

The Development and Implementation of a Protocol to Obtain Voluntary Blood Pressure Readings in an Adult Male Orangutan at Zoo Atlanta

**Lynn Yakubinis
Senior Keeper
Primate Department
Zoo Atlanta**



High Blood Pressure:

Major factor in heart disease in humans

Only know “normal” value for humans

Therefore, the Gorilla Health Project and Zoo Atlanta set out to learn more . . .



Tough Cuff

Zoo Atlanta studied blood pressure values on apes under anesthesia

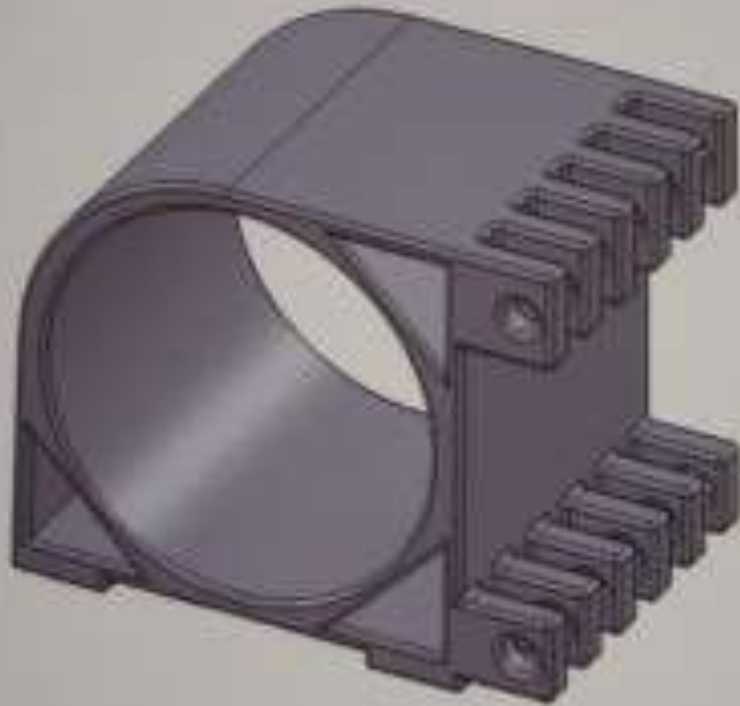
A team of students at GA Tech and Emory together with Zoo Atlanta created the Tough Cuff

Holds an inner plastic cuff in place, so the ape can place its arm through the cuff

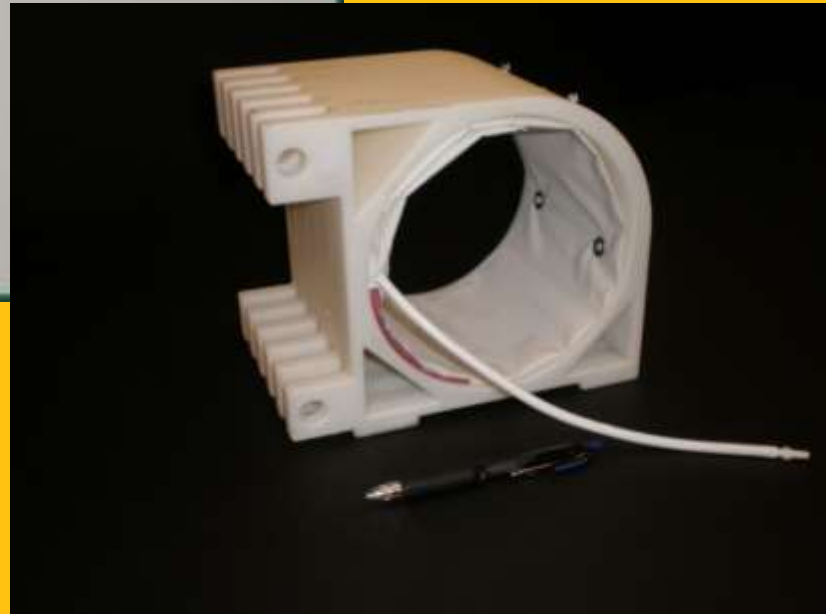
Plastic cuff needs to fit snugly around the edge of Tough Cuff



CAD Drawings



1.35 Gorilla Blood Pressure
Monitoring System
The Gorilla Tough Cuff
Isometric View
SCALE 2:3
April 20, 2008



Tough Cuff cont.

The Tough Cuff was developed for silverback gorillas and designed based on their arm size

Designed ONLY for the LEFT arm

Is not accurate on females, juveniles or smaller apes – need to develop an insert for smaller arm sizes



Mesh Sleeve and Portal Installation

Portal needs to be at heart level.



Zoo Atlanta Pilot Project

Modifying the method for the smaller arm size of adult male orangutans

Chantek - first orangutan to participate in voluntary blood pressure readings.
Obtaining values in 2012- but more consistent mid -2013

Observe trends

Next Steps:

1. Statistical analysis
2. Compare indirect values to direct values



Things to remember:

The orangutan's artery needs to line up with the artery line on the plastic cuff – use dowel to help with position



Orangutan's hand should not firmly grasp the dowel
(this could affect reading)

They should just lightly hold the dowel

Things to remember cont.

Adult long cuffs have a range of 33-45 cm. diameter. Therefore, the orangutans arm needs to be measured to find that correct diameter.

Gorillas - it is near the wrist

Orangutans - it is just under the elbow

Move Tough Cuff in the mesh sleeve to facilitate correct placement

Orangutan slides arm through Tough Cuff to line up correctly

There needs to be a little space between the orangutan's arm and the cuff – not extremely tight, but not too loose.



Training

1. Train orangutan to place his LEFT arm through the Tough Cuff alone – target onto dowel

2. Attach plastic cuff inside Tough Cuff

Start with cheap plastic cuffs – just in case!



Training cont.

3. Desensitize orangutan to 2 trainers present

4. Attach a manual bulb to the plastic cuff

Inflate cuff with 1 pump– release air – bridge - reward

It works well to not bridge until AFTER the air is being released.

5. Work up to more inflating.

Keep inflation variable – esp. when tight



Training cont.

6. Advance to a digital machine (Cardell 9401) Keep inflation variable.

Keep using cheap cuffs until the behavior is very reliable. If an orangutan pulls his arm out of an inflated cuff, it can pop.

Make note in your readings when you change cuffs – different cuffs and different machines will get different readings.

I recommend using constant reinforcement during the reading (diluted juice) and then a jackpot after the reading is over (fruit).



Factors to keep in mind for training:

Need Blood Pressure measurements from different times of the day and under different conditions

Make sure the ape stays extremely still to maintain accurate readings.

Try to take multiple readings at a time, allowing the ape to take their arm out if needed. Deflate cuff in between readings.

Readings in one session maybe different due initial excitement.



What to record and/or consider when obtaining voluntary ape blood pressures:

- Time of day.
- Temperature
- Activity prior to training.
- Surrounding environment. Is the ape alone in the cage during the training session?
- Who (humans) was present for training?



Orangutan 1.0 Chantek Blood Pressure

| DATE | MAP | PULSE | SYS | DIA | METHOD | TIME | TEMP | TRAINER/S | COMMENTS |
|-----------|-----|-------|-----|-----|------------|--------|------------------------------------|-----------|--|
| 7-Feb-14 | 92 | 90 | 120 | 71 | Tough Cuff | 1:30pm | building in 70s, warm | LY/Kim | inside all morning - session right before he shifted outside |
| 7-Feb-14 | 89 | 81 | 114 | 75 | Tough Cuff | 1:30pm | building in 70s, warm | LY/Kim | inside all morning - session right before he shifted outside |
| 7-Feb-14 | 82 | 78 | 102 | 65 | Tough Cuff | 1:30pm | building in 70s, warm | LY/Kim | inside all morning - session right before he shifted outside |
| 7-Feb-14 | 89 | 80 | 116 | 72 | Tough Cuff | 1:30pm | building in 70s, warm | LY/Kim | inside all morning - session right before he shifted outside |
| 21-Feb-14 | 58 | 85 | 87 | 46 | Tough Cuff | 8:30am | building in 70s, warm | LY/Kim | display before session - calm during session |
| 21-Feb-14 | 68 | 77 | 105 | 49 | Tough Cuff | 8:30am | | LY/Kim | in enclosure F |
| 21-Feb-14 | 72 | 76 | 99 | 58 | Tough Cuff | 8:30am | | LY/Kim | |
| 21-Feb-14 | 66 | 75 | 88 | 47 | Tough Cuff | 8:30am | | LY/Kim | |
| 26-Mar-14 | 80 | 94 | 118 | 62 | Tough cuff | 8:00am | building warm/70's patio access | LY/Kim | displayed before session |
| 26-Mar-14 | 74 | 86 | 99 | 49 | Tough cuff | 8:00am | | LY/Kim | patio access – separated from Dumadi |
| 26-Mar-14 | 86 | 89 | 112 | 66 | Tough cuff | 8:00am | | LY/Kim | patio access – separated from Dumadi |
| 18-Jul-14 | 78 | 81 | 107 | 61 | Tough Cuff | 1:00pm | building in 70's warm/patio access | LY/Kim | patio access/ displayed when he came inside |
| 18-Jul-14 | 79 | 81 | 102 | 63 | Tough Cuff | 1:00pm | | LY/Kim | |
| 18-Jul-14 | 77 | 75 | 101 | 54 | Tough Cuff | 1:00pm | | LY/Kim | |



More things to consider

3 readings a session /2-4 readings a month

PVC Tube method – different results

Comparisons across zoos = Document all factors

Only individual trends if different machines and/or methods

Will be valuable to get information from more adult male orangutans



Voluntary Blood Pressure Video



Video can be found on [Great Ape Heart Project website](#)



Thank you to:

Primate staff

Vet staff

Great Ape Heart Project

Adam Thompson – multimedia





Questions?



For more information:

Lyakubinis@zooatlanta.org

