

# Proposed Studies on Glucose Metabolism and Diet in Black Rhinos

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Iron overload in captivity correlates with wild forage  
Browsers (shrubs, branches) vs. Grazers (grasses)



← Black

White →



← Sumatran

Indian →



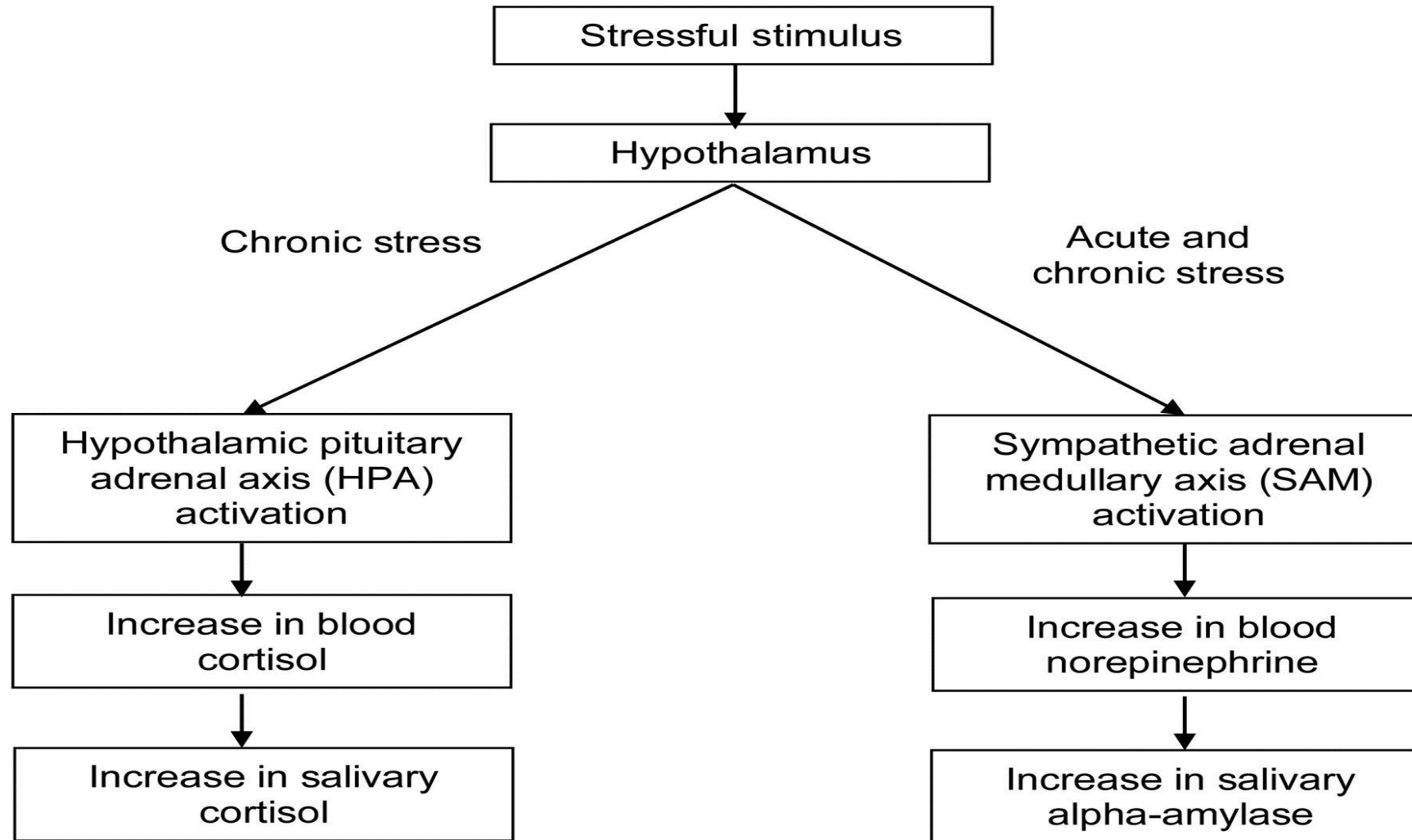
Affected by iron overload  
in captivity

Unaffected

Does glucose metabolism correlate with wild forage?

# What is the relationship between excess glucose, stress and reproduction in rhinos?

## Measuring the human stress response.



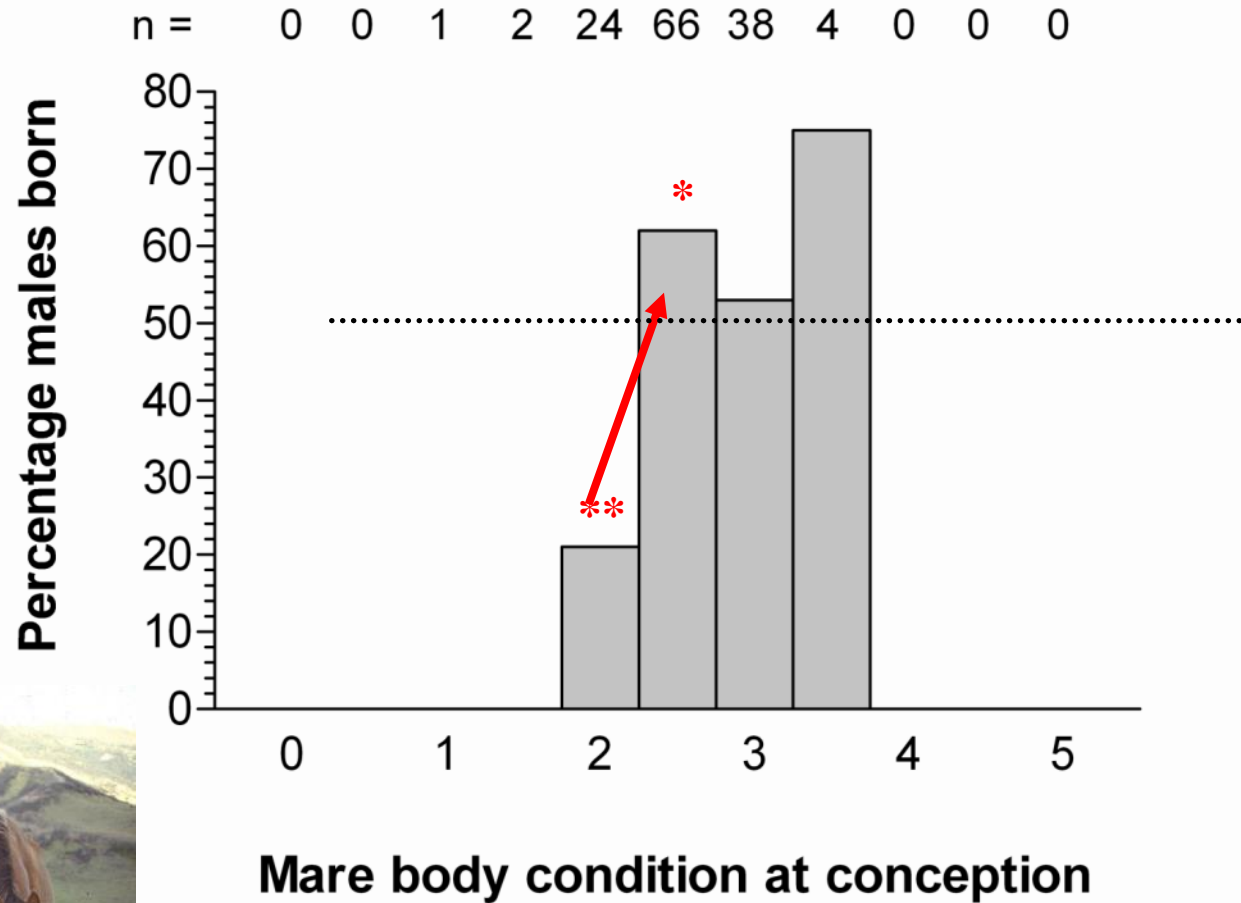
C.D. Lynch et al. Hum. Reprod. 2014;29:1067-1075

human  
reproduction

# Preconception evidence for Sex Allocation

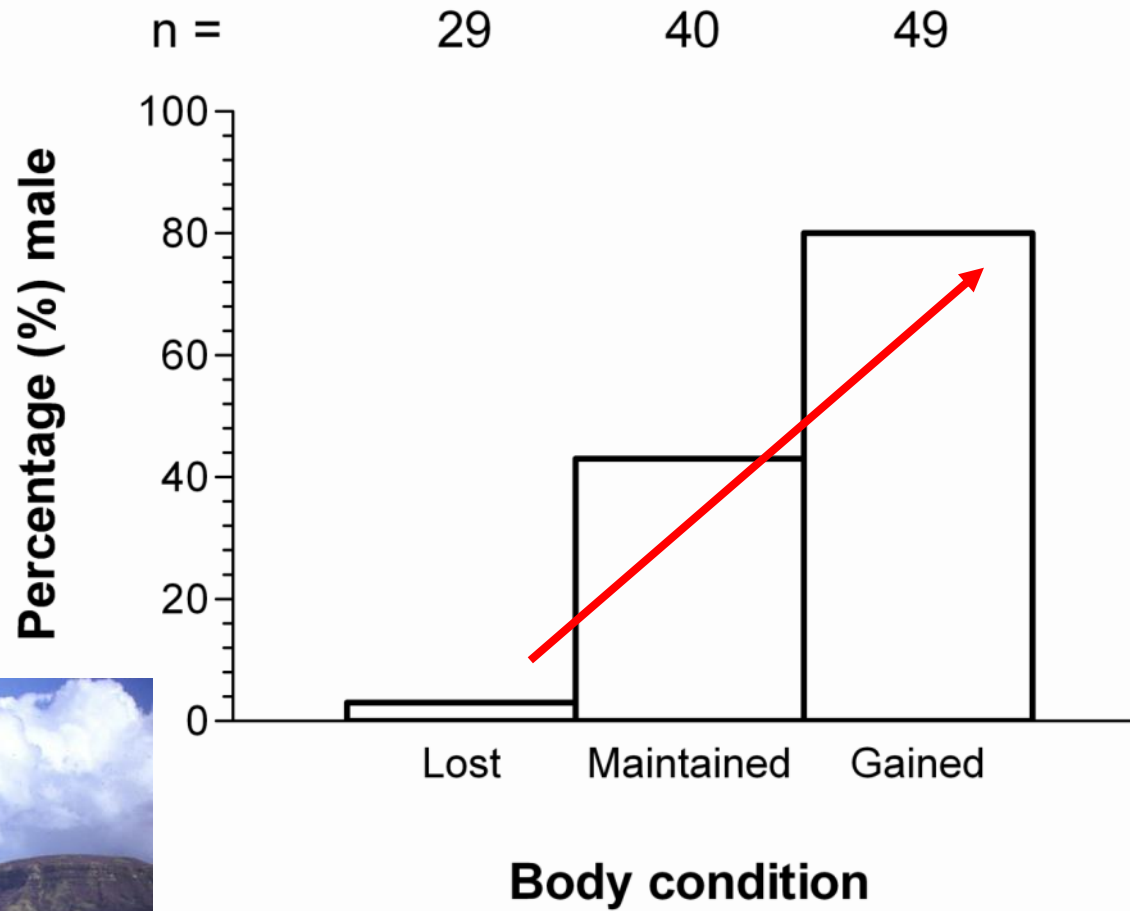
- Females in POOR condition (either too low OR too high) don't reproduce
- Females in increasing body condition prior to conception produce more males
- Females in decreasing body condition produce more females

**Mares in better body condition gave birth to more males.**



**Cameron, Linklater, et al. (1999). Birth sex ratios relate to mare condition at conception in Kaimanawa Horses. *Behavioral Ecology* 10 (5): 472-475.**

**Mares in  
INCREASING  
body  
condition  
gave birth to  
more  
males.**



**Cameron & Linklater (2007). Extreme sex ratio variation in relation to change in condition around conception. *Biology Letters*.**

# Environmentally mediated sex allocation occurs in wild black rhinos

Conceptions occur primarily during the rainy season (73%)

Rainy season conceptions are primarily males (57%)

Conception during rainy years are primarily males (60%)

## How can we use diet to bias birth sex in captive rhinos?



# Influence of dietary glucose on circulating glucose in white rhinos

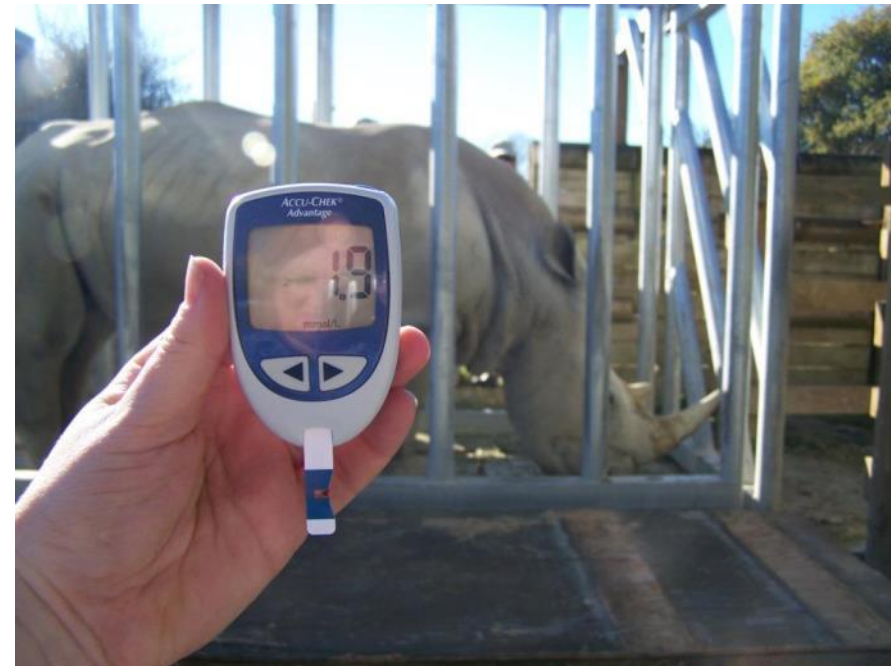
Six rhinos (3.3) at two zoos

Rhinos fasted overnight

At first meal of the day, 0800 hours, blood collected every 45 minutes for 3 hours

Handheld glucose meter

Each rhino fed each diet in randomized fashion





# Influence of dietary glucose on circulating glucose in white rhinos

5 foodstuffs tested:

10% glucose powder

5% glucose powder

10% horse pellets

10% lucerne hay

10% grass hay

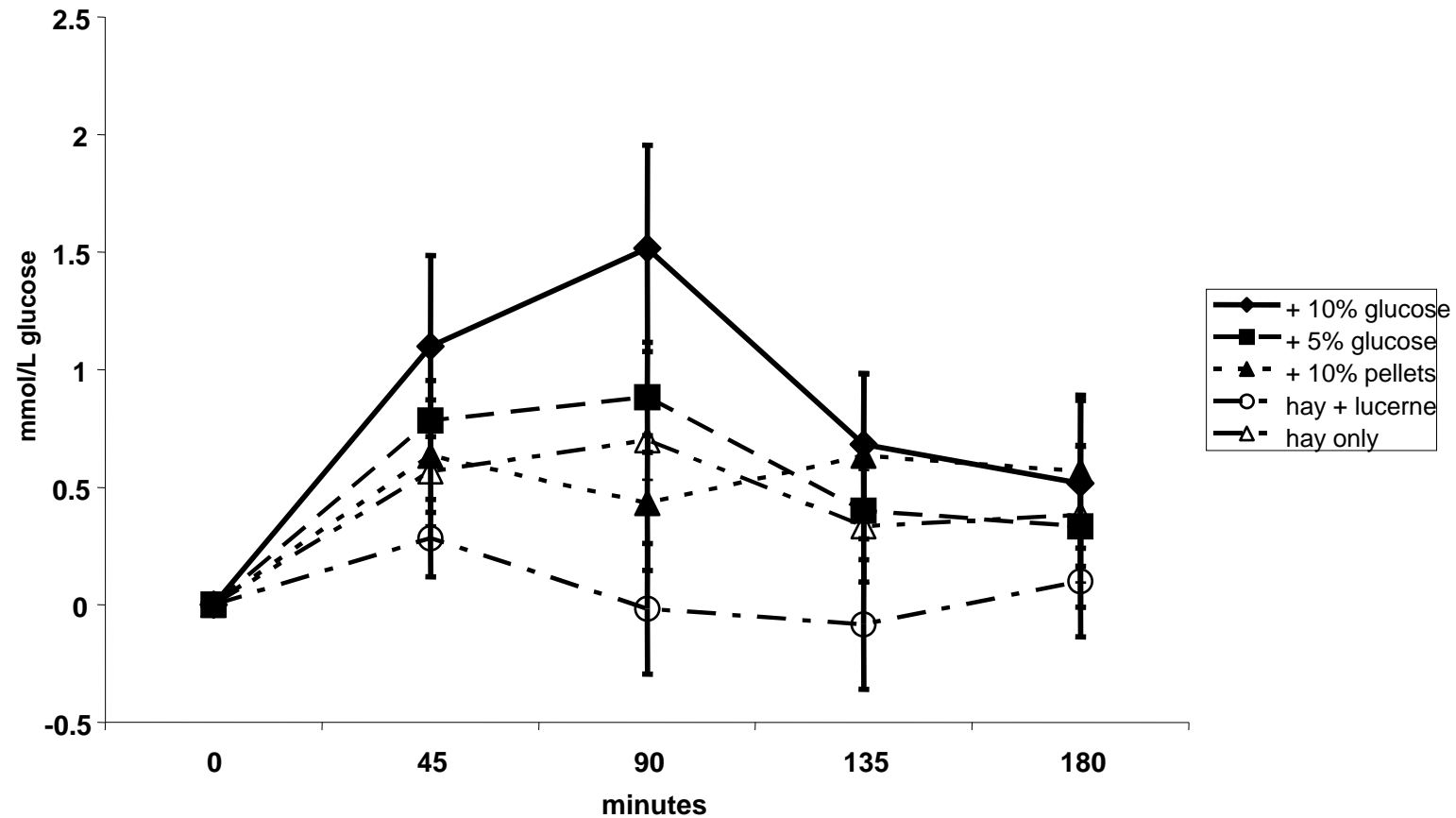
	% DM	CP % DM	CF % DM	ADF % DM	NDF % DM	DE % MJ/kg
Pellets	88.0	12.5	7.0	12.0	37.0	12.0
Grass hay	88.3	6.7	-	45.1	78.7	6.6
Lucerne hay	87.2	15.3	-	44.6	56.1	7.5
Glucose	-	-	-	-	-	15.5



Different diets result in changes in the magnitude and duration of the glucose response (similar to what is seen in horses)

Lucerne may be beneficial to keep blood glucose low in white rhinos

Changes in Baseline Blood Glucose Values in White Rhinos Fed Varying Diets,



# Does dietary glucose influence circulating glucose in black rhinos?

- Compare UK and European populations to US population
- Same bleeding and feeding protocol for all institutions
- Add salivary cortisol and salivary amylase

