

Reptile Face Masks

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Presentation Outline

- **Problem Statement**
- **Background Information**
- **Current Devices**
- **Competition**
- **Suggested Materials**
- **Design Constraints**
- **Problem Overview**
- **Alternative Designs**
- **Future Work**

Problem Statement

- **Clients:**
 - Kurt Sladky, MS, DVM**
 - Steve Johnson, MS, PhD, MD**
- **2 respiratory masks:**
 - Corn snake
 - Bearded dragon
- **2 ports**
- **Rigid plastic**
- **Air-tight seal**
- **Comfortable**

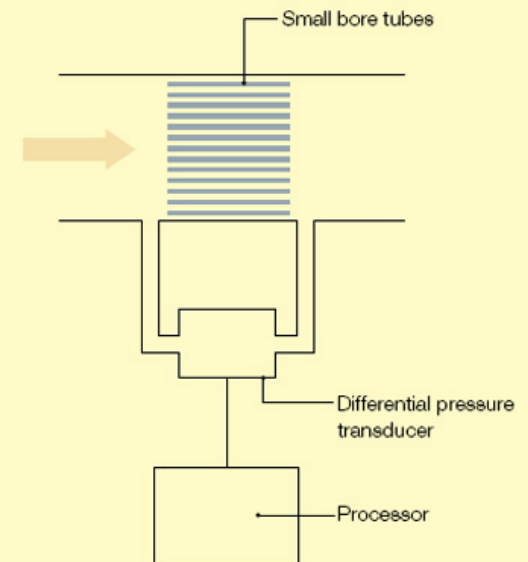


Background Information

- Pneumotachograph
- Opioids and Reptiles
 - Pain treatment
 - Effects unknown
 - Pain/Breathing suppression
 - Link to μ - and δ -opioid receptors
 - Morphine sulfate, oxymorphone

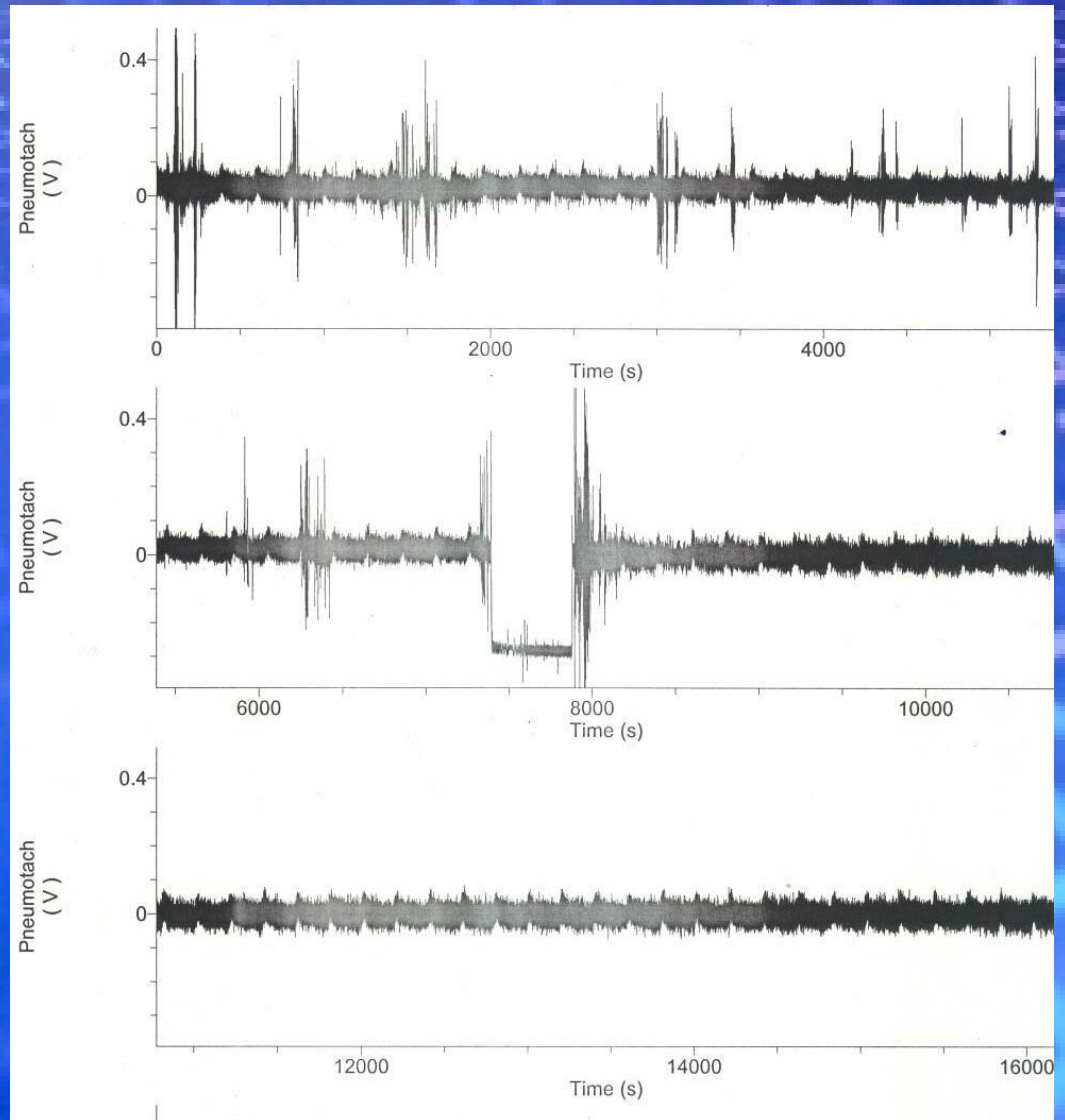


Pneumotachograph



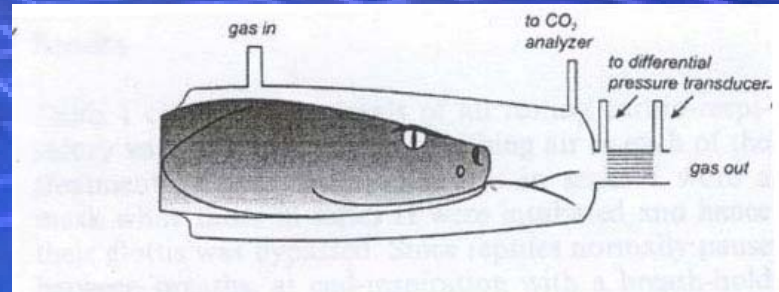
Background Information

Turtle Pneumotachograph Measurements: Before and After Morphine Injection

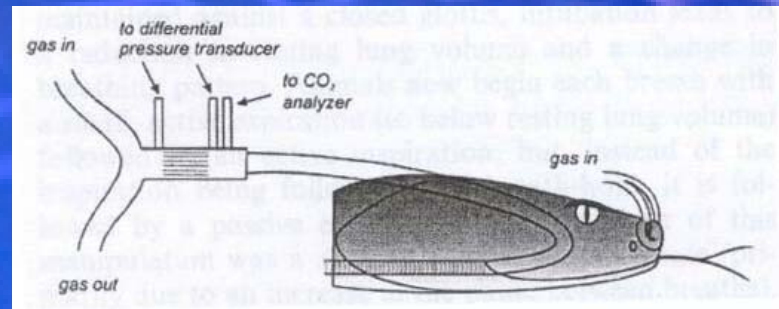


Current Devices

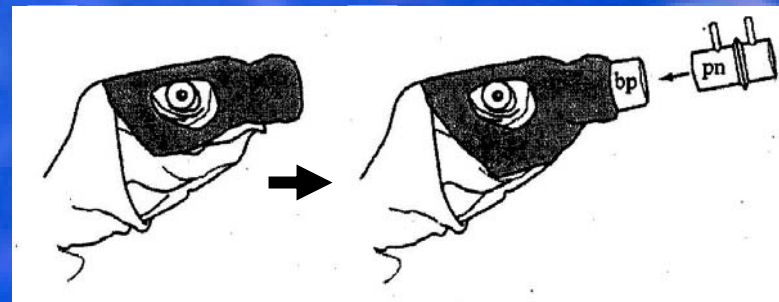
- Face mask (glued on)



- Intubation



- Cast mask (glued on)

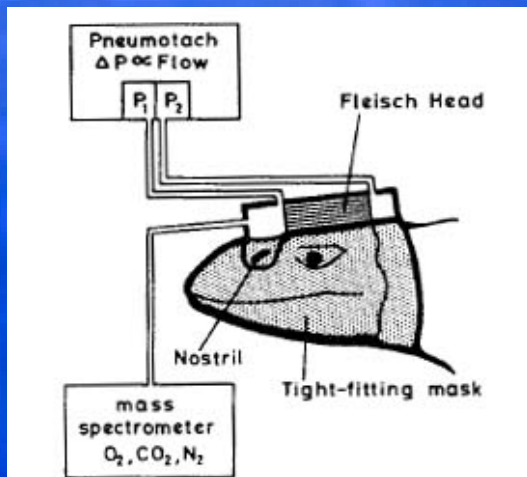


Competition

- Commercial anesthetic masks



- Previous designs from academic papers



Design Constraints

Corn Snake:



- Neck ~10x9mm
- Head ~13x9mm
~34mm long

Bearded Dragon:



- Air-tight
- Noninvasive
- Lightweight
- Easy to use
& clean

- Neck ~22x18mm
- Head ~ 40x22mm
~ 47mm long
- Spikes on side of
head
- Strong brow ridge

Problem Overview

Need two face masks, several options:

1. Corn snake

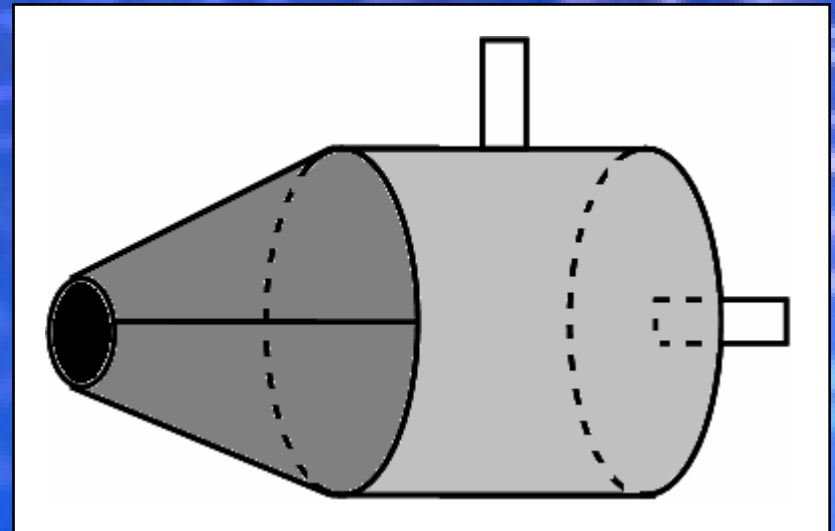
- **Full Head Design**
- **Nose Plug Design**

2. Bearded dragon

- **Full Head Design**
- **Nose Mask Design**
- **Nose Plug Design**

Design 1a: Full Head

- Hollow plastic cylinder
- Port drilled in top
- Plexiglas with port
- Rubber cone with zip-lock



Design 1a: Pros and Cons

Pros:

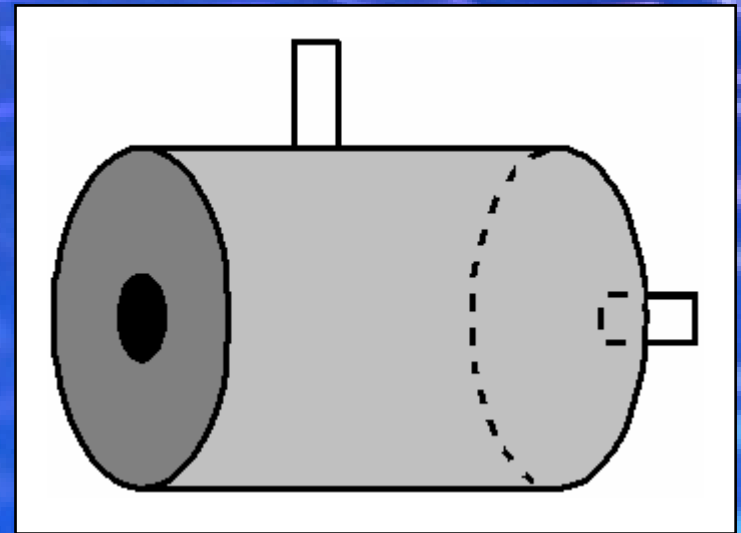
- Bearded dragon spikes avoided
- Quick release system
- Minimally invasive
- Useable for both reptiles

Cons:

- Heavy
- Dead space
- Time consuming placement

Design 1b: Full Head

- Hollow plastic cylinder
- Port drilled on top
- Plexiglas end with port
- Thin membrane with hole



Design 1b: Pros and Cons

Pros:

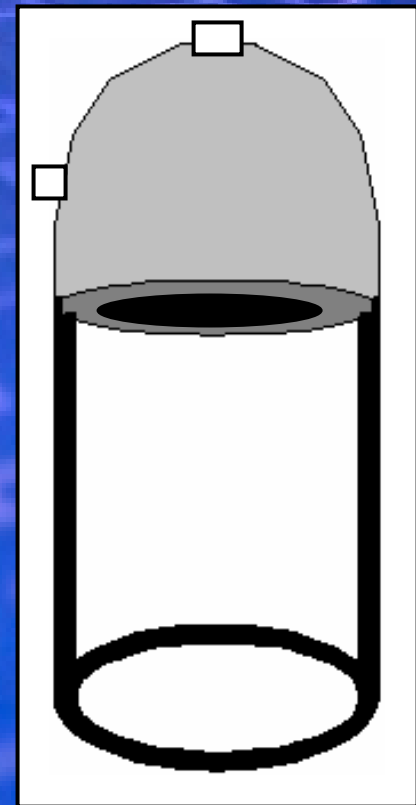
- Fits behind reptile's head
- Minimally invasive
- Easy to use

Cons:

- Heavy
- Dead space
- Membrane could tear
- Corn snake only

Design 2: Nose Mask

- Plastic cap over lizard's nose
- Collar and bands secure mask
- Ports attached to front and bottom of mask



Design 2: Pros and Cons

Pros:

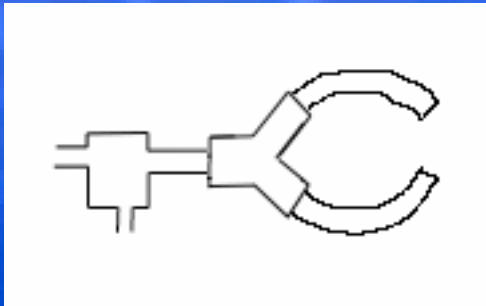
- Minimal dead space
- Low eye contact
- Lightweight

Cons:

- Difficult to seal
- Bearded dragon only

Design 3: Nose Plugs

- Corn Snake or Bearded Dragon
- Thin plastic tubes in nostrils
- Air input/output junction



Design 3: Pros and Cons

Pros:

- Minimal dead space
- Lightweight

Cons:

- Invasive/
uncomfortable
- Restricted air flow
- Securing nose
plugs
- Seal mouth shut

Future Work

- **Secure snake head in mask**
- **Redesign bearded dragon airtight seal**
- **Construct restraining units for reptiles**
- **Design lighter versions of prototypes**
- **Create duplicates of final designs**

References

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Pictures and drawings provided by Dr. Kurt Sladky and Kristen Seashore



Questions?

How a Pneumotachometer works

Q is Air Flow

R is Resistance to Air Flow

ΔP is the change in Pressure (pressure drop) due to Resistance

$$Q = \Delta P / R$$

Very similar to Ohm's Law:

$$V = IR$$

Most pneumotachometers have a heating element to keep condensation from forming. Reptile Pneumotachometers do not need this.

