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Pre-race testing and its role in equine medication control

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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 unmistakeable 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; excitation 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- to 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 horsemen 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

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sensitivity, in 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).

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Résumé

Le sang est le seul matériel sur lequel on peut fonder un plan de détection du dopage antérieur à la course. Son examen n'est pas aussi sensible que celui de l'urine et ne permet de déceler que 66% environ des substances identifiables dans celle-ci. En conséquence, l'examen du sang avant la course est toujours effectué en conjonction avec une analyse d'urine recueillie après la course. Parce que le sang peut être facilement et rapidement prélève, il est souhaitable d'inclure son étude dans toutes les méthodes d'examen postérieures à la course. L'examen du sang avant la course est une méthode onéreuse, mais semble être le seul moyen de pouvoir exclure de la compétition un cheval drogué.

Zusammenfassung

In der Regel ist Blut das einzige Material, das eine praktikable Durchführung von Dopingkontrollen vor den Rennen (= pre-race testing) erlaubt. Die Blutanalysen erweisen sich als weniger ergiebig als Harnanalysen. Es wird damit gerechnet, dass im Blut nur etwa 66% der Substanzen nachgewiesen werden können, die man im Harn findet. Deshâlb wird die Blutkontrolle vor dem Rennen immer zussammen mit einer Urinanalyse nach dem Rennen vorgenommen. Weil sich Blut leicht und rasch entnehmen lässt, wird der Gebrauch von Blutproben für alle Testprogramme empfohlen, die die Kontrolle der pferde vor den Rennen vorsehen. Obwohl derartige Kontrollen verhältnismässig teuer zu stehen kommen, sind sie doch das einzige Mittel, den Einsatz illegal behandelter Pferde im Rennen zu verhindern.

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BOOK REVIEW

Contributions to digestive physiology of the horse by Professor H. Meyer. Supplement 13 to the Journal of Animal Physiology and Animal Nutrition. Published by Verlag Paul Parey, Hamburg and Berlin, (1982).

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 ileocaecal junction are presented.

The first paper outlines the method employed in producing a large fistular 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 being little European research into the nutrition and physiology of the horse at the present time this publication forms a valuable source of date 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 flows naturally from that in the preceeding 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.

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