


A Comparative Study of Ocular Anatomy in Three Different Laboratory Swine Strains

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INTRODUCTION

- The use of laboratory swine in ophthalmic research has grown considerably due to their anatomical and physiological similarities to humans.
- This study was designed to confirm quantitatively the similarity of ocular structures quantitatively, both in size and weights, between Sinclair Nanopigs[®] (SN) comparable to those of the well-established Göttingen Minipigs (GM) and Yucatan pigs (YP).
- While these three swine strains are commonly used in toxicology and pharmaceutical studies, husbandry and animal welfare concerns arise when certain strains reach sexual maturity due to overall weight and size ^{1,2}.
- Consistent with established animal welfare principles, this study aims to minimize stress during personnel–animal interactions, improve housing suitability and quality.

METHODS

- A total of 49 animals (32 SN, 12 GM, and 5YP), with ages ranging from one to thirty-months old, were used in this study.
- Eyes were either dissected (24 SN eyes, 10 GM eyes, and 6 YP eyes) or fixed in 10% formaldehyde (40 SN eyes, 14 GM eyes, and 4 YP eyes) overnight for evaluation.
- Dissected eyes had the following tissues collected and weighed: aqueous and vitreous humor volumes, cornea, iris/ciliary body, lens, trabecular meshwork, retina, choroid/RPE, and sclera.
- Fixed eyes were sectioned sagittally for measurement of anteroposterior (axial) and transverse (horizontal) globe lengths, cornea diameter, anterior and posterior segment depths, and lens (thickness and diameter).
- All measurements were analyzed using one-way ANOVA and a post hoc Tukey-Kramer Test to evaluate significant differences.

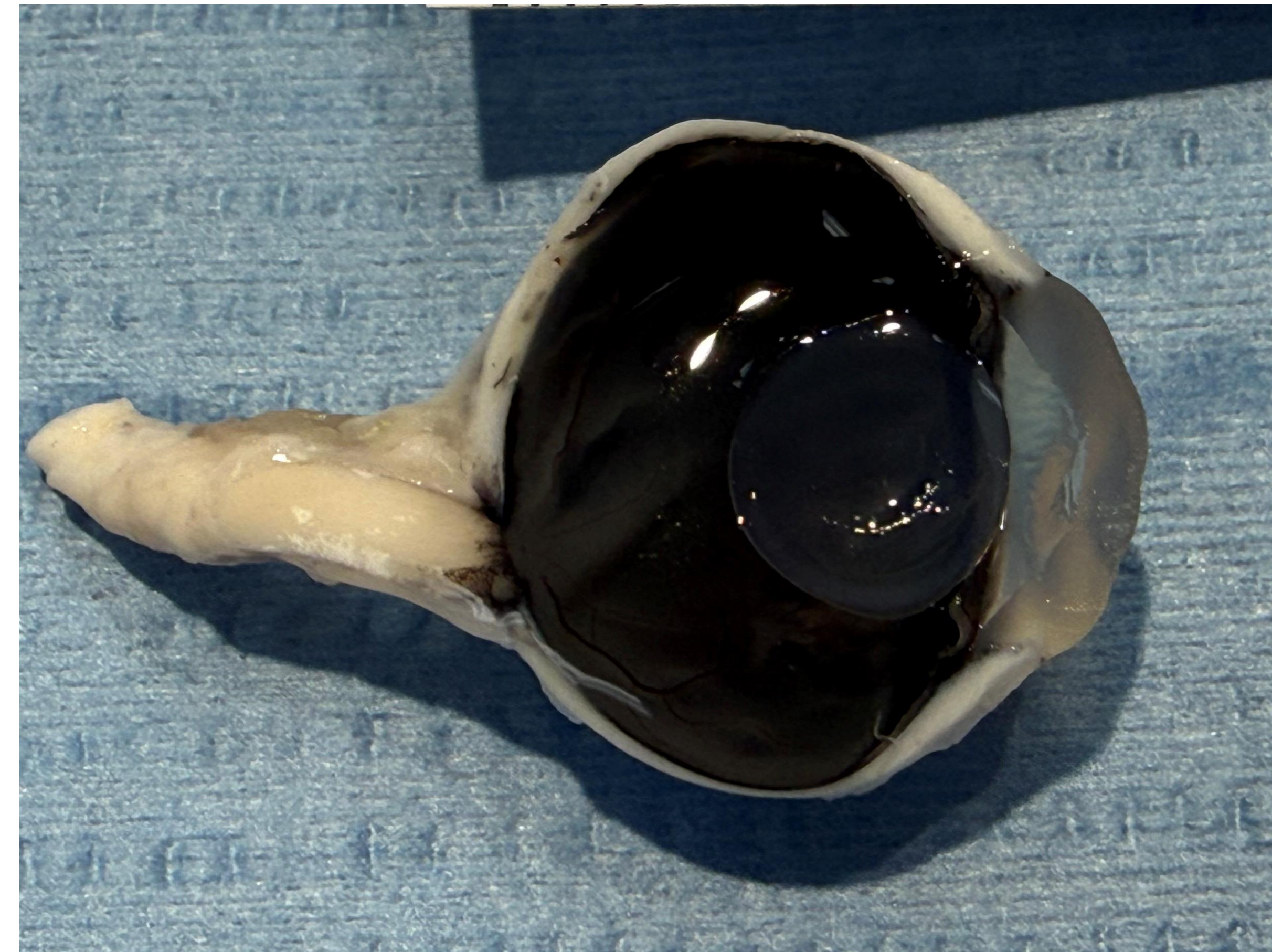


Figure 1. Representative image of a 6-month-old Nanopig eye.

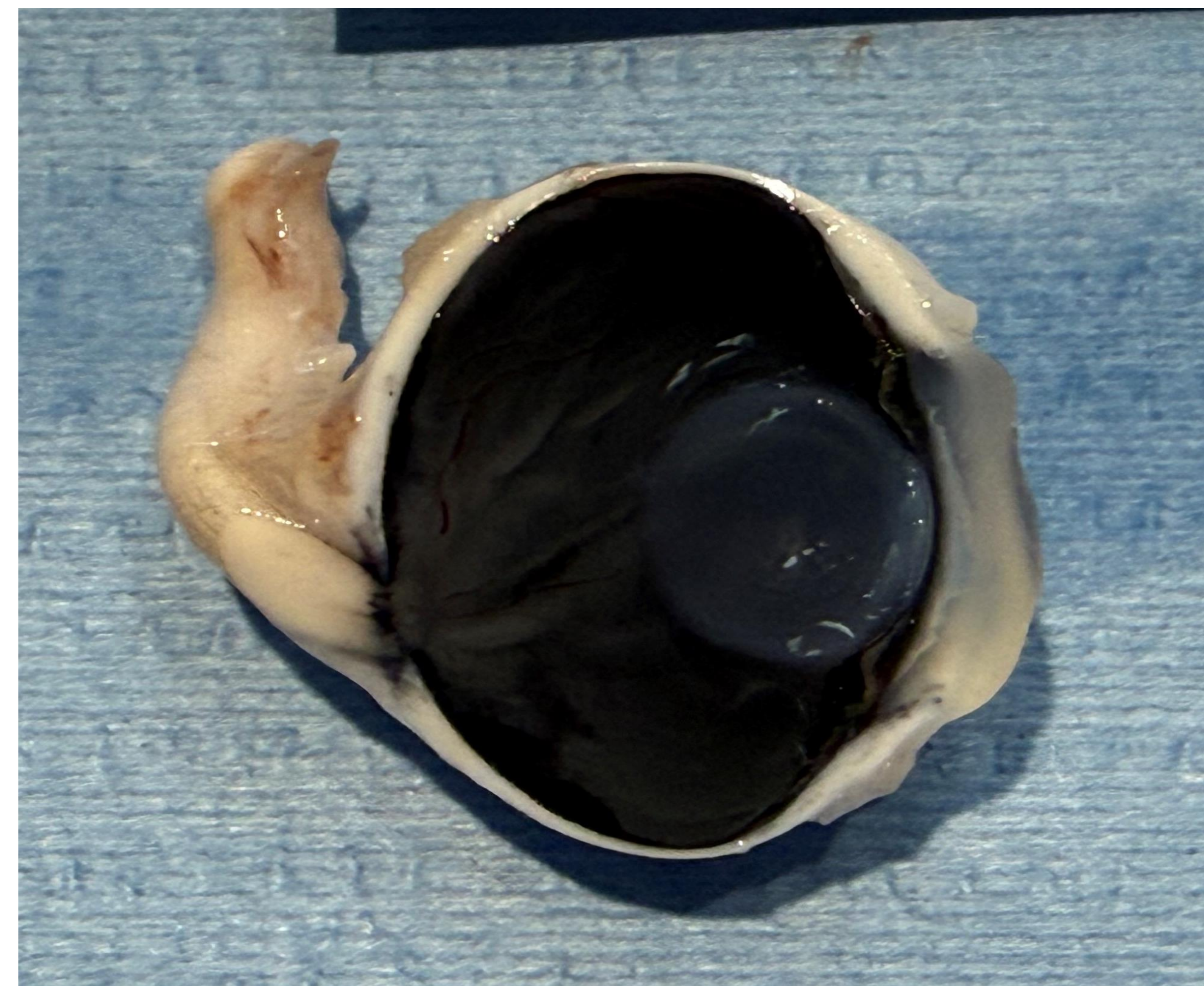


Figure 2. Representative image of a 6-month-old Minipig.

RESULTS

- Within our preliminary results, no significant differences were observed in axial globe length, lens width/depth, anterior segment depth, and subocular tissues weight between strains.
- Although minimal, statistically significant differences were observed in transverse globe length (21.9 ± 2.22 mm SN, 20.3 ± 0.74 mm GM, 23.3 ± 0.82 mm YP), corneal diameter (13.0 ± 1.46 mm SN, 13.4 ± 0.67 mm GM, 15.3 ± 0.52 mm YP), and posterior segment depth (9.3 ± 0.82 mm SN, 10.5 ± 0.85 mm GM, 11.0 ± 0.82 mm YP).

Table 1. Eye Globe Measurements

	Axial lobe length (mm)	Transverse globe length (mm)	Anterior segment depth (mm)	Posterior segment depth (mm)	Lens width (mm)	Lens depth (mm)	Corneal diameter (mm)
Sinclair Nanopig [®]	18.5 ± 0.65	$21.9 \pm 2.22^*$	7 ± 1.26	$9.3 \pm 0.82^*$	9.4 ± 0.9	6.2 ± 0.9	$13.0 \pm 1.46^*$
Göttingen Minipig	18.5 ± 0.59	$20.3 \pm 0.74^*$	8.3 ± 1.05	$10.5 \pm 0.85^*$	8.9 ± 0.32	6 ± 0.1	$13.4 \pm 0.67^*$
Yucatan [™] Pig	19 ± 0.98	$23.3 \pm 0.82^*$	8.5 ± 0.57	$11.0 \pm 0.82^*$	9.7 ± 0.5	6.5 ± 0.57	$15.3 \pm 0.52^*$

CONCLUSION

- In conclusion, while statistically significant differences were observed in some globe measurements among all three species, eye measurements from all three species are comparable in weight and size and equally suitable for use in ocular studies.

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