Welcome to EFTBA’s veterinary newsletter

Welcome to the fourth edition of EFTBA’s veterinary newsletter. The study this time is, again timely, and interesting, and shows how good stud management can lead to healthy foals and cut veterinary intervention.

I am extremely proud of, and would like to thank our active and influential Veterinary Advisory Committee: Dr Hanspeter Meier, Dr Des Leadon and Dr Roland Devolz, and James Crowhurst led by able Chairman, Tim Richardson.

I would also like to welcome to our Veterinary Committee Professor Dr Harald Sieme from Germany who I am sure will be a huge boost to our veterinary expertise within EFTBA.

Joseph Hernon
Chairman, EFTBA

Risk Factors for Neonatal foal diseases

With the newsletter no. 3, we got to know that other factors than antimicrobial prophylaxis are relevant for disease prevention and common knowledge is also that the development of clinical illness in foals can be predetermined by perinatal history and conditions of management or stressful environment. Therefore, Wohlfender et al. (2009b) also set out to determine potential risk factors for an increased incidence of infectious diseases during the first 30 days post partum.

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EFTBA Delegate (Switzerland) and veterinary advisor & Newsletter editor

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• Study on Risk Factors for neonatal foals

“Many thanks to Mrs. Eva-Maria Bucher-Haefner, Moyglare Stud Farm, for her valued sponsorship of this newsletter.”
reported several possible factors for immunodeficiency, e.g. prepartum lactation, foal unable to stand or suck due to weakness, deformity or convulsive syndrome, lack of suck reflex, death of dam, uncooperative (maiden) mare, colostrum withheld to prevent haemolytic disease, mare newly arrived at place of foaling and therefore inappropriate colostral antibodies, and, finally, failure to absorb colostral antibodies.

Recent studies on risk factors for infections in neonatal foals are missing, wherefore the accumulated data of the study of Wohlfender et al. (2009a) in newsletter 3 were also used to identify statistically significant risk factors for infectious diseases in neonatal foals.

**Material and methods**

**Population and data collection**

The study population consisted of the same Thoroughbred foals born on stud farms in the Newmarket (UK) area in 2005 (n = 1031) as in the study of Wohlfender et al. (2009a).

Among the foals that could be followed for the first 30 days post partum, the occurrence of the following diseases and their diagnostic criteria were monitored:
- septicaemia
- systemic disease with diarrhoea
- respiratory infection
- omphalitis
- infectious lameness including arthritis and osteomyelitis
- other infectious conditions
- total infectious diseases
- total infectious diseases excluding cases of systemic disease with diarrhoea
- and systemic disease with diarrhoea excluding rotavirus positive foals.

**Introduction - risk factors for neo-natal diseases**

Most acute infections in foals are opportunistic in character and the infecting organisms are often ubiquitous. Foals may be infected both in utero or post nataly (Platt 1983) and factors that put a neonate at risk of developing septicemia are:
1) a problematic farm environment
2) problems during pregnancy e.g. uterine and systemic disease in the mare
3) problems at parturition e.g. premature placental separation, dystocia and meconium staining
4) problems of the foal, failure of transfer of passive immunity and delayed ingestion of colostrum

These factors have been described by Rossdale (1972) and Stoneham (2005) as predisposing causes for infectious conditions in the neonate. Platt (1973) reported that predisposing factors were present in 84% of infected foals up to one month.


**Statistical analysis**

All parameters including frequencies, measures of means, medians and spread were analysed statistically und normal distribution was evaluated. Potential risk factors associated with specific disease definitions (case status yes/no) were identified and the overall level for statistical significance was set to 0.05.

**Potential risk factors tested**

The following stud farm, mare or foal related factors (n = 28) were assessed:
- stud farm management,
- number of broodmares on stud farm
- use of prophylactic antimicrobials (Groups A [treated] and B [untreated])
- foal’s exercise management
- mare’s age
- mare’s foaling history
- mare’s time at stud
- mare’s country of origin
- mare’s health
- rotavirus vaccination schedule
- prepartum lactation
- sex of the foal
- foal’s date of birth
- gestational age including prematurity
- birth weight
- birth complications
- daily vet check
- treatment schedule with prophylactic antimicrobials
- blood parameters (immunoglobulin G [IgG], WBC count, RBC count, TP, FIB, SAA, GLOB)
- colostrum intake
- colostrums quality
- plasma transfusion.
Results

Population
Data from a total of 1031 foals were collected of which 992 could be followed for the first 30 days after birth (incidence estimations). The 1031 foals were born on 36 different stud farms. For some parameters of foals from 5 stud farms no information was available (foal’s exercise management, time at stud before foaling, country of origin, mare’s health, blood parameters excluding IgG, colostrum quality).

Testing of potential risk factors for a higher incidence of infectious disease
For the 3 main disease categories ‘total infectious diseases’, ‘systemic disease with diarrhoea’ and ‘total infectious disease excluding diarrhoea’, multivariable logistic regression models were created. Other disease categories could not be analysed in this way due to the relatively low number of cases and only the factors identified as significant in this model (P<0.05) are presented here.

Clinical findings
- Foals with birth complications had a significantly higher risk for ‘total infectious diseases’ and ‘total infectious diseases excluding diarrhoea’.
- Furthermore, birth complications with assistance and premature placental separation were risk factors for foals to develop ‘systemic disease with diarrhoea’.
- Colostrum intake by stomach tube was a risk factor for ‘total infectious diseases’ and for ‘systemic disease with diarrhoea’. This association was not seen for ‘total infectious diseases excluding diarrhoea’.
- A high white blood cell count was a risk factor for ‘total infectious diseases’ and ‘total infectious diseases excluding diarrhoea’, but not for ‘systemic disease with diarrhoea’.
- Foals with a low red blood cell count and/or that were born in March were at risk for ‘systemic disease with diarrhoea’.
- To be born on the premises of a certain stud organization was associated with a significantly higher risk for foals to develop ‘infectious diseases excluding diarrhoea’.
- To be born on a boarding stud was a protective factor for ‘total infectious diseases’ and for ‘systemic disease with diarrhoea’ (the term ‘boarding stud’ was used for public stud farms where the population is transient compared to a private stud).

Discussion
The results have identified some interesting associations between infectious diseases in foals and foal, mare, and stud farm-related factors. Platt (1973) observed that in foals suffering from an infectious condition there is often evidence of an underlying defect or disability that existed at birth. As a consequence, every foal that showed clinical abnormality at birth was excluded from our calculations. It remains possible in some foals that very early stages of disease, without apparent clinical signs, were missed in the study; and that those foals therefore were included in the 30 day incidence study population, resulting in a minor overestimation of the true 30 day incidence.

Birth complications
Complications at birth were a risk factor for all 3 disease categories under study. This may either be a factor on its own, i.e. the birth process as such can be problematic or it can be associated with an intrauterine or prepartum problem. It was not possible to exclude or observe the mares for prepartum problems.

Assistance at delivery and placental separation
Assistance during birth by stud personnel has been associated with a higher risk for systemic disease with diarrhoea in comparison with assistance by a veterinarian. Premature placental separation was also associated with a higher disease incidence, as recently described by Stoneham (2005).

Colostrum intake
The reason for foals with a low IgG-value not being at a higher risk in this study for infectious diseases, as was reported before by McGuire et al. (1975, 1977) and many others, could be related to the fact that the IgG-value was checked in every foal soon after birth and that all foals with an IgG-value <4 g/l received a transfusion with hyperimmune plasma.

In addition the mare’s colostrum quality was tested before intake by the foal on almost every stud farm so as to minimise failure of passive transfer (FPT). Almost a quarter of all mares in the study lost colostrum ante partum. This result supports the importance of maintaining a bank of good quality frozen donor colostrum on stud farms. The division between ‘good’ and ‘bad’ colostrum quality is not exact, but nevertheless it shows a tendency. ‘Bad’ colostrum was not identified as a risk factor for a higher incidence of infectious diseases. This may be due to the fact that most foals received donor colostrum when their dam’s colostrum was found to be insufficient in quality or in quantity.

Further analysis is required to determine the reason for increasing a foal’s risk for developing severe diarrhoea and infectious diseases by administering colostrum by stomach tube. It is possible that these foals were predisposed due to weakness or being immature at birth and could not therefore suck colostrum by themselves, thus rendering them prone to infection regardless of the route of colostrum ingestion. Or, colostrum intake per nasogastric tube could adversely affect the absorption of the immunoglobulins by some unknown mechanism. This could be caused by corticosteroid secretion stimulated by the passing of a stomach tube. Corticosteroids may block the intestinal uptake (pinocytosis) of immunoglobulin-macromolecules (Jeffcott 1974). Furthermore, administering colostrum via stomach tube could introduce pathogens into the as yet un-protected gastrointestinal tract especially when nonsterile tubes are used. It was a common practice on many of the stud farms in this study to administer colostrum soon after birth to weak or slow foals; and this was preferred to waiting
for up to 4 h in the hope that the foal would suck colostrum on its own.

**White blood cell count**
Total leucocyte (WBC) and differential counts and measurement of plasma fibrinogen (FIB) were described as the laboratory tests most widely used for detection of infectious diseases in the foal by Hultén and Demmers (2002). Our results showed a raised WBC count 12–48 h after birth to be a risk factor for infection with the exception of systemic disease with diarrhoea. Rossdale (1972) described the WBC count as variable depending on the nature of infection. The differential count would have been interesting to analyse so as to be more precise in the diagnosis of the type of infection. Gayle et al. (1998) found a higher risk for nonsurvival in hospitalised foals that were leucopenic.

**Low red blood cell count**
A low erythrocyte count (RBC) 12–48 h after birth was found to be a risk factor for neonatal foals to develop systemic disease with diarrhoea. Peek et al. (2006) observed that a low total RBC count was a statistically significant predictor of overall foal mortality and that this could reflect anaemia, low-grade haemolysis or granulocytic and erythropoietic precursor suppression. Rossdale (1972) reported that a subnormal RBC count and haemoglobin content may be due to a reduced haemopoietic activity caused by bacterial toxins. A decrease in blood erythrocyte count, haemoglobin concentration and packed cell volume during the first 2 weeks post partum in comparison to values at birth has been reported in normal foals by Harvey et al. (1984). In the present study, only erythrocytes were counted at 12–48 h after birth.

**Immunoglobulins G (IgG)**
Acworth (2003) described a close relationship between total serum globulin (GLOB) and serum IgG-levels. This justifies the routine measurement of globulin levels in this study. Here 8% of foals had an insufficient IgG-value (<4 g/l) in comparison with 10% of foals with a globulin level lower than normal.

**Serum Amyloid A (SAA)**
The acute phase protein SAA has been described as a rapidly responding and sensitive marker of inflammation and infection (Pepys et al. 1989; Stoneham et al. 2001). This could not be confirmed by the results of the present study where a raised SAA value was not found to be a risk factor nor an indicator for infection.

**Fibrinogen**
The same was found for a raised fibrinogen value (FIB). Further analysis is required for reference values to establish if those used in this study were sufficiently sensitive.

**Vetcheck**
Foals examined by a veterinarian only once directly after birth did not have a higher incidence of infectious diseases in comparison to those examined 2 or 3 times. Therefore it can be presumed that a single veterinary examination is sufficient to discover most of the potential problems early enough to prevent or treat disease.

**Month of birth**
Foals born in March had a higher risk for developing systemic disease with diarrhoea than foals born in other months of the year. This could be because more foals are born in March leading to more stress and crowding for individuals.

**Boarding stud**
The relatively high percentage of mares that arrived only shortly before birth on the boarding stud is also a concern. It is widely recommended that at least one month of acclimatisation is needed for the mare’s immune system to produce adequate immunoglobulins in the colostrum (McKinnon and Voss 1993). However, in the present study this was not found to be associated with additional risks for the foal. But surprisingly, foals born on a private stud organization were at a significant higher risk for infection. It can be supposed that stress of travel to other premises of the stud organization and exposure to a new environment plays an important role.

**Prophylactic antimicrobial drugs**
No increased risk was found for foals that were not given prophylactic antimicrobial drugs compared to foals that were statistically analysed for the categories of infectious diseases. This result confirms the findings of Wohlfender et al. (2009a) where prophylactic antimicrobial drugs did not have a significant influence on the incidence of infectious diseases in the first 30 days in neonatal foals.

The four different schedules of prophylactic antimicrobial drugs used in the study revealed differences concerning the incidence of infections. The factor ‘antimicrobial schedule’ was significant in one level: Protocols 2, 3, and 4 combined as one were a risk factor for a higher incidence of infectious diseases for total infectious diseases and systemic disease with diarrhoea in comparison to foals that received the standard 3 day treatment or with those that did not receive any anti-microbial drugs.

This shows a trend of antimicrobial schedules different from the standard 3 day treatment towards a higher risk for the development of infectious diseases. We explain this with the fact that in most of these foals a problem was suspected although not confirmed at the first examination or that an endemic disease occurred on the stud farm and therefore the standard antimicrobial schedule i.e. 3 days of trimethoprim-sulphadiazine was not used. None of the observed schedules of prophylaxis on their own proved to be either a protective factor for, or a risk factor leading to a higher incidence of infections. The type of antimicrobial drugs and the schedule of administration were not significant when analysing the results.

**Rotavirus vaccination** of the mares was not a protective factor for systemic disease with diarrhoea. It is possible that the currently available rotavirus vaccine for mature
horses does not yet provide a sufficient protection of the foals via colostral antibodies.

Why are foals born on a boarding stud less likely to develop infection than foals born on private stud farms? A possible explanation could be a crowding effect: mares from different stud farms from all over the UK and other European countries coming together on a boarding stud for foaling may bring a different micro flora and therefore may provoke a broader immunity. Another reason could be the better disease and hygiene awareness of the staff working on boarding stud farms due to a constant confrontation with new horses arriving from many different places and countries.

A large number of mares came from all over the country and overseas (mainly Ireland, France and Germany) to the Newmarket area for foaling and mating. With the one exception mentioned above, this study may provide information of the current situation concerning infections in neonatal foals in the UK and Western Europe. Although the data collected for this study were regional, we suggest that they can be used for other similar situations as long as the study farm management is on a comparably high level.

Hygiene
Miller (1950) mentioned the importance of hygiene in foaling boxes and cleanliness during foaling to minimize the risk of infections. A good example for this is the recommendation by Madigan et al. (1990) to wash the mamma gland and coat of the mare with antiseptic before the foal stands, so as to reduce the spread of Salmonella infection.

However, in this study it was not possible to define a single factor that is directly representative for the general hygiene on the stud farm. Some of the potential risk factors under study may be considered as indirect indicators to the hygiene situation on stud farms, but further research is required. The number of boarding and private stud farms was equally distributed and the management of mares and foals was generally on a high level. Therefore, the population of foals from the different stud farms was comparable. In addition, a clustering for stud farms was restricted to only one foaling season. It was not possible to test potential risk factors for the other groups of infectious diseases described in part one of the study (Wohlfender et al. 2009a) because of the relative low number of cases in those disease groups.

A weak point of the study was that the duration was restricted to only one foaling season. It was also not possible to test potential risk factors for the other groups of infectious diseases described in part one of the study (Wohlfender et al. 2009a) because of the relative low number of cases in those disease groups.

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**References**

Readers are cautioned to seek advice of a qualified veterinarian before proceeding with any diagnosis, treatment or therapy.

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