SPONTANEOUS OCULAR FINDINGS
AND ESTHESIOMETRY / TONOMETRY MEASUREMENT
IN THE GÖTTINGEN MINIPIG
(CONVENTIONAL AND MICROBIOLOGICALLY DEFINED)

Olivier Loget
Pharmakon Europe
Domaine des Oncins - BP 0118
69593 L'Arbresle Cédex
France

SUMMARY
Gross examinations, ocular reflexes, esthesiometry, indirect ophthalmoscopical and
biomicroscopical examinations and tonometry were performed in eighteen 6 to 8 week old
microbiologically defined and in forty-nine 2 to 10 month old conventional Göttingen
minipigs. Ophthalmological findings often consisted of embryonic remnants (hyaloid artery,
pupillary membrane) which seemed to decrease in incidence with time, although this
decrease was not confirmed by statistical analysis. The most important findings were either
considered to be congenital in origin or of undetermined etiology. The most noteworthy
findings were, in decreasing order of incidence, as follows: hyaloid artery remnants
(microbiologically defined: 83.3 %, conventional: 76.5 %), tigroid fundus
(microbiologically defined: 72.2 %, conventional: 75.5 %), slight lens opacities
(microbiologically defined: 38.9 %, conventional: 41.8 %) and pupillary membrane
remnants (microbiologically defined: 33.3 %, conventional: 21.4 %). These findings did not
affect the visual capabilities of the pigs.

INTRODUCTION
Since the use of miniature swine to replace or to complement the dog or monkey as
experimental models in toxicity studies is likely to increase, a better knowledge of their
anatomical, physiological and histopathological characteristics is needed. In this study, the
normal ocular pattern of the Göttingen minipig is described, in order to be able to
differentiate between spontaneous and induced ophthalmological abnormalities which may
occur in subsequent toxicity studies. Consequently, the same examinations were performed
as those required for toxicity studies in non-rodent species.
MATERIALS AND METHODS

Eighteen (nine males and nine females) young microbiologically defined Göttingen minipigs and forty-nine (nineteen males and thirty females) older conventional minipigs (Ellegaard Göttingen Minipigs ApS, Sorø Landevej 302, DK-4261 Denmark) were examined. The examination of the young microbiologically defined minipigs was carried out on delivery at customer's facility (Leo Pharmaceutical Products, 55 Industriparken, DK-2750 Ballerup, Denmark). That of the older minipigs was performed at the clinic of the supplier's veterinarian (Dr. P. Skydsgaard, DVM, PhD).

The ocular reflexes (corneal palpebral, pupillary direct and consensual) were evaluated. (In the case of the microbiologically defined minipigs, the pupillary reflex was checked, a few days after the main examinations, by Dr. Jens Lichtenberg, DVM, Toxicologist, Leo Pharmaceutical Products.) After esthesiometry (Cochet-Bonnet esthesiometer) and macroscopic examination of the eye and its adnexae, the pupils were dilated with 0.5 \% tropicamide (Mydriaticum, MSD Chibret, Paris). Two drops were instilled into each eye about 15 minutes before examination. Then indirect ophthalmoscoical and slit lamp biomicroscopical examinations were performed using a binocular indirect ophthalmoscope (Heine Omega 100 with a double aspheric 20 D lens) and a Kowa SL 5 slit lamp biomicroscope. Prior to the ophthalmoscoical and biomicroscopical examinations, the head light source of the indirect ophthalmoscope was used to observe the external ocular adnexae, the anterior segment and the vitreous body. Retinography was performed using a fundus camera (Kowa RC2 with 25 Asa films : Koda Chrome 25). Thereafter, following corneal anesthesia (Novesine, MSD Chibret, Paris) tonometry was performed with a Tonopen tonometer. All the examinations were performed on non-anesthetized animals restrained in appropriate slings.

Analysis of variance and Student's t-test were performed on the esthesiometry and tonometry results and the three different groups (6 to 8 week old microbiologically defined, 2 to 5 month old and 6 to 10 month old conventional minipigs) were compared for the incidence of the main findings, using a chi-square test.

RESULTS

Gross Findings

Pupillary reflexes occurred slowly and their amplitude was small in conventional minipigs. In microbiologically defined animals, most of the pupillary reflexes were normal, but in two of them the reflex occurred faster and in two others it occurred slowly or very slowly.

Eyelids were thick and did not open very easily. The straight cilia were sometimes so numerous that it was difficult to perform some examinations (esthesiometry, tonometry, biomicroscopy...). Although blepharitis and conjunctivitis were noted in several microbiologically defined minipigs on the day of their arrival at the client's facility, this inflammation disappeared spontaneously, except in four animals.

The caruncle was well developed. The nictitating membrane was usually slightly brown in colour on its free margin. Due to the depth of the orbit, the ocular globe was in a deeper position than in other laboratory species. The sclerae were most often slight and rarely slightly brown pigmented (one conventional and one microbiologically defined minipig in this survey). The irises were brown, brown/blue or blue colored. In some animals, the iris was blue for one eye and brown for the other.