
Science & the Environment

18/02/04 **Vultures, Dying faster than the Dodo: Asian vulture populations collapse due to unregulated use of Veterinary medicine** by Edward Teague
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Vultures in the Asian tropics are graceful soaring raptors, on the ground they are repulsive, noisy, carrion eaters with few table manners and even fewer friends.

The commonest vulture, said to be the most abundant raptor in the world with a global population exceeding 10 million in the early 1990's, is the White backed Vulture (*Gyps bengalensis*), said to be more common than the pigeon in South Asia. Associated species, the slender billed (*Gyps teneirostris*) and Long billed (*Gyps indicus*) were, up to a decade ago, also common, but not as plentiful.

The first signs of a massive population crash of all 3 species was first noticed and reported from the Keolado National Park near the N. Indian town of Bharatpur where nesting pairs declined from 353 in 1987/88 to 20 in 1998/99 with none recorded in 1999/00 and 2000/01 and only one bird seen in 1999/00.

Sacred Birds

The Parsees of Bombay (Mumbai) of the Stones of Silence Temple, whose Zoroastrianism, a relict of their home in ancient Persia forbids burial and cremation, left their dead to be devoured by the flocks of vultures, which, as they are sedentary and not migratory, never left the Temple's grounds. This apparently bizarre form of dealing with the dead reflects their belief that the vulture helps release their spirit. The vulture is, also sacred to the Hindu, having rescued Sita's wife of the God King Ram from bondage.

The flocks of Temple vultures were familiar to Dr Vibu Prakash of the Bombay Natural History Society. In 1989 observing sickening birds, listless and evidently unwell, and inexplicably dying. He found after autopsy, evidence of kidney degeneration which he attributed to an unknown viral infection.

The result was, that the Indian Government with funds from the Darwin Institute for the Survival of Species, funded by the UK Government, through the Department of Environment and Farming (DEFRA)) set up a centre for research at Pinjore near Haryana, and arranged for Dr Prakash to have 6 months UK based training.

Avian virus suspected

In late 2002 he was able to report in further detail on the decline in vulture populations in the Indian sub-continent (*New Scientist* 8/10/02) in which it was felt that the widespread evidence of kidney failure was viral in origin, although Andrew Cunningham of the Zoological Society of London, who had undertaken some of the research, was reported as saying that "there was no evidence of any known virus".

Further research, different answers

At the 6th World Conference on Birds of Prey and Owls, held in Budapest, 18-23rd May 2003 Lindsay Oakes, from Washington State University reported the preliminary research results of the Asian Vulture Crisis Project, a joint effort of the Peregrine Fund, of Boise, Idaho, and the Ornithological Society of Pakistan which were fully reported in Nature 16/02/04 and was funded by a wide range of private and public scientific charities and funds in North America.

Between 2000 and 2003 16 colonies with 2,400 active nest sites of the White Backed Vulture were studied in four districts of Pakistan. They report high annual adult and sub-adult mortality of up to 86%, resulting in population declines of 34 – 95%.

Of 259 gross post mortems, 85% showed crystalline uric acid deposits characteristic of visceral gout, the consequence of rapid renal failure resulting in hyperuricaemia and widespread uric acid deposits in and on soft internal organs. Subsequent detailed necropsies on 42 freshly dead birds showed 66% with visceral gout, the remainder showed no evident cause (7 birds) and the rest, lead poisoning, gun-shot trauma and possible intestinal foreign bodies and organophosphate poisoning.

The corpses with visceral gout showed clear evidence of toxic renal failure. Additional testing showed evidence of an identifiable disease in one bird (infection with *Mycobacterium avium*), and intensive screening tests on soft internal organs for infectious bronchitis virus, avian influenza and West Nile virus were negative. Further tests for metal toxins, organophosphate and organochlorine pesticides and Polychlorinated Biphenyls showed very low sub-toxic levels or were not detected.

Based on the possibility that a veterinary chemical product or its residue in the corpses the vultures ate, could be the cause of renal dysfunction, it was decided, as a result of the new and widespread use of diclofenac as a veterinary cure-all for lameness, fever and general well being, to test for any diclofenac residues. Liquid chromatography and mass spectroscopy were used and 25 (100%) birds with renal failure symptoms, showed residue concentrations and none out of 13 that had died of other causes.

Further experimentation on live birds, showed diclofenac at mammalian level dosages rapidly induced hyperuricaemia. Subsequent experimentation showed that birds fed on buffalo and goat meat from diclofenac treated animals resulted in renal failure and death, but not when fed untreated animal flesh. Oral dosage of birds with diclofenac confirmed the connection.

The conclusion was that residues of veterinary diclofenac in fallen stock, eaten by vultures are directly responsible for the White Backed Vulture's population collapse in Pakistan, and possibly elsewhere.

What is Diclofenac ? How does it get into Vultures?

Diclofenac is one of a class of drugs called Non Steroidal Anti-inflammatory Drugs, (NSAID's) which includes familiar non prescription (in the UK) products such as Ibuprofen and are recommended for relief from muscle, joint and arthritic pains.

It's mode of action, as in all analgesics and NSAID's is not known, although it is thought to inhibit the release of prostogladins by inhibiting the action of an enzyme, prostoglandin cyclooxygenase. Prostoglandins are locally acting hormones that modify signals across nerve endings, or synapses and also act as vaso-diliators.

Ciba-Geigy, now part of Novartis, developed Diclofenac. The company lost its exclusive right to market the drug years ago, and it is now marketed and manufactured by many firms worldwide. Interestingly Ciba Geigy have a superb bird sanctuary, popular with visiting ornithologists on the cooling ponds of their Goan factory, with whistling ducks, blue herons and spectacular adjutant herons.

It was used as a human painkiller in Europe for 20 years, where it is still widely used, before being licensed for use in the United States.

The U.S. Food and Drug Administration turned down the request of IDEXX Laboratories Inc. of Westbrook, Maine, had a request for treatment of lameness in horses in May 2003.

Commonly marketed for human use as Voltaren, it is available as slow release oral tablets and is usually available as a prescription only drug. It is also available as an injectable sodium salt (Web prices quoted ,2p Sterling or 4 cents US per dose) and large bolus for veterinary use. Such products often incorporate Paracetamol at levels 10 to 20 times the level of diclofenac.

As a class NSAID's are associated with renal papillary necrosis and there is evidence of renal pathology in long term administration in animals, and oral doses have caused renal necrosis in baboon studies.

A second form of renal toxicity is a reduction of renal blood flow and is known to have resulted in acute renal failure in practice, but has not been observed in clinical trials. It's use is not recommended for patients with impaired renal function.

A novel, cheap cure all

Diclofenac was introduced as a veterinary, over the counter product to the Indian sub-continent about a decade ago, and it's use became very widespread five years ago. It's combination of low price and apparent therapeutic value in treating a wide range of ailments and consequent immediate, but short term relief, accounts for it's popularity. Many veterinarians claim it has no specific curative value and has many potential substitutes.

In the Punjab which has seen at least a 92% crash in vulture populations, the *Nature* authors discovered that of 84 drug retailers contacted, they all sold it, 77 of them daily and most agreed they commenced sale within the last 5 years.

Similar retail and unregulated availability of the drug has been reported from India and web searches identify many Indian sub-continent suppliers advertising the drug in injectable or oral form.often incorporating paracetamol

What do we do now ?

As a result of the conclusions of the Peregrine Fund's work, a Meeting was held at the Godavari Resort Hotel in Kathmandu, Nepal, " , on February 6th 2004 to consider, " Veterinary Use of Diclofenac : Another Environmental Threat exposed by the collapse of Vulture Populations in South Asia".

The US Ambassador, Michael Malinowski was present, and Dr G Rao of the Indian Veterinary Research Institute (IVRI) summed up the views of all the assembled scientists, Government and NGO representatives ... " Diclofenac is clearly the cause of the catastrophic decline in vultures...no amount of conservation efforts will succeed as long as the cause of the decline is left

intact". Bill Burnham, President of the Peregrine Fund called for, "an immediate and outright ban on the production, sale and use of veterinary Diclofane products to reduce vulture mortality". A resolution recommending this was passed.

Locally, Hem Baral, of Bird Conservation Nepal, provided evidence of a 95% decline in vulture numbers in Kosi Tappu, a wild life reserve 500 miles east of Kathmandu. He would be heartened by Dr Chandra Guring of the WWF who promised to, "support the awareness campaign in Nepal by providing necessary funds". Elsewhere the UK Government through the Darwin Fund has provided some £24,000 Sterling for a study of vultures in Africa with reference to the Asian population collapse and work on the migration patterns of the Eurasian vulture with respect to spreading avian viral diseases to Africa and Europe.

Regrettably none of the manufacturers of the drug, nor it's distributors or retailers was invited or present at the meeting.

Indian meeting proposes capture and breeding programs

At a later meeting at Parwanoo, Himachal Pradesh), on February 14th 2004 a workshop was held which included Jemima Parry Jones from the UK-based Birds of Prey Centre, Bombay Natural History Society Director Dr Asad Rehmani, Dr Andrew Cunningham from the Zoological Society of London, Dr Rick Watson from the US-based Peregrine Fund, Lindsay Oaks from the Washington Stat University, Pritpal Singh Soarae and Kathy Traylor-Holzer from the IUCN – The World Conservation Union, Dr Debbie Paine from the UK-based Royal Society for the Protection of Birds and the chief wildlife wardens from the States of Haryana, Himachal Pradesh, Assam and Punjab.

Haryana State is setting up two more vulture centres at Yamunanagar and Kurukshetra, in addition to expanding the existing site near Pinjore, Assam State is setting up three centres and Himachal state is suggesting setting one up near Pong Dam.

BNHS Director Dr Rehmani, strongly expressed the view that waiting for government action on banning diclofenac would take years. "We have been researching on the virus theory for four to five years and found no evidence. There is no guarantee that we will find evidence in the next one year on the virus theory. Diclofenac is one of the main causes of the vulture population declining," said Dr Rehmani.

Parry-Jones, stressed the urgency of the task capturing vultures and breeding them in captivity. "This should have started yesterday,"

Is it too late to save the Vultures ?

In 2001 BirdLife International, in the Red Data Book, registered all three Gyps Vulture species as "critically endangered", and reports of collapsing vulture populations are coming in from most of Indochina, the Thai/Malay Peninsula and Northern Cambodia. It is evident that the Asian vultures are disappearing faster than the Dodo – and like them a victim of the effects of man, although there appears no evidence, so far, that the unsavoury vulture is being eaten to extinction.

As there is no evidence of any viral component in the collapse after many years thorough investigation, it must be assumed that the only possibility of stopping their extinction is the instant withdrawal of diflocane from the Veterinarians tool kit as demanded by the Kathmandu conference. Doubts remain of course that

there may be other factors involved. If none are demonstrated, this is the first known instance of pharmaceutical products affecting the survival of higher order animals. In the ill regulated state of the bootlegging pharma industry of the Indian sub-continent it is difficult to believe that action to remove the drug will be soon or easily taken.

Meanwhile this highly efficient scavenger is no longer present in its role of speedily despatch rotting corpses, co-incidentally, by rapid disposal reducing the spread to humans from cattle of, TB, Brucellosis and Anthrax, and also preventing the spread of animal diseases such as Foot and Mouth, rinderpest and pleuro-pneumonia.

“Vultures have an important ecological role in the Asian environment, where they have been relied upon for millennia to clean up and remove dead livestock and even human corpses,” says Peregrine Fund biologist Munir Virani.

“Their loss has important economic, cultural and human health consequences.”

In the absence of the primary carrion eaters, a growing population of feral dogs has moved in (the Parsees are using solar power and caged vultures as an alternative at their Temple) on cattle corpses with their alarming potential for spreading rabies. Crows have also filled the gap, with all their potential of spreading avian viral infections, such as West Nile Virus. Where these minor carrion eaters are not present, or where they cannot penetrate the hides of fallen stock, the corpses of domestic beast are left to rot.

FOOTNOTE: Another unintended consequence

In a report in the Financial Times (London) of January 27th 2004, Ralph Rogers reports that FIFA's Player of the Year, the French footballer Zinedine Zidane, who plays for the Italian club Juventus, is being investigated for the long term use of 4 different drugs, which although not proscribed are considered to have performance enhancing effects. One of them is diflocane taken as Voltaren tablets, which Rogers states are widely abused by footballers.

As the unexpected victim of diflocane use, maybe Z Zidane could be approached to help fund or even lead a project protect the vultures of Asia, because such a scheme must inevitably follow up the results of this fascinating International detective work. It will need something to galvanise an International call for action, “Save the Vulture” doesn't have the appeal of say, “Save the Whale” or Adopt a Penguin”.

Surely this must be one for the Royal Society for the Protection of Birds ?

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