COUNTY OF MILWAUKEE
INTEROFFICE COMMUNICATION

DATE : July 5, 2018

TO : Milwaukee County Board Chairman Theodore Lipscomb Sr.

FROM : Charles Wikenhauser, Director, Zoological Department

SUBJECT: Gorilla Exhibit Report

Per your request, attached is the gorilla exhibit report.

Charles Wikenhauser (cw)
Charles Wikenhauser
Director, Zoological Department

Attachment

cc: County Executive Chris Abele
Raisa Koltun, Chief of Staff, County Executive
Scott Manske, Comptroller
Supv. Jason Haas, Chair, Parks, Energy and Environmental Committee
Supv. Sheldon Wasserman, Vice-Chair, Parks, Energy and Environmental Committee
Kelly Bablitch, Chief of Staff, County Board of Supervisors
Joseph Lamers, Director of Performance, Strategy & Budget, DAS
Steve Cady, Research and Policy Director, Comptroller's Office
Erica Hayden, Research Analyst, Comptroller's Office
Kelsey Evans, Parks, Energy and Environment Committee Coordinator
Jeremy Lucas, Budget and Management Analyst, DAS

Case History for Gorilla Deaths and Subsequent Corrective Action

Onset

On April 12th, 2018, "Cassius", a 31 year old male Western Lowland Gorilla was immobilized for an exam. He had been lethargic for two days, not eating and had loose stool. His exam showed poor cardiac function and he was given fluids and antibiotics. He was recovering slowly but died overnight. His necropsy was performed by the Pathology Service of the University of Wisconsin School of Veterinary Medicine (UW–SVM) and revealed a large section of necro-hemorrhagic bowel with possible accompanying sepsis and heart changes suggestive of heart disease.

On April 26th, "Naku", an 18 year old female Western Lowland Gorilla, who had a 7.5 month old female infant named "Zahra", did not come off the indoor exhibit at the end of the day and didn't eat well. On April 27th, Naku slowly came down in the morning and seemed tired, but did eat and drink small amounts. She was closely monitored throughout the day and plans were made to immobilize her at 9:30 am on the 28th. Keepers monitored her overnight and she slept and continued to eat and drink small amounts. No diarrhea was seen. Zahra was a little vocal but otherwise fine.

On the morning of the 28th, Naku became medically unstable at 7:30 am. She and Zahra were immobilized and taken to the Animal Health Center. An ultrasound revealed fairly good cardiac function, but some suspicious views of her abdomen. Her kidney function was compromised as well. Zahra was examined and was found to be healthy. The veterinary resident consulted with Dr. Hurley, the zoo's veterinary surgical specialist, on possible courses of action. We could either take Naku to Dr. Hurley's clinic for a CT or Dr. Hurley could come to the Zoo to perform emergency exploratory surgery. It was determined to be too risky to move Naku so Dr. Hurley was asked to come in. Surgery revealed two feet of necrotic bowel. Naku's prognosis and required follow up care if the bowel was resected was discussed with the entire team. Naku was not compliant in taking medications so she would have had to either be darted daily or remained immobilized for follow-up treatments. Given her already compromised physiology and the fact that Dr. Hurley gave a less than 10% chance of recovery even if everything went perfectly, we made the decision to euthanize Naku. Dr. Haley Murphy, the Gorilla SSP Veterinary Advisor was also consulted via phone

throughout the procedure and agreed we had done everything she would have done.

Naku's necropsy was performed by the Pathology Service of the UW-SVM and showed multifocal extensive necro-hemorrhagic inflammation of the entire gastrointestinal tract. Due to severity, extent and location of lesions, pathologists suspected a similar underlying bacterial etiology for the GI disease in both gorillas.

Laboratory testing and results

GI contents collected from male Cassius at necropsy were sent for culture, which grew many E. coli, which was susceptible to all tested antibiotics and negative for Shiga toxin by EIA. The culture also grew many Bacteroides fragilis and few alpha-hemolytic Streptococci. Feces were negative for Salmonella, Shigella, C. difficile, Campylobacter, parasites and negative for viruses by electron microscopy. The E. coli isolate was sent to the E. coli Reference Center at Pennsylvania State University where it was typed out as a non-pathogenic O24:H18.

A fecal sample collected from female Naku the day prior to euthanasia grew E. coli on culture, which was susceptible to all tested antibiotics and negative for Shiga toxin by EIA. Intestinal samples collected at necropsy were sent to both medical and veterinary laboratories for routine microbial cultures which grew rare E. coli, and few to many Streptococcus group G and alpha-hemolytic Streptococcus. Intestinal contents were negative for Salmonella, Shigella, E coli O157:H7, Aeromonas, Plesiomonas, Bacteroides fragilis, and C. difficile. GI contents were negative for Campylobacter at the medical lab but positive for Campylobacter hyointestinalis as the veterinary lab. One fecal sample was positive larva on float and for Giardia lamblia but negative for other parasites.

Intestinal contents from female Naku collected at surgery were also sent for DNA testing for microbe identification and Biofire PCR testing for GI pathogens. Next generation DNA sequencing identified E. coli as the second most common bacteria at 16%. Resistance genes identified included beta-lactam, macrolide, aminoglycoside and quinolone. PCR testing using the Biofire Diagnostics Film Array instrument indicated the presence of Enterococcus faecalis, enteropathogenic E. coli (EPEC), and Shigella/Enteroinvasive E. coli (EIEC). Multiple other pathogens (including Giardia lamblia) were not detected by PCR testing.

As soon as it was determined that a pathogenic E. coli had been detected, the Commissary Manager also checked the sourcing of the zoo's romaine lettuce as this was also the time when E. coli had been found in romaine lettuce from Yuma, AZ. It was confirmed that the zoo's lettuce source was California, not Yuma, AZ.

In an effort to determine how the gorillas may have come into contact with the infective pathogen, a veterinary microbiologist/epidemiologist from the Wisconsin Veterinary Diagnostic Laboratory was brought in to conduct environmental testing of the indoor exhibit and water system. Exhibit water and holding water from lixits showed low to non-detectable levels of chlorine, even though water testing by the City of Milwaukee Water Works showed sufficient to high levels of chlorine. This drop in chlorine levels was suggestive of a high biological demand in the gorilla water system. A combined sample of water collected on 3 May 2018 from all the Lixits in gorilla holding showed elevated numbers of E. coli. Subsequent tests of the water from individual Lixits did not show elevated numbers of E. coli.

Third potential case

During the environmental testing, a male bonobo also started to show similar symptoms to Cassius and Naku: inappetance, diarrhea and lethargy. He was immobilized, taken to the Animal Health Center, and started on a course of ertapenem, an injectable antibiotic. He recovered quickly. Biofire PCR testing of feces indicated the presence of EIEC. Next generation DNA sequencing did not identify any E. coli, although a fecal culture was positive for E. coli susceptible to all tested antibiotics and negative for Shiga toxin by EIA.

Corrective actions taken

Necropsy findings were consistent with a pathogenic colibacillosis. Fecal and water testing supported this hypothesis and consulting microbiologists indicated that these findings were strongly suggestive of a water borne pathogen. The drinking water lines for the animals were turned off and clean water was brought in from other sources to water the animals. The water lines for gorilla and bonobo holding were disinfected with high level chlorination. All galvanized pipes leading to the Lixits were replaced with copper piping, and all the hoses, hose reels and Lixits were removed and replaced with new items. Subsequent water testing has shown no E. coli.

Further, the sand substrate from the indoor exhibit has been removed, the hard surfaces will be disinfected the week of the July 2nd and new substrate will be placed.

It is our contention that the outdoor exhibit is not problematic as the only animals to became ill were those that had spent time in the indoor exhibit.

Follow-up on Zahra

Zahra was transferred in to 24/7 human-assisted rearing upon the death of Naku. During the 6 weeks she was in human care, we were fortunate to have human-assisted rearing consultants from Lincoln Park Zoo, Woodland Park Zoo and Columbus Zoo periodically come to Milwaukee County Zoo to assist us in providing appropriate care for Zahra. The Gorilla SSP was instrumental in helping coordinate their participation and we deeply appreciate their assistance.

It was originally advised by the Gorilla SSP to try and reunite Zahra with our remaining female, Shalia, as soon as possible. But upon further discussion of our situation, it was decided this was not the best course of action for two reasons:

1. We did not have a stable gorilla family group.
2. Shalia already had a 3.5 year old male juvenile, Suliaman. It was unrealistic for her to be able to care for an infant and monitor the activities of Suliaman.

Therefore, the SSP recommended Zahra be transferred to an AZA zoo with a proven gorilla surrogate program. Columbus Zoo was identified as the best choice. On June 13th, Zahra was driven to Columbus Zoo. She was accompanied by two Milwaukee County Zoo zookeepers and a Columbus Zoo staff member that she was already very familiar with and a veterinarian from Columbus Zoo. She safely arrived in Columbus and has been introduced to her surrogate mother.

Plans for Remaining Gorillas

The Gorilla SSP is very aware that we still house a solitary female gorilla and her almost 4-year old, male offspring. We are working with the Gorilla SSP to identify the best long-term housing and management for both of them and act on that recommendation as soon as possible.

Our two remaining males as a bachelor group are not recommended for breeding so they are not recommended to pair with Shalia. However, she does have visual access to them and is comforted by their presence.