

## **What has been discovered in the past twelve months that enhances the welfare of captive elephants?**

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### **Introduction**

Despite its long history, the relationship between human and elephant has been largely commercial and exploitative in nature. The study of the welfare requirements of elephants in captivity is a relatively new field of enquiry and it is only in the past decade that research has been directed at means of improving the welfare of elephants held in zoos, wildlife parks and circuses around the world. Knowledge in this area has been recently expanded by the publication of research material falling into three main categories, elephant biology, elephant behaviour and social structure, and diseases affecting elephants. With the proper analysis of results and implementation of recommendations, each of these avenues of study has the potential to improve the welfare of captive elephants.

### **Elephant society and communication - Do we speak elephant?**

It is now well recognized that elephants have complex social structures and methods of communication (Langbauer, 2000). Studies of the behavioural effects of environmental enrichment (Stoinski, et al., 2000., Hart, et al., 2001) and those exploring elephant communication (Rasmussen and Krishnamurthy, 2000., Langbauer, 2000) have significant potential to improve welfare for captive members of the species.

The introduction of new individuals into established groups is a potential stressor for most captive species. A study by Schmid et al. (2001) examined the effects on behaviour and urinary cortisol levels of the introduction of foreign females into an established group of Asian elephants. The elephants were observed over a six-month period and behaviours in different categories including stereotypies, social, comfort, feeding and exploration were recorded. Urinary cortisol levels were measured on at least ten separate occasions in the study group after transfer and compared to those prior to transfer.

All the elephants exhibited behavioural changes in the introductory period, but according to the authors, few of these could be interpreted as expected reactions to stress. Two of the transferred elephants exhibited an increase in the rate of stereotypic behaviour, while in the others the incidence actually decreased. The results of the cortisol measurements were equivocal, with only one of the females showing a short-term increase, one showing a decrease, and the others staying the same.

The question of how wild animals store and pass on social knowledge has also recently been applied to elephant populations with interesting implications for welfare (McComb et al., 2001). In an experiment using African elephants, playback calls were used to elicit behavioural responses that were then identified and recorded. The oldest members of a free-living group were shown to have superior discriminatory abilities in that they were able to decide when defensive behaviour was necessary and when it would have been, in effect, a waste of time and resources. The older females, or matriarchs of the group were thus found to be the "repositories of social knowledge" (McComb et al., 2001).

### **Reproductive physiology - Can we assess without stress?**

An important aspect of elephant management in modern zoos has been the problem of assessing reproductive capability in a non-invasive manner and with as little stress to the animal as possible (Brown, 2000., Ganswindt et al., 2002). The acquisition of serum samples for hormone assay is a particular problem in bull elephants, as these animals are notoriously difficult to handle (Brown, 2000). A method of measuring faecal and urinary testosterone levels has been explored by

Ganswindt et al (2002). The comparison of non-musth\* and musth levels of androgens in urine and faeces of male elephants of varying ages was performed by immunoassay and high pressure liquid chromatography. By testing the urine and stools of five bull elephants over a 33-month period, the researchers were able to demonstrate higher mean androgen levels in the samples from the adult bulls as compared to the juveniles. Androgen levels were found to correlate with the presence of musth. Low levels of androgen excretion, associated with weak and sporadic behavioural manifestations of musth were noted in one young bull. The authors postulate an inhibitory effect caused by the presence of an older dominant bull in the group.

#### **Elephant disease - Reducing the risks for captive elephants.**

The prevention and control of disease in captive elephant populations is closely related their welfare. Ryan and Thompson (2001) have explored the risk to captive elephants of contracting herpesvirus diseases from animals transferred for breeding purposes. In attempting to identify infection pathways between populations through studbook records, the study reported a higher than anticipated number of direct contacts between captive elephants. The design of this work is limited by a reliance on paper records to imply contact between animals and the heavy use of mortality data from a previous study (Richman et al., 1999). The "novel herpesvirus" is also poorly characterized and the research is constrained by a lack of data regarding pathogenicity of the agent under different circumstances. Clinical information supporting the alleged morbidity and mortality of disease caused by the virus and a full examination of tissue samples is lacking. The conclusions regarding a proposed route of transmission of an infectious disease suffer from the constraints above.

#### **What does it all mean? Implications for enhancing the welfare of captive elephants.**

Although the study of urinary cortisol was limited by the assumptions made regarding the hormone as a stress indicator in this species and the possibility of ignorance of other indicators of stress in elephant, the conclusions were significant in animal welfare terms. Extensive prior training of the elephants and continued close contact with keepers were thought to have a positive outcome, as did transport of a young female with a known adult. Most importantly, a good understanding of elephant behaviour and communication by handlers allowed them to interpret behavioral indicators of stress within the group and to correlate them with a physiologic variable.

In terms of enhancing welfare, the development of non-invasive methods of determining the reproductive capability of bull elephants has merit. Once again, this paper illustrates that an understanding of normal elephant behaviour and social interaction is of utmost importance in correlating measurable variables with observable changes in animals.

Although the paper regarding the transmission of herpesvirus between elephant populations suffered from the shortcomings discussed above, the reportedly high levels of contact and possible disease transfer within breeding programmes merit attention. In the interests of enhancing the welfare of captive elephants, it may be necessary to explore other avenues for captive breeding, such as artificial insemination and the transfer of single bulls rather than groups of females. The evidence of social memory in mature females and the development of non-invasive fertility testing described above support the welfare and feasibility benefits of such changes.

#### **Conclusion**

As more is learned about the physical requirements, reproductive physiology, behaviour, modes of communication and social interactions within elephant groups, there is increased potential to improve the welfare of these animals in captivity. The crucial step in the process is the collation of the results of such research in order to better plan the management and self-maintenance of captive populations, to develop and enforce standards for their care, and to ensure that their welfare is prioritised.

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