Introduction:
The aim of this study was to identify the causative allelic change that resulted in the atypical form of congenital hypothyroidism noted within a feline research breeding colony used to study glaucoma. Retrospective analysis of archival records as well as whole genome sequencing (WGS) of specific members of the breeding colony were performed. A pedigree was constructed to determine the inheritance pattern of the disease.

Background:
Simple congenital hypothyroidism occurs as a result of the triiodothyronine (T3)/thyroxine (T4) production pathway being disrupted within the endocrine system, specifically within the thyroid endocrine signaling pathway, thyroid transport, peripheral thyroid metabolism, or the thyroid gland itself, causing lowered quantities of these products in the body. Congenital hypothyroidism means it is present from birth. The sometimes transitory and incomplete block in thyroid production seen in our novel and atypical form of hypothyroidism manifests as affected kittens, which may achieve some thyroid production and function, such that as adults they are spared the full developmental consequences of severe congenital hypothyroidism, despite their thyroid hormone associated levels not being fully normalized. The transitory nature of this condition manifested with kittens who were detrimentally affected in their development both in terms of their gait and mentation, yet as the cats grew to be adults their T3 and T4 levels were somewhat but not completely normalized. This clinical picture is in sharp contrast to that seen for the simple and complete congenital forms of the disease (Greco, Deborah S., 2006).

References:

Results:
It has been determined that the inheritance is polygenic. The disease is likely not informed by a single gene as is evidenced by the inheritance denoted in the pedigree. Instead, the disease is inherited via multiple genes working in conjunction with each other. This study pointed to the disease inheritance being partially X-linked. In looking at the X-linked component, it is imperative that one factors inactivation and gene relationship play key roles in the status of each animal.

Future Plan of Action:
The results of the study have been sent to Dr. Leslie Lyons, an associate professor at the University of Missouri, to be studied further. Dr. Leslie Lyons is a renowned geneticist who studies a number of species but has focused on cats to develop biomedical models. The hope is that she can help pinpoint the allelic mutation causing this form of hypothyroidism in the breeding colony. The discovered inheritance pattern will help to decrease the number of possible causative agents.