**Diagnostic Summary Report**

**Accession Number:** D20-004113

**Received Date:** 02/03/2020

**Species:** Avian, Miscellaneous

**Breed:** Trumpeter Swan

**Age:** Adult

**Sex:** Unknown

**Weight:** 9 kg

**Site:** BRAINERD, MN

**Owner:** DNR NON GAME

**Premises ID:**

**Date(s) Sampled:**

**Submitted by:** DNR-Non Game & Wildlife Program

Attn: Pam Perry

1601 Minnesota Drive

Brainerd, MN 56401 US

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**History:** This adult male trumpeter swan was found dead on a lake near the shoreline on February 03, 2020. The necropsy was performed by Melissa Wolfe, Dr. Albert Canturri and Dr. Arno Wunschmann on February 04, 2020 between 2 and 3.15PM on the necropsy floor of the Minnesota Veterinary Diagnostic Laboratory.

**Specimen:** The whole carcass of an adult male trumpeter swan was submitted in a state of good postmortem preservation.

**Necropsy:** General condition: The animal was underweight based on the scant amount of internal adipose tissue (BW: 9.2kg).

Body cavity: There were no significant macroscopic lesions.

Integument: There were no significant macroscopic lesions.
Alimentary system: The ventriculus contained a silver metallic, non-magnetic approximately 3mm by 2mm by 2mm structure with a central opening (interpreted a fishing line weight). The ventricular mucosa was green (bile-stained). The liver weighed 217g (considered to be of normal size and weight).

Urinary system: There were no significant macroscopic lesions.

Respiratory system: There were no significant macroscopic lesions.

Endocrine system: There were no significant macroscopic lesions.

Hemolymphatic system: The spleen was mildly enlarged, light brown and soft.

Nervous system: There were no significant macroscopic lesions.

Reproductive system: There were no significant macroscopic lesions.

Cardiovascular system: The heart appeared to be mildly enlarged (weighing 119g). Less than 2ml of watery clear colorless fluid were present in the pericardial sac.

Locomotive system: There were no significant macroscopic lesions.

**Histopathology:** Slide A: Spleen, red pulp hyperplasia, moderate.

Tibiotarsal diaphyseal bone marrow, nsml.

Slide B: Lungs, thyroid gland and parathyroid gland, nsml.

Slide C: Liver: a. canalicular bile stasis, moderate to marked.

b. Kupffer cell hyperplasia and hemosiderosis, widespread.

c. accumulation of brownish granular pigment in hepatocytes, moderate.

d. hepatitis, lymphplasmacytic, portal/periportal, mild.

Cerebellum and brainstem, nsml.

Slide D: Cerebrum, thalamus and mesencephalon, nsml.

Slide E: Cerebrum, thalamus and mesencephalon, nsml; (possibly capillary thrombosis with necrosis in one nucleus of the mesencephalon).

Slide F: Adrenal gland, testis, duodenum and pancreas, nsml.
Slide G: Heart, fibrinoid necrosis of myocardial vessel, focal with fibroplasia in adjacent myocardium.

Slide H: Intestine and kidney, nsml.

Slide I and J: Eyes, fibrinoid necrosis of a conjunctival artery/arteriole.

**Toxicology:** The liver lead concentration was markedly elevated (98.8 microgram/g). The liver iron concentration was moderately elevated (10605 microgram/g).

**Molecular diagnostics:** A cloacal swab was negative for avian influenza virus and Newcastle disease virus by PCR.

**Diagnosis:** Final

1. Hydropericardium, mild.
2. Ventriculus, intraventricular metallic foreign body.
3. Heart, fibrinoid necrosis of myocardial vessel, focal with fibroplasia in adjacent myocardium.
4. Eyes, fibrinoid necrosis of a conjunctival artery/arteriole.
5. Spleen, red pulp hyperplasia, moderate.
   b. Kupffer cell hyperplasia and hemosiderosis, widespread.
   c. accumulation of brownish granular pigment in hepatocytes, moderate.
   d. hepatitis, lymphoplasmacytic, portal/periportal, mild.

**Comments:** The results of the toxicological analysis of the liver (in combination with the vascular lesions and heart lesion) are diagnostic of lead toxicity (see D19-007612, D19-007844 and D19-08203; last year's trumpeter swans from the same location). The presence of a non-magnetic metallic foreign body in the ventriculus is supportive of this diagnosis although chemical analysis of the metallic material would be necessary to prove that it was in deed composed of lead.

The significance of the elevated liver iron concentration that was also detected in last year's bird from the same location is uncertain but this finding is of minor importance compared to the lead intoxication.

The metallic foreign body and samples of spleen and kidney were saved frozen.
### Testing Summary

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<th>Laboratory/Procedure</th>
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<th>Count</th>
<th>Result</th>
<th>Quantifier</th>
<th>Interpretation</th>
<th>Result Value</th>
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### Remarks/Interpretations

Completed 02/16/2020 19:00:00

### Outsourced Lab Service

Updates 02/13/2020 13:40:30, 02/16/2020 19:00:00
## Minerals

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<td>(0.260-0.340)</td>
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L = Low Result; H = High Result; @ = Critical Result; ^ = Corrected Result; * = Interpretive Data; # = Result Footnote

Print Date/Time: 2/13/2020 12:31 PM
02/07/2020 13:54:00 Comment, Tissue Mineral
   Method: ICP-MS

   Results: Lead poisoning.

   Results are reported on a dry weight basis.
   Tissue minerals may be compared against an internal dataset of 68 swan livers:

   Heavy metals:
   As: (<4.5 ug/g); Cd: (0.12 - 2.4 ug/g); Pb: (<4.5 ug/g); Hg: (<6 ug/g); Ti: (<7.5 ug/g)

   Trace nutrients:
   Co: (<3 ug/g); Cu: (9 - 450 ug/g); Fe: (900 - 5000 ug/g); Mn: (1.5 - 13 ug/g); Mo: (<0.9 - 1.6 ug/g); Se: (6.5 - 15.5 ug/g); Zn: (70 - 400 ug/g).

   We are working to develop better interpretations for hepatic trace mineral concentrations. These values may be adjusted as additional data become available.

   John P. Buchweitz, Ph.D., DABT
   Clinical Toxicologist
   2/13/2020 11:54:48 AM EST

2/7/2020 1:54:00 PM Dry Weight Fraction (Gravimetry):
   Report Comment – Reference Ranges
   Please note that reference ranges have been updated and will differ from those on reports issued by this laboratory prior to May 2015.
   In general, the ranges are wider than before. Values within the reference range are those typical for animals that are adequately nourished and not suffering from intoxication. Reference ranges reported are species-specific and age-dependent.
   For additional details on the use and development of these reference ranges, please see DCPAH Liver Mineral Reference Ranges available on our website: http://animalhealth.msu.edu > Diagnostic Sections > click on Nutrition or Toxicology.
   Report Comment – Dry Weight vs. Wet Weight
   Mineral values and reference ranges are reported on a dry tissue basis.
   Dry matter fraction values below the reference range are unusual, but could potentially represent dehydration of the patient, or shifts in body water compartments due to electrolyte abnormalities.
   Dry matter fractions above the reference are not unusual and may represent either dehydration of the patient or fatty infiltration of the tissue. In the case of fatty tissue, particularly liver or kidney, interpretation of the tissue mineral concentrations is affected.
   For more information on dry weight vs. wet weight, including considerations for small samples, please see DCPAH Liver Mineral Reference Ranges available under Diagnostic Sections > Nutrition or Toxicology on our website at http://animalhealth.msu.edu.