



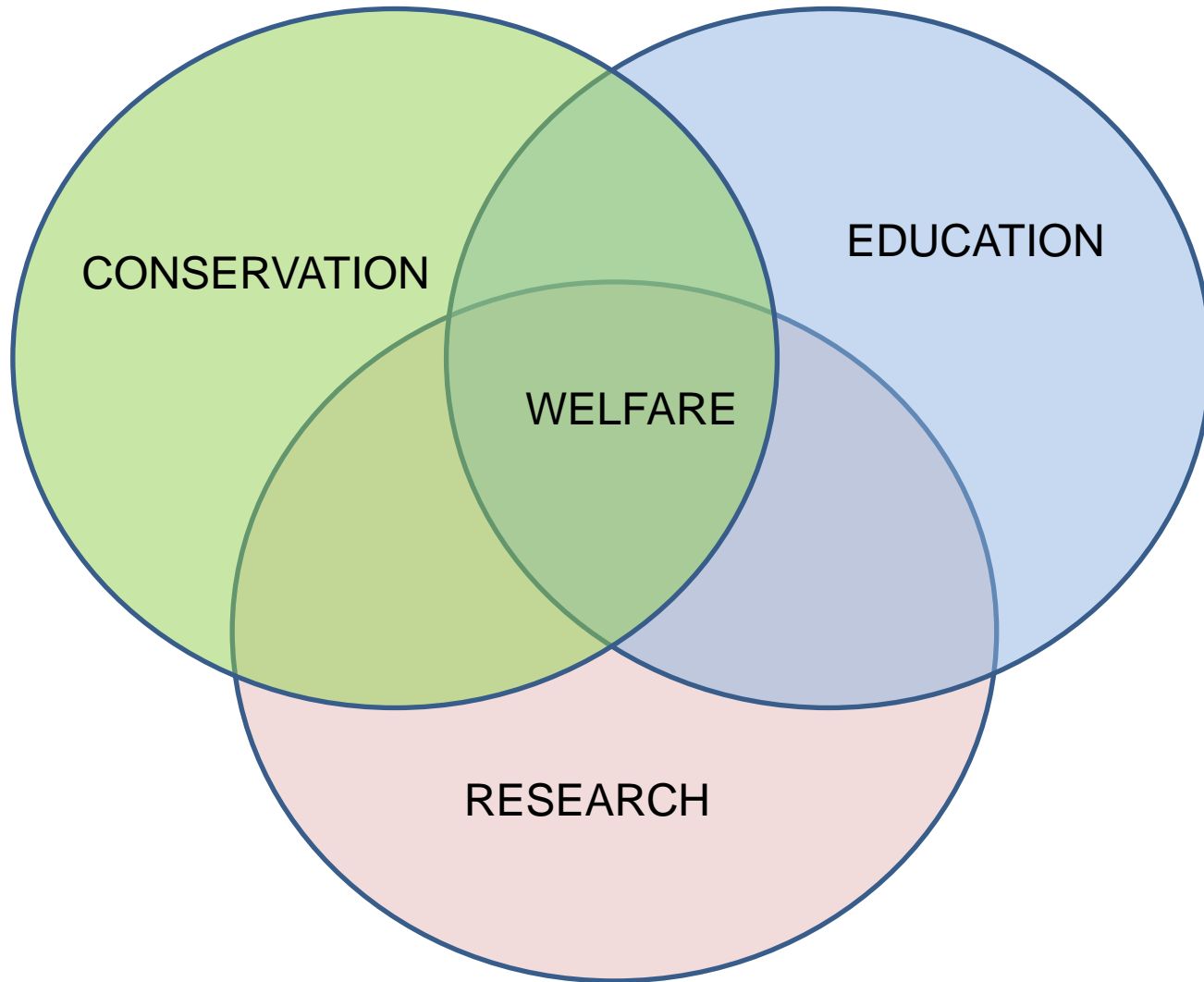
Assessment of animal welfare in ZOOS

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The role of the modern zoo



Why is good welfare so important?

- Conservation
 - Populations must be fit for breeding and reintroduction purposes, poor welfare can lead to stress, suppression of immune function and a decrease in reproductive fitness



Why is good welfare so important?

- Education
 - Animals should exhibit natural behaviours to educate the public about their natural habits



Why is good welfare so important?

- Research
 - Healthy animals exhibiting natural behaviours can give us valuable information on how their wild counterparts live and behave



How do we measure welfare?

- Subjective Vs Objective measurements
 - E.g. Assessment of an animal looking 'stressed' Vs faecal cortisol screening demonstrating measurable stress hormone changes
- Qualitative Vs Quantitative
 - E.g. An opinion on how much time an animal spends performing stereotypic behaviour Vs an activity budget ethogram recording measurable behaviours
- Objective quantitative measures preferred as more reliable and can measure the impact of any further changes we then implement.

Snapshot Welfare Assessments

- Of limited use – 1 moment in time
- No information on husbandry, keeper interaction, management programmes, training, enrichment, previous history, medical needs etc
- Enclosure assessment and group demographics may be possible





Five Freedoms

- **1. Freedom from Hunger and Thirst** - by ready access to fresh water and a diet to maintain full health and vigour.
- **2. Freedom from Discomfort** - by providing an appropriate environment including shelter and a comfortable resting area.
- **3. Freedom from Pain, Injury or Disease** - by prevention or rapid diagnosis and treatment.
- **4. Freedom to Express Normal Behaviour** - by providing sufficient space, proper facilities and company of the animal's own kind.
- **5. Freedom from Fear and Distress** - by ensuring conditions and treatment which avoid mental suffering.

Five Freedoms

- A subjective and qualitative measure
- Brambell Commission (UK govt) 1965, welfare of intensively farmed animals
- Do not encourage positive welfare – at best a ‘neutral welfare state’ can be achieved
- Now
 - *‘Life worth living’*
 - *‘Good life’*
- Modern ethologists place emphasis on minimising negative welfare aspects plus increasing opportunities for positive welfare

Telos

- Telos is the innate nature of an animal – the pig-ness of a pig or the chimp-ness of a chimpanzee
- Explains the strong neurobiological drive to fulfil certain behavioural activities even if all physical needs are met



Defining behaviour

Natural behaviour has been defined as a behaviour that is “typically observed in the wild; it is adaptive in the evolutionary sense...(i.e.) has evolved by natural selection which allows an individual to survive more easily in its particular environment and so gives it a better chance of leaving offspring than an animal not so adapted” (Poole, 1988b, p. 3).



Unnatural behaviour is defined as a behaviour that is “not seen in the wild. Not all unnatural behaviours are regarded as abnormal, however, as they may promote success within the captive environment” (Poole, 1988b, p. 3-4).

Defining Behaviour

Normal behaviour will

“promote the success and survival of the individual and its genetic contribution to the population” and is “clearly appropriate to the particular situation”. It may also “be either natural or unnatural” (Poole, 1988b, p. 4).

Abnormal behaviour is defined as a behaviour that is “rarely seen in wild populations and does not promote the success and the survival of the individual or its close relatives (i.e. it does not increase fitness). It appears not to be goal oriented, so that its function is not apparent.” It “may include elements of normal activities, but they are performed in an inappropriate fashion” (Poole, 1988b, p. 4).



Behaviour

Abnormal behaviour is of the most concern

- Examples of abnormal behaviour include:
 - Stereotypy (repetitive, aimless behaviour)
 - Overgrooming/feather plucking
 - Self-mutilation

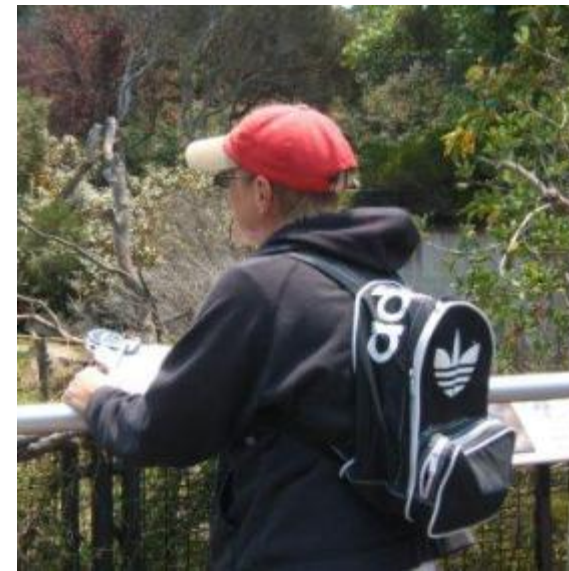
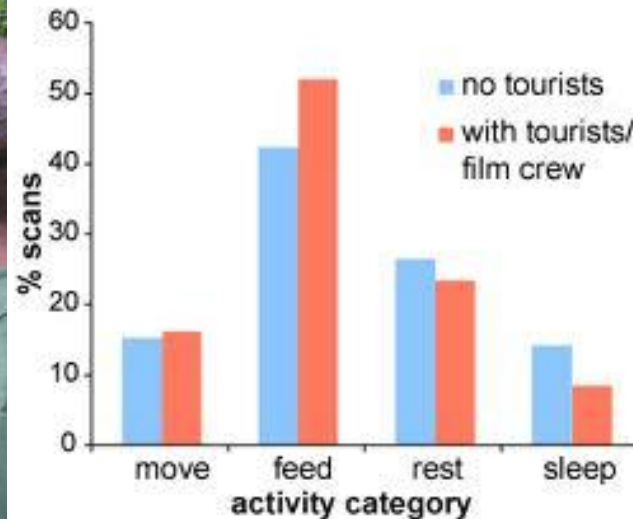


How do we assess behaviour in relation to welfare?

- By analysing how an animal behaves, we can compare its behaviour to other animals of the same species.
- We can assess whether it's behaviour is normal and functional
- We can identify any abnormal behaviours and quantify them as a % of the animal's 'activity budget'

Ethograms and Activity Budgets

- Ethogram
 - Tool for measuring a specific behaviour or a number of behaviours in an individual
- Activity Budget
 - The proportion of time an animal spends exhibiting each recorded behaviour



Ethogram

BEHAVIOUR OBSERVATION SHEET

Bear Name/No: _____ Location: _____ Date: _____ Time: from ___ to ___ Observer: _____

Weather Conditions:

Season: _____ Average/Approximate Temperature (Celcius) : _____ Comments: _____

Fine Cloudy/Overcast Wet Windy Stormy Hot Humid Warm Cool Cold

OBSERVATIONS:

When observing bear/s, record behaviours from the list below. Record behaviours every _____. Total Time Observed: _____ mins

Feeding Play Rest

Forage _____ Play – enrichment _____ Rest alone _____

Feed in Den _____ Play – enclosure fixtures _____ Rest with other/s _____

Explore/Investigate Interactions If known:

Environment _____ Play _____ → With who _____

Enrichment _____ Aggression: Vocalise _____ Fight _____ → Other bear/s _____

Bears _____ Avoidance (moves away) _____ → From who _____

Other _____ Other _____ → Other bear/s _____

Stereotypic Compulsive General Behaviour

Pacing _____ Excessive salivating/foaming _____ Alert Observ. of surrounds

Weave in front of dens _____ Self Directed Behaviour: Responsive to keepers

Head sway _____ - Self sucking or biting _____ Lethargic Not observant

Bar biting _____ - Slapping/hitting _____ Non-responsive to keepers

Food regurgitation _____ - Excessive grooming _____

Other _____ - Other _____ **General Health**

Noise Present Yes No Duration _____ Noise Type _____ Normal Abnormal Unsure

People Present Yes No Duration _____ Who/How many _____ Poss. Injury

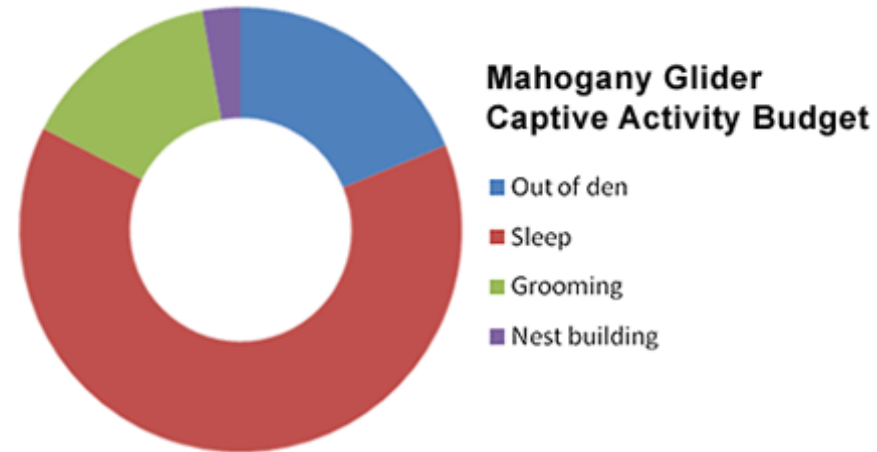
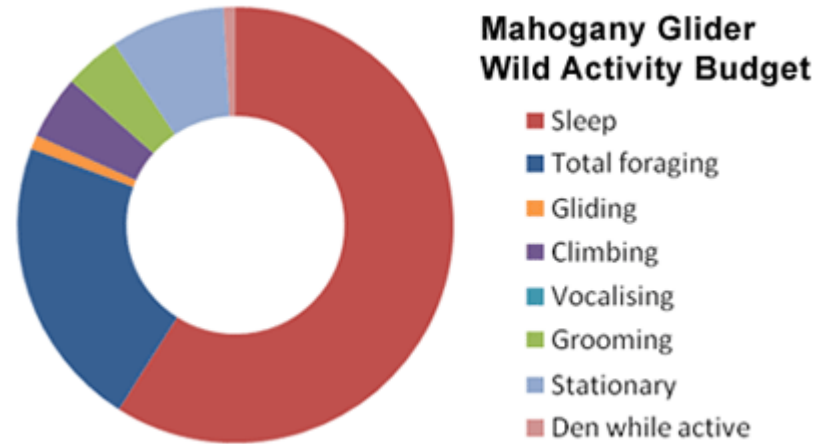
Out of Sight _____ Faeces – Normal Abnormal

General Comments: Add specific comments overleaf. Vomiting Vet/BM to view

Percentages: Feed _____ Play _____ Rest _____ Explore _____ Interactions _____ Stereotypic _____ Compulsive _____ Out of Sight _____

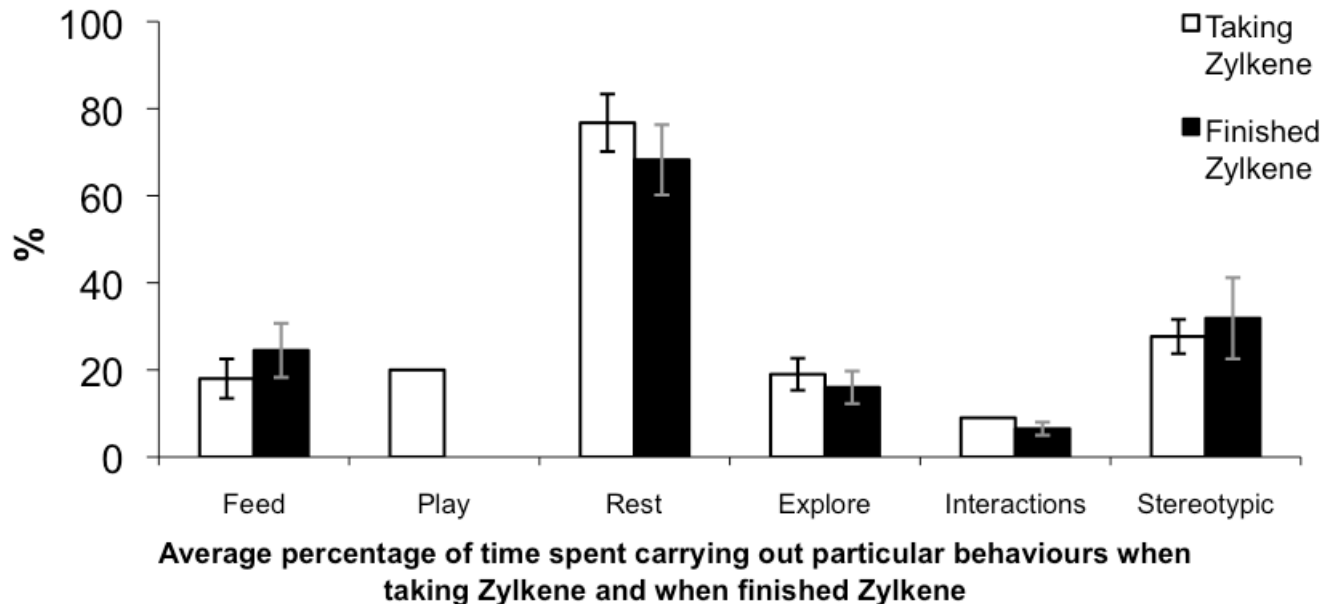
Activity budgets

- Once behaviours are recorded, we can compare against individuals of the same species within the zoo, at other zoos or even in the wild



Activity Budgets

- Analysis of activity budgets can highlight
 - Reduced behavioural repertoires
 - Abnormal behaviours such as stereotypy
 - A behaviour being performed excessively
 - The effect of human interventions e.g medical treatment, visitor effects or enrichment

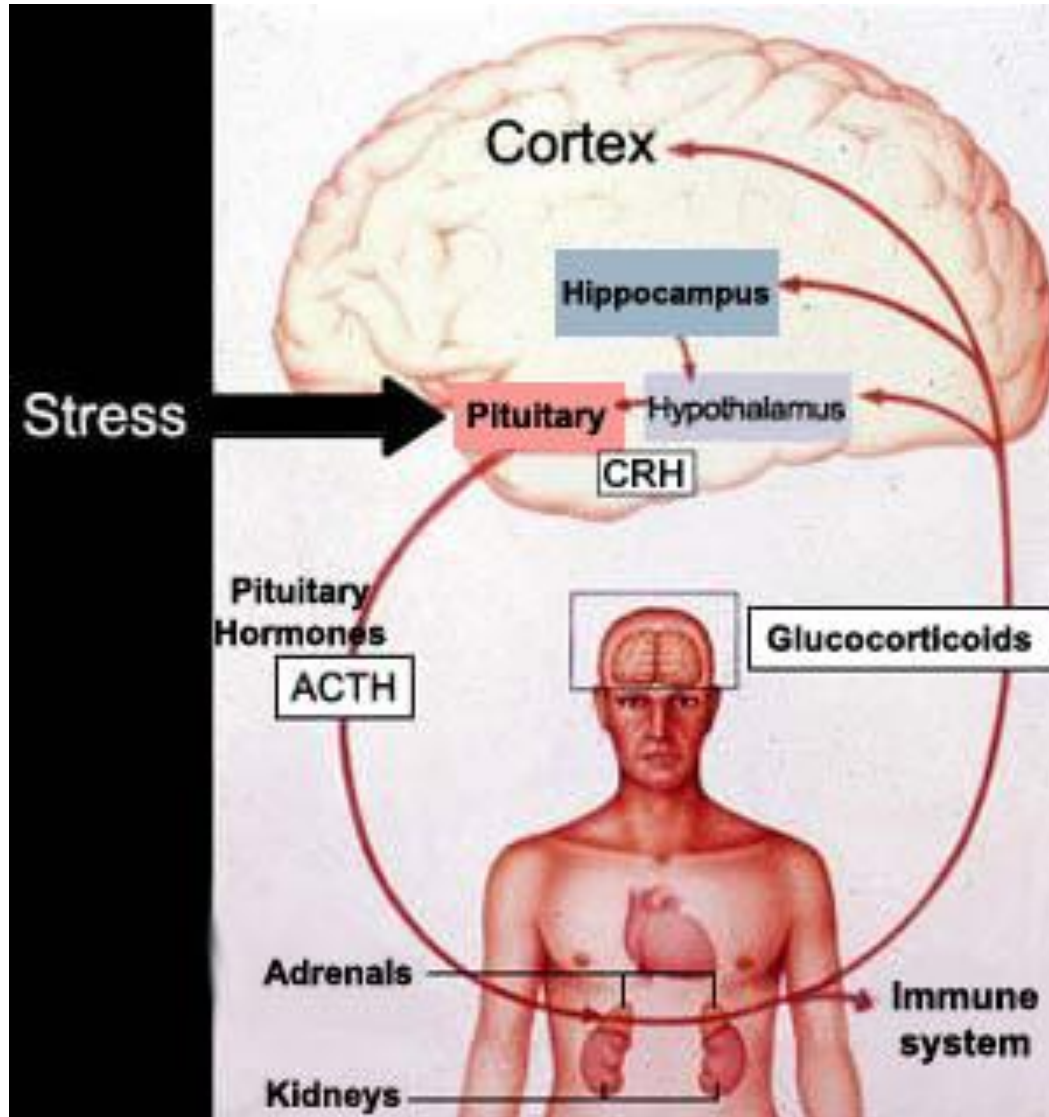


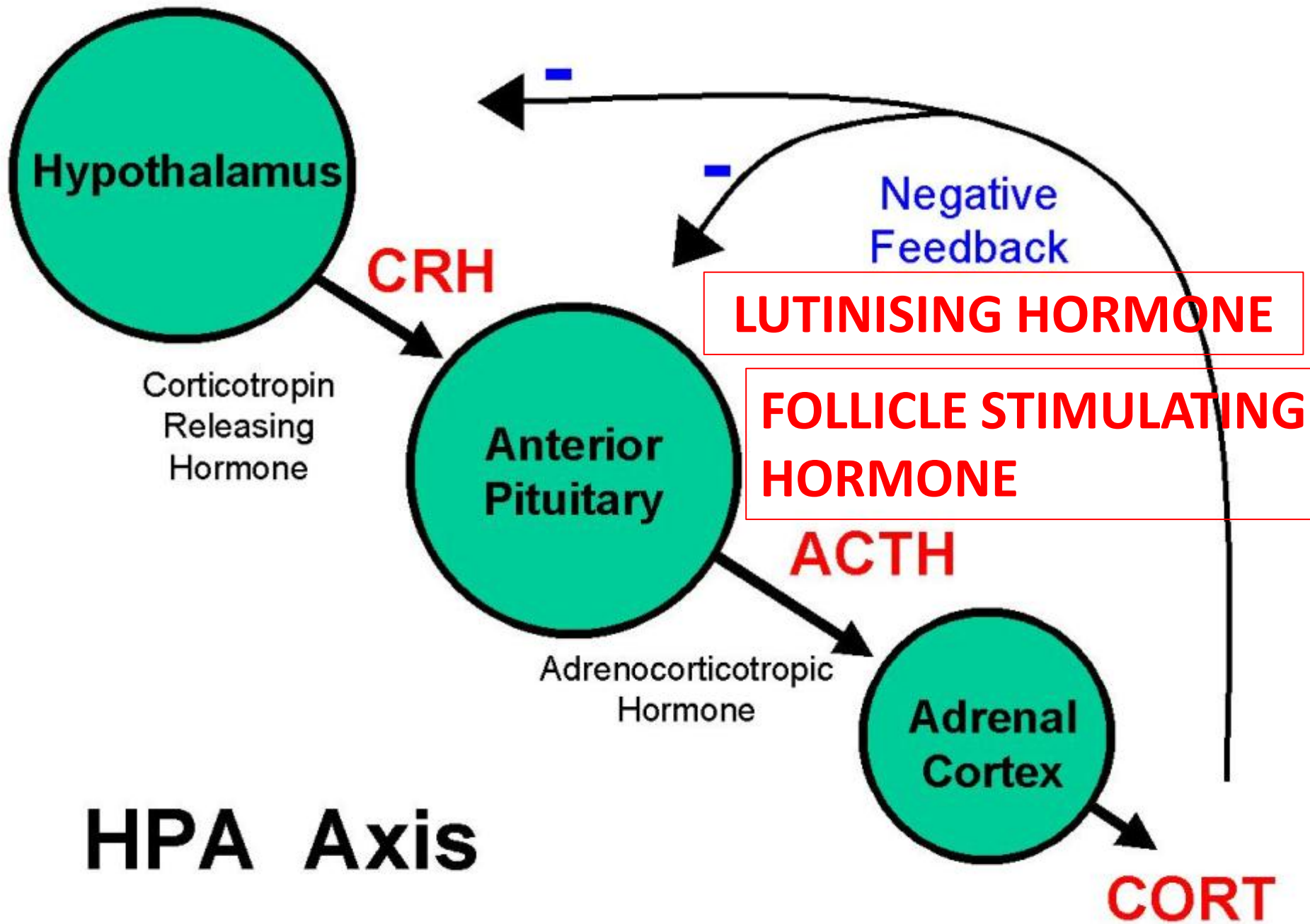
Cortisol analysis

- Cortisol is a steroid hormone, produced by the adrenal gland in response to stress
- Actions
 - Increases blood glucose
 - Suppresses the immune system (decreased lymphocyte proliferation)
 - Decreases bone formation
 - Promotes metabolism of fat and carbohydrate
 - Inhibits reproduction (suppresses pulsatile LH secretion)

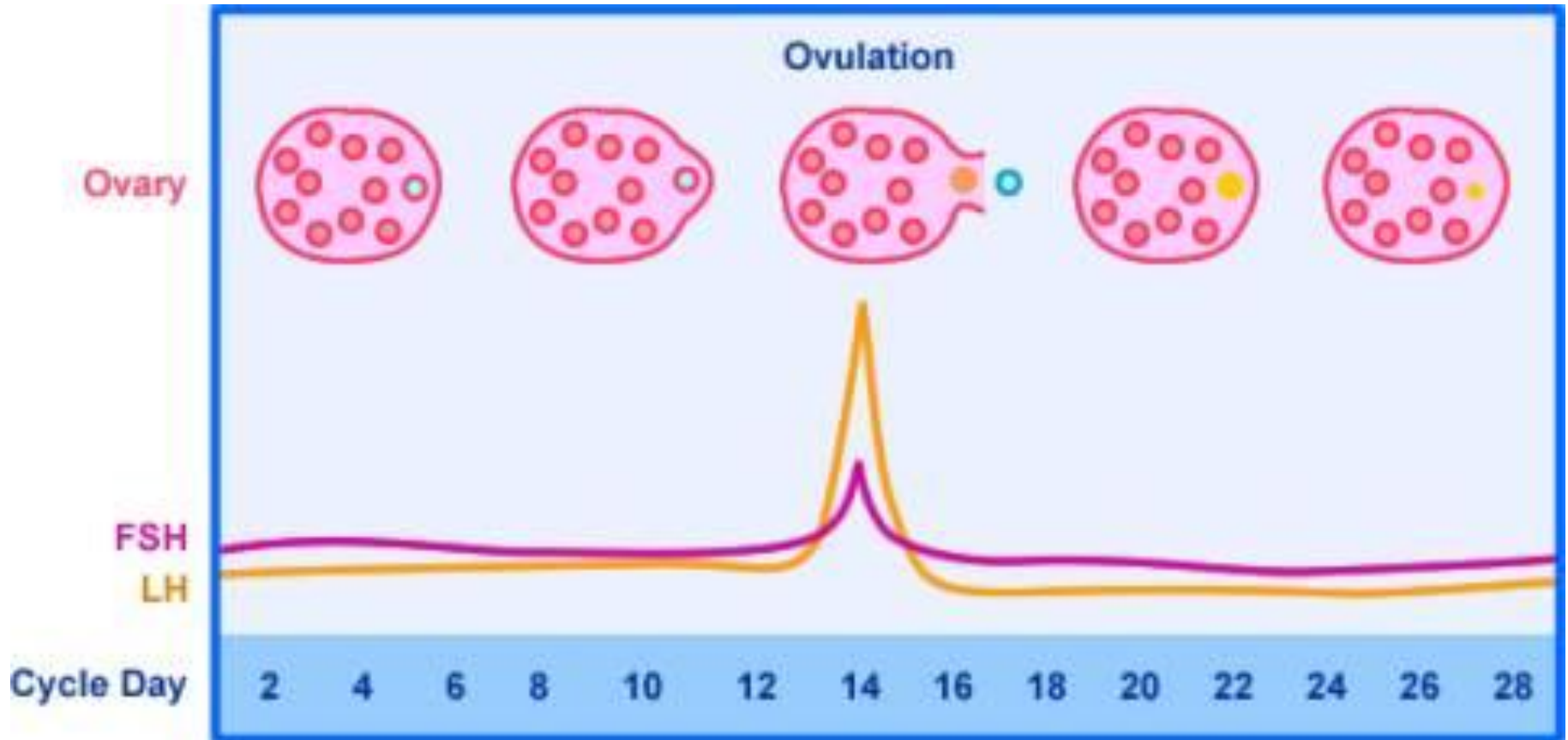


Cortisol



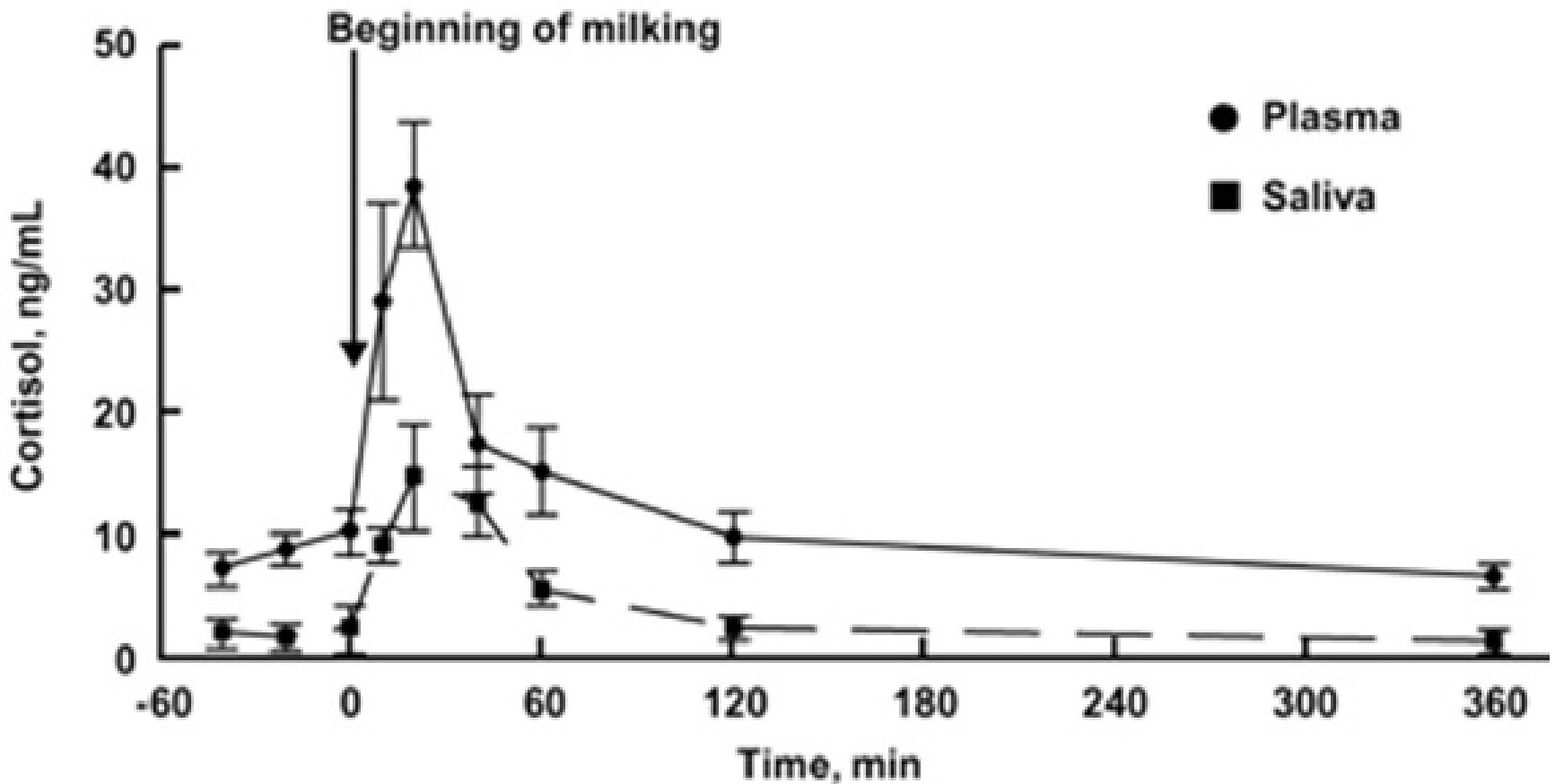


LH and FSH surge is essential for ovulation, and is inhibited by cortisol



Cortisol

- Can be measured in serum, urine, saliva, faeces and hair.



Cortisol

- Faecal cortisol levels in spider monkeys in different habitats.
- Lowest cortisol levels are in wild monkeys in conserved habitat. Highest levels are in pet monkeys

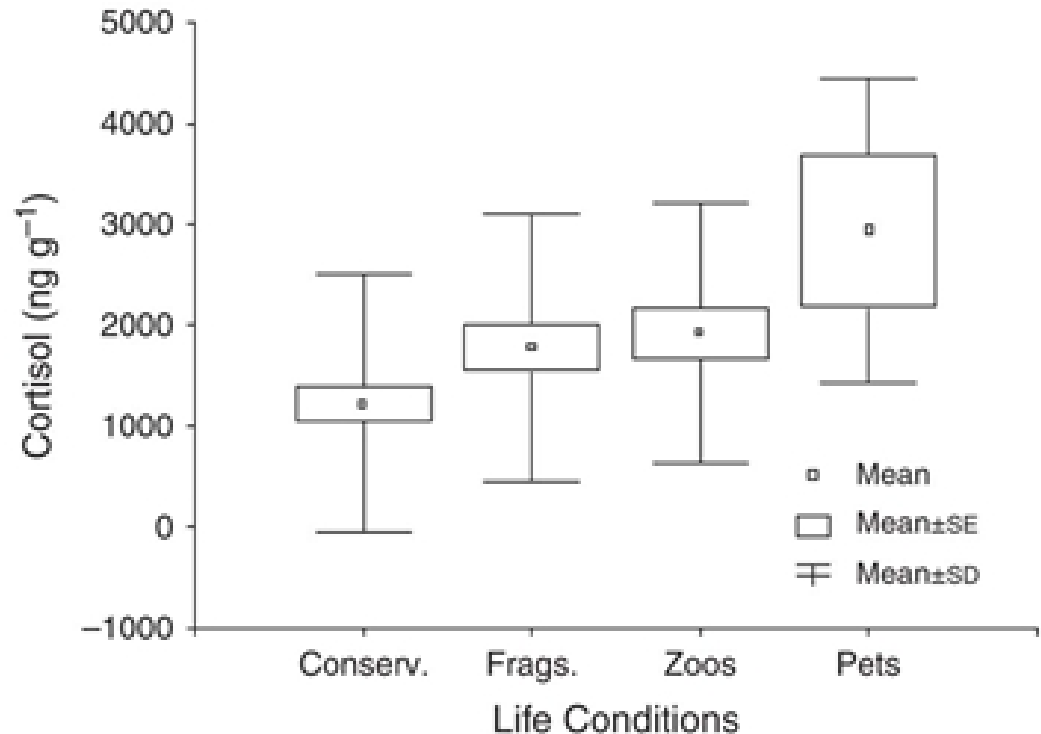
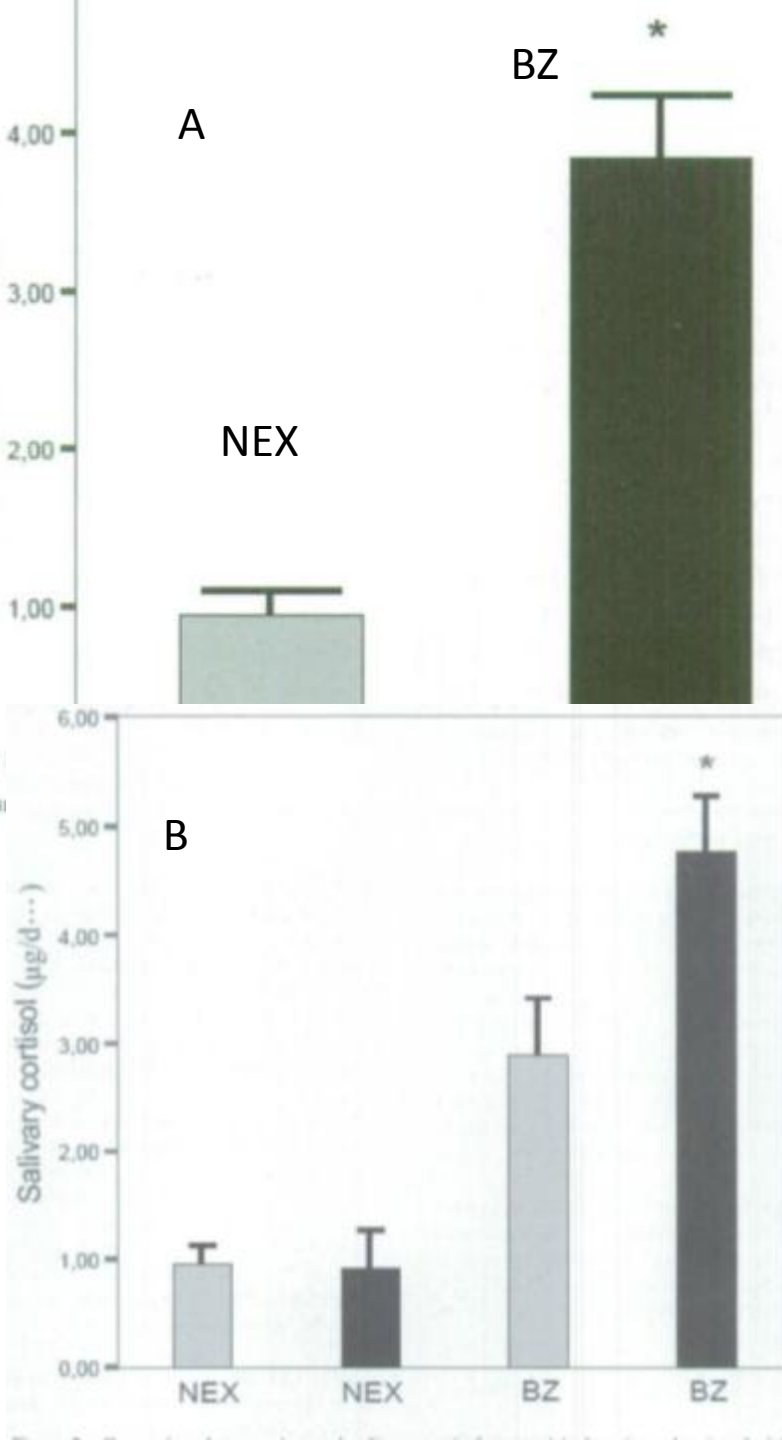


Figure 3 Mean fecal cortisol concentrations of spider monkeys *Ateles geoffroyi yucatanensis* under different environmental conditions. Data indicate mean \pm SD. Conserved habitat ($n=58$); fragmented habitat ($n=33$); zoo animals ($n=26$); pets ($n=4$).

Cortisol



- A = Differences in salivary cortisol in jaguars at two different zoos (NEX and BZ)
- B = Salivary cortisol levels in jaguars at the same two zoos on days where visitors are present (black) and are not present (grey)
- Difference is in location of public viewing area in relation to enclosure

Disease Prevalence

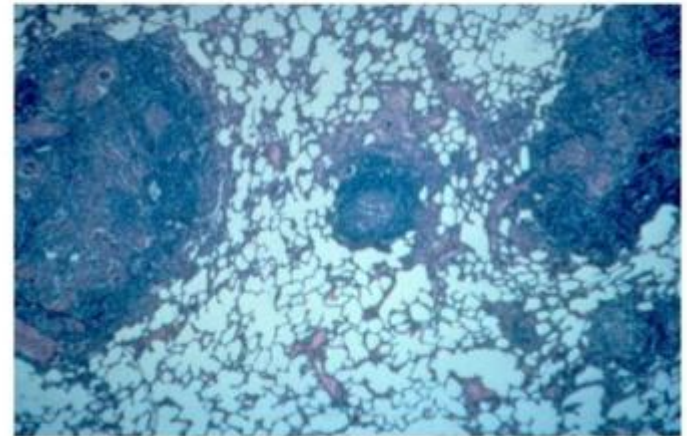
- In general captive animals live longer than their wild counterparts
- But is quantity of life a good welfare indicator?
- We need to look at quality of life also
- Disease is detrimental to welfare, and it may be exacerbated by stress
- Captive animals may suffer from disease syndromes not recorded in the wild

Disease Prevalence

- Infectious disease
 - Human TB (*Mycobacterium tuberculosis*), *Salmonella*, *E.coli* etc
 - Canine distemper virus, infectious hepatitis, Feline herpesvirus, Elephant endotheliotropic herpesvirus
- Husbandry-related disease
 - Foot problems in elephants

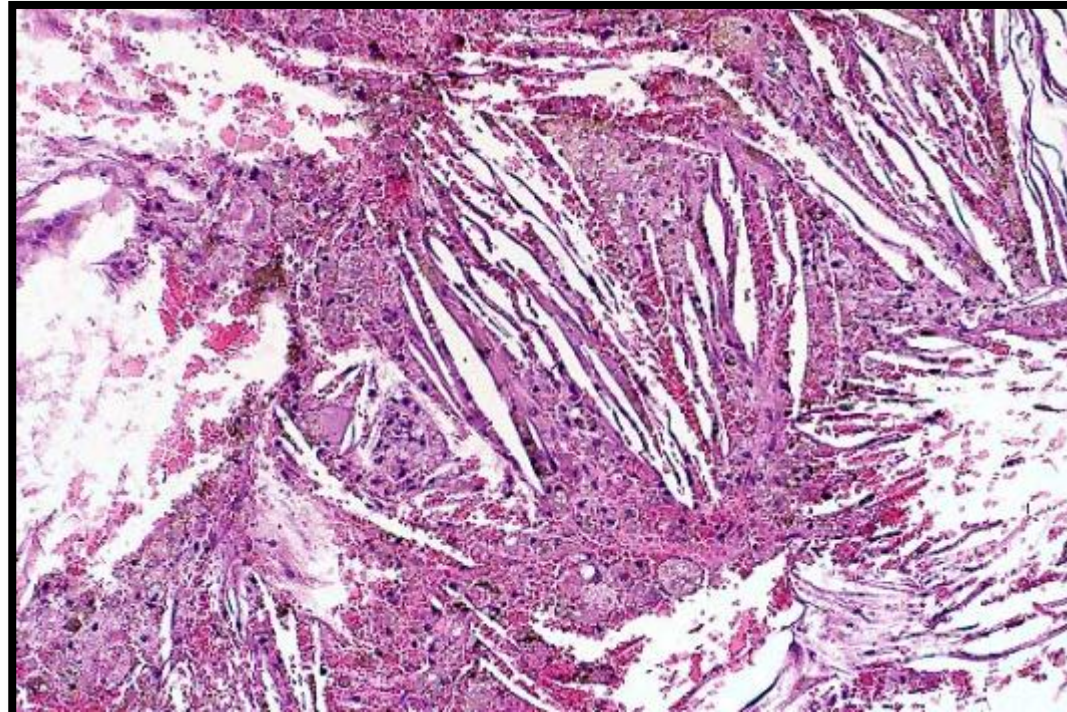


Primate Tuberculosis



Disease Prevalence

- Nutritional disease
 - Nutritional hyperparathyroidism in large cats
 - Hsing-Hsing, the panda at the National zoo in Washington fed snacks of blueberry muffin
 - Cholesterol granulomas in meerkats
- Human-induced disease
 - Female rhino at Granby zoo Quebec died after inhaling plastic



Disease Prevalence

- Multi-factorial disease
 - Alopecia in spectacled bears
 - Genetics, husbandry, allergies?
 - Mortality in captive Orcas
 - Immune suppression, dental disease, early parturition
 - Feather plucking in parrots
 - Stress, husbandry, nutrition, UV access



Other measures

- Reproductive success
 - Asian elephants have poor reproductive records in captivity due to stress, herpesvirus infection, foot and musculoskeletal disease
 - Many species require high levels of reproductive management e.g. artificial insemination or embryo transfer. As these animals would naturally breed in the wild is this extreme intervention indicative of stress inhibiting reproduction?



Summary so far..

- Inadequate captive environments, poor nutrition, inappropriate visitor behaviour and poor keeper training can all create stress for captive animals
- Stress induces high cortisol levels, inhibiting reproduction, suppressing the immune system, decreasing normal behaviours and inducing abnormal behaviours
- Creating a low stress environment can increase behavioural repertoire and promote animal health and reproduction.

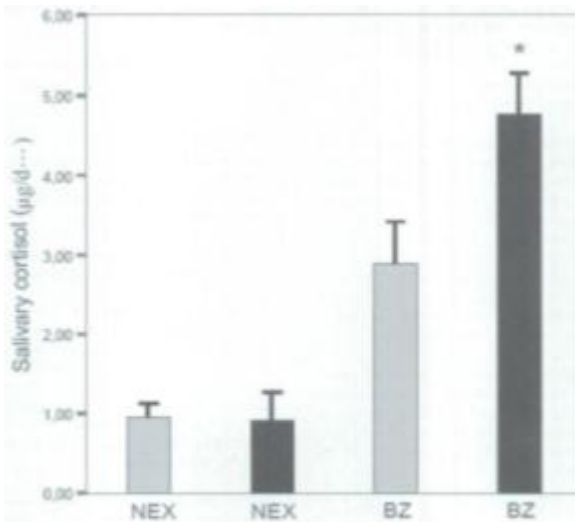
How do we create a low-stress environment?

- Gather information on natural state and needs - Telos
 - Natural history and ecology
 - Feeding behaviour
 - Social behaviour
 - Habitat
- Assess captive state using ethograms to assess activity budgets
- Consider
 - Enclosure design, diet, keeper interaction, visitor viewing access, husbandry routine, behavioural repertoire, enrichment and enclosure furnishings



How do we create a low-stress environment?

Assess data collected and implement changes e.g. providing enclosure furniture to encourage more varied behaviour



Consider educational signage to change visitor behaviour, plants to screen visitors from view or changing the location of visitor viewing areas.

Figure 2 - Comparison between jaguars' salivary cortisol at no-visit days (grey bars) and visit days (black bars). NEX is "No entry" Organization and BZ is Brazilia Zoo. * is the statistical difference between only BZ jaguars (Kruskal-Wallis test, $df=1$, Chi-squared=23, $P=0.017$). Bars represent mean and standard errors.

Behavioural Management Strategies

- Behavioural management allows the development of proactive standards for the care and psychological well-being of captive animal
- Behavioural management incorporates behavioural enrichment, training, animal behaviour issues, and exhibit architecture and husbandry.

Enclosure design



Enclosure design



Behaviour



Behaviour



Human interaction



Human interaction



Summary

- Welfare assessment in captive wildlife can be difficult but it is possible.
- Stress can predispose to a number of physical and mental diseases
- Zoos should continually assess and audit their management practices to reduce stress and enhance quality of life
- Remember the importance of Telos, behaviour and mental health
- Aim to ensure ***“A Good Life”***

Thank You

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