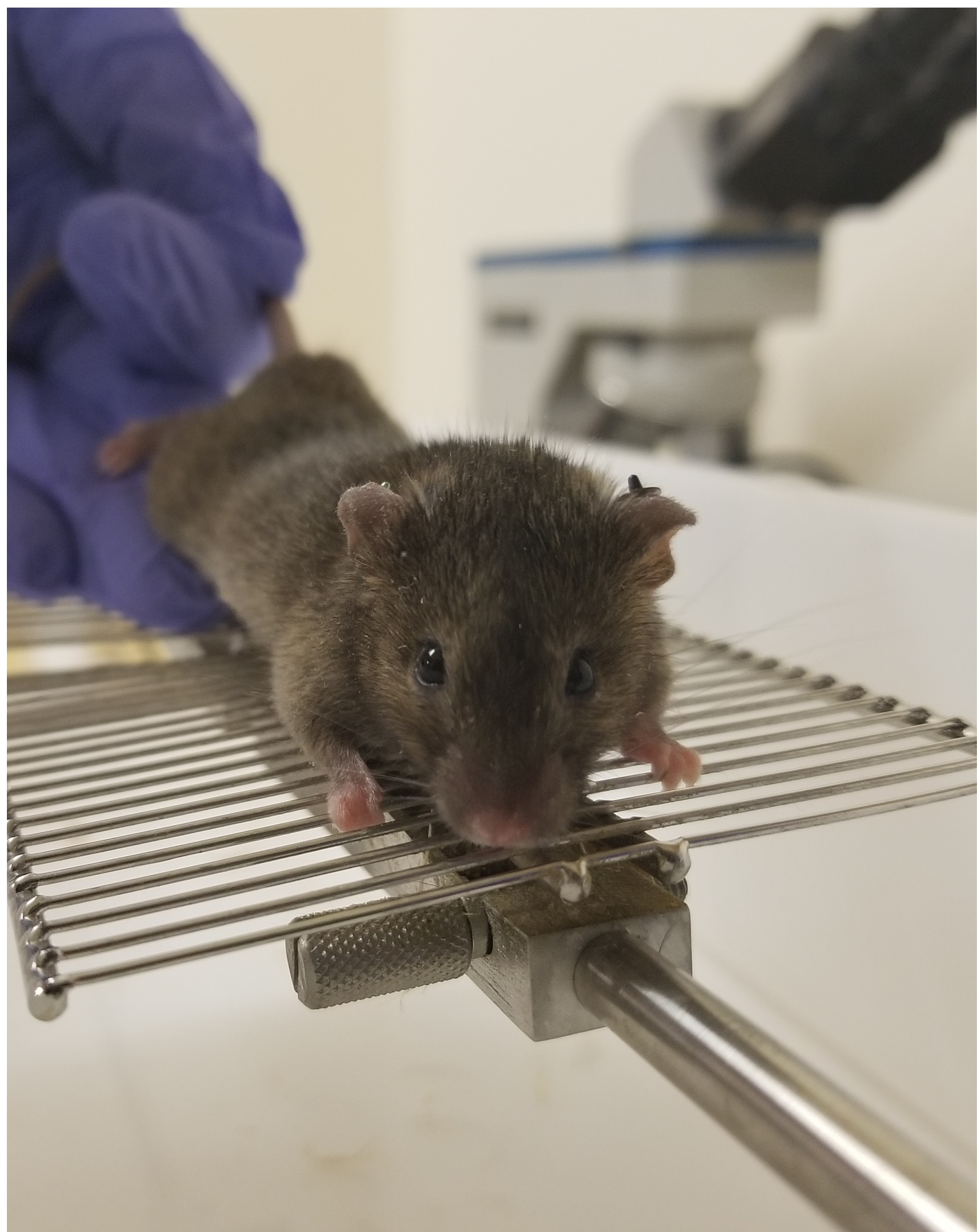


Glucose Tolerance Test (GTT): A=Control groups, B=mice with transplanted ovaries.

Figure 1 - Glucose Tolerance Test



Glucose Tolerance Test (GTT) Key: Young, old, very old = control, GC=received young ovary transplant, GD=received germ cell-depleted young ovaries.



Conclusions

Current results revealed that mice that received germ cell-depleted ovaries experienced restoration of health associated with metabolism. Germ cell-depleted ovary recipient mice performed better in other areas of health as well.

This study hold promise for the treatment of the health decline associated with menopause. Further work is being conducted to evaluate adapting this concept to human use.