Preventing Pests for Healthier Schools

The Health Case for Integrated Pest Management

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Keeping Pests Out of Schools for Healthy Bodies and Minds

Cockroaches, mice, rats, fleas, ticks, bed bugs, house dust mites and other pests found in school facilities can be hazardous to the health of students and staff. Some pests spread pathogens that are harmful to people For example, cockroaches and rodents spread *Escherichia coli* (*E. coli*), *Listeria* and *Salmonella*, which cause food poisoning.

Many pests also are common sources of allergens, which can result in serious allergic reactions and trigger asthma attacks.[1] In some cases, pests may contribute to the onset of asthma,[2] a chronic respiratory condition that accounts for more school absenteeism than any other childhood chronic disease.[3] In an average classroom of 30 students, about three students have asthma,[4] and in total approximately 13.8 million school days are missed each year in the United States due to asthma.[5] When students miss school days, not only does their academic performance suffer, but their schools stand to lose state funding as well.[6]

What Is Integrated Pest Management?

Integrated pest management (IPM) is a smart, sensible and sustainable approach to controlling pests. IPM takes advantage of all appropriate pest management strategies, including the judicious use of pesticides. In contrast to conventional pest management, which controls existing pests through scheduled pesticide applications, IPM controls pest populations by removing their basic survival elements, such as food, water and shelter, and by blocking access to facilities where these items might be readily available.[7] IPM prevents pest problems before they begin. IPM also supports healthy school environments by reducing the unnecessary exposure of students, teachers and staff to pests and pesticides.

"IPM is the best way to eliminate cockroaches which, in turn, eliminates the allergens that they produce."

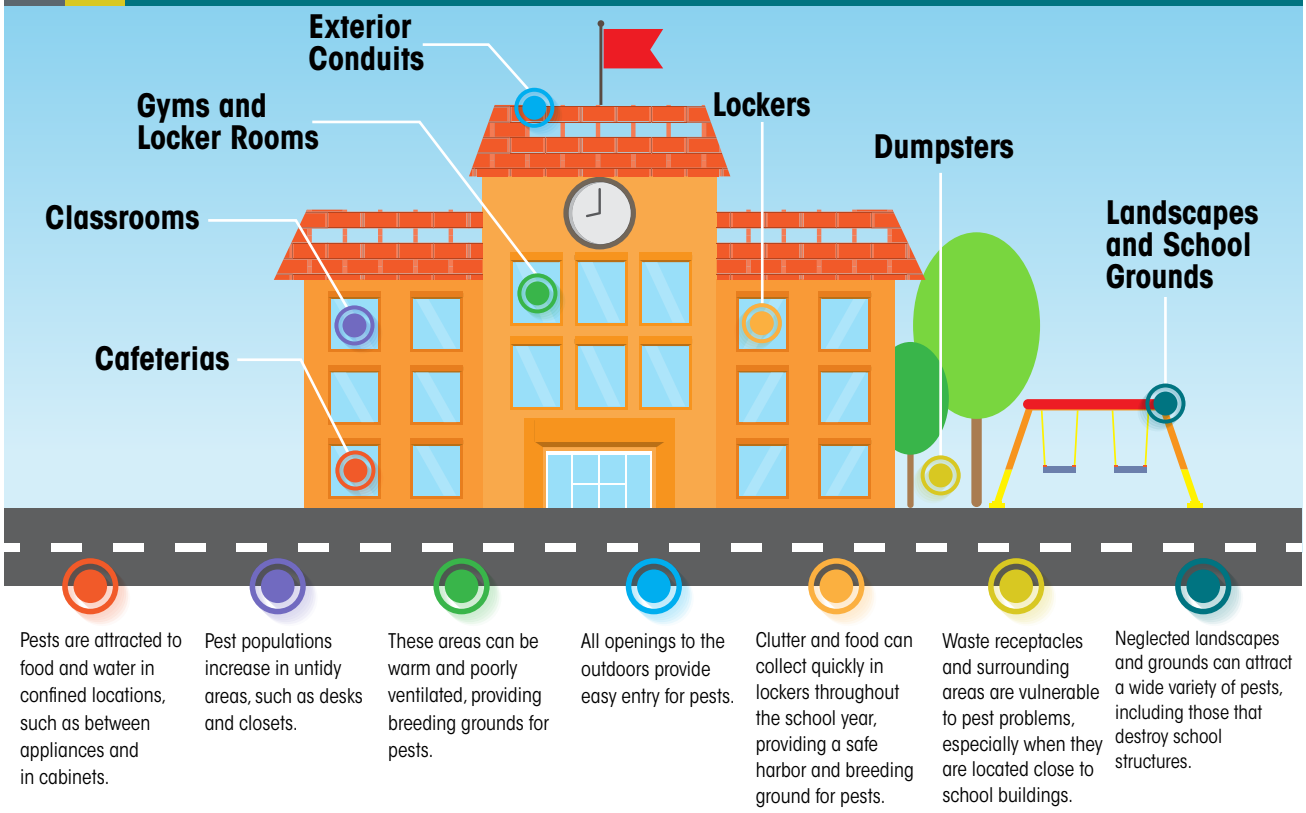
—Coby Schal, Ph.D., Professor of Urban Entomology, North Carolina State University

Implementing IPM Within School Facilities and on School Grounds[8]

- Regular inspection and monitoring
- Maintaining records and writing regular reports on each building, detailing—
  - Monitoring results
  - Recommendations
  - Inspection findings
  - Inspection schedule
- Repairs to facilities and maintenance
- Weatherizing buildings and sealing pest entryways
- Traps and baits
- Education and application of knowledge of pest lifecycles
- Targeted and strategic application of pesticides
- Education of school staff, teachers and students on steps to prevent pests

All students deserve a safe and healthy school environment.

Figure 1. Where to Look for Pests in Schools



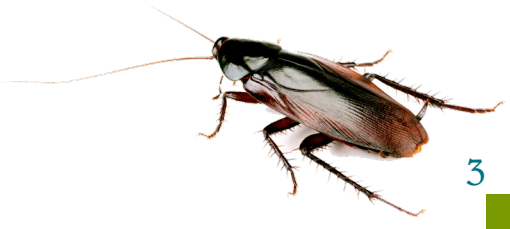
"IPM is a common-sense, sustainable approach. Rather than relying on quick-fixes that simply suppress pests, IPM poses the question, 'Why are these particular pests a problem at this point in time in this particular environment?' This approach provides more sustainable results."

—Dawn Gouge, Ph.D., Associate Professor and Associate Specialist, Urban Entomology, The University of Arizona

Everyone in the school environment has a role to play in identifying and reducing the conditions that harbor pests (**Figure 1**).[9]

The American Academy of Pediatrics and other groups have joined EPA in recommending the use of IPM in schools to reduce exposure to both pests and pesticides. IPM has gained traction in schools across the country, with the number of states implementing IPM in schools increasing from five to 21 between 2008 and 2013.[10]

IPM is a science-based strategy that is effective, feasible and affordable. IPM not only improves the health of students, faculty and staff, but also it can lower costs and keep schools running efficiently. This method of pest control has been shown to reduce pest complaints in schools by 70 to 90 percent with no long-term increase in costs.[10,11]



Pest Reduction in Schools Through IPM

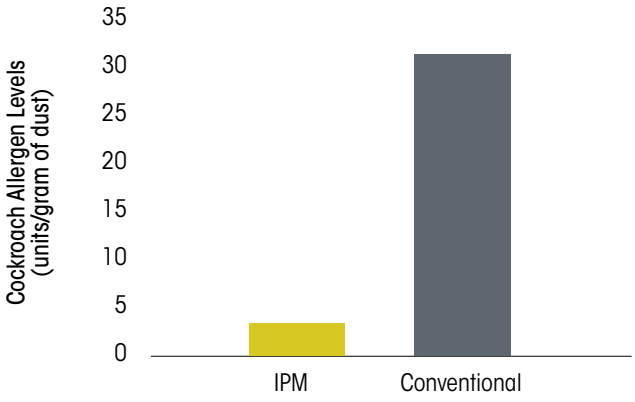
- Zero cockroaches were found in traps in IPM-treated schools compared to 82.6 cockroaches found in conventionally treated schools every week[12]
- Allergen levels in school dust samples: 14% (IPM) versus 44% (conventional)[12]
- IPM-treated schools administered 99.9% less active pesticide ingredient than conventionally treated schools[13]

Research in Schools Supports IPM for Managing Pests

IPM has proven to be an effective method for controlling pests in homes and apartment complexes, inspiring research on its effectiveness in school settings.[12,13]

One study, directed by North Carolina State University, compared IPM and conventional treatment methods in three North Carolina school districts.[12] Through visual inspection, trap setting and dust sample collection, IPM was found to be more effective than conventional methods involving pest management professionals and monthly pesticide applications. In the schools using IPM, no cockroaches were discovered in the traps following the implementation of IPM (e.g., sealing cracks, addressing initial infestation levels), whereas the traps recovered from the schools treated with conventional methods averaged 82.6 cockroaches per week. Forty-four percent of dust samples in the conventionally treated schools had detectable concentrations of cockroach allergen compared to 14 percent from the IPM-treated schools. In the samples with detectable allergen, the IPM-treated schools had lower and safer levels of the allergen (**Figure 2**), as well as fewer pest infestations.

Figure 2. Cockroach Allergen Levels by School Pest Control Method



Another study in North Carolina, administered in nine schools by North Carolina State University, compared a basic IPM program and a conventional pest management program with monthly pesticide applications. Over a 12-month period, 99.9 percent less active pesticide ingredient was used in the application of IPM methods compared to conventional methods.[13] The study demonstrated that in school environments with cockroach problems, even a simple IPM program can be implemented successfully with no negative tradeoffs and using significantly less pesticide.

The Health Case for IPM

IPM creates healthier environments for students, faculty and staff: food preparation areas are cleaner, bacteria are reduced, the spread of viral pathogens is limited, and exposure to pesticides is carefully controlled.[12] Rodents, for example, can carry bacteria and spread illness as they move from outdoor areas to classrooms, kitchens and other school facilities, moving easily between walls and

"We definitely can tell people that IPM works—we wouldn't be doing it for 10 years if it didn't work."

—Ricardo Zubiate, Assistant Director, Facility Services, Salt Lake City School District, Utah

"The value of instituting an Integrated Pest Management program in the Metropolitan School District of Pike Township has enabled us to utilize all available pest management strategies to prevent damaging pest outbreaks while reducing risks to human health and the environment. The outcome has been an increase in student attendance and academic achievement."

—Raul Rivas, Facility/Security Director, Metropolitan School District of Pike Township, Indianapolis, Indiana

carrying pathogenic viruses such as *Salmonella*.[14] An IPM program educates staff about how to maintain a healthy space and encourages healthy habits such as strategic cleaning and maintenance. These efforts emphasize eliminating conditions conducive to pests, such as clutter and access points, and targeting pest-vulnerable areas, such as kitchens, cafeterias and break rooms. The cleaning and maintenance necessary for IPM's overall success also improves the quality of the building's indoor air.[15]

Asthma is the most prevalent chronic health issue among children in the United States, affecting nearly 10 percent of children nationwide.[16] Approximately 80 percent of asthma in children is allergic, meaning caused by allergens.[17] The correlation between exposure to pests—primarily cockroaches and rodents—and asthma has been widely documented. Allergens found in indoor dust that have been linked to asthma include those derived from arthropod feces (such as from cockroaches), rodent excrement and pet dander.[18] About 43 percent of the U.S. population is allergic to at least one common indoor allergen, and 26 percent exhibit allergic sensitization to the common German cockroach.[12] According to the National Cooperative Asthma Study, 37 percent of children with asthma in the United States are allergic to cockroach allergens.[19] Children who are allergic to these cockroach allergens also are more likely to require medical attention for asthma-related issues. Additional studies have shown that greater exposure to cockroach allergens is associated with hospitalizations of children with asthma.[18]

Mouse allergens also are prevalent in school settings. A study conducted by the Boston Children's Hospital found that mouse allergens were detectable on desktop surfaces in 100 percent of sampled urban preschools and 95 percent of sampled urban elementary schools.[20] Children allergic to mice who are exposed to high levels of mouse allergens were more likely to have unscheduled doctor visits, emergency department visits and hospitalizations.[21]

"Research has shown that in 24 hours one mouse can produce up to 3,000 microdroppings of urine. In that urine is the protein that triggers asthma. When schools seem to indicate that budgets are often limited for the building repairs necessary to exclude mice, I emphasize that implementing a complete IPM program is actually a cost-effective way to manage pests and thus protect the health of school children."

—Robert Corrigan, Ph.D., Urban Rodentologist, RMC Pest Management Consulting

Although children may encounter pest allergens in many settings, they spend most of their time in school and home environments. More than 75 percent of U.S. homes contain detectable mouse allergens,[22] and there is a significant association between exposure to mouse allergens and asthma sensitization, particularly in inner-city, multifamily dwellings.[23] These allergens contribute directly to the exacerbation and onset of asthma among children, and increased exposure to allergenic proteins generated by pests is associated with increased sensitivity to those proteins.[24] Effective reduction of pest presence can reduce allergens and asthma triggers, and promoting IPM in schools for the abatement of these asthma triggers can both improve health and reduce asthma-related absenteeism.

IPM is a smart, sensible and sustainable way to reduce pests and improve health.

Asthma, Absenteeism and Allocated Funding: What's IPM Got to Do With It?

In 2013 in the United States, children with asthma ages 5 to 17 years missed 13.8 million days of school, an increase from 10.4 million in 2008. Nearly half (49%) reported missing 1 or more school days due to asthma.[5] In addition, 7 to 11 percent of children with asthma miss more than 10 days of school each year.[5] Improving indoor air quality through IPM can help by reducing asthma symptoms and minimizing missed school days.

Besides lost classroom time, school districts also often receive—or lose—funding based on student attendance.* Although attendance-based funding can vary greatly by district, districts can lose as much as $100 million in funding due to absenteeism alone; in one school district, 5-year losses totaled more than $620 million.[25] To reduce absenteeism and as a result help maintain school funding streams, school districts should implement measures that protect their students' health. IPM is a cost-effective approach to pest management that can provide many benefits to the school system: it protects student and staff health, has the potential to increase attendance, and helps keep school buildings in better condition.

*These states include California, Idaho, Illinois, Kentucky, Mississippi, Missouri and Texas. (Adams, J. M. 2013. "Schools Focus on Intervention, Understanding to Stem Chronic Absenteeism." *EdSource*. edsource.org/2013/class-matters-schools-increasing-focus-on-intervention-understanding-to-stem-chronic-absenteeism-at-its-roots/37975)

Reducing the Need for Pesticides

With an emphasis on discrete and discriminate use of pesticides, IPM also can improve student health by eliminating the unnecessary use of pesticides. Conventional pest management entails regular (often monthly or quarterly) pesticide applications to entire buildings and facilities, but IPM dictates the application of pesticides only when needed and in the specific problem area. Conventional calendar-based pest management often does not completely eliminate a pest population, creating a resistance among these pests to the applied pesticides. By more effectively reducing the number of pests in a building, IPM decreases reliance on pesticides.[24] A study comparing the effects of IPM in schools with the effects of conventional pest management in schools showed that buildings and structures implementing IPM used significantly fewer pesticides and resulted in significantly fewer pesticide residues beyond the treated area.[13]

It is also important to note that when pests move readily from sewer systems, bathrooms or dumpsters to kitchen and classroom areas, they can bring dangerous microbes and pathogens with them, including antibiotic-resistant microbes.[24] By identifying potential pest sources and emphasizing a preventative approach to eliminating pests in schools, IPM can help to ensure a healthy learning environment.

Addressing Health Disparities Through IPM

Some communities experience pest-related health effects more acutely than others. Children in underserved communities, especially those in urban settings, experience greater morbidity and hospitalizations due to asthma.[26] Studies focusing on minorities have shown that non-Hispanic African American children are about twice as likely as Caucasian children to have asthma, and they have poorer outcomes, including higher rates of emergency department visits.[27] According to a recent study of asthma prevalence in Maryland, African American children in

Baltimore have an annual asthma hospitalization rate three times higher than that of Caucasian children.[17]

These urban environments are highly conducive to large numbers of pests and pest infestations. The combined effect of living in less sanitary areas—both indoors and outdoors—and being unable to control pests poses a higher risk for asthma-related emergency department visits and hospitalizations.[15,17,28] A study by Johns Hopkins University showed that up to a quarter of children living in inner-city Baltimore were exposed to pest allergens at levels equal to those found in laboratories in which mouse studies are conducted, levels high enough to trigger allergic or asthma responses.[22] With both asthma and pest exposure disproportionally affecting underserved and minority communities and children,[29] implementing IPM as a pest management strategy in schools can improve health outcomes by reducing pest exposure.[24]

From "Good Idea" to "Great Outcomes": Overcoming Obstacles to IPM

Implementing IPM practices and policies in schools can be an effective solution for reducing or eliminating cockroaches, rodents and other pests. Reducing such pests decreases exposure to both pathogens and allergens, thereby reducing allergic reactions, the onset of asthma and the exacerbation of existing asthma. By decreasing exposure to pests and associated allergens, IPM can be a cost-effective way to reduce asthma symptoms, improve health outcomes and improve school attendance—so why aren't more schools insisting on IPM?

Barriers to IPM

Ideally, all schools would be able to find the time and secure the funding needed to implement IPM. In reality, schools face a number of obstacles as they try to ensure that IPM policies are given serious consideration and are observed by all school staff and contractors. Nonetheless, *all of these barriers can be overcome.*

> *"It's not 'rocket science.' It's common sense. The challenge is to change people's behavior when they may have few custodial resources. Once we overcame this challenge, change started to happen. The building was dirty and dingy at first, but by the end of the year-long transition to IPM the building was shiny and everything was clean. It was an unbelievable transformation. Not only were our pest problems better addressed, we had compliments from our parents about the cleanliness of the school."*
>
> —Claudia Riegel, Ph.D., Director, Mosquito, Termite, and Rodent Control Board, City of New Orleans, Louisiana

Key barriers include—

- **Upfront costs.** IPM reduces long-term costs for schools, by stopping pests at the source. Labor costs are the primary IPM expense once facilities are in sound condition, but making repairs to facilities may pose a financial challenge for some schools, especially if the school has a pest management contract that does not cover these costs or does not allow for a flexible spending allocation. Once the necessary repairs and upgrades to keep pests out are made, costs level out quickly, but schools must first invest in upfront costs to eventually see the savings. Additionally, many of the IPM strategies implemented also can increase a building's energy efficiency and water savings, for example, by sealing access points or fixing leaks, leading to further cost savings.[7]

- **Conflicting priorities.** School administrators, staff and faculty wear many different hats and juggle multiple priorities, and each person prioritizes a different set of school needs. Limited resources can lead to competing priorities, and conversations about IPM may take a backseat to other issues that schools face on a day-to-day basis.

"Knowledge is a major barrier. Many people assume that pest control happens when they see an individual come through and spray the baseboards. They see a few cockroaches with twitching legs and think, 'That's pretty good.' Improving the knowledge base around IPM and its benefits is critical."

—John C. Carlson, M.D., Ph.D., Assistant Professor of Pediatrics, Tulane University

- **Lack of understanding.** -Resistance to IPM often results from a lack of understanding. When school administrators and facilities staff are not fully aware of the benefits of IPM or the techniques and practices that comprise an IPM program, they may not be willing to make it a priority or be able to fully implement an IPM program. (See "Schools in Action: Salt Lake City School District" featured in this brochure for more on how school districts are using education to strengthen their IPM program.)

Making IPM a Reality in Every School

Through their own experiences, school IPM experts have identified key motivators in developing and implementing strategies that can improve health, decrease absenteeism and save money for schools:

- **"Educate, educate, educate."** A school or school district won't be able to fully implement IPM if its staff does not know what IPM entails or what benefits it offers. According to Dr. Claudia Riegel, schools need to be educated about IPM and to understand the broader benefits of the program. Communicating with staff (both internal and external), parents and students about procedures, expectations and outcomes of IPM ensures that everyone is working together toward the same goal of eliminating pests and improving school health.
- **Prioritize resources.** Although IPM can be a cost-effective solution in the long-term—reducing the overall presence of pests and decreasing the amount of pesticides needed—initial implementation requires both time and money. School administrators, by ensuring that IPM is a permanent allocation in the budget and acting as champions for smart, sensible and sustainable pest control, can ensure that this vital operational aspect of school health isn't overlooked as more immediate school concerns and issues arise.
- **Focus on health.** There are a number of reasons why IPM is a smart choice for schools, and focusing on the health case can encourage schools and school districts to commit to an IPM program. Student, teacher and staff health is a unifying issue that everyone can agree on, and making this a central message is critical when crafting a campaign for IPM.

"Children are the most vulnerable members of society when it comes to the effects of poor pest management. One hundred percent of our future is in their hands. We really should invest in creating the healthiest, most effective learning environment for our students."

—Dawn Gouge, Ph.D., Associate Professor and Associate Specialist, The University of Arizona

IPM offers schools the opportunity to go beyond conventional pest control and implement a more effective pest management strategy, ultimately decreasing the presence of pests and eliminating the unnecessary use of pesticides in schools. Pesticide use is not mutually exclusive with an IPM program, but "pesticides in the absence of an IPM program are unacceptable."[24]

IPM seeks to prevent pest infestations before they begin, in addition to addressing them when they occur. Research has shown that IPM is a science-based, effective approach to pest management that delivers the healthy environment students, faculty and

staff deserve. School pests, particularly cockroaches and rodents, can negatively affect health by causing or exacerbating asthma and spreading illness, thereby contributing to absenteeism and potentially negatively affecting school funding. In addition, IPM does not increase long-term costs when compared to conventional pest management efforts. IPM—a science-based strategy for reducing pests that improves health and saves money—is a proven solution that schools should adopt as their new "smart, sensible and sustainable" pest management practice.

Suggested Resources

"The Basics of School Integrated Pest Management" webinar. U.S. EPA, 2014. www.epa.gov/managing-pests-schools/previous-webinars-about-integrated-pest-management-schools#Oct2014.

School Integrated Pest Management for Teachers. U.S. Cooperative Extension System, 2015. articles.extension.org/pages/21012/school-integrated-pest-management-for-teachers#.Vk95WU2FMdU.

IPM Cost Calculator. Southwest Technical Resource Center for School IPM, 2015. www.ipmcalculator.com.

There's an App for That!

EPA's School IAQ Assessment Mobile App is your "one-stop shop for implementing IAQ management guidance, including about IPM, from the *IAQ Tools for Schools* Action Kit. Through actionable steps and checklists, the app assists schools and school districts in assessing facilities to protect the health of children and school staff.

The IPM Checklist in the app can help your school or school district identify—and implement—key steps in reducing pests in a safe and sustainable manner.

Download It Today!

Schools in Action: Salt Lake City School District

IPM is a smart, sensible and sustainable way to minimize exposure to pests and their associated allergens and asthma triggers. With IPM, negative health outcomes and absenteeism are reduced and funding levels for schools are less likely to be lost. IPM can both eradicate pests and maintain healthy environments, and schools across the country are taking notice.

Ricardo Zubiate, Assistant Director, Facility Services, Salt Lake City School District, Utah

Salt Lake City School District (SLCSD) in Utah has demonstrated its commitment to school health, launching a successful IPM program that has reduced both costs and pesticide use across the district.[30] Although both SLCSD and its pest management contractor were committed to establishing an IPM program, SLCSD's facility director noticed that the pest management technicians were not utilizing proper techniques and continued to spray pesticides indiscriminately. Inspired by a presentation at a children's health conference in 2004 and troubled by the lack of IPM practices at SLCSD, the facility director developed an IPM pilot program in 2005 for three of the district's schools. SLCSD terminated its pest management contract and brought the pest management program in-house, training the custodial staff in IPM and licensing them to apply pesticides.

Over the past 10 years, SLCSD has reduced its total pest management costs and pesticide use. IPM services now cost only $2,000 to $3,000 annually, and pesticides have been applied fewer than 45 times over the past decade, a significant reduction from its prior monthly scheduled sprayings. The key to this success, says Ricardo Zubiate, Assistant Director of Facilities, has been having a champion to advocate for IPM policies, ensure their implementation, and educate all school stakeholders throughout the process. The entire school, from the kitchen staff to the teachers, needs to be informed about IPM and the signs of infestation and be committed to communicating potential problems to custodial staff as quickly as possible.

SLCSD at a Glance

- **24,723 students**
- **53 schools**
- **$25,000 saved annually on pest management**
- **85% reduction in pests since 2010**

Endnotes

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