Refining the use of animals
in scientific research

Living syringes

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Scientists are busy developing some really exciting high-tech methods to replace the use of many animals in scientific research, like **organs-on-a-chip**. But for those scientists who don't yet have an alternative, the principle of refinement is crucial. And sometimes clever thinking is all that's needed to improve animal welfare.

refinement: *minimising potential suffering and improving animal welfare*

What problem are scientists trying to solve?

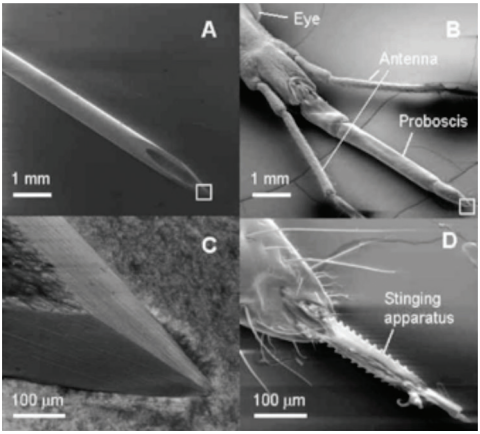
Understanding the effects humans have on the nesting behaviour of birds is really important if we want to protect endangered species like Kakapo and Kiwi. Having access to blood samples from birds lets scientists monitor changes in hormone levels, the amount of energy they consume, genetics and more. But taking blood samples from wild birds is very stressful, as they need to be trapped and handled. This stress can also change the levels of hormones and other chemicals researchers are interested in. Stress can also lead some brooding birds to abandon their nests.

The solution

Blood-sucking bugs as living syringes

A very clever way to get blood from birds without having to catch and handle them involves getting parasitic blood-sucking bugs to take the sample instead! Mexican triatomines (also known as kissing bugs) have a needle-like mouthpart called a proboscis that is 30 times smaller than the type of needle scientists normally use to take blood from birds. The bugs also secrete a pain-reducing enzyme, that lets them feed on the bird without stressing it out, as well as a chemical that prevents the blood from clotting.

Because the blood doesn't clot, scientists can extract it from the bug using a syringe. The blood-sucking bugs are placed into artificial eggs the same size and colour as the bird's own eggs, with an opening that lets them feed on the birds when the birds sit on the eggs. Scientists in Germany have shown that blood samples collected with the bug method are almost identical to samples taken using a needle.



Left: (A) Electron microscope image of a 0.6x30mm needle (also used for vaccination in babies) (B) and the head and proboscis of a Triatomine bug. The tip of the bug's stinging apparatus (D) is much finer than the tip of the needle (C). *Photo credit: Voigt et al. 2006 with permission from the Journal of Wildlife Diseases.*

Right: Blood-sucking bugs in artificial Common Tern eggs (egg size 42x31mm). *Photo credit: Dr Christina Bauch.*

Pros

- Don't need to catch and handle the animals
- No puncture wound from a large needle
- Reduces stress and pain
- The same animals can be sampled many times
- More reproducible and reliable data
- Bugs of different sizes can be used for different sizes of animals to avoid taking too much blood.

Cons

- Triatomine bugs can transmit diseases
- Animals may have an allergic reaction to the bite
- Samples can become contaminated if bugs feed on more than one animal
- Takes a lot longer to collect a sample
- Possible digestion of parameters of interest
- Unclear which bit of the animal the bug takes the blood from
- No triatomine or similar bugs in New Zealand.

Not just for birds!

Using bugs to take blood samples could be useful for aggressive zoo animals that would normally need sedating. In fact, scientists have already tested the method on nearly 40 species of zoo animals including hippo, cheetah, giraffe, elephant and white rhino!

Right: Sampling by bug method in African elephant.

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Photos of bugs in artificial eggs have been kindly provided by Dr Christina Bauch, Germany. Photos of bugs on zoo animals have been reproduced with permission from André Stadler, Wuppertaler Zoo, Germany.

For further information

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