Topic B10: Indoor air for animals and plants

The impact of electrostatic air cleaning in free-ranging egg production

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INTRODUCTION: All animals respond to air pollution by activating the immune system causing an "oxidative stress" known to affect many different functions, including premature ageing. The biologically active components in the stable air – the bioload – consist of many different components, some rather inert but other highly biologically active. The smaller the particles are the greater is the likelihood they will end up in the finest parts of the lung, only to be handled by the immune cells causing an inflammatory response. With that, energy is required and the feed conversion factor will increase. The most toxic components are the air borne mycotoxins generated by molds.

METHODS: The development of a patented polymer based electron emitting technology (EAC) has provided the means by which we now may start to study the impact of reduced bioload on productivity. Apart from the capturing of very fine particles in a negatively charged electrostatic field operating over the entire stable with hundreds of meters of emitting structure, the electrons combine with oxygen and vapor to produce hydrogen peroxide to block mould metabolism. Data from three egg producing farms with 20-50 000 free-roaming layers were collected as part of their standard procedure. The first EAC system was installed in September 2010 and the study is on-going. Hygicult Y&F cultures exposed to stable air for 60 minutes were used to check for air borne mould. Control data from six production periods covering 22 to 75 weeks of age were provided from three farms with free-ranging poultry, two of these farms were then followed over 2- 3 EAC treated production cycles and in the remaining farm we studied the switch from cage to free-roaming. Thus, there are data from six controls and six EAC treated Swedish egg production cycles.

RESULTS: The number of mould colonies have decreased from >7 (range 7 – 30) to single colonies. Lay percentage over the production period covering 22 to 75 weeks of age has increased by 3% and the food conversion was improved by 9%. During the last 10 production weeks, the overall improvement in productivity was 27% enabling the farmers to maintain a high productivity despite an older population of layers.

CONCLUSIONS: Mounting an immune response requires significant energy and therefore requires using resources that could otherwise be allocated to other physiological processes. Energetic trade-offs are likely when energy demands are high. Obviously, faster growth or a more efficient conversion of feed into desirable products in an animal is both economically and ecologically important. Furthermore, the improvement in breeding with increasing productivity and maintained productivity with increasing age reduces margins of safety – any cause for increased immunological activity (oxidative stress) will activate the process of ageing and reduce the benefits of the breeding efforts. Thus, it appears as if enhanced control of the stable air bioload will become an even more important issue in the future. The data presented provides a cost-efficient means to reduce stable bioload.