

Approaches to reducing distress



PENNY HAWKINS

RESEARCH ANIMALS DEPARTMENT

SCIENCE.RSPCA.ORG.UK/SCIENCEGROUP/RESEARCHANIMALS

EC Working Document on severity assessment

PRE-STUDY CONSIDERATIONS

All aspects of the study that may cause pain, suffering, **distress** or lasting harm should be identified, and consideration given to how their effects can be **minimised**, for example by consulting the **literature**, **colleagues**, **animal technologists**, the **veterinarian** and the **Animal Welfare Body** if appropriate

ec.europa.eu/environment/chemicals/lab_animals/pdf/Endorsed_Severity_Assessment.pdf

What do we mean

by 'distress'?

Recognition and Alleviation of Distress in Laboratory Animals





nap.edu search for 'distress' and 'laboratory'

Definitions 1: stress

- Stress = a real or perceived perturbation to physiological homeostasis or psychological wellbeing
- The body uses behavioural or physiological mechanisms to counter the perturbation
- Stressors can elicit coping mechanisms or adaptive changes, e.g. behavioural reactions, activation of SNS, secretion of glucocorticoids



Definitions 2: distress

- Distress = an aversive (unpleasant) state in which the coping/adaptive mechanisms fail to return the organism to physiological/psychological homeostasis
- Distress = psychological distress; a negative emotional state; poor well-being

- associated with pain <u>and</u> other negative experiences



Distress and pain





The Five Domains Model of animal welfare

Physical domains; survival-related factors (1 to 4)

1 - Nutrition		2 - Env	ironment	3 - Health		4 - Beh	aviour
Negative – restric water/food Positive – balance varied diet	ted ed and	Negativ uncomf features Positive pleasan	ve – Fortable physical s e – comfortable, t environment	Negative – diseas injury Positive – healthy	se, ⁄, fit	Negativ expressi Positive express behavio	e – behavioural on restricted – able to rewarding urs
Affective experience – Mental state (5)							
Negative				Positive			
Thirst Hunger Malnutrition malaise Chilling/ overheating Hearing discomfort	Breathlessness Pain Debility, weakness Nausea, sickness Dizziness		Anger, frustration Boredom, helplessness Loneliness, depression Anxiety, fearfulness Panic, exhaustion	Drinking pleasure Taste/chewing pleasure Satiety Physical comfort	Vigour of good health and fitness Reward Goal-directed engagement		Calm, in control Affectionate sociability Maternally rewarded Excited playfulness Sexual gratification

doi: 10.3390/ani6030021



Mice are bu	ut
Nocturnal and crepuscular	they are housed in bright light
Highly dependent on smell and scent markings	their markings are completely destroyed whenever the cage is cleaned
Sensitive to ultrasound	there are many sources of ultrasound in the laboratory, and these are not always checked and minimised
Able to feel more secure when touching objects (thigmotaxis)	they are often housed in barren cages
Master diggers	they have no opportunity to burrow
Highly social (sex and strain dependent)	they are often housed in inappropriate groups or singly
Capable of covering long distances	they are housed in small cages
Omnivorous, trying new foods from different feeding sites	they are fed boring, monotonous diets from hoppers
Made extremely anxious when captured by the tail	most people catch them by the base of the tail
Most comfortable at a temperature of 26° to 34°C	many facilities house them at colder temperatures, and/or do not provide sufficient nesting material
enrichmentrecord.com/wp	-content/uploads/2014/01/FACTS-AND-DEMO.pdf

Reducing the conflict

- BETWEEN NATURAL HISTORY AND HUMAN REQUIREMENTS
- Member States shall ensure that
 - any restrictions on the extent to which an animal can satisfy its physiological and ethological needs are kept to a minimum (Article 33 1b)
 - to help animals cope with procedures and other stressors
 - staff dealing with animals have information specific to the species housed in the establishment (Article 24 1b)
 - to help them understand what will cause distress, e.g. to 'prey' species



From the EC Working Document

PRE-STUDY CONSIDERATIONS

All aspects of the study that may cause pain, suffering, **distress** or lasting harm should be identified, and consideration given to how their effects can be **minimised**, for example by consulting the **literature**, **colleagues**, **animal technologists**, the **veterinarian** and the **Animal Welfare Body** if appropriate



EC Working Document on AWBs and NCs

- Tasks include advising on animal welfare and Three Rs
- Core competencies should include animal ethology, husbandry, care, health and welfare; welfare assessment



• Wider membership than minimum in Article 26 is advised



<u>ec.europa.eu/environment/chemicals/lab_animals/pdf/endorsed_awb-nc.pdf</u>



Available online at www.sciencedirect.con SCIENCE dDIRECT. APPLIED ANIMAL BEHAVIOUR SCIENCE Applied Animal Behaviour Science 86 (2004) 261-289 ier.com/locate/applanir

From house mouse to mouse house: the behavioural biology of free-living Mus musculus and its implications in the laboratory

> Naomi Latham*, Georgia Mason Department of Zoology, Animal Behaviour Research Group, Oxford University, South Parks Road, Oxford OXI 3PS, UK



Georgia J Mason 'mouse house'

cues, foraging, finding mates and rearing litters. The potential impact of these many differences and restrictions on laboratory mouse development, normalcy and welfare has only begun to be explored. © 2004 Elsevier B.V. All rights reserved.

Keywords: House mouse; Mus musculus; Sensory biology; Behaviour; Development; Welfare; Standardisation

1. Introduction

Understanding a species' natural biology and behaviour is important for good husbandry (e.g. Dawkins, 1980; Jensen, 2000; Mason et al., 2001). This has been acknowledged for

* Corresponding author. Tel.: +44-1865-271-214; fax: +44-1865-281-253. E-mail address: naomi.latham@zoo.ox.ac.uk (N. Latham).

0168-1591/S - see front matter © 2004 Elsevier B.V. All rights reserved. doi:10.1016/j.applanim.2004.02.006

What is it like to be a rat? Rat sensory perception and its implications for experimental design and rat welfare

Article in Applied Animal Behaviour Science 112(1):1-32 · July 2008 FULL TEXT

ledge of

improve

an not or



1st Charlotte C Burn 25.9 · Royal Veterinary College

Abstract

ZERRAFISH Volume 4, Number 1, 2007 @ Mary Ann Liebert, Inc. DOI: 10.1089/zeb.2006.9997

Zebrafish in the Wild: A Review of Natural History and New Notes from the Field

RAYMOND E. ENGESZER, LARISSA B. PATTERSON, ANDREW A. RAO, and DAVID M. PARICHY

ABSTRACT

The zebrafish, Dunto rerio, has emerged as a major model organism for biomedical research, yet little is known about its natural history. We review the literature pertaining to the geographic range, biotic and abiotic habitats, and life cycle of the zebrafish. We also report our own field study to document several aspects of zebrafish natural history across sites in northeast India. We found zebrafish particularly abundant in silt-bottomed, well-vegetated pools and rice paddies adjacent to slow moving streams at a range of elevations. We further identified co occurring fishes likely to be zebrafish competitors and predators. Finally, we present observations that indicate substantial habitat degradation and loss, and suggest guidelines for documenting and preserving natural zebrafish populations.

INTRODUCTION

KNOWLEDCE OF ZEBRAFISH NATURAL HISTORY A and ecology is critical for interpreting its behavior and physiology, extant genetic and phenotypic variation, and the evolutionary history of embryonic, larval, and adult traits. Yet and its competitors and predators.

study, not for a broad understanding of the or-ganism in its native environment.³⁻⁶ Despite the wealth of information on developmental

and genetic mechanisms and the arsenal of re-

PMID: 18041940

evolution and behavior. More fully realizing the potential of zebrafish for organismal biology, as well as integrative studies spanning multiple levels of organization, requires some knowledge of zebrafish natural history: its geographical distribution, physical habitat, diet,

We review the scant literature on zebrafish the wild and document our own recent work. ned at developing a deeper understanding zebrafish natural history. We present a hythesis for zebrafish life history in the wild, gest how studies of natural populations can form research in the laboratory, and make ommendations for future work in this area.

LITERATURE REVIEW

sources and techniques for studying zebrafish, An extensive literature exists on Central Asian fishes and specifically on Indian fishes.7-13 Yet, this species remains underexploited for organismal research, comprising studies of ecology, these works focus on taxonomy and regional

researchgate.net Charlotte C Burn 'what is it like'

on, and somatosensation, and describes now rat perception differs minal work (1974) implies, we cannot truly know what it is like to be a eir perceptual biases. These primarily nocturnal rodents are hting frequently causing retinal degeneration, and their vision extends and ultrasonic hearing means they are influenced by environmental not perceive. Rat and human gustation are similar, being omes largely redundant in the laboratory, where rodents typically

Welcome to RATLIFE.org the web site for the film:

THE LABORATORY RAT : A NATURAL HISTORY



ratlife.org



21

The Five Domains Model of animal welfare

Physical domains; survival-related factors (1 to 4)

1 - Nutrition 2 - Er		vironment	3 - Health		4 - Behaviour		
Negative – restric water/food Positive – balance varied diet	cted ed and	Negat uncon featur Positiv pleasa	tive – nfortable physical res ve – comfortable, ant environment	Negative – disea injury Positive – health	se, y, fit	Negativ express Positive express behavio	ve – behavioural sion restricted e – able to s rewarding ours
Affective experience – Mental state (5)							
Negative				Positive			
Thirst Hunger Malnutrition malaise Chilling/ overheating Hearing discomfort	Breathlessness Pain Debility, weakness Nausea, sickness Dizziness		Anger, frustration Boredom, helplessness Loneliness, depression Anxiety, fearfulness Panic, exhaustion	Drinking Vigour of go pleasure health and Taste/chewing fitness pleasure Reward Satiety Goal-directe Physical engagement comfort		f good nd ected nent	Calm, in control Affectionate sociability Maternally rewarded Excited playfulness Sexual gratification
RSPCA				do	i. 10 22	oolan	i6030021

`Critical anthropomorphism' = empathy + objective, knowledge-based consideration of what is likely to be significant to the animal



The animal's life 'story'



- each procedure is just one event





Whole life experience

- Early maternal separation
- Transport
- Marking for identification
- Genotyping
- Housing in inappropriate social groups (or individually, for social animals)
- Understimulating and/or uncomfortable housing
- Husbandry procedures
- Scientific procedures and their after effects
- The humane killing process



- all of these can cause, or add to, distress

Contingent effects/cumulative severity









www.nc3rs.org.uk/mouse-handling-tutorial





Rheumatoid arthritis

DOI 10.1007/S10787-015-0241-4

Cause of distress	How to reduce this
Capture, handling and restraint to administer inducer	Competent, empathetic capture and handling (e.g. tunnel, not tail)
After effects of anaesthesia; dehydration, inappetance	Treats – Nutella™, sunflower seeds; ensure animals can reach water and food with high water content
Disability, vulnerability due to arthritis	 Husbandry refinements, e.g. spacious refuges; soft litter; short and soft nesting material; long drinking nozzles; soft, appetising diet Very gentle, empathetic handling, e.g. using Vetbed[®] Environmental enrichment including group housing for social animals
Behavioural problems, e.g. aggression	 Use littermates where possible Review group size and nest box provision If single housing is necessary, ensure adequate enrichment



Detecting distress

NEED TO KNOW WHEN AN ANIMAL ...



- is acutely distressed
- has become sensitised to repeated procedures
 - exaggerated responses to a 'routine' procedure?
- is no longer coping with life in the laboratory
 - chronic distress, depressive symptoms …?
 - not using enrichment, poor self-care …?



Assessing distress



- Welfare assessment protocols should include indicators and humane endpoints relating specifically to distress
- This should be part of the project evaluation
 - Article 38: 'project is designed so as to enable procedures to be carried out in the most humane ... manner possible; an assessment of compliance of the project with ... Refinement'
 - Annex VIII: methods used to reduce or eliminate pain, suffering or distress; humane endpoints



Positive welfare

- Good self-care, including grooming and 'comfort' behaviours
- Normal activity levels and time budget, including sleep patterns
- Seeking interactions with humans
- Curiosity and interest in exploring
- Appropriate social interactions with conspecifics, including allogrooming
- Mating
- 'Anticipatory' behaviour
- Using enrichment items, especially for 'luxury' behaviours
- Interest in food treats
- Play
- Vocalizations associated with positive welfare
- Normal learning and cognitive functions

Working Party Report

A guide to defining and implementing protocols for the welfare assessment of laboratory animals: eleventh report of the BVAAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement*

P Hawkins (Editor)¹, D B Morton (Chair)², O Burman³, N Dennison⁴, P Honess⁵, M Jennings¹, S Lane⁶, V Middleton⁷, J V Roughan⁶, S Wells⁹ and K Westwood¹⁰

¹Reseach Animals Department, RSPCA, Wilberkorce Way, Southwater, West Sussox RH13 RFS, UV, ¹82130 Valellae, Pranot; ¹Popartment of Biological Sciences, University of Lincoln, Risinchare Park, Lincoln LAZ 240, UK (formety) Annia Welfae & Behaviour Research Graup, University of Bristol, Langford House, Langford, Bristat BSA 500, UK; ¹Animals Scientific Procedures Inspectration Homo Office, PO Box 6779, Dundee DD1 9WW, UK; ¹Department of Veterinary Services, University of Dubrd, Pasks Road, Dubrd OK1 ST, UK ¹Nivarias Hornham Research Centes, Winbielkurst Road, Alvestam, West Sussos RH12 SAB, UK; ¹Hunfingdon Research Centes, Wooley Road, Alconbury, Huntingdon, Cambridgenite PE38 445, UK; ¹Centre for Behaviour and Evolution, Institute of Neuroscience, The Madical Science, Neuroscie University, Familigenite PE38 445, UK; ¹Centre for Behaviour and Evolution, Institute of Neuroscience, The Madical Science, Neuroscie University, Familigenite PE38 445, UK; ¹Centre for Behaviour and Evolution, Institute of Neuroscience, The Madical Science, Neuroscie University, Familigenite PE38 445, UK; ¹Centre for Behaviour and Evolution, Institute of Neuroscience, Mary Lipon Centre, Harwell Science and Innovation Campun, Oxfordhire OX11 0RD, UK; ¹⁶Companion Animals Department, RSPCA, Wilberlorov Way, Southwelf, Welf, Stasser RH13 245, UK; ¹⁶Companion Animals Department, RSPCA, Wilberlorov Way, Southwelf, Welf, Stasser RH13 PS, UK

The UK-Joint Working Group on Refinement (JWGR) was established in 1988 by the Bitlish Veterinary Association Arian Wefaas Foundation (BWAWR), the Fund for the Replacement of Animatis in Medical Experiments (FRAMB), the Royal Society for the Prevention of Coucley to Animatis (RSPCA) and the Universities Federation for Animali Welfare (UFRW). The aim is to provide up-to-date practical information on refinement. The JWGR prepares reports on specific topical, dawing bigether experts in each field to define contemporary best practice and ideas to aspire to Professor David Monton chains the Group and the societariat to provided by the RSPCA. See http://www.spca.org.uk/sidenogroup/researchanimals/mpienenting/sn/efinement (last checked 26 May 2010). Comeporing another: P Hawkins. Email: pharkwinshipmaca.org.uk

Abstract

The refinement of hurbandry and procedures to reduce animal suffering and improve welfare is an essential component of humans science. Successful refinement depends upon the ability to assess animal welfare effectively, and detect any signs of pain or distress as rapidly as possible, so that any suffering can be alleviated. This document provides practical guidance on setting up and operating effective protocols for the welfare assessment of animals used in research and testing. It sets out general principles for more objective observation of animals, recognizing and assessing indicators of pain or distress and tailoning these to individual projects. Systems for recording indicators, including score sheets, are reviewed and guidance is intended for all staff required to assess or monitor animal welfare, including animal technologists and care staff, veterinarians and scientists. It will also be of use to members or settiscs or animal care and use committees. A longer version of this document, with further background information and extra topics including training and information sharing, is available on the *Laboratory Animals* website.

Keywords: Refinement, welfare assessment, pain assessment, score sheets, humane endpoints

Laboratory Animals 2011; 45: 1-13. DOI: 10.1258/la.2010.010031

1 Introduction and aims

Reducing animal suffering through the refinement of husbandry and procedures is an important component of good science.¹⁻⁵ It is also essential for humane reasons

and is a specific requirement of legislation in some countries. If reducing animal suffering is to be effectively achieved, suffering must be detected as mpidly as possible so that appropriate action may be taken such as providing

Laboratory Animals 2011; 45: 1-13



journals.sagepub.com/home/lana: search for 'welfare assessment'

If 'distress' is an objective

FORCED SWIM, TAIL SUSPENSION, CHRONIC MILD STRESS 'MODELS'

- There is debate regarding the validity and translatability of these screens and models
- Might another paradigm be more appropriate, e.g. cognitive bias, anhedonia?
- Could compounds be screened without creating a model at all?



Action points 1



- Recognise that *distress* is distinct from *pain*
- Set a goal to identify and minimise distress for all projects
- Make time to set out each animal's 'life story', with input from different viewpoints and expertise
 - use your Animal Welfare Body
- Make sure the named person in Article 24 1b is adequately resourced and supported



Action points 2



- Understand the biology and behaviour of animals you work with or care for, to help identify events that will distress them
- Research and define indicators of distress and include these in project applications
- Facilitate positive welfare
- Critically review whether and how 'models' that involve causing distress will be employed



Thank you!





