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29th Annual Meeting of the Northern California Regional Chapter of the

Society of Environmental Toxicology And Chemistry

NorCal SETAC

The Future is Now: Novel Approaches for Evolving Challenges

September 21-24, 2020
Virtual (Zoom)

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Monday, September 21 | Short Course

Navigating the Intersection of Science and Policy in California: A #SciPolComm Workshop
Ben Landis and Gabby Nepomuceno, 3:00 p.m. - 5:30 p.m.

Tuesday, September 22 | Conference

10:00 a.m. **Welcoming Address** by NorCal SETAC President Aniela Burant

10:05 a.m. **Opening Plenary with Marjorie Brooks, PhD**
Assoc. Professor, Dept. of Zoology, Southern Illinois University, Carbondale
“Stress Equivalence: Challenges and Opportunities for Conservation Battles in the Anthropocene”

11:05 a.m. **Opening Plenary with Deldi Reyes[1] and Vanessa Galavíz[2]**
Environmental Justice Manager, Office of the Secretary, CalEPA[1]
Environmental Justice Public Health Scientist, Office of the Secretary, CalEPA[2]
“Toxics, Environmental Justice and Equity”

12:00 p.m. **Break**

12:30 p.m. **Racial Equity Panel.** Eugenia McNaughton.

1. **Lazaro Cardenas**, Racial Equity Specialist, CDPH
2. **Suzanne Fluharty**, Division Manager, Environmental Program, Yurok Tribe
3. **Dr. Beth Rose Middleton**, Professor, Dept. of Native American Studies, UC Davis
4. **Dr. Geetika Joshi**, Sr. Environmental Scientist, CDFA

Wednesday, September 23 | Conference

10:00 a.m. **Platform Session 1 Opening Remarks: Aquatic Toxicology Impacts.** David Ostrach.

10:05 a.m. Dissolved and hydrophobic pesticides in California Central Coastal streams. Lisa Nowell. USGS.

10:25 a.m. Interactions of Salinity Gradients and Pyrethroid Toxicity on Early-Life Stage Delta Smelt. Richard Connon. UC Davis.

10:45 a.m. *Effects of Salinas Valley agricultural runoff on fathead minnow (*Pimephales promelas*) larvae. Sarah Stinson. UC Davis.

11:05 a.m. ***Poster:** Mortality and Behavioral Effects Post Exposure to Agricultural Run-Off and Direct Pesticide Solutions in *Daphnia magna*. Nicole Egan. UC Davis.

11:15 a.m. **10 Minute Break**

11:25 a.m. *Effect of temperature on Chinook salmon's susceptibility to columnaris disease. Samah Abdelrazek. UC Davis.

11:45 a.m. *Evaluating Health Effects of Microplastics in Marine Mammals: A Scoping Review. Prathima Garudadri. UC Davis.

12:05 p.m. ***Poster:** Potential pathway of microplastic exposure across a marine trophic web. Sami Michishita. UC Santa Cruz.

* Student presentation

Thursday, September 24 | Conference

1:00 p.m. **Platform Session 2 Opening Remarks: Characterization and Remediation of Contaminants that Impact Human Health.** David Ostrach.

1:05 p.m. Will publicly-owned wastewater treatment plant (POTW) effluent be our next water supply? The decision may depend on pesticides. Kelly Moran. TDC Environmental.

1:25 p.m. *Identifying Metabolites of Anthropogenic Chemicals Using a Nontarget Workflow. Madison Hattaway. UC Davis.

1:45 p.m. *Informing treatment of pesticides in agricultural drainage: using molecular docking simulations to identify candidate enzymes to promote degradation of pyrethroids and strobilurins. Olivia Wright. UC Davis.

2:05 p.m. **10 Minute Break**

2:15 p.m. *Characterization of covalent and noncovalent interactions of diverse PFAS with proteins using suspect-screening and molecular docking. Li Wenting. UC Davis.

2:35 p.m. *The Mafia and Hazardous Waste: A Review of Health Consequences in Southwestern Italy. Janae Bonnell. UC Davis.

2:55 p.m. **Poster:** Rapid detection of lethal amatoxins (amanitins) from mushroom and urine samples using a portable, simple test strip. Candace Bever. USDA.

3:05 p.m. **Closing Remarks.** Aniela Burant

Dissolved and hydrophobic pesticides in California Central Coastal streams (2017).

L.H. Nowell, U.S. Geological Survey, Sacramento, CA, M.W. Sandstrom, U.S. Geological Survey, Denver, CO, P.W. Moran, U.S. Geological Survey, Tacoma, WA, T.S. Schmidt, U.S. Geological Survey, Helena, MT, I.R. Waite, U.S. Geological Survey, Portland, OR, B.J. Mahler, P.C. Van Metre, U.S. Geological Survey, Austin, TX, M.L. Hladik, U.S. Geological Survey, Sacramento, CA.

To evaluate the role of pesticides as stressors on aquatic biota, pesticides were analyzed in water, bed sediment, and biofilms from 85 streams in the California Central Coast region. This 2017 study was one of five regional multistressor studies done by the U.S. Geological Survey National Water Quality Program. Dissolved pesticides and degradates (n=253) were measured in six weekly water samples using LC-MS/MS. Hydrophobic pesticides (n=110) were measured once in stream sediment and biofilms using GC/MS, and algal and benthic invertebrate communities were surveyed using reach-wide benthos methods. Frequently detected pesticides included chlorantraniliprole, several neonicotinoids, methoxyfenozide, boscalid, and carbendazim in water, and pyrethroids and DDT compounds in sediment and biofilms. Potential invertebrate toxicity was predicted at about 50% of streams from benchmark comparisons in water and(or) sediment with several neonicotinoid, organophosphate, and pyrethroid insecticides, fipronil compounds, DDT compounds, novaluron, methomyl, diflubenzuron, and linuron. Mixture complexity increased along an urban gradient, but mixed land-use sites had the most pesticides detected and the highest predicted toxicity. Multiple lines of evidence, including pesticide toxicity predictions, correlations to invertebrate community metrics, statistical multistressor models, and mesocosm experiments, indicate that pesticides likely contributed to poor invertebrate community condition in many of the sampled streams.

Interactions of Salinity Gradients and Pyrethroid Toxicity on Early-Life Stage Delta Smelt

A. Segarra, P.A. Mundy, F.K.J. Biefel, N. Raffat, M.L. Hladik, S.M. Brander, R.E. Connon

Pyrethroid insecticides are used in urban and agricultural settings in California, and are frequently detected in the San Francisco Bay and Delta (SFBD). These insecticides are highly toxic to fishes and are suspected contributors to Pelagic Organism's Decline. Stringent concentration goals for Delta surface waters were recently adopted by the Central Valley Water Quality Control Board targeting six pyrethroids; including permethrin. Moreover, there is a knowledge gap regarding sublethal effects to resident fishes, particularly during early life and at salinity conditions relevant to the SFBD. Information on pyrethroid toxicity in the context of changing SFBD salinity gradients is vital to understanding sublethal effects in fish.
We investigated behavioral effects of permethrin on larval Delta smelt; *Hypomesus transpacificus,* exposed at three environmentally relevant concentrations (1, 10 and 100 ng/L and 0.1, 1 and 10 ng/L, respectively) across a salinity gradient (0.5, 2 and 6 PSU). We measured several behavioral endpoints such as the distance moved, velocity, bursting or the freezing of early life stage Delta Smelt larvae at 96-hour post-exposure using a light/dark stimuli induced behavior test. Exposure to environmentally-relevant concentrations of permethrin affected the locomotor behavior of the Delta Smelt larvae, particularly at salinities of 2 and 6 PSU. At a salinity of 2 PSU, hypoactivity was observed for larvae exposed to the lowest and highest concentration (1 and 100 ng/L) of permethrin in the light periods. At a salinity of 6 PSU, exposure to permethrin elicited a hyperactive state during light period for all concentrations tested. In contrast, no difference was observed between the control and the three permethrin concentrations during the light period at 0.5 PSU. In addition, at 2 and 6 PSU, the low and medium concentrations significantly increased the freezing duration of larval fish during dark periods compare to the control, showing nonmonotonic dose response curves. We will be describing the project and presenting the above, preliminary, results.

*Effects of Salinas Valley agricultural runoff on fathead minnow (*Pimephales promelas*) larvae.

Stinson, SA[1], Hasenbein, S[2], Erika Holland[3], Xin Deng[4], Connon, RE[1]
[1]University of California, Davis, CA., [2]Technical University Munich, Germany, [3] California State University Long Beach, [4] California Department of Pesticide Regulation.

Runoff can introduce influxes of highly toxic, complex chemical mixtures into nearby aquatic habitats, causing adverse biological effects. These dynamic mixtures often include chemicals of concern known to have adverse biological effects in single chemical laboratory exposure experiments. Exposure to multiple stressors occurring in the natural environment often results in complex, nonlinear organismal responses which contrast results obtained from exposure to single stressors under laboratory conditions. In this study, we performed 96h exposures with larval fathead minnows (*Pimephales promelas*) and applied a suite of molecular biomarkers to evaluate toxicological and behavioral effects of agricultural runoff associated with long-term monitoring sites in Salinas, CA. We compared these data with results of single and binary chemical exposures on two chemicals of concern known to be present in our ambient field water samples; Imidacloprid (IMI) and Chlorantraniliprole (CHL). Chemical analysis of ambient field water collected at the monitoring sites show repeated detections of two chemicals of concern, IMI and CHL, which contribute to complex mixtures, each consisting of more than fifteen individual chemicals. When considered individually, no single chemical exceeded benchmark levels, or approached the LC50s for sensitive species. Differential expression (determined by qPCR) of genes involved in first line detoxification (CYP1a and CYP3a), muscular and neuronal function (PVALB and SERCA1) was observed in ambient field water 96h exposures. Exposure to Imidacloprid also resulted in changes in expression of genes associated with detoxification and neuromuscular activity (ASPA, CYP3a and SERCA1), at low (25ng/L), medium (500ng/L), and high (10,000 ng/L) concentrations. No significant changes in expression were observed in CHL, nor in the IMI+CHL mixture exposures at any concentration. Our findings suggest that ambient field water is more toxic to sensitive species than predicted by the two frequently detected pesticides, IMI and CHL. Synergistic effects of multiple stressors is well-documented in previous studies, and serves to illustrate the potential hazard of formulating inaccurate conclusions from results of studies of single stressors. It is possible that additional chemicals not included in the Pyrethroid screen or LC-screen could be contributing to the observed toxicity and sublethal effects on gene expression. Changes in swimming behavior after exposure to various environmental pollutants can act as early indicators of stress. To understand sublethal ecologically relevant impacts of exposure, and to link physiological stress to behavior, we conducted swimming behavior assays in a Daniovision chamber. Hyperactivity was observed in *P. promelas* for sites with the highest observed levels of target chemicals, when compared with other sites and Controls. This change in behavior could increase visibility to predators and/or reduce the ability to capture prey, thus altering ecological fitness. Our study resulted in no fish mortality in any of our field or lab exposures, which on its own suggests no direct toxicity to a model fish species, however, sublethal responses suggest potential for longer term direct or indirect effect, which need further investigation.

*Mortality & Behavioral Effects Post Exposure to Agricultural Run-Off and Direct Pesticide Solutions in *Daphnia magna.*

N. J Egan, University of California, Davis, Davis, CA, S. Stinson University of California, Davis, Davis, CA, X. Deng, California Department of Pesticide Regulation, Sacramento, CA, R. Connon, University of California, Davis, Davis, CA.

Aquatic organisms living downstream of agricultural areas are often exposed to agricultural runoff that contains a complex mixture of pesticides. Besides mortality, exposure can cause sublethal effects such as alterations in behavior; a sensitive endpoint of ecological relevance. In this study we aimed to characterize both lethal and sublethal effects of agricultural runoff collected at three sites in the Salinas River watershed, California, using a sensitive toxicological model organism; *Daphnia magna*. To do this, we exposed *D. magna* neonates (<24h) for 96h to ambient water samples at 100%, 60% and 30% dilutions. Chemical analyses of site water detected varying concentrations of several pesticides of concern, including Imidacloprid and Chlorantraniliprole; contaminants of emerging concern. Toxicity varied between sites, and showed increasing mortality with concentrations and zero percent mortality in controls. Significant differences in swimming behavior were determined between the treated and control groups. Organisms exposed to non-lethal concentrations of ambient water had significant changes in behavior. A follow up study was then done to assess these same effects after exposure to both single and binary chemical mixtures of Imidacloprid and Chlorantraniliprole. The results of these studies emphasize the need to consider sublethal responses when assessing water quality.

*Effect of temperature on Chinook salmon's susceptibility to columnaris disease.

Samah M.R. Abdelrazek 1 , Jiangtian Guan 1 , Amelie Segarra 1 , Florian Mauduit 1 , Esteban Soto 2 , Richard Connon 1 .
1 Department of Anatomy, Physiology, and Cell biology; 2 Department of Medicine and Epidemiology, School of Veterinary Medicine, Davis, California, 95616, USA.

In conjunction with impaired water quality and rising water temperatures associated with climate-driven conditions, diseases are among the most pressing risk factors that contribute to the imperiled status of local salmonids. Flavobacterium columnare is a significant bacterial pathogen and the etiological agent of columnaris disease. This study aimed to determine how water temperature increase influences the F. columnare abundance and expression of immune-related genes in gills; and evaluate the impact of elevated water temperature, F. columnare infection, and their interaction on juvenile Chinook salmon exploratory and locomotor behavior. Fish were assigned to one of four treatments, designed as a full factorial of F. columnare: challenged or non-challenged, and water temperature: 14 or 18 o C. QPCR-based determination of F. columnare abundances showed that bacterial copy numbers μg −1 were significantly higher in challenged fish kept at 18°C compared to challenged fish kept at 14 after ten hpi accompanied with an increase of proinflammatory genes expression. Data collected from swimming behavior is currently under analysis, as are pesticide exposure and infection interactions data. Our results suggest that at elevated water temperatures (18°C), juvenile Chinook salmon may become more susceptible to F. columnare infection, putting them at risk of impaired swimming behavior.

*Evaluating Health Effects of Microplastics in Marine Mammals: A Scoping Review.

P.A Garudadri, University of California Davis School of Veterinary Medicine, Davis, CA, J.B. Lang, UC Davis One Health Institute and Karen C. Drayer Wildlife Health Center, Davis, CA, E.D.Fausak, Carlson Health Sciences Library, Davis, CA, J. Gjeltema, DVM, Dipl. ACZM, UC Davis School of Veterinary Medicine Department
of Medicine and Epidemiology, One Health Institute, and Karen C. Drayer Wildlife Health Center.

The ubiquitous presence of plastics in the environment presents an emerging health risk to marine organisms and ecosystems due to potential harmful physical effects, leaching of toxic additives, and transport of pathogens or pollutants. There is little current consensus in the field related to methodologies used or specific health effects. This scoping review uses standardized review guidelines to provide an evidence-based evaluation and consolidation of methodologies used, risk factors, exposure pathways, and health effects for marine mammals related to environmental microplastic pollution. A systematized search of the literature across 4 databases was screened using inclusion and exclusion criteria by 2 independent reviewers and an arbiter. All articles related to the evaluation of microplastics, macroplastics, plasticizers, and common plastic additives in marine mammal tissue were included yielding around 70 relevant articles. Results from this scoping review suggest that benthic deep diving cetaceans may be at highest risk of plastic exposure. Prey predilection, feeding strategy and geographic location also appear to play a role in exposure to plastics. The results of this review highlight the current state of research and directions of future research important to assess and better understand the health risks of microplastics to marine mammals.

*Potential pathway of microplastic exposure across a marine trophic web.

S. Michishita, Univ. of California Santa Cruz, Santa Cruz, CA, C. Gibble, CA Dept of Fish and Wildlife Office of Spill Prevention and Response, Santa Cruz, CA. C. Tubbs and R. Felton, San Diego Zoo Institute for Conservation Research, Escondido, CA, M. Finkelstein, Univ. of California Santa Cruz, Santa Cruz, CA.

Plastic pollution is resulting in a widespread crisis of plastic ingestion by marine species. Microplastic particles (smaller than 5 mm) are particularly concerning as they can remain in the digestive system, allowing for plastic-associated chemicals to desorb into tissue. Many plastic-associated chemicals, such as bisphenol-A (BPA), are xenoestrogenic and can disrupt the endocrine system. We will investigate the potential trophic transfer of microplastics in a marine food web by quantifying microplastics in seawater, northern anchovies (*Engraulis mordax*), and common murres (*Uria aalge*) from the Monterey Bay National Marine Sanctuary, California. We hypothesize that i) there will be microplastic presence in seawater, prey fish, and seabirds, and ii) the recovered microplastic will have a quantifiable level of estrogenic activity. Three promising techniques for microplastic quantification and estrogenicity will be tested: tissue digestion with 20% v/v potassium hydroxide for extraction, FT-IR and Raman spectroscopy for plastic validation, and the estrogen-receptor activation assay. Preliminary data indicate that microbeads, fishing line, and microfibers are present in prey fish and seawater. Our study will document the potential trophic transfer of microplastics through indirect ingestion and provide some of the first data of measuring estrogenic activity of plastic-associated chemicals extracted from microplastic.

Will publicly-owned wastewater treatment plant (POTW) effluent be our next water supply? The decision may depend on pesticides.

K. D. Moran, TDC Environmental, LLC, San Mateo, CA; M. LaBella, Central Contra Costa Sanitary District, Martinez, CA.

California is planning for a future where people are intentionally drinking treated POTW effluent. POTWs use biological processes not designed to remove chemical pollutants. Even the most sophisticated POTWs cannot fully remove toxic chemicals, including pesticides; therefore, some pesticides and other toxic chemicals pass through into effluent. To support potable reuse of effluent, POTWs typically provide additional treatment using reverse osmosis (RO) technology. The RO treatment process generates millions of gallons daily of liquid waste ("RO concentrate") containing chemicals at up to five times effluent concentrations. The presence of concentrated chemicals, including pesticides, may create disposal difficulties, dramatically increase the cost for RO concentrate disposal, or – in the worst cases – stop potable reuse projects entirely due to the inability to discharge RO concentrate to surface water. Since POTWs cannot regulate pesticides, to make potable reuse succeed, they are focusing on prevention as a means to protect human health and overcome RO concentrate disposal challenges. Monitoring and modeling studies that incorporate human health endpoints and RO concentrate management are needed to inform pesticide product design and, as necessary, regulation and mitigation measures to allow society to obtain the full benefits of its soon-to-be necessary new urban water supplies.

*Identifying Metabolites of Anthropogenic Chemicals Using a Nontarget Workflow.

M.E. Hattaway, O.M. Wright, H.N. Bischel, T.M. Young, University of California, Davis, Davis, CA.

Nontarget analysis promises the ability to identify a broader range of contaminants, beyond the limitations of target or suspect screening, to find the "unknown unknowns". However, this approach also can generate daunting lists of thousands of "features", or aligned spectral peaks presumed to be chemicals. Beyond being computationally intensive, attempting to identify all features is unnecessary, as some may be spurious artifacts of the alignment algorithm, while others may be unthreatening biomolecules. The goal of this research is to develop a workflow to process nontarget data aimed specifically at identifying breakdown products of anthropogenic chemicals. The EAWAG Envipath pathway prediction system will be used for generating a database of exact masses of metabolites of target- and suspect-identified compounds. The utility of this database in prioritizing nontarget features for further investigation to determine formula and structure will be discussed. Applications to reactors that treat pesticide-containing water, including municipal wastewater treatment systems and woodchip-based bioreactors will be discussed.

*Informing treatment of pesticides in agricultural drainage: using molecular docking simulations to identify candidate enzymes to promote degradation of pyrethroids and strobilurins.

O.M. Wright, T.M. Young, H.N. Bischel, Department of Civil & Environmental Engineering, University of California, Davis.

Cost-effective strategies are needed to degrade pesticides in agricultural drainage systems. Bioaugmentation is a strategy involving supplementing treatment areas with microorganisms known to degrade target contaminants. However, selective enrichment of beneficial microbial communities for continuous contaminant treatment can be costly and materials intensive. Moreover, isolating pesticide-degrading microorganisms often involves the addition of the toxic contaminant itself to selective growth media. Molecular docking simulations using enzyme receptors may help identify specific beneficial enzymes, and thus microbes, along with alternative, benign substrates for use in selective enrichment. We applied virtual screening to identify enzymes with the capacity to degrade target pesticides and screened these enzymes against nontoxic and cheaper selective substrate candidates. Specifically, we used a custom bioinformatics workflow followed by molecular docking simulations to predict the catalytic potential of carboxylic ester hydrolases for the degradation of ester-containing pyrethroids and strobilurins. We obtained a shortlist of microbial enzymes by integrating information from a biodegradation pathway prediction system and protein databases. We screened 31 pesticides, and a suite of nontoxic ligands with shared functional groups, for their ability to bind to enzymes' catalytic residues. Ongoing analysis is assessing these results to inform the design of future selective enrichment studies for targeted pesticide degradation.

*Characterization of covalent and noncovalent interactions of diverse PFAS with proteins using suspect-screening and molecular docking.

W. Li, University of California Davis, Davis, CA. H. N. Bischel, University of California Davis, Davis, CA.

Aqueous film forming foams (AFFF) used for hydrocarbon fire suppression consist of a mixture of poly- and perfluoroalkyl substances (PFASs). The most abundant ingredients (e.g., PFOS) have been phased out of production due to their toxicity, persistence, and bioaccumulative potentials. However, PFASs with similar structures continue to serve industrial needs. The assessment of bioaccumulation of PFASs sourced from commercial products has been insufficient and challenging. Covalent binding is an example of overlooked PFASs bioaccumulation pathway, which contributes to permanently retained PFASs in tissues. We exposed human serum albumin protein (HSA) to a series of AFFF (3M, 1999) dilutions in equilibrium dialysis assessed by High Resolution Liquid Chromatography Quadropole Time-of-Flight Mass Spectrometry (HPLC-QTOF-MS). From equilibrium dialysis experiments, we assessed the noncovalent associations of 26-targeted PFASs, which exhibited strong binding affinities with HSA, including C4-PFASs (log K_a= 4.1-4.9 M^{-1}). Low levels (5-20%) of the three PFASs(PFBS, PFOS, and PFOA) exposed to HSA are retained via covalent binding, which might contribute to toxic effects. We further expanded our analysis by screening our samples against a PFAS library containing over 3,000 compounds, as over 91% of organic fluorine in AFFF cannot be assessed with target-analysis against 26-PFAS standards. We calculated pseudo-bioaccumulation factors (BAF_{pseudo}) for covalently bound and noncovalently bound PFASs that were qualified from suspect-screening. The short-chain PFASs have been considered to be less bioaccumulative, yet BAF_{pseudo} for the C_4 sulfonate in the covalent-bond fraction ($BAF_{PFBS,pseudo}$ = 9.88 ± 1.94) was an order of magnitude greater than that for L-PFOS. By simulating interactions between PFASs and HSA crystal structures via molecular dockings, we were not only able to validate the computational method for targeted PFASs but also to predict protein binding affinities of novel PFASs qualified from suspect-screening. The combination of experimental and modeling techniques provided value in rapidly assessing the bioaccumulate potential of emerging PFASs in commercial products and addressed the significance of overlooked PFASs bioaccumulation pathways.

*The Mafia and Hazardous Waste: A Review of Health Consequences in Southwestern Italy.

J. C. Bonnell, University of California, Davis, Davis, CA.

Since the late 1980s, the Italian Camorra mafia group has illegally dumped and burned over ten thousand tons of hazardous waste in the Campania region of southwestern Italy, now infamously known as “The Land of Fires”. Much of this waste contained hazardous industrial by-products, such as polychlorinated biphenyls and dioxins. Exposure to these materials is known to cause cancer, and may lead to reproductive health issues and birth defects. The results of investigations into the current population health in the Campania region may inform responders on the efficacy of clean up efforts in the area. In this review, literature published in English analyzing the effects of this illegal waste dumping on human health endpoints was assessed. This analysis revealed trends in published literature indicating that the rates of lung, liver, and bladder cancer mortalities, as well as the incidence rate of urogenital birth defects, increased significantly in the areas of Campania with the highest concentrations of illegal waste. Male fertility in highly impacted areas has also been found to be adversely affected. Further research should be undertaken using larger sample sizes to confirm these results, as well as to explore the effects of confounding variables on these preliminary observations.

Rapid detection of lethal amatoxins (amanitins) from mushroom and urine samples using a portable, simple test strip.

C.S. Bever, ARS-USDA, Albany, CA.

Amatoxins are potent protein synthesis inhibitors that are found in some mushroom varieties. Inadvertent ingestion of mushrooms containing amatoxins often result in liver failure (in both humans and dogs) and even death. Current methods for the detection of amatoxins require the use of expensive instrumentation, such as liquid chromatography/mass spectrometry (LC/MS) and complex extraction protocols using organic solvents. In order to improve the speed and accuracy of amatoxin detection, we have developed novel mouse monoclonal antibodies (mAbs) against α-, ß- and γ-amanitins. These mAbs were then employed in a lateral flow immunoassay (LFIA) test strip format to rapidly detect the presence of amatoxins in suspected mushrooms samples and urine specimens from exposed individuals or animals. Our assay clearly indicates the presence of 10 ng/mL of amatoxins and the method including extraction and detection can be completed in approximately 10 minutes. The test can be easily read by eye and has a presumed shelf-life of at least 1.5 years. This assay can be used to address the shortcomings (speed, portability, cost) of current clinical diagnostics, holding high promise to identify fatal mushroom poisonings sooner. In addition, this LFIA can be used to aid mycologists and clinicians to quickly identify amatoxin-containing mushrooms.