

Nsaids killing vultures (really....you have to read this)

Source: <http://sci.tech-archive.net/Archive/sci.med.cardiology/2005-02/0084.html>

From: Zee (zwalanga_at_yahoo.com)

Date: 02/02/05

Date: 2 Feb 2005 14:39:12 -0800

<http://www.signonsandiego.com/news/science/20050202-9999-lz1c2vulture.html>

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Diclofenac (pronounced dye-KLO-fen-ak) is a nonsteroidal anti-inflammatory drug (NSAID) commonly used by arthritis sufferers. Recently, Indian and Pakistani veterinarians had started using it for livestock, as well. A few inexpensive injections can get an arthritic cow or water buffalo back on its feet, a valuable boon in a culture where farmers still use animals for plowing.

NSAIDs are typically considered safe for cattle and water buffalo (although some, such as Vioxx, have come under scrutiny due to links to heart attacks in humans). But overdoses of NSAIDs can cause kidney damage. Doctors and veterinarians know what doses are safe for people and cattle, but nobody had ever tested them in birds. And, Oaks was soon to discover, birds – or at least vultures – are unusually sensitive to kidney damage from NSAIDs.

All that remains

Asian vulture populations are being felled at an alarming rate by arthritis drug

By Richard A. Lovett
UNION-TRIBUNE

February 2, 2005

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Scientists believe three species of vultures on the Indian subcontinent, including the Oriental white-backed vulture (above), will likely become extinct in the near future.

When the first Europeans arrived in America, one of the most numerous birds was the passenger pigeon, which, as recently as the mid-1800s, darkened the skies in flocks containing hundreds of thousands or even millions of birds. But by 1914, the birds were gone – exterminated by hunting and habitat destruction in one of the most dramatic die-offs in history.

Today, a depressingly similar die-off is occurring in India and Pakistan, and again, humans are the cause. As recently as a decade ago, tens of millions of vultures ranged across India, Pakistan, Nepal and neighboring countries. These birds we

re believed to be the most numerous raptors in the world, so numerous that nobody even bothered to count them, says Rick Watson, director of international programs for The Peregrine Fund, headquartered in Boise, Idaho.

Historically, the birds coexisted easily with humans because farmers had discovered that they served as efficient, inexpensive cleanup crews. When an aging cow or water buffalo died, there was no need to bury it; you simply hauled the carcass to a field and left it for the vultures. Biologists estimate that in the 1990s, dead farm animals were the birds' primary source of food.

But in 1999, naturalists reported a decline in vultures in parts of India – a decline that has continued at alarming rates. Where once a buffalo carcass might have drawn a hundred or more birds, today's carcasses often draw no vultures at all, says J. Lindsay Oaks, a professor of veterinary medicine at Washington State University.

Oaks is part of a team of researchers recruited by The Peregrine Fund to investigate the vultures' decline. In 2000, the scientists staked out the three largest remaining vulture-nesting sites, in Pakistan. At the time, these sites had a total of about 1,500 breeding pairs. Now, there are no vultures left at two of the sites, and the third is down to less than a quarter of its original numbers.

The goal, however, was to do more than simply catalog the birds' decline. In a scientific detective story ranging from Pakistan to San Diego, team members pursued the killer, finding that, for once, it had nothing to do with hunting or habitat encroachment. Rather, the culprit proved to be a surprising side effect of a drug called diclofenac, a normally benign substance in the same family as ibuprofen.

Toxin search

Like any good episode of the hit TV series "CSI," the diclofenac story begins with experts studying a dead body. Or in this case, many bodies. But first, the scientists needed to collect dead birds for examination, something that proved unexpectedly difficult. "We thought that with all of these birds dying, it would be easy to get samples," says Oaks. "But it required an intensive amount of manpower."

The problem was that the biologists faced stiff competition from wild dogs. "Anything sick or dead that hit the ground got scavenged, right away," Oaks explained at a meeting of the Society of Environmental Toxicology and Chemistry, last fall in Portland, Ore. "Here we were, witnessing one of the greatest bird die-offs in history, but it was hard to get specimens."

Eventually, the biologists realized that the best way to beat the dogs to the carcasses was to look for birds that tangled in tree limbs when they died, rather than falling to the ground. When the locals found out what was needed, Oaks added, "we created a nice little cottage industry in tree-climbing."

That allowed the team to collect 259 birds, most of which proved to have died of kidney failure. That's an easy condition to diagnose, Oaks says, because it causes uric acid, a substance normally excreted by the kidneys, to accumulate in the birds' bodies, coating their internal organs in a white crust called "visceral gout."

But knowing that the birds were dying of kidney failure wasn't the same thing as knowing why their kidneys had failed. The biologists therefore took tissue samples from 28 birds that had died of visceral gout and 14 others that died of other causes, such as being struck by automobiles. These samples were then shipped to Oaks' lab in Pullman, Wash., which then shipped microscope slides to Bruce Rideout, chief pathologist at the San Diego Zoo.

In retrospect, Rideout says, one of the team's greatest accomplishments was studying these samples systematically, rather than single-mindedly trying to confirm a predetermined hypothesis. "When something catastrophic like this happens, there's a temptation to jump to a conclusion," he says. "And because of the way it was spreading, a lot of investigators assumed this had to be an infectious disease."

But infectious diseases don't usually cause visceral gout, and the kidney damage didn't look like anything normally caused by viruses or bacteria. That's because infections cause white blood cells to rush to the site of the infection, and Rideout and the other pathologists found little sign of the type of inflammation this would cause.

Although the team continued to cover its bases by searching for a pathogen, Oaks and Rideout were already wondering whether the birds were being killed by a fast-acting toxin. To test this, they conducted toxicological screens for what Oaks calls the "usual suspects,"

including heavy metals and pesticides. But the results came up negative.

Having ruled out the obvious, Oaks turned to the not-so-obvious. In particular, he began wondering whether there could be a link to the fact that the birds ate dead farm animals. Could something in the livestock be toxic?

To find out, he compiled a list of veterinary drugs sold in India and Pakistan, looking for something known to cause kidney damage – something that had only recently come into widespread use.

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Uncertain future

The first confirmation came when the scientists ran new chemical tests and found traces of diclofenac in all the birds that had died of the mystery disease – and none in those that died of other causes.

That's about as close to finding a smoking gun as a statistical analysis can ever come, but the researchers still needed to prove that an animal carcass could contain a fatal dose of diclofenac. Therefore, the biologists in Pakistan treated goats and water buffalo with the drug, butchered them, and fed the meat to injured vultures that would have been euthanized, anyway.

Most died of kidney failure, particularly those that gorged most heavily on the contaminated meat. Oaks' team reported its findings a year ago in the journal *Nature*. But skeptics still questioned whether diclofenac use could be widespread enough to account for the rate at which the vultures were dying.

A team of British researchers led by Rhys Green, of England's Royal Society for the Protection of Birds, set out to find the answer. In a study published last year in the journal *Applied Ecology*, the team

created a computer simulation of vultures eating water buffalo carcasses. They found that given the birds' feeding habits, the population would indeed crash if as few as 1 in 130 carcasses (and possibly as few as 1 in 760) contained diclofenac.

In addition, Oaks' market studies found that large quantities of veterinary drugs, including diclofenac, are indeed used in Asia. "It's widely available," he says, "and cheap."

Luckily, there appears to be little risk to vultures in other parts of the world, such as Africa, where such drugs might also be inexpensive and widely available. That's because Africans do not dispose of carcasses by leaving them for scavengers, says Rideout. They're also much more likely to butcher animals before they become old enough to develop arthritis.

But the future looks bleak for Asian vultures. "There are three different species," says Watson. "Of these, the slender-billed vulture is in such low numbers that last year we only knew of one or two breeding pairs, anywhere. This species may already be functionally extinct (meaning that there are no longer enough animals to reproduce in the wild)."

As for the other two species, one is the Oriental white-backed vulture, which his team has been monitoring in Pakistan. Although this year's count isn't complete, it appears that the largest surviving colony is down to about 100 pairs.

And that's only because last year, once diclofenac was discovered to be the culprit, his team managed to slow that colony's demise by setting up a "vulture restaurant" of uncontaminated food. Even so, the number of birds has fallen by approximately 35 percent since last year.

The third species, the long-billed vulture, tends to live in very remote locations and is less severely affected. "I would give that species a few years until extinction," Watson says.

One solution

In America, we might be able to react quickly to a straightforward problem, once the cause is known. In fact, Oaks says, we've already dealt with a similar concern by making it illegal for farmers to allow scavengers to eat carcasses of animals "put down" with certain drugs, because the drugs can kill eagles.

But so far, only one Indian state, Gujarat, has taken official action, prohibiting state-employed veterinarians from using diclofenac. That sounds like a positive move, but given the ready access to the drug in village stores, it would take much more than that to halt the birds' decline.

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In the short run, the answer is captive breeding. Luckily, two of the leading organizations involved – the San Diego Zoo and The Peregrine Fund – have extensive experience with such programs. In fact, The Peregrine Fund was created in 1970 to save peregrine falcons from extinction when it was discovered that their populations were being decimated by DDT. (Now, peregrines are again thriving in the wild.)

Rideout is optimistic that future generations will also watch vultures soar the skies of Asia. "The fact that we got answers very quickly," he adds, "will enable us to intervene and make sure that they don't become the passenger pigeons of the 21st century."

Watson is a little less sanguine. U.S. animal–importation rules make it necessary to carry out the captive breeding program in Asia, he says, and so far, nobody has stepped forward to do the work. "Breeding birds of prey in captivity is really a lifestyle, rather than a job," he says. "We haven't yet found individuals willing to dedicate their lives to it, and that's what it takes. The key is finding those individuals."

Richard Lovett is a freelance writer in Portland, Ore. and frequent contributor to Quest.