Proficiency Testing for Analytical Toxicology

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The State of Veterinary Diagnostic Toxicology:
Toxicology & Analytical Chemistry Survey Results

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USDA NAHLN Toxicology Working Group

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Toxicology & Analytical Chemistry Survey

- Survey consisted of 30 questions.
  - Monkey Survey through USDA NAHLN.
- Results from 39 laboratories (from the 2009 survey).
- 12 of the 39 laboratories (from 2009 survey) have no toxicology section & several more have only limited testing.
  - Of the laboratories that had a tox section and eliminated it, 7 responded that the main reasons were: lack of funding, unable to recruit personnel, and/or cheaper to outsource.
- Of the laboratories with toxicology sections, 5 more were considering closing
  - primarily due to funding & the high cost of instrumentation.
- Of the diagnostic labs with toxicology, approximately
  - 90% in NAHLN,
  - 50% in FERN,
  - 40% in LRN.
- Only 2 veterinary toxicology residency programs.

Survey Results

- Wide variation in instrumentation, personnel, & funding which could limit ability to respond to chemical events.
  - 60% responded that they did not have sufficient personnel and/or equipment to handle analyses for a major event, but that it would depend on the analyte.

- Approximately 1/3 of labs with LC/MS, ¾ with GC/MS, and 1/3 with ICP/MS.

- All laboratories with analytical toxicology sections could detect commonly-encountered chemicals and nutrients.

Survey Results

- Few laboratories have the ability to test for non-routine chemicals such as blue green algae toxins, ricin, shigatoxin, or tetrodotoxin.

- Only one laboratory, at the time, reported ability to analyze for any USDA Select Agents with the exceptions of DAS and T-2 (in feeds) which could be analyzed by numerous laboratories.

Survey Results - Funding

- Funding over the past 6 years:
  - Increased – 15%
  - Decreased – 27%
  - Remained steady – 58%, however, comments made that with increasing costs, steady funding = decreased.
- One half of respondents planning new equipment purchases in next two years, but many for metals (ICP-MS) rather than for detection of organic compounds.
- Over 90% responded that current funding was inadequate to purchase & maintain instrumentation, &/or to hire and retain sufficient numbers of knowledgeable & trained personnel.
  - Inadequate for response to routine or extraordinary analytical toxicology needs.
  - Amount of surge capacity depends on analyte. Personnel often more limiting than instrumentation.

Survey Results

- Majority of respondents indicated that components of a National network include:
  - **Broadly-available basic** capabilities.
  - **Comprehensive regional** capabilities.
  - Improved **interlaboratory communications & coordination**.
  - Improved **coordinated methods development & validation.**

- Minimum instrumentation for comprehensive analysis = ICP/MS, GC/MS, LC/MS.
- Ideally, veterinary diagnostic laboratories need a PhD chemist, veterinary toxicologist and sufficient technical support to interact with ref veterinarians, officials, develop & validate methods, and run sample analyses.

Survey Summary

- Existing veterinary toxicology & analytical chemistry laboratories provide valuable services to their States & Nation for analysis of common toxicants and nutrients.
  - State & National Emergencies require expertise of Veterinary Toxicologist & Analytical Chemist working as team to recognize, diagnose, interpret results & formulate response sometimes requiring multiple laboratories.
- More resources are needed to preserve, enhance, & connect these laboratories as they continue their efforts to protect human and animal health.

Acknowledgements for Survey

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- AAVLD Laboratory Directors
- USDA VS
- USDA CSREES

II. Proficiency Testing - Reasons

- To insure actual proficiency in the detection / confirmation of xenobiotics in typical diagnostic samples
- To support and possibly expand the current actively sharing analytical toxicology community
- To support Tox labs continuing to compare capabilities, methods and solutions to problems
- To provide data showing where analytical capabilities may be improved
- To allow documentation of analytical capabilities in support of accreditation requirements

Proficiency Testing - Reasons

- Results from PT –
  - indication of a laboratory's competence
  - integral part of assessment & accreditation

- AAVLD endorses the need to formally demonstrate testing competencies & recognizes the role played by external proficiency testing programs.

III. AAVLD AAVCT Proficiency Testing 2009 & 2010

- Round Robin Proficiency Test Program organized by AAVLD Toxicology Working Group and AAVCT in 2009 & 2010.
  - Organized at AAVLD Annual Meeting

- Considerations – Need to use analyses common to all veterinary diagnostic laboratories for maximum participation
  - Instrumentation & methods variable between labs

AAVLD AAVCT PT - 2009

- 2009- **Elements in bovine liver**
- Bovine liver from an animal **with lead toxicosis**
  - Lots of liver
- Distributed Feb 2009 to 32 participants.
  - Of these, **28 participants returned** results
- Data was processed as per the Food Analysis Performance Assessment Scheme (FAPAS) Protocol for the organization and analysis of data, distributed, and **presented at AAVLD 2009**.
  - Data collection and analysis by **Nick Schrier, Guelph, Ontario, <u>Canada</u>**

AAVLD AAVCT Proficiency Testing 2010

- 2010- **Bovine blood**
- Bovine blood collected in EDTA
- Distributed January 2010 to 32 participants.
  - Of these, **26 participants returned** results
- Analyses: **lead, selenium, AChE, (Cu, Fe, Zn, Cr, As)**
- Data was processed as per the FAPAS Protocol for the organization and analysis of data, distributed, and presented at AAVLD 2010.
  - Data collection and analysis by **Nick Schrier, Guelph, Ontario, <u>Canada</u>**

AAVLD AAVCT PT Program

- Limited opportunities for veterinary diagnostic toxicology laboratories to participate in PT programs.
  - do not provide opportunities to assess competencies across the broad spectrum of analytes & matrices unique to those laboratories.
  - focus primarily on metal proficiency tests
- Critical need to better characterize PT samples with regard to analyte concentrations & stability, and sample homogeneity.
- While successful, the AAVLD/AAVCT PT Program lacks funding
  - has relied on individual laboratories to prepare & ship samples, collect, analyze, and disseminate results.
- Therefore, there is need to identify a stable source of funding
  - allow continuation & expansion of the program to include a greater variety of analytes in relevant matrices.
  - continued improvement and expansion of the program without funding is not possible.

IV. Federal Coordination of PT Program

- Assist in program logistics, coordination of PT program elements;
- Serve as objective coordinating center (Not an End User) for:
  - Sample set distribution
  - Testing results collection & interpretation
  - Issue summary reports that maintain anonymity of individual participating labs / individuals
- Serve as additional information facilitator : methods and problem solutions
- FDA &/or USDA NVSL

Toxicology Proficiency Testing Program - Aims

- Ensure proficiency in the detection/confirmation of chemicals of interest
  - to support mission of the FDA & to diagnostic veterinary toxicology.
- Support & expand the current active veterinary analytical toxicology community.
- Allow toxicology programs/labs the ability to compare capabilities, methods and solutions to analytical problems.
- Provide data showing where analytical capabilities may need improvement.
- Allow documentation of analytical capabilities in support of accreditation requirements.
- Support the FDA CVM Mission to Protect Human and Animal Health.

TP2 – Guidance Committee

- Possible TP2 Guidance Committee:
  - Composed of permanent members, term members (members selected from the participating labs), and a USDA NVSL liaison.
- Purposes of Guidance Committee:
  - Ensure fair and broad representation of all participants in the policies of the program.
  - Ensure consideration of differences in laboratory variation including instrumentation.
  - Assist in the selection of test analytes & sample matrices.
  - Ensure that all participants gain as much value from the program as possible.
  - Ensure that the TP2 meets the needs of the participating laboratories and the FDA.

TP2 – Year 1

- Identify or appoint the TP2 Guidance Committee members.
- Establish the procedural details of the TP2 program.
- The TP2 GC will select 3 analyte/matrix combinations to be analyzed over the first 12 month period.
  - Analyte matrix combinations will be delivered on an established schedule (e.g., every 4 months).
- Volunteer laboratories will be solicited to prepare each of the sample sets as needed.
- Test results will be collected and statistical analyses performed.
- Report of results will be written & distributed.
- PT Results will be presented at the AAVLD annual meeting.

TP2 – Year 2

- The TP2 GC will select 3 analyte/matrix combinations to be analyzed over the first 12 month period.
  - Analyte matrix combinations will be delivered on an established schedule (e.g., every 4 months).
- Volunteer laboratories will be solicited to prepare each of the sample sets as needed.
- Test results will be collected and statistical analyses performed.
- Report of results will be written & distributed.
- PT Results will be presented at the AAVLD annual meeting.

Proficiency Testing - Summary

- Analytical Toxicology sections of state and university veterinary diagnostic laboratories, working with practicing veterinarians, are often the first or second responders to feed-related poisoning in animals.
- When needed, it is often critical to have analytical capabilities available, including expertise to identify toxicoses and rapidly develop new methodologies
  - Analyses in tissues and bodily fluids are unique to veterinary diagnostic laboratories.
- As a step in establishing a nation-wide network of veterinary diagnostic toxicology laboratories, a proficiency test program (Toxicology Proficiency Testing Program or TP2) should be implemented.

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