Pre-race testing and its role in equine medication control

T. TOBIN
Department of Veterinary Science, University of Kentucky, Lexington, KY 40546-0076, USA

Summary
In general, blood is the only material on which a practical pre-race testing scheme can be based. Blood testing is not as sensitive as urine testing and detects only about 66 per cent of the drugs detectable in urine. Therefore, pre-race blood testing is always performed in conjunction with post race urine testing. Because blood is easily and rapidly drawn, the use of blood samples in all post race testing schemes is recommended. Pre-race testing is also a relatively expensive proposition, but it is the only method which actually prevents the running of an illegally medicated horse.

Introduction
THE first serious effort at pre-race testing for drugs in horses was that of Professor James Munch in the USA in the 1930s. This test was based on the Straub reaction in mice. This is the unmistakable S-shaped curve, associated with a running response, in mice injected with morphine. To apply this test, Straub and his colleagues fitted out a truck as a mobile laboratory at the racecourse. A sample of saliva or urine from the test horse was injected into a mouse, and its reaction observed. A Straub tail reaction was a positive for a morphine-like drug; excitement or convulsions suggested central nervous system stimulants. Pre-race testing, as it is today in the USA, was developed by Dr Richard Ray and his colleagues at the Ohio State University (Ray, Noonan, Murdick and Tharp 1972) and is based on gas chromatographic techniques of drug detection (Blake and Tobin 1976). Nowadays thin layer chromatographic techniques are also used (Maylin 1974). Pre-race testing is now in use in harness racing in New York, New Jersey, Pennsylvania and Ohio and, most recently, it has been introduced into Thoroughbred racing in the Finger Lakes region of New York State.

Pre-race testing procedure
In the USA, all the horses taking part in a race are brought for pre-race testing to a secure paddock about 2 h before the race. Blood samples (20 ml) are collected and analysed for the presence of drugs in a laboratory at the racecourse. The results are reported to the stewards before the parimutuel windows are opened, and the stewards usually disqualify any horse found positive. In addition, normal post race testing of urine samples is always performed. The post race portion of the testing process in the USA involves the collection of urine samples from winners, beaten favourites and other horses which the stewards see fit to test (Tobin et al 1979). Saliva is not used in pre-race testing because the sample is small in volume and certain drugs are not detectable at all. Neither sweat nor urine can be reliably collected pre-race.

Advantages and disadvantages of pre-race blood sampling
The principal advantage of pre-race testing is that it is the only mechanism by which the running of illegally medicated horses can be prevented. The incentive to legal challenge of the regulatory system is reduced because the horse is disqualified before it has won any money. All horses entered are tested pre-race and the testing coverage is considered equitable. Also, the horses are readily available for additional testing if this is required by the analyst or owner.

Blood samples are readily obtained and drugs present in blood are usually in pharmacologically active or unchanged forms. Drug "traces" do not remain in blood for long periods after administration, in contrast to the persistence of traces in urine. There is no evidence that the venepuncture associated with blood testing harms horses. The main disadvantages of blood testing are that the analytical techniques required are somewhat more exacting than, and are not as sensitive as, those required for urine testing. Also, drugs tend to clear from the blood more rapidly than from urine, which may decrease the number of "positives" reported. As a general rule, blood testing detects about 66 per cent of the drugs found by urine testing.

Urinary levels of drugs and drug metabolites are usually higher than blood levels because water soluble drugs or metabolites may be concentrated 50-100-fold in urine samples; the kidney's ability to concentrate drugs makes it much easier to detect certain drugs in urine. On the other hand, this concentrating mechanism can lead to drug traces being picked up in urine for quite long periods after drug administration, causing problems for horsemens and veterinarians.

Pre-race testing is performed under considerable time pressure and the evidence on which positives are reported under these circumstances may be less than optimal. Pre-race positives are usually confirmed by post race tests at a reference laboratory but the situation that might arise if this confirmation did not occur has not been defined.

Finally, pre-race blood testing is costly, as it requires well equipped laboratory facilities and highly trained personnel to be available at the race tracks for the duration of the meeting.

Post race testing
Post race testing is most commonly performed on urine samples and, in some states such as Kentucky, on post race blood and urine samples. Very few racing jurisdictions in the USA now use saliva in their testing procedures.

The principal problem with urine testing arises from its great

This article is based on a presentation to the 19th annual congress of the British Equine Veterinary Association.
sensitivity, that traces of drugs may often be found in urine days after legitimate treatment, and long after the pharmacological effects of the drug have dissipated. It may, therefore, be difficult to interpret the forensic significance of traces of certain drugs in urine. For example, the pH of horse’s urine can vary within quite wide limits, so the concentration of some drugs in horse urine can be highly variable. It has been shown in England and Japan that the urine of racing horses may vary over a range of 5 pH units. Given this large pH range, the concentration of procaine, for example, in a horse’s urine may vary up to 9000-fold, depending on whether the horse’s urine is acidic or basic. Obviously, with such a large variability in the urinary concentration of procaine, it is not possible to draw any firm conclusion about the route or time of administration of procaine (Tobin 1981).

Acknowledgements

The assistance of Thomas Nugent, who helped with the procedures, is gratefully acknowledged. This research was supported by grants from the Kentucky Equine Research Fund and a UKRF Graduate Fellowship. The article was first published (publication number 82) by the Kentucky Equine Drug Research Program, Department of Veterinary Science, University of Kentucky.

References


Accepted for publication 15.7.82

BOOK REVIEW


This short book is a monograph written by Dr Meyer and his colleagues from the Institute of Animal Nutrition and Animal Husbandry, Hannover. In the seven papers presented, the methodology and results of investigations into the digestive physiology of the ileoceleal junction are presented.

The first paper outlines the method employed in producing a large fistula in three horses from which samples of digesta can be drawn from the distal ileum, caecum and proximal ventral colon. The succeeding six papers provide quantitative data on the flow of ileal chyme and its composition in terms of dry matter, volatile fatty acids, protein, non-protein nitrogen, calcium, magnesium, phosphorus, sodium and potassium. The flux of these minerals, urea and ammonia between the blood plasma and the three compartments of the digestive tract is also considered. The horses used were given diets consisting of concentrate or hay or straw, or a combination of concentrate and straw. The effects of feeding the concentrate before the straw or vice versa were observed, leading to some interesting and significant observations.

The Hannover group of workers is in the forefront of research into the digestive physiology of the horse and the publication is well presented and printed in Germany. There is being little European research into the nutrition and physiology of the horse at the present time this publication forms a valuable source of data and references in addition to the new evidence presented on this specialised subject. There are 33 tables, 21 figures and 109 references, including some very recent ones. Scientists conducting investigations into this field will therefore find the monograph an invaluable source of information.

The publication is put together in a systematic manner so that the papers are closely interrelated and the discussion in each flow naturally from that in the preceding paper. The experiments deal, in the main, with concentrations of nutrients and not with entry rates, but undoubtedly with the passage of time the Hannover group will expand the scope of their work. Each paper contains a reliable English translation of generally high standard, with two exceptions. One relates to the question of concentration rather than total amount in that the statement "the dry matter content of the caecum" should read: "Dry matter concentration in the caecum", or "dry matter content of caecal chyme". The second translation anomaly is an error in the third summary statement on page 69 where the word "lower" should presumably read "higher". Other very small printing slips in the text are readily interpretable.

D. L. FRAPE