Haematology and blood biochemistry changes related to age in Göttingen minipigs

Andrew Makin, Jes Tøvborg Jensen and Signe Klastrup, Citoxlab Scanfod A/S, Ejby, Denmark

Abstract
Minipigs are increasingly used as a non-rodent model in non-clinical research. These animals are used in a broad range of studies and at a wide variety of ages and stages of development. In our laboratories, we use Gottingen minipigs and they vary from neonatal up to several years of age depending on the type of study. The early development of young Göttingen minipigs is rapid. From birth, their eyes are open and they are able to move around freely. By 4 weeks of age they are weaned and from around 4 to 6 months of age they reach sexual maturity. Despite this rapid growth and early maturity, they continue to grow during the first 2 years or so of their lives so that an animal at the end of a chronic toxicity study will be significantly bigger and more developed than it is at the start. This prolonged growth period is also reflected by other changes in the animals other than a simple increase in size. Because all data generated during toxicology studies need to be interpreted, and findings need to be put into context using both concurrent control and also historical data, we were interested to see how the routine parameters that we measure in toxicology studies change over time.

Materials and methods
The data presented are the historical values taken from our minipig database, arranged by age and sex of the animals. The data are taken from untreated animals and are the result of sampling both the control animals in our studies and also sampling of all animals during the pre-study screening. Blood samples were routinely collected from the jugular vein/bi-jugular trunk and the animals were fasted overnight before sampling. Haematology samples were taken into tubes using K3EDTA as an anticoagulant and analysed using an ABX Pentra DX120S. For the coagulation tests, samples were taken into tubes containing citrate as anticoagulant and analysed using aACL 9000 analyser. Finally the biochemistry analyses were performed on serum using an Hitachi 917 analyser.

The values obtained for each parameter depend on several factors. Some of these relate to the equipment used and the test conditions, so that background data obtained in one laboratory are not readily transferable to another. One should also check the units used because these can also vary from laboratory to laboratory.

The background data presented are based on data from control animals plus data taken from all animals before entry to studies. Thus we have data from large numbers of animals at the lower age ranges, while the data at the higher ages is from smaller animal numbers.

It should be noted that minipigs reach sexual maturity early in life (ca 5 months of age) although growth continues for much longer. Therefore while the animals in our oldest group are certainly to be regarded as mature adults, they are not completely grown.

Results

This range of ages represents the range most commonly encountered in toxicological studies where it is normal that animals would be 4-5 months old at the start of treatment. Therefore they are slightly younger when first sampled for pre-treatment screening. The longest toxicology studies are normally 9 months to one year in duration, hence the oldest animals in our survey are 16 months. The data are presented as mean values (by sex and age) with the number of animals upon which the mean is based. In the interests of visual presentation, we have not included ranges or Standard Deviations. For many parameters the data ranges are generally rather narrow. Parameters that generally show a large inter-individual variability include Activated Partial Thromboplastin Time (APTT), differential white blood cell counts, creatinine and protein. The values obtained for each parameter depend on several factors. Some of these relate to the equipment used and the test conditions, so that background data obtained in one laboratory are not readily transferable to another. One should also check the units used because these can also vary from laboratory to laboratory.

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Conclusion
Minipigs are an increasingly common species for use in non-clinical toxicology studies. As with all species, a good understanding of the background historical values is of value. As with all species, a good understanding of the background historical values is of value.