Ohio Journal of
Environmental Health

2nd Quarter 2017

Why Soil Lead Testing at Community Gardens is Essential

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- Calculating Return on Investment of a Mosquito Prevention and Control Program
- 2017 AEC Award Highlights
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The object and purpose of the Association shall be the betterment of the health and welfare of mankind through the improvement of the environment. This shall be done by sponsoring state and regional meetings and publications, by developing methods of measuring and evaluating achievements in environmental health, the establishment of a central point of reference and education material for the membership, the procurement of cooperation with other agencies and organizations, and such other activities as will lead to the greater efficiency and professional growth of the membership.

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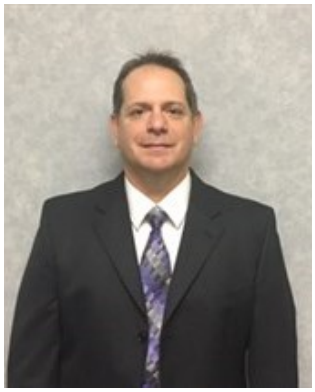
President's Message

Paul DePasquale, MPA, R.S.
Stark County Health Department



It is a special honor and a privilege to begin my term as president of the Ohio Environmental Health Association. Our outgoing president, Chad Brown, deserves an enormous thank you from all of us for guiding the association with his excellent leadership skills. Luckily, for all of us, Chad will continue to serve as an officer of the association for an additional year, in the role of past -president. I am especially grateful that I will be able to rely on his wise counsel during my term. Chad's last President's Message in the Journal he stated: "I did my absolute best to serve the association with dignity, and I'm hopeful you all are pleased with the progress the association has made over the past year." Well Chad I can say with a resounding YES! Yes, we are pleased!

Our association has been working hard to promote and advance environmental health in Ohio and on April 6th and 7th, 2017 our 71st Annual Educational Conference was instrumental in achieving this goal. I want to thank Garrett Guillozet and his conference committee for all their hard work, dedication, and service to our association in putting together an excellent conference for all of us to learn and enjoy. Job well done!

In April, the Ohio House Finance Committee unveiled its revised budget bill (Substitute House Bill 49) which contained an alarming provision that abolished the Ohio Board of Sanitarian Registration. Additionally, the legislation proposes to transfer all of the Board's duties to the Ohio Department of Health, giving full authority and oversight of our registration to the Director of Health. The OEHA Board of Directors and I promise our membership that we are working with our lobbyists to oppose this legislation. We are developing opposition testimony that we will present on behalf of OEHA in the legislature. Additionally, we are working with our lobbyists and other professional public health associations in the state regarding the future of the Board. This is a top priority for the Board and we know this is an important issue for all of us so we will stay on it and be aggressive.

Sanitarians are on the front lines of improving and protecting the health and well-being of people and communities. Across Ohio and the nation, sanitarians provide services aimed at promoting healthy environments; preventing diseases and injuries; ensuring access to safe food, water, and clean air; preparing for and responding to public health emergencies. Spring is here and summer is right around the corner, which marks environmental health's busy season. I know many of you are out in the elements protecting the public by inspecting, educating, and enforcing. I remind you all to stay SAFE. So, when you're out take time to know the weather report for the day, pay attention to your driving, and be alert of your surroundings. Protecting the health and well-being of our communities and environment only occurs when we first keep ourselves safe.

Thank you for your attention and all the important work you do to protect public health in Ohio!

Featured District Director's Message - Northeast

Tom Blackford, R.S.
Lorain County General Health District

I was asked to write a short article to introduce myself as well as provide any pertinent updates about Northeast District. I'll start with the easy part. I received my Bachelor of Science in Human Biology from Michigan State University in 2004. I was originally on track for medical school, but after much deliberation, decided that it was not my path in life. Having said that, I still took the MCAT, applied to medical schools, and even got called for interviews, but still decided against it. This lead to a few interesting jobs between 2004 and 2007. I was a painter, I worked for a small medical ultrasound sales company, and worked at an automotive paint testing laboratory. There were also several stretches of no employment as well. Fast forward to April 2007, where I started with Cuyahoga County Board of Health. I worked mostly in food protection and food plan review, and would occasionally help out with hoarding, nuisance complaints, ORV, and mass vaccination clinics. I left Cuyahoga County in 2015 and began working at Lorain County General Health District, where I am currently employed. I continue to work in food protection, but also work in the solid waste program and school safety program. In my spare time, I play guitar in a band. You can find us playing in Lake County on almost any given weekend.

Northeast District will have the conference for the second year at the Galaxy in Wadsworth. This location was well received last year, which was a major factor in choosing it again. The Galaxy is centrally located in the district, has nice accommodations, and good food. The "networking events" are also worthwhile. The theme will be something along the lines of "You Can't Make This Stuff Up." We all have that one crazy, you-wouldn't-believe-this-unless-you-were-there story, and we'd like people to share that with the group. We're interested in photos with quick captions of what happened, short stories, etc. Feel free to email to me or any other member of the planning committee. One of the keynotes will be about one of these unbelievable stories that happened in Lorain County very recently. Also at the conference this year, we have a great entertainer lined up for the banquet (and no, it's not my band). He's a hypnotist, so if he's terrible, he can probably hypnotize us into thinking he was great. I may have him come back at the end of the conference too, just to be safe.

Public Affairs Committee Report - 2nd quarter 2017

Stephan Ruckman, R.S., MPH
Public Affairs Committee

It is a busy time in public affairs for OEHA. As noted in President Paul DePasquale's message, the Ohio House Finance Committee unveiled its revised budget bill (Substitute House Bill 49) in April. This revised bill contains a provision that would abolish the Ohio Board of Sanitarian Registration and transfer all of the Board's duties to the Ohio Department of Health. There will be a strong and continued effort on behalf of OEHA to oppose this legislation. An important role for the Public Affairs Committee is to assist with our lobbyists and work [with] other professional public health associations in the state regarding the future of the Board. We encourage members to have an active voice on this issue and contact any member of the Board or myself to share your thoughts.

In other news, the Ohio Public Health Advisory Board met on May 5th, 2017. Several rules were considered on the agenda related to direct care providers, nursing home licensure, naturally occurring radioactive material, and childhood lead poisoning prevention. All rules were recommended to be approved by the Director with the exception of childhood lead poisoning prevention. Program staff will be sharing new language with stakeholders prior to future consideration of the Board. There is a provision in the new language that would allow for Lead Risk Assessors to do investigations without being Registered Sanitarians, but only if approved by a Local Board of Health and after direct training from a Registered Sanitarian. The next meeting of the Ohio Public Health Advisory Board is June 23rd, 2017. A tentative agenda for rule review includes: residential care facilities, private water systems, swimming pools, newborn screening, and certification of radiation experts for medical radiation equipment.

It will likely be a busy second quarter for all of us tasked with the responsibility to monitor issues that will impact our members. We are all very fortunate to have great leadership guiding us and very skilled legislative liaisons assisting along the way. Please let me know if you have any questions or concerns you would like to share.

Why Soil Lead Testing at Community Gardens is Essential

Anne Kaup-Fett, MS, R.S., REHS
Certified Healthy Homes Specialist
Clark County Combined Health District

Introduction

"Eat local foods." People are encouraged to shop at local farmers markets, dine at restaurants that feature local foods on their menus, and – best of all – grow their own local produce. Many people choose to be part of community gardens because they want to eat local produce, but live in urban areas where affordable fresh fruits and vegetables are hard to find ("food deserts") or they have limited backyard space. Thousands of community gardens already exist where enthusiastic neighbors found a vacant lot nearby, obtained permission to develop it into a garden, hosted a meeting for like-minded participants, and broke ground (1).

The benefits of community gardens are many. They encourage strong and productive neighborhoods; build new friendships; strengthen families; and teach sustainable living and healthier eating (2, 3). Community gardens provide outdoor activities for children and encourage them to eat fresh produce. Community gardeners are reported to eat more fresh fruits and vegetables than non-gardeners (4) and a diet rich in fresh fruits and vegetables can reduce the risk for diabetes, heart disease, obesity, and some types of cancer (5). Everyone wins – right?

Well, there can be a problem. The elephant in the room is the pervasive presence of lead.

How is lead associated with community gardens?

Lead has been a threat to healthful urban living in the United States since Colonial times when it was added to house paint to make it more durable (6). Lead was not banned in house paint in the United States until 1978; from plumbing until 1986; or from gasoline until 1996! So, if the vacant property considered for the community garden is near heavily-travelled roads or the site of a former building with lead-contaminated paint, lead is probably in the soils (7, 8).

Why is that an issue?

Once lead has been deposited in the soil, it does not break down or move much, so lead can persist in a location for a very long time (9). Since children play close to the ground and in the dirt, they are vulnerable to lead poisoning. They can be exposed via soil residues on unwashed produce, via produce that has taken up lead through its skin or roots, and via dirt on unwashed hands when they eat. (10). They can be exposed to lead when they inhale soil particles made airborne during gardening activities or when dirt is transported into homes on dirty clothing and shoes (11).

Why should we worry?
Are blood lead levels really such a problem?

Numerous guidance documents state that, for children age six and under, the blood lead level should [be] 5ug/L or less (12). So, you can be excused for thinking that any level below that is manageable, treatable, or possibly even "okay". But, the reference value for lead was not set because it is a "safe" level that a human body can tolerate - it was set because it is the minimum level that the medical laboratory instruments can detect with confidence (13). Lead is a potent neurotoxin and there are no "safe" blood lead levels (14). Any elevated blood lead level is a health threat to children because their nervous systems are still

Figure 1. Community Garden!

developing. It can have irreversibly negative effects on intellectual development and future educational, financial, and social success. Numerous research projects have confirmed that children who are exposed even to very low lead levels early in life can experience profound behavioral and developmental problems later on (15). Cohort studies of individuals who were exposed to lead in early childhood self-report crippling effects on later life experiences, such as delinquent behavior (why can't I stay out of trouble?), anti-social behavior (why can't I get along with my family or hold a job?), and aggressive behavior (why am I angry all the time?) (16). Well-documented adult criminality data has found a direct connection between number of arrests and high blood lead levels in the first six years, with each 5ug/dL rise in blood lead levels leading to a 48% increase in violent criminal behavior (17).

Research has also shown that lead can lower IQ. The estimated IQ point decrements associated with blood lead levels from 2.4 to 10ug/dL; 10 to 20ug/dL; and 20-30ug/dL are 3.9; 1.9; and 1.1, respectively (18). This means that very low blood lead levels (well below the reference value of 5ug/dL) can have greater effects on intellectual development than higher blood lead levels.

So, it is best to avoid exposing children to lead in any setting. Just as children can be inadvertently poisoned by lead during well-meaning but dust-generating home renovations, a cruel consequence of community gardening could be the inadvertent exposure of healthy children to lead in a community garden setting. Let's prevent that from happening.

Project

In order to determine the prevalence of lead in soils in Clark County community gardens, samples were collected from sixteen of the estimated forty-one community gardens in the county. The samples were tested for lead and the results shared with the community garden members. Guidance was provided to assist with garden design to reduce the risk of inadvertent exposure of children to lead-contaminated soils. Follow-up re-sampling was conducted at six gardens to determine if recommended corrective actions had reduced the lead content of the soils.

Test Areas

The Clark County Combined Health District reached out to the Ohio State University Clark County Master Gardeners community garden program and organizers of known community gardens, offering free lead soil testing. Many community gardens in Clark County are located in neighborhoods with a high percentage of housing built before 1950, low rates of fruit and vegetable consumption, and relatively high rates of poverty (See Table 1). Several are located at schools, shelters, nursing homes, and churches.

Methods

Between 2011 and 2016, soil samples from eighty-four plots from sixteen community gardens were collected and tested for lead levels. Samples were collected from plots in current gardens, proposed new plots in current gardens, and proposed plots for entirely new gardens. The layout of each garden was mapped and measured, using gardener information, photographs, and aerial photographs to note landmarks for future reference.

Each plot was identified and assigned a number. Five or more sampling locations were chosen from each plot – one at each "corner" and one or more in the "center" to ensure a representative composite sample. The top layer of exposed soil or turf thatch was removed from the surface at each sampling location and a slice

Table 1. Clark County Community Health Survey and Housing Age Data for Clark County Community Gardens.

Areas in Clark County	Zip code tabulation area	# of community gardens per zip code	% of housing built before 1950	Community Health Survey Questions		
				Below poverty level	Ate no fresh fruits yesterday	Ate no fresh vegetables yesterday
Springfield	45503	10	48.5%	30.2%	11.7%	24.9%
	45504	20				
	45505	3				
	45506	5				
New Carlisle	45344	3	19.2%	19.7%	16.9%	28.2%

of soil approximately 4-6 inches deep was removed with a clean trowel or shovel. The bottom sections of the slices were mixed in a clean plastic bag, breaking up lumps and removing any roots, plants, or stones to create a uniform composite sample. The composite sample was split into two samples, one to be mailed to the testing laboratory and one to be kept as a back-up in case the mailed samples were lost. The mailed samples were packaged in UPS envelopes and mailed to a certified soil testing laboratory. The lead levels were determined by the soil testing laboratory, using US EPA Standard Methods 7000 B and 3050 B.

The lead sample results were provided to the community garden group with an aerial photograph and map of the site (on which each garden plot was identified and numbered), guidance documents (with information on how to understand the lead results in the report), and recommendations on how to proceed with garden design and development.

Results

The background concentration of lead that occurs naturally in surface agricultural soils in the United States is an average of 10ppm, with a range of 7-20ppm (19). Lead was detected above the average background level in 100% of the soil samples. The lead result ranges and median levels for initial and follow-up sampling are listed in Table 2.

45% of plot samples (38 samples) were less than 50ppm, 43% of plot samples (36 samples) were between 50 and 400ppm, and 12% of plot samples (10 samples) were greater than 400ppm. One sample was greater than 1200ppm (maximum level = 5093ppm). In eight gardens (50%), all of the plots had lead levels below 400ppm. Seven gardens (44%) had one or more samples which fell between 400 and 1200ppm, and one garden (6%) had a sample greater than 1200ppm. See Initial Sampling data in Table 2 and Figure 2.

Six garden groups undertook corrective actions for specific plots in response to lead testing. In the first, with a lead level of 619ppm, compost was heavily incorporated and the new lead result was 23.9ppm. In the second, with a lead level of 400ppm, raised beds (with replacement soil at 10ppm) were installed. In the third, with a lead level of 954ppm, raised beds (with replacement soil at 12ppm) were installed. In the fourth, with a lead level of 954ppm, the plot was abandoned and the overall garden reconfigured to place the plot farther back on the lot. In the fifth, with a lead level of 750ppm, raised beds (with replacement soil at 10ppm) were installed. And, in the sixth, with lead levels between 350 and 5093ppm, the garden site was abandoned and a new site is being sought. See Follow-Up Sampling data in Table 2 and Figure 3.

Table 2. Initial and Follow-up Lead Results for All Gardens Sorted by Median Lead Level.

Garden	Initial Sampling			Zip Code	Follow-up Sampling			Reduction in lead (ppm)
	Result Range (ppm)	Median Level (ppm)	Number of samples		Result Range (ppm)	Median Level (ppm)	Number of Samples	
1	44.5 – 52.1	48.3	2	45505				
2	46-54	50	2	45506				
3	23.4 – 42.6	32.8	4	45344				
4	36.2 – 44.9	37.4	3	45506				
5	39.8	39.8	1	45506				
6	41.1	41.1	1	45505				
7	18.8 – 619	38.8	20	45506	23.9	23.9	1	595.1
8	27.2 – 400	41.8	6	45506	10	10	1	390
9	29.2 – 83.7	43.1	10	45504				
10	65.8	65.8	1	45504				
11	31 – 954	215	3	45506	31 - 215	123	2	831
12	30.9 – 188	72.2	5	45505				
13	42.2 – 750	112	3	45506	10	10	1	740
14	88-282	147	11	45505				
15	301-667	379	9	45505	301	301	1	366
16	350-5093	937	3	45506	Not done	Not done	Not done	Not done

Figure 2. Numbers of Soil Samples at (0-50ppm) (50-400ppm) (400-1200ppm) (>1200ppm) BEFORE Corrective Actions.

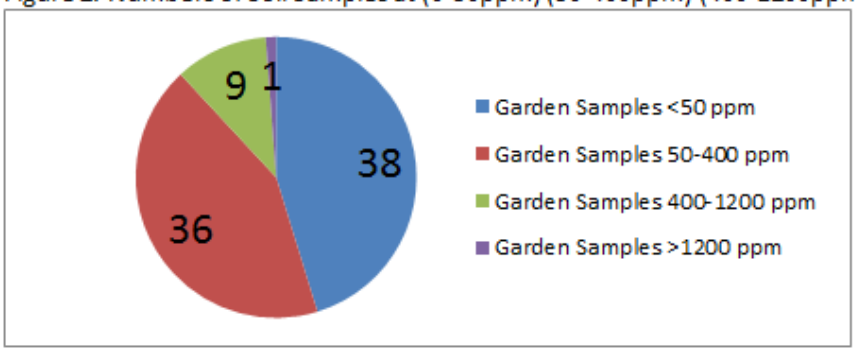
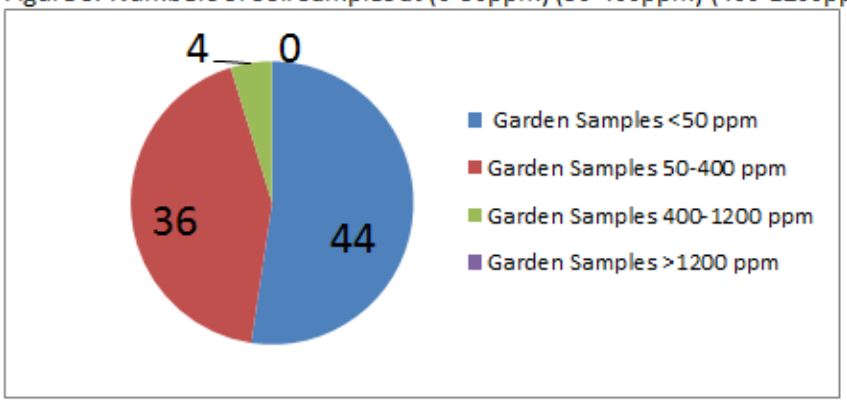


Figure 3. Numbers of Soil Samples at (0-50ppm) (50-400ppm) (400-1200ppm) (>1200ppm) AFTER Corrective Actions.



Discussion

There are no US EPA or State of Ohio health-based soil lead standards for community gardens. The lead concentrations in this study were compared to the US EPA residential bare soil standard of 2000ppm at a building perimeter, 400ppm for bare soil play and high contact areas for children, and 1200ppm average for bare soil in the rest of the yard (20); and the Oregon State University Extension's recommended garden practices, which are based on results of soil tests for lead (21). See Table 3.

The 50ppm level was considered the benchmark for little or no lead contamination and 45% of the samples fell below this. There were no special precautions recommended for these plots beyond instructions on handwashing, and proper food preservation.

The 50-400ppm range was the area in which additional precautions were recommended and occurred in 43% of the samples. The additional precautions for these plots included ensuring the incorporation of compost into the beds and good coverage of bare soil to limit dust and soil consumption by children.

11% of the samples fell within the 400-1200ppm range, in which additional precautions included limiting leafy vegetables (such as lettuce and greens) and root crops (such as carrots, beets, and potatoes), and the use of raised beds with clean soil.

The 1200ppm level was considered the

Table 3. Recommended Corrective Actions Based on Results of Soil Lead Tests (Oregon State University Extension)

Soil Lead Test (ppm)	Recommendations
Less than 50	Little or no lead contamination in soil. No special precautions needed.
50 to 400	Some lead present from human activities. Grow any vegetable crops. Choose gardening practices that limit dust and soil consumption by children.
400 to 1200	Do not grow leafy vegetables or root crops. These crops carry the highest risk of lead contamination. Choose gardening practices that limit dust or soil consumption by children.
Greater than 1200	Not recommended for vegetable gardening. Mulch and plant perennial shrubs, groundcover, or grass. Use clean soil in raised beds or containers for vegetable gardening.

point at which the lead soil contamination was elevated enough to recommend either the complete replacement of garden soils, the exclusive use of raised beds with clean soil, or an alternate location. Fortunately, only one garden sample was this high.

Corrective Actions

Most of the approximately 41 community gardens in Clark County are at least 5-10 years old. The participants are aware of the potential for soil contamination with lead and have already adopted one or more best gardening practices to reduce lead exposure. See Figure 4.

Six of the tested community garden locations, with at least one sample location greater than 400ppm, successfully applied the recommended corrective actions after receiving the lead sample results for their gardens. One group heavily incorporated compost, three groups installed raised beds, one relocated the proposed plot to an alternate location on the same site, and one group abandoned the proposed site and is actively seeking a new site.

Conclusion

Should the potential presence of lead in urban soils discourage community groups from even considering the development of community gardens on vacant urban lots? Absolutely not! The health and social benefits of producing and eating fresh fruits and vegetables are proven and should be encouraged. But, lead testing should always be a part of community garden planning, before breaking ground and before planting.

Corrective actions should be discussed and undertaken whenever elevated lead levels are discovered because, as shown in Table 2 and Figure 3, soil lead levels can be effectively reduced through the application of relatively simple and inexpensive best gardening practices.

This was the first study of lead contamination in Clark County community garden soils. Only sixteen of the approximately forty-one community gardens were tested, but 50% of those tested had one or more plots with lead soil levels greater than 400ppm. And, of the samples checked, 12% had lead levels in excess of 400ppm. Therefore, conducting lead testing and advising community gardeners about best gardening practices continues to be very pertinent and important.

Figure 4. Best Garden Practices.

- Locate the proposed garden away from former building foundations and nearby roadways.
- Cover bare soil with barriers: landscape fabric covered by at least 4 inches of mulch, gravel, clean soil, or sod.
- Provide a fence or hedge as a barrier to block dust from sources of contamination such as nearby roadways.
- Add organic matter (compost) every year to limit the uptake of lead in crops.
- Maintain a pH of 6.5 or more to make lead less mobile in the soil and lessen the amount taken up by plants.
- Use raised beds or containers.
- Replace contaminated soil with new clean soil.
- Plant appropriate crops.
- Clean produce before eating.
- Wash and peel root crops
- Wash and remove outer leaves and bottoms of leafy green vegetables.
- Keep dirt out of homes – avoid wearing dirty clothes in the house.
- Wash hands often during gardening activities and before eating.

Anticipated Improvements to the Program in 2017

1. Increase outreach to community gardeners.
2. Increase the number of gardens tested.
3. Improve sampling to include pH levels. Research has demonstrated that maintaining soil pH levels above 6.5 tends to render lead unavailable to plants (22).
4. Provide site-specific on-site reminders about lead, possibly in the form of durable signs and pamphlets.
5. Improve the availability of resources, such as clean soil and compost, for community gardeners.

Acknowledgements

The author wishes to acknowledge the Ohio State University Extension Clark County Master Gardeners who provided information, addresses, and contacts for many of the Clark County community gardens. The author also wishes to thank the many community partners who spread the news about the program and the community garden groups who allowed access to their gardens for sample collection. Finally, the author wishes to thank the Ohio Healthy Homes Network (especially Dr. Kim Dietrick, University of Cincinnati), who graciously provided research information on lead testing and the long-term effects of lead exposure.

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Calculating Return on Investment of a Mosquito Prevention and Control Program

Adam R. Howard, R.S., REHS
Delaware General Health District

The purpose of this report is to provide environmental health practitioners a method to show return on investment (ROI) of a mosquito prevention and control program and provide calculators to aid in the ROI review, if needed.

Background:

Mosquito prevention and control programs aim to prevent mosquito-borne disease such as West Nile Virus (WNV), Chikungunya, La Crosse Encephalitis, Zika Virus, et cetera through education, surveillance, and control of the vector mosquitoes. This is typically completed by routine education (press releases, social media posts, and brochures), surveillance (mosquito collections, avian death reviews, and monitoring human disease incidence), and control measures (source reduction, larvicide, and adulticide application).

Mosquito prevention and control programs derive their authority from different laws and regulations based on the locality, but, in general, authority in Ohio is derived from Ohio Revised Code 3709.22 "Duties of a board of city or general health district", 3707.07 "Complaint concerning prevalence of disease – inspection by health commissioner", and 3707.32 "Erection of temporary buildings by board – destruction of property" [1,2,3].

> ORC 3709.22: "Each board of health of a city or general health district shall study and record the prevalence of disease within its district and provide for the prompt diagnosis and control of communicable diseases…"[1].
>
> ORC 3707.07: "When complaint is made or a reasonable belief exists that an infectious or contagious disease prevails in a house or other locality which has not been reported as provided in section 3707.06 of the Revised Code, the board of health of a city or general health district shall cause such house or locality to be inspected by its health commissioner, and on discovering that such disease exists, the board may send the person diseased to a hospital or other place provided for such person, or may restrain him and others exposed within such house or locality from intercourse with other persons, and prohibit ingress and egress to or from such premises"[2].
>
> ORC 3707.32: "…Such board may cause the disinfection, renovation, or destruction of bedding, clothing, or other property belonging to corporations or individuals when such action is deemed necessary by the board or a reasonable precaution against the spread of contagious or infectious diseases" [3].

Together, these three laws provide a health district the authority to conduct surveillance (3709.22), investigate potential disease threats (3707.07), and disinfect or treat an area with pesticide as a reasonable precaution to prevent the spread of disease (3707.32) [1,2,3].

Effective mosquito prevention and control programs utilizing surveillance and control can improve public health outcomes and reduce the chance of mosquito-borne disease in the human population. An active surveillance system can detect disease risk in humans as much as 2-4 weeks before the onset in the human population [7,8]. Once detected, the opportunity exists to reduce the mosquito population, which reduces the prevalence of infected mosquitoes and thereby reduces the chance for a human to contract the mosquito-borne disease. To reduce the mosquito population after surveillance indicates disease is present, ultra-low volume (ULV) adulticiding events can be directed

in those areas with disease as it has been shown to reduce the mosquito population [5]. Therefore, to protect the public from mosquito-borne disease a Health District can monitor the mosquito disease prevalence and control the mosquito population when necessary.

Cost of Disease:

Reducing and eliminating disease in the human population alone is a worthy reason to maintain a mosquito prevention and control program, but proving the effectiveness of such a program can, at times, be difficult. In times of competing resources, many programs in Environmental Health can utilize cost methodology and fee revenue to justify the expense beyond the noble cause of lowering the disease burden in the human population. In non-funded programs, such as a mosquito prevention and control program, traditional revenue-expense methods of justifying a program's creation or continuation fall short. In these circumstances, other means must be utilized to evaluate the ROI of the program.

Two studies conducted with different populations in different areas have estimated the cost of a WNV case during a WNV outbreak. In 2002, a WNV outbreak occurred in Louisiana which was used to estimate an average cost per case of WNV during the outbreak [6]. During this Louisiana outbreak the average medical cost of a case of WNV was $27,610. In 2005, another WNV outbreak occurred in Sacramento, California. Barber, Schleier, and Peterson studied this outbreak looking for an estimated WNV case cost [4]. The authors found that on average a case of WNV cost approximately $13,971 [4]. However, not all cases result in the same health outcomes. A human case could result in mild or severe infection. Barber et al. not only found an average for all cases of WNV, but went further to find the average cost of mild infection, not requiring hospitalization, to be $1,170 [4].

These two reports represent wide ranges in the potential cost per case of WNV and are consistent with WNV as the outcomes can vary from no illness to hospitalization. Using the estimations from both studies, it is possible to extrapolate how many WNV cases must be prevented to justify a mosquito prevention and control program. Utilizing the estimation from Zohrabian et al., a Health District whose expense was $50,000 would need to only prevent 2 cases ($55,220) to monetarily justify the entire program's expense [6]. Utilizing the more conservative estimations from Barber et al., for all cases, this same Health District, would need to prevent only 4 cases ($55,884) to monetarily justify the program's expense [4]. Utilizing estimations from Barber et al. for those with mild infection who did not require hospitalization, this same Health District would need to prevent many more cases [4]. The prevention tally would need to reach 43 ($50,310) to monetarily justify the program.

Estimating Infections:

Knowing an estimated cost of infection is only one piece of the equation. To show the potential cost to the community the number of infections prevented must also be known. For this, Kilpatrick, Kramer, Campbell, Alleyne, Dobson, and Daszak provide a method to estimate WNV infections in a given population in a given year [9]. This method involves the mosquito species abundance, the fraction of time the mosquito feeds on mammals, the infection rate, vector competence, and the population density [9]. Using this formula, predictions can be made for the total number of cases that would have occurred in a given year. The standard fraction of 0.19 feeding on mammals and vector competence of 0.38 identified by Kilpatrick et al. can be used for this estimation [9]. To evaluate mosquito species abundance and infection rate, surveillance data maintained by the Health District or the Ohio Department of Health will need to be utilized. Population density can be derived from a local Regional Planning Commission, US Census, and County Engineer.

Figure 1 represents a year for Health District Alpha. Health District Alpha collected 20,000 total mosquitoes in a single year; collected 17,000 culex mosquitoes in a single year; had 15 positive WNV pools in a single year, has a population of 100,000, and has 350 square miles. The fraction blood meals mammal and the vector competence come from Kilpatrick et al. (2005).

Figure 1

Estimating Number of Illnesses		
Total Mosquitoes Collected	20000	LHD data
WNV Positive Pools	15	LHD data
Culex Mosquitoes Collected & Tested	17000	LHD data
Abundance	0.85	Calculated based on Kilpatrick et al., 2005
Fraction Blood Meals Mammal	0.19	Kilpatrick et al., 2005
WNV Prevalence	0.75	Calculated based on Kilpatrick et al., 2005
Vector Competence	0.38	Kilpatrick et al., 2005
Population	100,000	US Census data
Square Miles	350.00	County Engineer data
Population Density	285.7143	Calculated based on Kilpatrick et al., 2005
Risk Measure	0.0460	Calculated based on Kilpatrick et al., 2005
Predicted Infections	13.1507	Calculated based on Kilpatrick et al., 2005

Using the formulas from Kilpatrick et al. (2005) the abundance, WNV prevalence, population density, risk measure, and predicted infections can be calculated. For Health District Alpha, the data suggests that 13.15 human WNV cases should have occurred.

Proving ROI:

If the number of cases is known, the predicted number of infections as developed by Kilpatrick et al. can be combined with the estimated cost of infection developed by Barber et. al and Zohrabian et al. to estimate the total savings the program provided to the community in a single year [4,6,9].

Figure 2 takes Health District Alpha and utilizes cost of infections from Barber et al. and Zohrabian et al. [6, 9]. In this example there were 0 human cases of WNV during the year, but 13 were predicted. Utilizing the cost per infection, Health District Alpha can estimate the money saved to the community for running a mosquito prevention and control program and show a ROI for every dollar spent in the program. In this example, Health District Alpha's ROI is between -34,613.66 and $313,091.22 or, simply, for every dollar spent on the program, between $0.31 and $7.26 are saved by the community.

Conclusion:

This method is just one way to show the ROI of a mosquito prevention and control program. And, this method only takes into account WNV. A more complete ROI estimator should consider Chikungunya, La Crosse Encephalitis, Zika Virus, et cetera. Accounting for these other diseases would likely increase the ROI for a program. But, in times of competing resources, ROI can be a powerful tool to prove the need for a program. Practitioners should look to the literature for proven methods to justify all programs and to protect the public's health. A calculator is available that only requires minimal inputs (total mosquitoes collected, positive pools, culex mosquitoes collected, population, square miles, and program cost) and will calculate the remainder of the information in the figures. If you would like a copy of the calculator, please contact the author.

Figure 2

Program Cost Effectiveness						
	Cost Per Infection	Estimated Infections Prevented	Estimated Community Savings	Program Cost	Monetary Program Effectiveness (ROI)	For Every $1 spent, the $(s) below are saved by the community
Infection Cost (Zohrabian et. al, 2004)	$27,610.00	13	$363,091.22	$ 50,000.00	$313,091.22	$7.26
Infection Cost (Barber et al., 2010)	$13,971.00	13	$183,728.63	$ 50,000.00	$133,728.63	$3.67
Mild Infection Cost (Barber et al., 2010)	$1,170.00	13	$15,386.34	$ 50,000.00	($34,613.66)	$0.31

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2017 Annual Educational Conference Award Highlights

Gus E. Dria, R.S., REHS
Canton City Health Department
OEHA Awards Chair

I would like to congratulate all the award winners and thank the District Awards Chairs for their work recognizing member achievements at the State and District level.

State Committee Members/ District Awards Chairs

- Melissa O'Connell Northeast—Medina County Health District
- Nicki Rumschlag, RS Northwest—Seneca County General Health District
- Carrie Yeager, RS Southwest—Warren County Combined Health District
- Kathyrn Madden, RS Southeast—Columbus Public Health. Kathyrn also serves as the Science Fair subcommittee chair.

Life Members

The following 2017 class of new Life Members were recognized:

- Pam Huber, RS, (NE District) Summit County Health Department -17 years
- Jerry Weber, RS (NE District) Ohio EPA - 17 years
- Mary Ann Webb, RS (SE District) Madison County General Health Department - 33 years
- Deborah Leopold, RS, (SW District) Greene County Combined Health Department - 38 Years

Photo: Life Members Deborah Leopold, Mary Ann Webb and Pam Huber with Gus Dria, OEHA Awards Chair.

George Eagle Scholarship Awards

The George Eagle Memorial Scholarship Committee annually reviews applications and awards a graduate and an undergraduate scholarship for $2,000 each.

The 2017 undergraduate scholarship was awarded to Emily Fuson from Wright State University. Emily is majoring in Environmental Health.

The 2017 graduate scholarship was awarded to Sarah Jensen from Greene County Public Health. Sarah is pursuing her Masters in Public Administration from Kent State University.

Photo: President Chad Brown, Sarah Jensen, GE Graduate recipient, Emily Fuson, GE undergraduate scholarship recipient and Joe Ebel, GE Scholarship Committee Chair.

Outstanding Legislator Award

The Outstanding Legislator Award was presented to Ohio Representative Brian Hill for his outstanding contributions in support of Environmental Health.

Photo: President Chad Brown and Representative Brian Hill, Outstanding Legislator Award recipient.

Publication Award

The 2017 State Publication Award was presented to Dustin Ratliff, RS, REHS, MPH from Warren County Combined Health District. This award was presented for Dustin's article published in the 1st Quarter 2016 Issue of the Ohio Journal of Environmental Health entitled "Emerging Public Health Issues: Zika Virus."

Photo: President Chad Brown, Dustin Ratliff, Publication Award recipient, and Adam Howard, OEHA Publications Committee Chair.

Each year, the District Director and District Planning Committees recognize members with a Membership Award and Outstanding Sanitarian Award at the Fall Education Conferences. Here is a summary of the 2016 fall winners:

Outstanding Sanitarian Award Recipients

- NE – John Schoeni, Mahoning County District Board of Health
- NW – Adam Howard, Delaware General Health District
- SE – Mike Cooper, Athens County Health Department
- SW – Tony Bushchle – Warren County Public Health

Membership Award Recipients

- NE – Gus Dria, Canton City Health Department
- NW – Melissa Adams, Delaware General Health District
- SE – Meredith Lawler, Columbus Public Health
- SW – Deborah Leopold, Greene County Combined Health Department

The Ivan Baker Membership Recognition Award

The Ivan Baker Membership Recognition Award is given to a member who has made a sustained effort for many years in promoting the advancement of the Ohio Environmental Health Association. The 2017 Ivan Baker Membership Recognition Award was presented to Deborah Leopold, RS, retired from the Greene County Combined Health Department.

Photo: President Chad Brown, Deborah Leopold, the Ivan Baker Membership Recognition Award recipient and Tracy Buchanan, award presenter…colleague and friend.

Ray Watts Outstanding Sanitarian Award

The Ray Watts Outstanding Sanitarian Award is given to a member who has made outstanding contributions in the field of environmental Health. The 2017 Ray Watts Outstanding Sanitarian Award was presented to Adam Howard, RS, REHS, from the Delaware General Health District.

Photo: President Chad Brown, Adam Howard, the Ray Watt Outstanding Sanitarian Award recipient and Dustin Kent, award presenter and 2016 Northwest District Director.

President's Award

The 2017 President's award was presented to Jack Pepper, RS, Athens City-County Health Department and 2016 Southeast District Director.

Photo: President Chad Brown and Jack Pepper, President's Award recipient.

OEHA Outstanding Supporter Award

The outstanding supporter award was created to recognize profit and non-profit sponsors and exhibitors that have provided outstanding support to the Ohio Environmental Health Association. The 2017 Outstanding Supporter Award was presented to Scott Hetrick, Norweco Inc. for all the support they have provided OEHA. Thank you for your dedication and support!!!

Photo: Shannon Self, OEHA Exhibitor Chair and Scott Hetrick, Norweco, Inc., Outstanding Supporter Award recipient.

Vice President and Program Chair Award

The Vice President's Award was presented to Garrett Guillozet, RS, REHS, Franklin County Public Health.

Photo: President Chad Brown and Garrett Guillozet, Vice President's Award recipient.

Past President's Award

The Past President's Award was presented to outgoing president, Chad Brown, RS, REHS, MPH from Licking County Health Department by incoming President Paul DePasquale, R.S., MPA, Stark County Health Department.

Outstanding Service Award

The Outstanding Service Award was presented to Vicki Johnson to recognize 30 years of service to this association.

Photo: Tracy Buchanan presenting Vicki Johnson with the Outstanding Service Award.

Legislative Updates

OEHA monitors legislation related to public health closely. This is mainly done through our lobbyists at Hicks Partners. Our members are continually monitoring, reviewing and evaluating legislation. Representatives from Hicks Partners attend each of our board meetings and our Annual Education Conference. We value our relationship with Hicks Partners tremendously, and we look forward to working with them for many years to come.

- 2017 Ohio Executive Budget Bill
  https://www.legislature.ohio.gov/legislation/legislation-summary?id=GA132-HB-49
- 2017 Ohio House-Proposed Budget Changes
  https://associationdatabase.com/aws/OEHA/asset_manager/get_file/154757?ver=150
- Talking Points Regarding the Proposed Abolishment of the RS Board
  https://associationdatabase.com/aws/OEHA/asset_manager/get_file/154813?ver=340
- Opposition Testimony Regarding the Abolishment of the RS Board
  http://www.ohioeha.org/aws/OEHA/asset_manager/get_file/155901?ver=238
- House Bill 65- Regulate reviews of sanitarians who inspect restaurants
  https://www.legislature.ohio.gov/legislation/legislation-summary?id=GA132-HB-65
- House Bill 65 Testimony
  http://www.ohioeha.org/aws/OEHA/asset_manager/get_file/150459?ver=324

Announcements

Have a grant, educational opportunity, move, promotion, or other announcement you would like to share? Please email a member of the publications committee.

Educational Opportunities

September 19-20, 2017: SE Fall Conference
Athens, Ohio

October 2-3, 2017: HIA Practitioner Workshop
Washington, D.C.

October 4-5, 2017: SW Fall Conference
Dayton, Ohio

October 10-11, 2017: NE Fall Conference
Wadsworth, Ohio

October 12-13, 2017: NW Fall Conference
Sandusky, Ohio

Open Positions (Posted after 4/1/17 to the OEHA website with an opening of at least 6/15/17 as of 6/1/17)

Contract Sanitarian
Putnam County Health Department

Sanitarian/Emergency Response Specialist
Warren County Health District

Sanitarian/Sanitarian-in-Training
Columbiana County General Health District

RS/SIT
Lawrence County Health Department

Registered Sanitarian/SIT
Portage County Health District

Environmental Health Sanitarian 1-Part Time
Mercer County Health District

2017 Mosquito Control Intern-Full Time Seasonal
Pickaway County General Health District

Environmental Health Intern
Miami County Public Health

Temporary Seasonal Intern
Columbiana County General Health District

Temporary Seasonal Sanitarian in Training
Columbiana County General Health District

Promotions and New Positions:

Angel Arroyo-Rodriguez
Congratulations to Angel who recently became the ES3 for the Infectious Waste and Composting Unit with Ohio EPA. DMWM welcomes Angel back after spending time with the Planning Unit, Ohio EPA and Office of Compliance and Pollution Prevention, Ohio EPA.

Channon Cohen
Congratulations to Channon who recently became an ES3 in the Scrap Tire Unit in DMWM of Ohio EPA. DMWM welcomes Channon back after spending time with DEFA. Channon will serve as point of contact for all question relating to scrap tire compliance/technical assistance, beneficial use of tires, and rule interpretation. She will also serve as the unit's point person for the upcoming rule review.

We Remember

Larry Holbert - 1953-2017
Larry served environmental public health for 35 years at the Ohio Department of Health.

This article was originally published in the Journal in 1954 vol. 9 no. 3 pg. 95-96

SANITATION EDUCATION OF THE PUBLIC

BY: Ivan Baker, President
Ohio Association of Public
Health Sanitarians

Many factors are involved in the satisfactory execution of any or all programs of sanitation. These factors include uniform regulations, support of industry involved, uniform interpretation of regulations, education of government officials, education of industry, and the education of the public. Probably the most neglected of these items is the sanitation education of the public.

Unless the public understands and accepts the sanitation program, its effectiveness and continuity is greatly handicapped. First of all, the people must be informed of the need. Secondly, it must be shown how the sanitation program will answer the need. But how do we accomplish these tasks?

The value and use of surveys in pointing up the need should not be ignored. However, the surveys should be made by responsible state or local officials. The surveys can be effectively augmented by the use of slides or pictures of local situations, communicable disease reports, number of nuisance complaints, and comparison with areas that have accepted programs. It is then a logical process to explain how an effective program can improve the situation.

However, the difficult task is disseminating this information to the public and selling the idea. The following methods are suggested as possible procedures to realize acceptance of a sanitation program.

Inform the entire health department staff including the board of health. Get the department to work as a team. Utilize all persons available, including health educators and nurses.

The survey results and ideas for improvements can be made newsworthy. Tell your story to the press, radio, and television. Work diligently to develop good relationship with these publicity agencies.

Schedule meetings specifically inviting only government officials, such as county commissioners, township trustees, and councilmen. Educate these people as to the need and possible correction.

Develop exhitits, displays, posters, and pamphlets.

Instigate the formation of a council or committee from the industry involved to assist in the problem. This offers two opportunities. One is the education of the industry. The other is the assistance this group can offer in the education of the public.

Utilize the schools. Talk to classes or assemblies. Sponsor poster contests or use any desirable method to get the story to the school children.

Develop a speakers' panel and provide them with audio-visual aids or props. Get these speakers into as many groups as possible.

There are many ideas or methods that have not been mentioned. However, the proper approach is of extreme importance regardless of what methods are utilized. It should be approached from the viewpoint of the facts brought out by the survey and a community realization of the problem. Then, what shall we of the community do to improve the situation? It is the responsibility of the health department to lead the community in the development and acceptance of a reasonable solution to the problem.

However, we must not rest on our laurels if we are fortunate enough to realize the necessary procedures for improvement. Sanitation education of the public must be a continuing educational program.

Baker, I. (1954). Sanitation education of the public. *The Ohio Sanitarian, 9:*3, 95-96

Picture This

"Stagnant water is a PHN and potential drowning hazard"

Submitted by:
Denny Tan, R.S.
Staff Sanitarian II
Canton City Health Department

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Columbus Public Health

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Eric Cherry, R.S.
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