Analysis of the "Equine Health Impact Statement" for the Drayton South Coal Project

Prepared by:
Brett Tennent-Brown BSc, DipSc, BVSc, MS, DACVIM, DACVECC
Senior Lecturer in Equine Medicine
The University of Melbourne Equine Centre
Faculty of Veterinary and Agricultural Sciences
The University of Melbourne
250 Princes Highway
Werribee, VIC 3030

Andrew van Eps, BVSc, PhD, MACVSc, DACVIM
Associate Professor and Registered Specialist in Equine Medicine
The University of Queensland Equine Hospital
School of Veterinary Science
The University of Queensland
Gatton Campus
Gatton, QLD 4343

The authors were engaged by Darley Australia Pty Ltd and Coolmore Australia to analyse and comment on the content of the 'Equine Health Impact Statement' (EHIS, Appendix J) contained within the proposal to extend open cut mining at the Drayton South Coal Project, and subsequently the Proponent's Response to Submissions and the Department of Planning and Environment's (the Department) Preliminary Assessment Report (PEA).

Executive Summary: The Equine Health Impact Statement (EHIS) contains no information on the possible effects of dust derived from coal mining activities on the health of horses. It is therefore difficult to determine if a potential health risk for horses exists. Published information on the effects of dust derived coal mining on equine health is scant; however, there has been no consideration of the relevant, good quality published information that does exist for horses. Additionally, the EHIS has completely ignored the huge volume of excellent literature that details human health concerns as they relate to coal mining. This human research has been dismissed by the author of EHIS on the basis of unsubstantiated suggestions that functional differences exist between the human and equine respiratory tracts that protect the lower respiratory tract of horses from inhaled particulate matter.

The extended discussion on Inflammatory Airway Disease (IAD), a condition that typically affects horses maintained in a barn environment, and the role of endotoxin in IAD is largely irrelevant when evaluating the effects of particulate matter derived from coal mining activities. However, the very high prevalence of IAD in horses and the documented adverse effects of IAD on performance clearly demonstrate that the equine airways are inherently sensitive to inhaled particulate material. Furthermore, clinical experience and research suggest that even very limited exposure to injurious agents can adversely affect respiratory health in horses.

The methods used to determine air quality for humans (and reported in the Environmental Impact Statement [EIS]) are almost certainly insufficient to determine the dust burden on the equine respiratory tract. This is, at least in part, because horses spend large a portion of their day grazing, disturbing and inhaling dust that has settled on the ground. The quantity of dust inhaled by horses will therefore be much higher than suggested by standard air quality measures. Thoroughbred horses in the Hunter Valley are bred and raised solely to perform as *elite* athletes and respiratory function is critical to performance; it is therefore not acceptable to conclude that horses will not be adversely affected simply if human air quality criteria are met.

Based on the considerations outlined here, we strongly recommend that an extremely cautious approach is taken when assessing the potential risks of coal mining activities to equine health. Furthermore, it is our opinion that the precautionary principle must be exercised in this case as it is quite clear that scientific consensus does not exist:

> "…if an action or policy has a ***suspected*** risk of causing harm to the public or the ***environment***, in the ***absence of scientific consensus*** that the action or policy is ***not*** harmful, the burden of proof that it is ***not*** harmful falls on ***those taking the action***…"

Response to the Equine Health Impact Statement and Subsequent Submissions by the Proponent and Department of Planning and Environment

The EHIS contains no directly relevant information regarding the possible effects of dust derived from coal mining activities on the health of horses. Exposure to coal mine dust causes a range of respiratory diseases in humans collectively termed 'Coal Mine Dust Lung Disease (CMDLD)' that includes the well-known 'Coal Workers' Pneumoconiosis (CWP)'.[1,2] CMDLD and CWP remain important human health concerns even in first world countries where there is evidence that respiratory disease associated with coal mining activities is increasing both in prevalence and severity.[2,3] Disease occurs in both underground mining and surface coal miners with chronic exposure.[4] The EHIS has ignored the extensive human medical literature describing the effects of exposure to coal mine dust on the basis of anatomical differences between the human and equine respiratory tracts. However, the author of the EHIS has provided no evidence, other than his opinion, that these differences between humans and horses will in fact protect the equine respiratory tract from inhaled particulate matter.

The EHIS suggests that the anatomical differences between humans and horses might protect the lower airways of horses from inhaled fine particulate matter. The studies cited in support of the EHIS's position have been incorrectly interpreted and/or overstated. A recent review has pointed out that airway dynamics are complex and suggests that it is difficult to predict what proportion of inhaled particulate matter might reach the lower airways of horses.[5] Regardless, it is quite clear that fine particulate material can reach the lower airways of horses in sufficient quantities to cause injury.[6-11] There is also good evidence to suggest that increased dustiness impairs the function of normal respiratory defense mechanisms increasing the risk of infectious respiratory disease.[12-14]

A large portion of EHIS is devoted to discussion of Inflammatory Airway Disease (IAD). IAD is extremely common in horses kept in a barn or stable environment that, as a consequence, are exposed to relatively high concentrations of a wide range of airway irritants derived from feed, bedding and manure.[15-18] There is a large volume of scientific research investigating the causes and effects of IAD in horses and this has been cited extensively in the EHIS. However, research on IAD almost entirely focuses on young (race) horses confined to stables for the majority of the day.[15-19] Pneumoconiosis, not IAD, occurs in horses exposed to particulate matter derived from coal mining activities and lesions are similar to those described in human workers.[6-8] As such, scientific research on IAD is not particularly relevant when considering the health of horses kept at pasture and exposed to particulate matter derived from *mining activities*. However, the high prevalence of IAD in young horses placed in an environment that most humans find tolerable illustrates the sensitivity of the equine airways to aerosolized irritants. This highlights our concern that the application of human health criteria might be inappropriate when assessing the risk to equine health.[5]

The EHIS focuses on evidence that IAD and Recurrent Airway Obstruction (RAO or heaves) in horses is triggered by inhalation of endotoxin associated with dust derived from stables, feed and bedding. It is suggested that that dust *without* endotoxin attached does not contribute to respiratory disease (and IAD in particular); however, this is an over-simplification and the role of endotoxin has been overstated in the EHIS. Experts agree that the pathogenesis of IAD is not well understood and the contribution of different organic and inorganic particles (including endotoxin) and other airway irritants to IAD is

unknown.[15,18] The role of inhaled endotoxin in RAO is debated and endotoxin is certainly not the only molecule capable of causing inflammatory respiratory disease.[20] Dust originating from coal mining activities is *expected* to be low in endotoxin yet causes ***severe*** respiratory disease in humans and horses characterized by a chronic inflammatory reaction and pulmonary fibrosis (scarring).[2,3,6,21]

The EHIS further suggests that dustiness in of itself does not contribute to equine respiratory disease. The role of dust alone (without endotoxin or other organic substances attached) has not been well studied in horses. However, recent studies examining the effect of dust on airway inflammation has quantitatively confirmed that *more* dust causes *more* airway mucus accumulation and that the equine respiratory tract is much more sensitive to particulate material than suggested by the EHIS.[22,23] There is evidence indicating that increased dustiness impairs the function of normal respiratory defense mechanisms and increases the risk of acquiring an infectious respiratory disease.[12-14] Furthermore, improving air quality improves equine respiratory health.[13]

The EHIS concludes that domestic horses are normally exposed to high levels of dust and are well adapted to this environment. This conclusion is inaccurate (and contradicted within the report itself); dust is an important contributor to IAD and respiratory health improves when strategies are implemented to reduce dust in the horse's environment.[13,15] Studies confirm that IAD impairs lung performance and IAD is one of the leading causes of poor performance in horses.[24-27] It should be noted that, in the Thoroughbred horse in particular, respiratory function is a 'bottleneck' for performance.[28] Even small impairments of respiratory function caused by subclinical lung disease (such as IAD) can adversely impact performance.

McGorum *et al* (1998) measured median ***total*** dust levels of 170 µg/m^3 (range 80-170 µg/m^3) and median ***respirable*** (particles < 7 µm) dust levels of 80 µg/m^3 (range 80-170 µg/m^3) in pasture during winter in Scotland.[29] The fact that predicted dust levels for the areas adjacent to the proposed coal mine are much lower than those described by McGorum *et al.* (1998) does ***not*** indicate that there is no risk to horse health. Rather, the discrepancy suggests that the modelling techniques used are not appropriate when considering the inhaled dust burden of horses. It should be remembered that horses spend the majority of their day grazing; disturbing and inhaling particulate matter that has settled onto the pasture. McGorum *et al.* (1998) attached small dust monitors to the nose band of the head collar to sample dust within the breathing zone. This technique has been show to give a much better indication of the amount of dust inhaled by a horse when compared to standard monitoring techniques.[30]

The summary of the air quality report does not describe in detail the expected levels of smaller particles that are thought to be the more important contributors to respiratory disease.[31] Additionally, the presentation of mean dust levels will tend to obscure acute increases in dust that might be detrimental to equine respiratory health.[32] This is important since the level of dust and *duration* of exposure required to cause disease in horses is unknown; however, based on research and experience with other respiratory diseases (particularly heaves [Recurrent Airway Obstruction]) the duration of exposure required to cause disease in horses might be very short.[32,33]

Anglo-American has suggested that a horse health monitoring regimen could be implemented to mitigate some of the concerns of horse owners and breeders; however, no information has been provided on what should be monitored or how any monitoring regimen might be facilitated. The EHIS

repeatedly suggests that horse health on farms bordering coal mines is unaffected by mining activities; however, no information is provided on how equine health, and respiratory health in particular, has been assessed. In the absence of relatively invasive evaluation of the respiratory tracts of exposed horses, it is difficult to understand what the author of the EHIS has based these statements on. Even very mild respiratory disease caused by exposure to coal mining dust could affect performance in Thoroughbred horses intended for racing and would be unlikely to produce obvious clinical signs. A previous PAC has stated that Anglo-American's suggested monitoring approach was unacceptable. More importantly, the suggested monitoring regimen misses the point; once an adverse impact on equine health is detected, potentially irreversible damage will have occurred.

Conclusions and Summary: There is insufficient evidence within the EHIS to determine that the proposed extension to the Drayton South mining operations does not pose a risk to equine health. Horses exposed to dust derived from coal mining activities develop pneumoconiosis similar to that observed in human coal works not IAD. The information on IAD contained within the EHIS is, therefore, not particularly relevant. However, the high incidence of IAD in horses does demonstrate that the equine airways are highly sensitive to inhaled particulate matter. Based on the results from equine studies, the methods used to determine air quality are almost certainly insufficient to determine the burden of additional dustiness on the equine respiratory tract. Furthermore, clinical experience suggests that even very limited exposure to injurious agents can cause disease in some cases. We therefore strongly recommend that an extremely cautious approach be taken when assessing the potential risks of coal mining activities to equine health.

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