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Mongabay Series: Asian Rhinos

With poaching curtailed, a new menace to Nepal's wildlife

17 May 2017 / **Alex Dudley**

Diseases spread by domestic animals pose increasing danger to rhinos and other vulnerable species.

- *Since 2011, with poaching largely under control in the country, conservationists in Nepal have been paying increasing attention to the risks of diseases spreading to wildlife from domesticated animals.*
- *Domesticated animals near Chitwan National Park form a reservoir of pathogens that could cross to wildlife. Veterinarians have already identified tuberculosis in a dead rhino and a suspected case of canine distemper in a leopard.*
- *The country currently lacks facilities to fully analyze and respond to the threat of diseases, but local and international groups are working to rapidly increase capacity.*

SAURAHA, Nepal — Since the 1980s, SARS, Ebola, HIV, and other diseases originating in wildlife have hit global headlines due to their devastating impact on human and livestock populations. By comparison, diseases blighting wildlife populations, including those transmitted from humans and domestic animals, are largely overlooked.

A few outbreaks have received considerable publicity — like the mass die-off of bats due to white-nose syndrome — but even conservation experts have only recently begun to fully appreciate the magnitude of the threat posed to endangered species by disease.

Nepal offers a case in point. With poaching of rhinos, tigers, and elephants largely stemmed in the country since 2011, Nepalese conservationists and their foreign partners have begun awakening to a new menace on the horizon that experts say threatens to undo the country's extraordinary conservation progress.

In March 2016, officials of Chitwan National Park, home to over 90 percent of the country's greater one-horned rhino (*Rhinoceros unicornis*) population, encountered a dead rhino in the park's western Amartali buffer zone. The previous day, conservationists had seen the animal

behaving lethargically. That, combined with the rhino's intact horn, ruled out poaching as the cause of death. Upon performing an autopsy, scientists from Nepal's National Trust for Nature Conservation (NTNC) made a startling discovery. Granulomatous lesions, the hallmark of tuberculosis, lined the rhino's lungs, making this female the first recorded individual of any of the five rhinoceros species to exhibit the disease.

More recently, in November 2016, a common Asian leopard (*Panthera pardus fusca*) was observed for several days on the outskirts of villages in the Himalayan Palpa District. The leopard showed no inclination to confront villagers or attack livestock, and as with the Chitwan rhino before its death, appeared gravely ill.

Conservationists brought the dying animal to NTNC's Chitwan office in Sauraha, where veterinarians fought hard for two days to save its life. Their efforts were in vain. While the leopard remains to be diagnosed, its behavior led the NTNC vets to suspect "canine" distemper, a virus that in spite of its name devastates numerous mammalian carnivores and is not necessary transmitted by domestic dogs.

These two cases highlight the long and perilously neglected danger posed by wildlife diseases in Nepal.

A rhino family in Chitwan national park. Photo courtesy of Veterinary Initiative for Endangered Wildlife (VIEW).

“We have a potential soup kitchen of pathogens that needs to be investigated,” U.S. veterinarian Deborah McCauley said about Chitwan’s domestic animal population in an interview in Sauraha.

Investigations already conducted among livestock have uncovered alarming results. A recent study of 100 domestic dogs in Chitwan’s buffer zones conducted jointly by the NTNC, Washington State University, and McCauley’s organization Veterinary Initiative for Endangered Wildlife (VIEW) yielded 27 individuals with canine distemper, the disease which killed at least four Bengal tigers (*Panthera tigris tigris*) in neighboring India in 2013. Furthermore, over ten domestic Asian elephants (*Elephas maximus*) in Nepal died of tuberculosis between 2002 and 2014, and in 2015, a comprehensive screening of captive elephants throughout the country found that 13 percent carry TB antibodies.

In interviews conducted at the organization’s office in Sauraha outside Chitwan NP, NTNC staff explained that they have struggled to fully understand and respond to the new threat of wildlife diseases in Nepal. The country lacks sophisticated facilities to house and diagnose blood and tissue samples, limiting current knowledge of how diseases originate and transmit between species.

“That type of work, diagnostic work, in wildlife is just progressing,” said Kamal Gairhe, a veterinarian with the country’s Department of National Parks and Wildlife Conservation. “It is not in [an] advanced stage, so we have a lot to do in this field.” At present, any discussion of how the Chitwan rhino became stricken with TB or how the leopard became infected with suspected distemper must remain speculative.

However, since livestock comprise the main reservoir of wildlife diseases across the globe, the NTNC has concentrated on cattle and dogs inhabiting Chitwan’s buffer zones as the prime suspects. Until the mid-1950s, the prevalence of malaria in Chitwan largely deterred human settlement. But in 1954, the Nepalese government began a successful campaign to eradicate malaria from Chitwan. Subsequently, waves of migrants from the country’s overpopulated hill regions settled in the area over the last half-century, accompanied by large numbers of livestock.

 A herd of cattle in the Baghmara Community Forest near Chitwan National Park. Livestock are a potential source of diseases like tuberculosis. Photo by Alex Dudley.

The cattle herds in the buffer zone and burgeoning stray dog population around Sauraha may have long acted as a reservoir for wildlife diseases even as the Nepalese government and NTNC focused on more obvious threats.

“Historically, conservation has been [focused on] habitat encroachment and poaching,” said McCauley, who has been working with NTNC-Sauraha veterinary staff since 2010 to properly diagnose and confront wildlife diseases in the park. “And even if a tiger leaves the park, or a rhino leaves the park…that tiger may be leaving the park because there’s a disease component. But historically it’s always been ‘Habitat encroachment! That’s the answer!’ And there’s got to be other reasons.”

In 2012, McCauley founded VIEW upon discovering that no organization focused on countering diseases transmitted from livestock to wildlife. In her previous fieldwork, she witnessed the devastation wrought by canine distemper in both black-footed ferrets (*Mustela nigripes*) in the western United States and carnivores in the Serengeti, where a third of the resident African lion (*Panthera leo*) population and nearly all resident African wild dogs (*Lycaon pictus*) perished from the disease in the mid-1990s. McCauley spoke urgently about what she portrayed as a ticking time bomb posed by diseases to wildlife in Nepal and beyond.

Nepal has roughly 30 million people, each of whom has an average of five animals, McCauley said. The possibility of those domesticated animals transmitting diseases to wildlife “is the most

threatened, unaddressed threat to our endangered species," she said. "I know for a fact that is true. But [diseases] could potentially be *the* threat to our endangered species, period."

Tourist safari elephants pass a one-horned rhino in Chitwan National Park. Domesticated elephants like these are potential sources of tuberculosis infections in wildlife. Photo by Alex Dudley.

Among the pathogens in Chitwan's "soup kitchen" are the closely related species within the *Mycobacterium tuberculosis* complex. Scientists have long recognized the menace posed by *M. tuberculosis*, the typical human pathogen infecting both Asian elephants and 3 million people in South Asia.

The Chitwan rhino casualty represented a newly recognized pathogen, *M. orygis*, originally diagnosed in captive Arabian oryx (*Oryx leucoryx*), and more recently identified in other antelope species, humans, spotted deer (*Axis axis*), rhesus monkeys (*Macaca mulatta*) and domestic cattle. While the original host of *M. orygis* in Chitwan remains at large, NTNC veterinarian Amir Sadaula said that the organization is currently investigating domestic cattle in the buffer zone as a potential reservoir.

Sadaula said that the rhino with *M. orygis* may have contracted the disease from livestock because the dead animal was found in a buffer zone: "It was not in a core area and it is the buffer zone where this rhino was a regular interface with domestic livestock, grazing livestock. In the

buffer zone, there is more chance that the rhino and livestock will come to graze together in the same grass and are in the same water."

In the ongoing detective story of rhino tuberculosis, domestic elephants are also being investigated as suspects. Sadaula noted that the elephant TB cases recorded so far in Nepal and other South Asian countries represent *M. tuberculosis* and not *M. orygis*. However, the infected rhino died in an area which formerly hosted tourist elephant rides, a popular means for park visitors to spot wildlife in the area's high grass. Therefore, the NTNC is studying whether domestic elephants can transmit tuberculosis (either *M. tuberculosis* or *M. orygis*) to rhinos and deer encountered during anti-poaching patrols or safaris.

Amir Sadaula demonstrates laboratory techniques to veterinary students. Photo courtesy of VIEW.

"We are working on the one-health approach because we can see that the elephant is traveling across the river and across the road, and they are coming into contact with all the human and the domestic animals," Sadaula explained. "And finally, when [the elephants] are taken to the safari, they are in contact with the jungle animal in the wild." To hinder the further spread of

tuberculosis to wildlife, he added, over the last five years, scientists have conducted a large-scale campaign to screen both privately owned and government elephants for the disease.

As with the Chitwan rhino, no smoking gun exists as to the origin of suspected distemper in the Palpa leopard. However, since domestic dogs are among the favored prey items of leopards throughout Asia, NTNC vets currently suspect the animal may have contracted distemper from feeding on a canine stricken with the disease. According to Sadaula, distemper might be transmitted from domestic dogs to smaller carnivores regularly visiting the buffer zones, such as civets, leopards, and jackals. In turn, these animals could carry the virus to the park's core, where tigers and Asian wild dogs (*Cuon alpinus*) generally remain.

Beyond distemper's potential to devastate endangered carnivore populations, Sadaula added, the virus could indirectly pose a menace to Nepalese villagers: neurological and muscular degeneration observed in the country's infamous man-eating tigers could be the hallmark of the disease, causing the animals to seek out human prey. "We cannot say that [the tigers] have canine distemper but neither can we rule out canine distemper in such scenarios," he said.

Fortunately, just as the growth of wildlife numbers in Nepal owes to collaboration between rural communities and Nepalese army units against poaching, the country appears intent on demonstrating the same concerted and multifaceted approach to nip the threat of diseases in the bud.

Deborah McCauley (center) with students participating in the dog distemper study. Photo courtesy of VIEW.

This year, NTNC-Sauraha staff, in collaboration with VIEW, aim to collect serum samples from around 500 domestic dogs in Chitwan's buffer zones, and another 500 samples next year, to screen for canine distemper. According to Sadaula, within the next two or three years, the NTNC vets plan to test every individual dog in the buffer zones for the disease. "[Tuberculosis and distemper] are the most important diseases which can hamper our wild population and we are targeting both of these diseases this year," he said. Concurrently, he added, the NTNC aims to vaccinate over 10,000 livestock in the buffer zones this year against foot-and-mouth disease.

In recent months, Nepal has gained key ground in its battle against wildlife maladies. In December, the NTNC office in Sauraha obtained a thermal cycler to diagnose blood samples from wildlife. In January, ground broke on the construction of an upgraded NTNC veterinary facility in Sauraha, an endeavor funded in part by Denver-based conservation organization Team Nepalorado. This facility will begin operating in mid-2018 and will play a critical role in allowing the NTNC to finally diagnose and counter wildlife diseases, as well as housing and treating sick animals. "After the establishment of the lab … no disease will go unnoticed," Sadaula said.

Despite the ever-present challenges to conservation in Nepal, McCauley remains optimistic that the country can prevent disease from negating the country's gains over the last decade. "They've done a great job on poaching," she said. "Let's investigate the natural causes. I'm really, I'm super impressed with the work that Nepal does…No matter how hard maybe life is in Nepal, they are at the forefront, really, in helping in conservation and have the foresight to listen."