DO COLOURS AFFECT 'NORMAL' BEHAVIOUR OF LABORATORY AND FARM ANIMALS? INSTANTANEOUS CHANGE OF BEHAVIOUR BY PRESENTATION OF RED IN THE PEACH-F

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ABSTRACT: Mebes H.D. **Do colours affect 'normal' behaviour of laboratory and farm animals? Instantaneous change of behaviour by presentation of red in the Peach-Faced Lovebird** *Agapornis roseicollis* **(PSITTAFORMES).** *Journal of the South African Veterinary Association* (1979) **50** No. 2, 97 (En) Dept. of Biology, University of Kaiserslautern, P.O. Box 5049, D-675 Kaiserslautern, Germany.

In spite of genetic and environmental standardisation in farm and laboratory animal science, a considerable amount of variation in the results of comparable experiments remains. This presumably depends upon the individual variability within a species, and upon differences of various species in their specific demands to the environment in captivity. Due to a discovery in the Southwest-African lovebird species *Agapornis roseicollis,* used as a conventional laboratory animal in bioacoustic research, the phenomenon of instantaneous fear expressed in a number of different displays in connection with the presence or presentation of red objects is described and compared to earlier observations of instantaneous phobias, aggressions, and preferences towards colours, in other bird species.

Consequently it is suggested that investigation of the chromatophobe and chromatophile behaviour of typical laboratory and farm animals be undertaken to ensure the adequate design of lodging and experimental environments.

INTRODUCTION

There are two main tasks in laboratory animal science. The first is to reduce the variation of biological data in animals for experiments, and the second is the standardisation of environmental conditions[4 16 19]. In spite of extreme genetic and environmental standardisation, a relatively large number of variations and of errors in experimental accomplishment remains. This presumably depends upon the individual variation within a species, and upon the differences of various species in their specific demands to the environment in captivity. Therefore, in order to clarify errors, to reduce variations to a minimum, and to maintain the animal's welfare[17], the behavioural preferences and also aversions (phobias) of each species, domesticated or not, must be known and taken into account when designing a species-specific artificial environment for animal lodging in laboratories or on farms.

Owing to an accidental discovery in the Southwest-African lovebird species *Agapornis roseicollis,* used as a conventional laboratory animal in bioacoustic research[14], the phenomenon of instantaneous fear upon the presentation of coloured objects is described and compared to earlier observations of instantaneous phobias, aggressions, and preferences towards colours in other bird species.

MATERIAL

The Southwest-African Peach-Faced Lovebird *Agapornis roseicollis* (Vieillot, 1817) is a sexually monomorphic bird. Throughout the year the four plumage colours of both sexes, red, green, blue,and black, remain unchanged. The beak is yellow, except in juveniles, which have a black saddle marking on the upper maxilla. *Agapornis* species now show some signs of domestication[11]. The number of individuals observed ranged from one isolated couple and four juvenile siblings to two more groups of six and thirteen birds.

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Observations on *Agapornis roseicollis*

Even minor changes in the environment of the captive birds caused their temporary arousal. Only until certain aversions seemed obvious, i.e., when the birds avoided me entering their cage room with unfamiliar objects, did I pay particular attention to their behaviour towards colours in and outside the aviary. After some accidental and then intended presentations of red objects, several behavioural indications of fear – in decreasing order – were observed:

1. Alarm calls of some individuals and hasty escape of the whole group into the upper corner of the aviary.
2. A series of mobbing calls and mobbing, i.e., stretched body and wing-beating without flying away from the perch.
3. Attention calls with an alert posture typical for this species, i.e., stretched and sleeked body with eyes widely opened.
4. Relatively normal behaviour, but always carefully watching and avoiding the environment of the 'dangerous' object.
5. Silent approach-and-withdrawal tendency over a period ranging from ten to fifteen minutes up to two to four hours, until eventually nibbling at the object.
6. One other form of display when a tamed and rather adapted lovebird is confronted with a red object without being able to flee: all feathers, particularly those around the neck, ear coverts, crown and forehead are ruffled, and the bird – in most cases females only – utters short and very low "kch"-sounds. This display marks the turning point from defensive aggression to offensive aggression.

Two more examples may illustrate fearful behaviour towards red objects:

1. A red cup filled with seeds was not touched by juveniles for almost two days.
2. The individuals of three adult groups gave up collecting nest material for several hours, when a sheet of red cardboard was laid on the floor. Eventually, owing to a descent of reactivity level, adaptation took place and the birds approached the object. Green, blue, white or black sheets caused no visible fear; yellow sheets caused some fear and precaution. Thereafter, curiosity and approach-withdrawal behaviour occurred,

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and finally the animals nibbled at the plates. (Quantified experiments are in progress.)

In another experiment, directly following the one before, the red pieces of cardboard held as a bundle were again treated as being potentially dangerous, and the birds fled into the upper corner of the aviary. Green, blue, white, or black bundles caused no visible fear; yellow bundles caused some fear. Preiss[15] observed phobia towards red for the first time, when one of his female lovebirds saw the red finger nails of a visiting friend. He then presented two other red objects to the birds (females) which led to the same behaviour.

Observations on other bird species

1. Colour aversions combined with fear (Chromatophobia).

Heinroth[5] names three songbirds, the Yellow Wagtail, *Motacilla flava,* the Yellowhammer, *Emberiza citrinella,* and the Meadow Pipit, *Anthus pratensis,* and cites von Lucanus' observation on the sulphur-Crested Cockatoo, *Cacatua galerita,* all of which were instantaneously horrified by the presentation of blue. According to experiments of von Toerne[18], blue and violet painted wheat corns induced complete aversion in the pheasant, the domestic chick, the pigeon, and the partridge. According to observations of a colleague (personal comunication) the colours dark-brown or black (clothing!) induce fear in the Red-Rumped Parrot, *Psephotus haematonotus,* and a female canary refused to enter its nest with brown strings of wool in it. Instead, the bird preferred to collect its own light-blue and yellow threads.

2. Colour aversions combined with aggressive threat.

Aversions against red in connection with the releasing of intensive fighting are well known in the domestic cock, in turkey cocks, and in the male robin, *Erithacus rubecula,* in its own territory.

3. Colour preferences (Chromatophilia)

Colours which may cause some 'comfort-feeling' in an individual bird, can be listed for the following species[3]: the Jay, *Garrulus glandarius,* chooses preferably blue; a female Jackdaw, *Corvus monedula,* and a Carrion Crow, *Corvus corone,* preferred grey and black (innate releasing mechanism very probable); Yellow Wagtails, *Motacilla flava,* prefer yellow, and Meadow Pipits, *Anthus pratensis,* green colours; the Australian Bowerbird, *Ptilonorhynchus violaceus,* selects only blue colours, and so does the male of the Bluethroat, *Luscinia s. svecica.* Finally, several species of humming birds are said to prefer red colours[2].

Colour preferences in farm animals like chicks, ducklings, and quails have been investigated[1 6 7 8 9 10 12 13].

CONCLUSIONS

Although exact quantitative evidence is lacking in most cases of chromatophobia summarised above, the identical observations of instantaneousness in the aversive behaviour should be valued positively insofar as they point to the fundamental danger of carelessly planned colour conditions at least for those animals which are – for testing purposes – temporarily outside their familiar colour environment. It is evident that many of the above-mentioned bird species do not serve as typical laboratory or farm animals. There is, however, no reason to believe that chromatophobe or chromatophile behaviour does not exist among these, including also laboratory or farm mammals. It is conceivable that white or light-coloured environments, e.g., walls or white overalls of the laboratory personnel – chosen perhaps for reasons of anthropomorphic imagination of cleanliness and hygiene – may cause either fear, or aggression, or 'comfort-feeling' in domesticated or non-domesticated species, and thus a deviation of their 'normal' behaviour in captivity. Therefore, colour experiments within the field of animal lodging design could throw more light onto the species-specific capability of short term or long term, adaptation to colours, or lack thereof. Amazingly, where study of this nature would have its greatest import, i.e., in the field of pharmacological research, published findings, to my knowledge, do not exist.

With respect to the Peach-Faced Lovebird, at least, an atypically large number of alarm or warning calls is usually found in bioacoustic experiments when foreign red objects are presented. I must confess good fortune in dealing with a species so demonstrative in reacting to experimental stimuli.

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CONFERENCE ON MUSCULAR DYSTROPHY IN ANIMALS HELD IN NEW YORK

A conference on muscular dystrophy and other inherited diseases of skeletal muscle in animals was held in New York City on January 25–27, 1978. The aim of the conference, sponsored by the New York Academy of Sciences and Muscular Dystrophy Association, was to achieve a better understanding of recent advances made in the general field of muscle diseases in animals and a critical appraisal of the work being done in the animal field as it related to similar diseases in man. Conference participants also sought to identify areas where scientific knowledge is incomplete or sketchy and to evaluate techniques being used to study some aspects of animal diseases. Other subjects discussed included muscular dystrophy in hamsters, mice and birds; inherited diseases of muscle in man and animals, and inherited diseases of the nervous sytem in small laboratory animals.

The proceedings of the conference will be published in the Annals of the New York Academy of Science.

Source: National Society for Medical Research Bulletin, April 1978.

DEATH ASSOCIATED WITH INHALING TOXIC GAS FROM LIQUID MANURE

On December 8, 1977, a 16-year-old farm worker collapsed and died while steam cleaning gutters inside a calf barn in Eau Claire, Wisonsin. The apparent cause of death was inhalation of toxic gas,with hydrogen sulfide (H_2S) the probable agent. The source of the gas was decomposing liquid manure that had been agitating for 30 minutes to an hour in a 100,000-gallon tank beneath the barn. The boy had been working inside the barn approximately 30 feet from the tank for about 10 minutes when he was overcome. While trying to rescue him, 2 other workers experienced syncopal episodes-,but they recovered. No animals died during the incident; however, no calves were in the affected area at the time of the workers' exposure.

The farm worker had been in good health. He had no chronic illness, took no medications, and had no history of drug abuse. Autopsy findings were consistent with inhalation of a toxic gas resulting in emesis and aspiration. H_2S was implicated as the causative agent by air tests done under similar conditions 2 days after the incident. The tests showed that hydrogen sulfide concentration at the site of death after 8 minutes of manure agitation were >60 ppm. (NIOSH recommends a maximum exposure concentration of no more than 10 ppm over a 10-minute period. When concentrations reach >50 ppm, evacuation is recommended.) Other gases, such as nitric oxide, nitrogen dioxide, and sulfur dioxide, which have been associated wih death in silos, were not detected. Carbon monoxide was ruled out at autopsy by blood tests, methane was thought not to be present since 2 open flame heaters were in use, and ammonia was considered unlikely to have been present in high concentrations because its odor and irritant properties act as warning signals.

The number of liquid manure systems continues to increase in the United States as farmers become more concerned with the efficient recycling of energy-rich waste. Numerous deaths in swine and beef and dairy animals have been associated with exposure to these systems. Several farm workers have died after entering recently emptied liquid manure tanks or have drowned after falling into full tanks. This death is among the first to occur from the inhalation of gas outside the storage tank.

Several factors appear to have contributed to hazardous conditions on the day of the young man's death:

(1) the manure tank was full, and the conents had been agitating longer than usual before the pumping began.

(2) The barn was inadequately ventilated that day; only 1 of the 5 fans was in use, and then only intermittently, and a westerly wind blew through the only open door.

(3) The calves' high protein diet made the formation of hydrogen sulfide more likely. A number of toxic gases are released from decomposing manure, but hydrogen sulfide, carbon dioxide, methane, and ammonia are of principal concern. H_2S, the most toxic of these, even at low concentrations (10–50 ppm) causes headache, irritation of the mucous membranes and respiratory tract, nausea, and dizziness. With increasing concentrations (<100 ppm) one's sense of smell decreases, and at high concentrations (<1,000 ppm) syncope and death following respiratory paralysis may occur with little or no advance warning.

Preventive measures that may be taken to reduce farm workers' risk include improving ventilation and developing contingency plans for evacuating workers and animals from buildings during agitation of manure. Farm workers who must enter a closed space containing a manure tank should wear self-contained air packs and safety harnesses, and reserve workers should be stationed outside.

Source: Center for Disease Control: Death in farm worker associated with toxic gases from liquid manure system, Wisconsin. Morbidity Mortality Weekly Rep 27:47–48, 1978.