Is There Danger Underfoot?

Backyard poultry and exposure to toxic chemicals: What you need to know

By Maurice Pitesky and Birgit Puschner

When we think about our backyard poultry and the food they produce, we assume that they are producing a healthy, natural product for our family—after all ,they are living right outside our house in our backyard. While our backyard chickens typically do produce healthy, nutritious food, we need to recognize that just like us, chickens "are what they eat" and if they ingest contaminants, those contaminants can accumulate in their eggs and other parts of the chicken.

This "we are what we eat" reality is compounded in chickens since unlike us, chickens spend up to 25 percent of their time eating off the ground. This feeding behavior can lead to ingestion of toxic compounds that may be in the environment.

Natural disasters like fires and floods can spread toxic chemicals at both a local and regional level. For example, when we have fires, chemicals can be disseminated into the environment as ash which can then be ingested by our backyard chickens. Specifically, ash material created during a fire can aerosolize and deposit in soil or dissolve in water and be further disseminated.

In addition to natural disasters other events like nearby demolition, proximity to heavily-driven roads, industrial chemical plants, and environmental clean-up sites (aka superfund sites) can contaminate our environment with similar chemicals.

We'll describe the nature of this problem and provide some useful tips toward monitoring the health of your chickens and the quality of the food they produce with respect to exposure to various classes of chemicals.

We are what we eat…

Our backyard chickens typically live off and eat off the soil and hence are at risk for exposure if there are any toxic chemicals in their soil environment. Chickens spend so much of their time pecking dirt and grass that toxic chemicals can be ingested. Potentially, these can be absorbed into various organs, tissues (i.e. muscle), and developing eggs destined for human consumption.

What kind of chemicals can my chickens be exposed to?

A growing body of research is focusing on contamination of eggs from toxicants that are found in the environment and are often derived from man-made chemicals. To simplify the different types, we have divided up some common contaminants into the following categories:

- **Heavy metals** such as lead, cadmium, mercury, copper, and arsenic can be present in various building materials and electronics/computer parts. Heavy metals can become more mobile after fires by "traveling" as ash. Alternatively, they can leach into groundwater and impact soil and food crop quality.

■ **Dioxins** are compounds that persist in the environment and are by-products formed during various industrial processes that include incineration, power generating, pulp and paper manufacturing, and synthesis of herbicides and pesticides. Toxic exposure can result in cancer, endocrine and thyroid disruption, and immunological effects. They can also be transferred to breast milk. Humans are exposed primarily via food-chain animal products, including fish, meat, animal-derived fats, dairy products, and eggs.

■ Even though **PCB** (polychlorinated biphenyl) production in the U.S. was stopped in the 1970s, PCBs are still present today in the environment, and can be found in many materials including office furniture. PCBs can cause a variety of adverse health effects including immune system dysfunction, endocrine disruption, and deficits in neurodevelopment.

■ Various types of **PBDEs** (polybrominated diphenyl ethers) are commonly used as fire retardants. Some PBDEs have been linked to health problems including various endocrine problems and learning and memory impairment.

Of the many potential soil contaminants of concern to urban agriculturalists, lead is the most consistently-elevated pollutant within and among urban areas of the United States. Lead when ingested is a neuro-toxicant. It is unfortunately somewhat ubiquitous in our environment since it was

used in paints in the U.S. until 1978. It is also used in many other common household items including batteries, alloys, pipes, fishing sinkers, and lead shot.

Also, metals can persist in the environment indefinitely. For example, if a home was built and painted pre-1978 in the U.S., lead may have been used. Paint chips can end up in the soil and be consumed by our chickens. In addition, most chickens exposed to lead can appear clinically normal, although in developing birds clinical signs are apparent and include muscle weakness, difficulty walking, and anemia. Unlike bacteria (i.e. *E. coli, Salmonella*) lead cannot be "disinfected away"—mitigation is more challenging than simply cleaning with an appropriate biocide.

Where does the risk come from?

One of the unfortunate legacies of natural disasters like fires and floods, and the historical presence of toxic chemicals in our environment, is the residual contamination of land, soil, and water. Debris from natural disasters can include the combustion of household hazardous waste (e.g. batteries and other electronic waste, paints,

flammable liquids), building material (e.g. stucco, sheetrock, joint compound, asbestos siding and pipe insulation), pesticides, and fire suppression chemicals that may have been used.

For example, ash debris from the California wildfires from 2007 was found to contain heavy metals that could cause long-term health effects. Likewise, floods can result in the dilution of toxic chemicals into surface and ground water. As that water evaporates, chemicals including toxic chemicals can come "out of solution" and persist in the environment.

How to get the lead (and other toxic chemicals) out

Unfortunately, there is limited scientific data on this issue. For example, while the yolk can take between two to five weeks to fully develop before the final 25 hours for egg production, we don't know that after removal of the toxic chemical if there is a withdrawal time in days, weeks, or months (or never) for clearance of the toxicant.

We know far less about these type of potential risks than food safety risks associated with bacteria. It is therefore best to act with an abundance of caution.

Interestingly, the U.S. Food and Drug Administration has not established regulatory limits for concentrations of trace metals in edible tissues of livestock and poultry. (The exception is arsenic, which has been

monitored by the Food Safety and Inspection Service of the U.S. Department of Agriculture since the 1970s.)

If you want to be super-cautious, work with a diagnostic lab where eggs and/or organ meats from your chickens can be analyzed—livers and kidneys are typically where toxic compounds are found in the highest amounts. In addition, consider working with an environmental toxicology lab to understand if there is a risk in your soil.

Furthermore, your state's department of public health and office of environmental health may be able to provide some guidance with respect to lead exposure and other toxicants in your community. If exposure to a toxicant is identified in a flock, every effort must be made to identify the source of contamination in the environment. Submitting appropriate samples (such as soil, water, feed, and wood chips)—along with a thorough scouring of the environment for manmade sources—will help identify the source.

What if they found something?

Specific recommendations could include removal of the toxic materials, elevation of coops above the ground to minimize contamination from soil, and avoiding using chicken eggshells in compost (because of the potential to re-contaminate the hens or other food sources). The contamination of chickens or eggs suggests a potential source in the environment to which children could have direct access, as well.

Finally, any chicken presenting illness should undergo a heavy-metal screen regardless of clinical signs or primary diagnosis. With respect to lead, anyone concerned about acute or chronic lead exposure from animal products should contact the local health department or physician about testing their blood levels, particularly in children and pregnant women.

In addition, many animal science programs and veterinary institutions routinely test eggs and blood levels in animals.

For you and your flock

Use common sense. In the same way you focus on biosecurity to protect your chickens from diseases, you can use a similar common sensical approach to assess whether your chickens may have access to toxic compounds in the environment.

Consider the risk by doing a thorough assessment of your home and its surrounding environment. Using that knowledge will help you assess risk and help you determine if some type of additional testing is worthwhile.

Backyard chicken keepers should periodically assess the lead concentrations in eggs of family-owned flocks.

About the author

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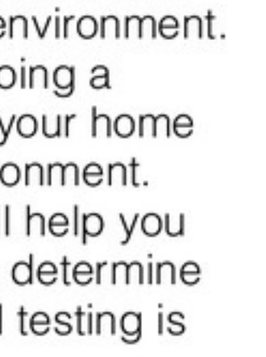

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