INTERNATIONAL WORKSHOP ON POISONING AND VULTURES IN ÁFRICA-ANDALUCÍA

Ronda, Málaga 8-11 April 2014
Conventional and nonconventional samples used in toxicology analysis

International workshop on poisoning & vultures: what is the situation in Africa and how can Europe help? April, 8-11. 2014
Which sorts of compounds are we considering?

- Organophosphates
- Carbamates
- Organochlorines
- Fungicides
- Pyrethroids
- Rodenticides
What is considered a conventional sample?

- Samples typically favoured – or collected - for toxicological analyses
- Soft tissues (e.g., kidney and liver)
- Blood **
- Ingested material**
- Digestive tract
- Brain tissue

**Can also be collected from living birds**
How are poisons incorporated into samples?
<table>
<thead>
<tr>
<th>Compound</th>
<th>Time to death</th>
<th>Detectable (compound or metabolites)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strychnine</td>
<td>Fast – minutes</td>
<td>Stomach?</td>
</tr>
<tr>
<td>Organophosphates and Carbamates</td>
<td>Depends can be hours</td>
<td>Mouth Talons Stomach *plasma, brain ChE</td>
</tr>
<tr>
<td>Rodenticides anticoagulants</td>
<td>Depends can be 24-48-72 hours</td>
<td>Stomach Liver</td>
</tr>
<tr>
<td>Organochlorines</td>
<td>Hours -years</td>
<td>Mouth Talons Stomach Fat (with except endosulfan)</td>
</tr>
</tbody>
</table>
When are these samples at their best?

- Living bird: balance taking blood sample ASAP and potential health repercussions
- Carcass: has to be fairly fresh and intact or still contain undamaged target sample
- Cause of death cannot have been too fast-acting
- Presence of acute toxins may only be measured in some samples (e.g. inside mouth)
- If you can freeze or even refrigerate the samples to stop the degradation of toxins
Signs a carcass is fresh

- Body still ‘squishy’ but firm, retaining moisture
- Absence of living or deceased insects on or around...
- ...BUT in parts of Spain and in Africa insects may be present even before death
- Bait residues discernible
Bait residues

- Individual grains visible, colour stains
- Easy to see inside the craw, ventricle, stomach
- If an organophosphate, you can sometimes smell it, e.g. chlorphenvinfos – NOT the case for carbamates
- **take pictures that can readily be linked to carcass**
Signs a carcass is decomposed

moderate

advanced

Mummification/desiccation/skeleton
What is considered ‘unconventional’?

- Samples not typically collected or considered
- Talons
- Foot washes (with solvent)
- Beaks/tongues/palates
- Oral swabs
- Vomit
- Insects
- Soil/ground under the carcass
- Feathers
- Pellets
- Bone
- Eyes

IMPORTANT: Carcass components that withstand degradation
Valuable alternative samples in wildlife forensic cases

- talons
- beak & mouth/oral cavity
- palate bone
- carcass fauna
- digestive tract
Samples of limited/variable value for detecting poisons?

- Tongues of degraded birds and mammals
- Pellets
- Eyes
- Ground under the carcass
- Bones
- Feathers
# Talons

## Studies

<table>
<thead>
<tr>
<th>toxin</th>
<th>sample</th>
<th>reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>diazinon</td>
<td>Gosling feet</td>
<td>Vyas et al. 2003</td>
</tr>
<tr>
<td>carbofuran</td>
<td>Screech-owl talons</td>
<td>Vyas et al. 2005</td>
</tr>
<tr>
<td>carbofuran</td>
<td>Vulture talons * &amp; beaks</td>
<td>Otieno et al. 2010, 2011</td>
</tr>
</tbody>
</table>

## Our experience

<table>
<thead>
<tr>
<th>Toxin</th>
<th>level detected mg/kg</th>
<th>species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldicarb</td>
<td>0.74</td>
<td>black kite</td>
</tr>
<tr>
<td>Aldicarb sulfoxide</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>Aldicarb sulfone</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Chlorfenvinphos</td>
<td>0.45</td>
<td>griffon vulture</td>
</tr>
</tbody>
</table>

*Often best sample when presented with autolyzed carcasses, talons may be clenched around bait material*
Beak & oral cavity, palate

- If highly acute or high concentration of poison is ingested
- Rapid onset of death, toxins not metabolized or spread to organs
- Chlorpyrifos detected in mouth/oral cavity of black kite (bait)
- Carbofuran detected in vulture beak simple by Otieno et al.
- Chlorfenvinphos detected in vulture palate
Carcass insects

- Important to analyze, even if dry
- Some toxins can accumulate in chitin -including lead-
- Carbofuran and chlorfenvinphos have been detected in insects recovered with carcasses
Vomit & digestive tract

- Vomit may contain poison in original – unmetabolized - form
- Remains in digestive tract may be protected from environmental conditions
- Both provide direct evidence that poison was consumed
Ground/soil beneath carcass

- Still working with this sample, but should be considered

- Soil under victim’s head may contain vomit

- Fluids from carrion decomposition and/or bait (poison source) may have leached into ground