

2009 Elephant Population Management Program



Introduction

Elephant population management is one of the most critical conservation issues facing many areas in Africa. Wildlife managers are struggling with growing elephant populations and limited management options. Since 2001 our team has been working with conservationists and wildlife officials with the goal of providing an elephant management tool that can be used to maintain biological diversity and reduce the need for culling. Surgical sterilization is a permanent contraceptive technique that is used around the world and is one of the most common methods of birth control in both animals and humans. A vasectomy is one method of surgical sterilization that has the advantage of maintaining normal hormone levels and thus breeding and social behaviors remain unchanged. Elephants that have been vasectomized will continue to go into musth, breed (although sterile) and maintain their social status within the population.

There are several advantages for using vasectomy as a population management tool over the limited number of other methods of population control. The first is that while anesthesia and surgery are relatively invasive, vasectomy is a one-time procedure which does not require further manipulation of the individual animal. This is also a very flexible tool and application on pre-selected bulls can allow wildlife biologists the ability to determine what level of birthrates best fit their unique situation. In some cases, 0% birthrate may be optimal, while in other parks some degree of calving (e.g., 1-6%) may still be desired. The reduction in birthrate is directly proportional to the percentage of dominant breeding bulls that have been vasectomized.

Elephant Anesthesia and Positioning

Maintaining the health of our elephant patients during and after the surgical procedure is our highest priority. Several new and innovative techniques have been developed to assure patient safety. Bull elephants are identified by local wildlife biologists, pursued by helicopter and then darted with the potent anesthetic agent, etorphine. An experienced wildlife capture team is used for this specialized procedure to ensure the safety of the elephant patient and project personnel. Once anesthetized, the elephant is suspended by a crane truck using heavy straps that support the head and body.



With the elephant in this modified standing position, both sides of the patient are

simultaneously accessible for surgery, thereby minimizing total procedure time. Due to their great size, unique elephant equipment has been developed to safely anesthetize, maintain and monitor these animals during surgery. An endotracheal tube is placed in the elephant's trachea and the animal's respirations are assisted using a portable ventilator system. While

anesthetized, a wide variety of important physiologic parameters are measured to monitor the patient's health including blood pressure, oxygen saturation, end tidal carbon dioxide, body temperature, heart rate, respiratory rate and blood gas analysis. The equipment that has been

developed and the information gained from these procedures will greatly contribute to future surgical and anesthetic management of both free ranging and captive elephants. After surgery is complete, the elephant is lowered from its suspended position and the anesthetic reversal agent is given. The patient typically wakes up and walks away in less than five minutes.



Elephant Anatomy and Specialized Surgical Equipment

Unlike most mammal species, elephant testes are internal and can be found adjacent to the kidneys. Recent advances in medical technology allow surgical access to the elephant's reproductive organs using minimally invasive laparoscopic instrumentation and protocols. With the

use of this technique, a rigid laparoscope, with camera attachment, is introduced into the elephant's abdomen to allow the surgeon to manipulate the internal organs while viewing a television monitor. Since only a small incision is necessary, there is less chance for infection, the surgery time is much faster and there is less post-surgical discomfort and complications. Inspired by the needs of this project, KARL STORZ has developed several unique laparoscopes for use in elephants and other large animals. These operating laparoscopes have working channels that allow a variety of specially designed instruments to perform a range of surgical procedures including vasectomy.



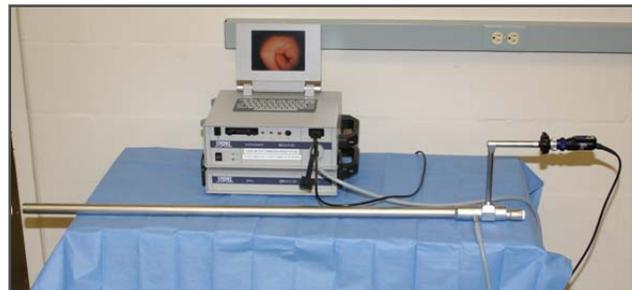
Laparoscopic Vasectomy Surgery

Once in position, the elephant is prepared for surgery with a disinfectant scrub of the

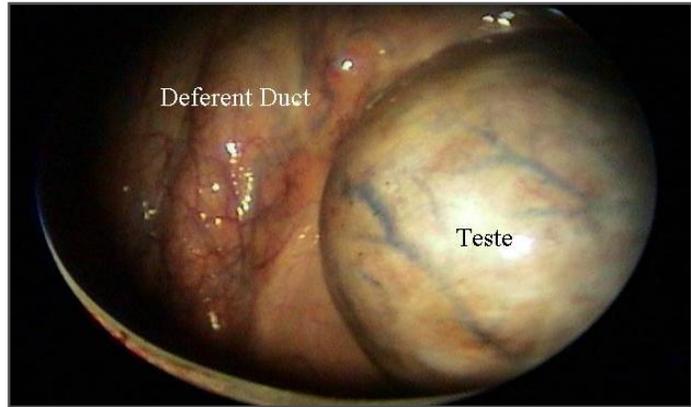
elephant's skin and the area is then covered with sterile drapes. The primary incision is approximately 10 cm long and made just in front of the elephant's tuber coxae, or point of the hip. The laparoscope is placed through the elephant's body wall and pressurized air is delivered into the abdomen to increase the size of this space for better viewing of the



internal organs. To minimize surgical time, two teams work simultaneously on each side of the elephant. The testes, epididymis and the deferent ducts can be found suspended just next to the spine and close to the kidney.



The deferent ducts are clamped and a laparoscopic scissor is used to cut and remove a 4-6 cm portion of the sperm carrying ducts. Surgical times are relatively short, with most procedures lasting less than one hour.



Post-Operative Monitoring and Long Term Follow-Up

All vasectomized bulls are closely monitored following surgery. Our goal is to ensure that there are no post-operative complications, and to have on-site staff routinely observe these animals for any potential negative side effects. Our work with free-ranging elephants has demonstrated that these animals recover quickly from this minimally invasive surgery and return to normal behaviors. Generally, the elephant's incision heals in less than a month and it is often difficult to see a scar at six months.



Recent Population Management Programs

In July 2006, four bull elephants at the Welgevonden Game Reserve had complete laparoscopic vasectomies performed as part of a pilot study into the feasibility of this technique as a population control tool in elephants. The local ranger staff and research biologist have been monitoring this elephant population since the program was initiated. All the bulls have healed well and have shown no negative behavioral or social effects from the procedure. The research study at Welgevonden helped document that vasectomized bulls continue to go into musth, chase away subdominant bulls, and continue to breed with elephant cows as they did prior to surgery.

In July 2007, an elephant population control program using laparoscopic vasectomy was initiated by the Mpumalanga Parks Board at the Songimvelo Game Reserve in South Africa.



In 2008, this elephant population control tool was initiated at the Pongola Game Reserve in Kwa Zulu-Natal, South Africa. Seven bull elephants were sterilized via laparoscopic vasectomy. In partnership with the Space For Elephants Foundation, the entire elephant population at Pongola is part of a long-term research project that will document elephant population dynamics and be part of behavioral observation studies until 2011. Furthermore, genetic profiles of vasectomized bulls and any subsequent calves produced from associated herds are obtained so parentage and social reproductive issues can be monitored. This work is providing specific data concerning the expected decrease in birth rates after the vasectomy program has been initiated, while monitoring for any change in social behaviors. In addition to performing a contraceptive service to the Parks Board, the project team has provided innovative and valuable information to a variety of African wildlife managers, biologists and veterinarians regarding elephant anesthesia and surgical techniques. Consistent with the project objective of capacity building, the sharing of these developed skills has already been initiated. Faculty veterinarians from the University of Pretoria's Onderstepoort Veterinary Academic Hospital (OVAH) are involved and have learned how to perform the procedure.



This is an international collaborative project that brings together conservation groups, universities and private industry to address this complex problem. We recognize that surgical vasectomy will not provide the solution for the controversy of controlling very large elephant

populations. Additionally, further research will be necessary to fully understand if the procedure may have any negative impact on the individual elephant, its herd, or the ecosystem. It is our hope that this team of dedicated professionals can provide a new tool and a legitimate option for elephant population management.

Project team

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Corporate Sponsor

KARL STORZ, Tuttlingen, Germany. Design and manufacture of specialized laparoscopic surgical equipment. **Doug Merker**, President, Karl Storz Veterinary Endoscopy.



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