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Permanent Address: http://blogs.scientificamerican.com/guest-blog/2013/01/21/braniac-parrots-threatened-by-widespread-lead-poisoning/

Brainiac Parrots Threatened by Widespread Lead Poisoning

By Cristy Gelling | January 21, 2013

New Zealand's kea* are among the most devastatingly intelligent birds on the planet. For instance, animal cognition researchers say kea are as smart as crows at solving mechanical puzzles. So it comes as a shock to learn that much of what we know about the kea's unusual behavior in the wild comes from studies of birds stultified by lead poisoning.

Lead is toxic at such low doses that public health authorities have yet to identify a "safe" level of exposure. Chronic exposure of children to relatively low doses of lead can affect their IQ, and some even argue that lead in gasoline can explain the major crime trends of the twentieth century.

So if tiny flecks of lead paint can affect our intelligence and behavior, what happens to a 2 lb parrot that regularly chews on lead-headed nails and lead roof flashing? Recent research suggests that the kea's insatiable curiosity is causing widespread poisoning and endangering the birds wherever they live near human habitation.

The kea's unusual culinary experiments are well known to visitors to New Zealand's Southern Alps, who often find gangs of the parrots "eating" their rental cars. Kea use their beaks like a Swiss army knife to strip out windscreen wiper blades and window seals, and to snap off radio antennas; if any tourist is silly enough to leave a window open, they will happily dismantle the seats and dashboard, too. "I would describe them as like a hyperactive four year old," says Brett Gartrell, director of Massey University's Wildbase, a wildlife health centre. "If you've had a four year old running rampant in your living room, then you know how destructive that can be."

But these destructive behaviors are crucial to the kea's ability to find food in their harsh mountain habitats. Many juvenile kea do not survive their first winter, and to avoid starvation they must be willing and able to eat almost anything they find. It is their distinctive curiosity and intelligence that gives them the behavioral flexibility to exploit new sources of food as they become available.

This strategy served the kea well when European settlers started converting kea habitat into sheep ranches in the nineteenth century. Kea were able to exploit all the high calorie treats that humans tend to leave unattended, including an extremely rich source of fat – sheep. Kea quickly learned to ride a sheep's back and pierce through the wool to chew on the underlying fat, leaving the unfortunate sheep vulnerable to blood poisoning.

"The attacks aren't very common, but when they do occur, they're quite horrific," Gartrell says. In the 1880s, under pressure from sheep farmers, the government placed a bounty on the head of every kea, offering up to three shillings per beak. The incentive was enough that, by the 1970s, as many as 150,000 kea had been killed. Only a few thousand remain and that number seems to be declining from predation by stoats and other introduced mammals. New Zealand's Department of Conservation (DOC) now classifies the kea as

nationally endangered.

Although the kea are no longer threatened by bounty hunters, their fearless eating habits still get them into trouble. For instance, one kea is known to have died from eating too much dark chocolate, and others have died from eating rubber camping mats or insulation. Over the years, a few kea also turned up with lead poisoning, but it wasn't thought to be a population-wide threat. That changed in 2006, when Jenny McLelland, a veterinary student at Massey University, needed some extra chapters for her master's thesis on lead toxicity in Australasian harriers. She followed up on the few odd cases of kea lead poisoning by taking blood samples from 12 wild kea, all juvenile males from Aoraki / Mt Cook village. Unexpectedly, all 12 had elevated blood lead levels.

"It was surprising to everybody," says Clio Reid, a kea researcher and PhD student at Massey University. Reid, at that time a master's student at Victoria University of Wellington, was part of the team that joined with McLelland, Gartrell and Kate McInnes, a DOC wildlife vet, to see if the problem was as bad as that initial sample suggested. They asked researchers working in many different kea habitats to collect blood samples from local kea. Every bird they sampled showed some evidence of lead exposure, though for populations remote from human activity the levels were not usually of concern.

But it was a different matter altogether for kea that live near humans. Most of them had blood lead levels suggestive of lead poisoning. We're not talking levels consistent with subtle lead exposure here, we're talking about lead poisoning – the level at which body functions start to fail. Many of these birds had blood lead levels that would earn any human a trip to the emergency room. Reid says one had a lead level so high it would certainly have killed a human.

Heavy metal tolerance varies between species, so it is possible that kea are relatively resistant to lead. Even if that turns out to be true, lead has insidious effects that can still cause death indirectly. Studies of other birds have shown that as lead exposure increases, the chance of death from other causes also increases; it makes animals less resistant to infectious disease and easier for predators to catch.

Whether directly or indirectly, lead does seem to affect kea mortality in the wild. The group reviewed 20 wild kea post-mortem records and found that 11 of the birds had tissue lead levels diagnostic of lead poisoning. That is an astonishingly high number. Although this figure is inflated by the fact that birds sent to vet clinics are much more likely to be from human inhabited areas—most birds that live far away from lead die without human witnesses—it is still solid evidence that wildlife managers should be concerned. In fact, during the research, they observed a disoriented and uncoordinated kea that they suspected might be suffering the effects of lead. It died in the clinic, diagnosed post-mortem with lead poisoning.

Not only are the researchers convinced that birds are dying from lead exposure, the birds that are most likely to have elevated blood lead levels are juveniles. Like humans, kea enjoy a relatively long childhood, giving them the time to learn the tricky business of extracting food in the mountains and navigating the highly structured kea social scene. They spend much of that childhood exploring their environment. "They do that by nibbling on everything, just like kids go around and stick everything in their mouths," says Reid.

It's largely these youngsters that chew on the pliable and sweet-tasting lead nails, yet they are also the most vulnerable to the effects of lead on their still developing nervous system. Even more alarmingly, the only two nestlings that have been sampled so far also had high blood lead levels. This means that either their parents were feeding them lead-contaminated food, or they were exposed to lead that accumulated in their mother when she was just a juvenile chewing on nails.

It is also possible that lead exposure has distorted our understanding of the kea's unique behavior, since the most heavily studied kea populations are those that live near humans and their roofing materials. For example, many influential studies of wild kea ecology and behavior have been performed near Arthur's Pass village, often at a refuse dump that was a popular kea foraging ground until it closed in the 1990s. The DOC ranger JR Jackson conducted the first major kea field studies in Arthur's Pass in the 1950s and 1960s, frequently banding kea amongst the smell and flies of the village dump. He ascribed several odd kea behaviors to "social regulation" of birds at the bottom of the pecking order. In retrospect, these birds—underweight, anemic and "psychotic"—sound suspiciously like the casualties of chronic lead exposure.

DOC has responded to the new research with a program of lead replacement on land under their care. Although helped by community and conservation groups like the Kea Conservation Trust, this is a big task in a time of declining budgets. They are also trying to spread the word to private land owners, who vary in their degree of concern. "It's still within living memory that people thought of kea as evil," says McInnes.

Of course, lead is not the only challenge for the kea, nor even the most severe. Kea are killed by stoats and possums, run over by cars, inadvertently killed by animal control poisons and still occasionally shot by angry property owners or cruelly smuggled in the illegal pet trade. But such a pervasive presence of lead may be impairing the kea's best coping strategy—their intelligence. McInnes warns: "With climate change affecting what food is going to be available and when things fruit, I think the kea needs all its wits about it to survive in the modern world."

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*The word "kea" is both singular and plural, just like the word "sheep."

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