

A Primer on Strategy for Bed Bug Management

Introduction

As the bed bug crisis unfolded, first slowly in the 90's and then with some speed, I was invited to give a presentation to the Street Care people along with Dr. Tim Myles¹. Soon after that initial meeting, the issue drew attention in Shelters for the homeless. As the problem continued to grow in Toronto, I was asked to speak to other groups including the Woodgreen Townhall meeting, as well as at Ontario Non Profit Housing Association (ONPHA) conferences in Toronto and Ottawa in 2007 and 2009 and at the Social Housing Conference. I had the privilege of writing a manual on IPM in Housing for ONPHA as a shared project back in 1999 before bed bugs were a major issue. The subject of bed bugs only had a short paragraph with some concerns but at the time, the actual frequencies of bed bug calls were so low that my knowledge of the management of this pest was limited and I had not actually seen an infestation – a situation common among the vast majority of pest control professionals - but soon to change. It was, however, still a most urgent occurrence that we addressed with speed as a high priority. . Health Departments clearly have a role in helping to address the issue. There has been a commitment of Health Departments to addressing pest control issues especially when the pests are vectors of serious disease such as malaria, West Nile Virus, and Western Equine Encephalitis, and of course, food borne disease in which pests can be indicators of poor practices, but there has also been a focus in Schools of Public health on the contribution of cockroaches to allergies and asthma, especially in children, as well as to concerns about excessive pesticide usage. The attitude of Health Departments towards the bed bug

¹ Dr. Myles initial work on bed bugs and amazing images were very noteworthy, but he decided to continue his focus on his area of interest, termites, in spite of my urging him to devote some of this time in this area. I acknowledge his support of my efforts and referral of others to me as a professional courtesy. His passion for his work in termite biology and control is such that I believe he did not want to divide his attention as this area is also very demanding.

crisis has changed in the past few years. In Toronto, the Bed Bug Project is being led by Toronto Public Health (TPH) and it is hoped that an excellent example and standard will be set in Toronto that can be used by others in the province. This is a natural outcome as urban centres are the focus of the problem in the world. Public Health Agencies are therefore key in assisting in education and this has been demonstrated by the work by TPH on their website, however the Ministry of the Environment has a key role in management of bed bugs as does Health Canada through the Pesticide Management Regulatory Agency.

I have often stated in presentations and training sessions that governmental regulation is key to enabling a societal response to the bed bug issue. I also recommend educating Property Standards Officers in IPM principles and practice in order to enable compliance and support. I have been advised by TPH that due to so many other duties, and not unlike TPH resources, Municipal Standards have limited resources, but are very important in ensuring that compliance and action are encouraged and enforced. Much of the load is therefore on TPH. I have noted in this document that there needs to be an educational strategy and plan that enables action by landlords and their staff working with pest control firms and IPM specialists so that TPH and Municipal Standards groups are utilized in difficult situations where their knowledge and skills in enablement will produce the best results. It is also important to emphasize that various support agencies can train their staff to be the primary first alert resource in identifying bed bug infestations and bringing this to the attention of their supervisors so that a supportive response that includes landlords, family and other support can be organized. This can only be enabled if these key people are not fearful of carrying infestations home or aversive of their clients due to bed bugs..

I offer my nuances from more than 22 years working in IPM in Housing, and working with Health Departments in Toronto, Etobicoke, Scarborough, and North York in a most co-operative basis addressing pest control and other health related issues over the years. I have always appreciated how

positive outcomes can result from mutual respect and working together. Landlords may be disinclined to call a Health Department for support, but I have encouraged this practice in special cases as the smart and right thing to do to help solve problems and help individual tenants as well as their neighbours and landlords.

Background

The Resurgence

We began to note increases in bed bug service requests in the mid 90's but these did not seem to be dramatic at the time. Reports of bed bug infestations were made in the pest control trade magazines with some concerns about imported infestations from overseas, but none of the now known experts had the expectation of the extent of the resurgence.

This has now been attributed to

- Changes in patterns of use of pesticides for roaches providing a safer environment for bed bugs ²
- Removal of more toxic and effective products due to concerns about risk to children and potential long term health effects
- Unresolved major infestations called "reservoirs" that resulted and continue to result in more spread of infestation
- Resistance of bed bugs to the current products used that are mostly synthetic pyrethroids

² This has recently been discarded as a consideration due to DNA studies of different populations of bed bugs in the world showing resistance to synthetic pyrethroids in specimens from tropical climates and indicating a relationship between bed bugs in North America and those from many sources in Africa and other tropical and sub tropical locations. The detail of these findings too complex to explain here.. The source of the resurgence is most likely from reservoir infestations in hotels carried to North America and Europe and elsewhere by business travellers and vacationers. Once transported the lack of the more toxic products and other failures ensured their success.

- Lack of knowledge of bed bug behaviour by pest control professionals which has now been dramatically upgraded in the past ten years
- Lack of awareness by the general public which is becoming a point of information through the internet especially, though with much disinformation as well
- Poor quality of pest control services – this is a harsh reality that is often not reported. It is most often related to a false economy of scale and lack of knowledge in purchasing services, but sometimes even paying a lot of money does not mean services are good. Education in understanding quality of service is therefore key

1. Recent History 1999 – 2010

The Spread

Since 1999 the infestations of bed bugs in the GTA area and in the world in general in U.S., Canada, U.K., Australia and elsewhere have increased dramatically. This is well documented in the literature and has been reported in many cities in Canada.

Difficulties of Control

i. Awareness

Awareness has been lacking and at first, there was a strong reluctance by some tenants and landlords/managers to actually state that there was a problem due to fears of stigmatization as well as loss of reputation of various organizations.

This may be appropriate in a hotel setting as business practice when measures are extensive (and expensive) and such sites as Bed Bug Registry have location identification including hotels and apartment buildings, however, in residential settings, the focus should be on

alert awareness and encouraging reporting. This can only happen if fear and stigmatization are not reaction to tenant notification and landlord accountability is promoted to show that a landlord is responsible in preventive and support actions.

Resistance

Resistance of bed bugs to insecticides is well documented and experts indicate that bed bugs are 200 - 300 times more resistant to some products than even the German cockroach, the most successful structural pest world wide. A common statement is that "you must hit them directly with spray to even hope to kill them and they may even walk away from that". Residual toxic action of the current spray products available in Canada and elsewhere is not good. This is partly due to the fact that bed bugs do not feed on anything but blood and do not consume any debris from grooming. They apparently do not get enough exposure from walking on most insecticide products. Silica Gel and diatomaceous earth do work in void spaces, but this is a slow process. Silica gel is a more effective product that is used by most pest control professionals.

What is usually not mentioned is that inadequate treatment is the one of the causes of resistance. The more times a service is inadequate and does not kill most bed bugs, the greater the risk of enhanced resistance as this is dependent on survivorship of those individuals with a genetically transmitted biological capacity to survive the toxins at higher doses than others. Improvement in treatment is therefore a major compensating factor against

resistance. Better products are needed, of course, but the answer is not merely in better products but in better overall preparation and treatment.

Preparation Issues

Preparation is the most difficult aspect of bed bug treatment as it involves a lot of work and some people are either unwilling to do this through lack of understanding or will, while others simply cannot manage due to physical or mental challenges. The lack of financial resources is another common cause for failure of preparation being accomplished properly. Getting help early is critical, and ensuring that this is seen as a responsibility of all key stakeholders is clear. The key is to enable this in the most cost effective and sustainable manner. **Quick fixes do not work.** This is also an issue with severe roach infestations often in the same homes as the extreme bed bugs infestations, and is equally important; therefore processes of sustainability through education of supportive agencies are very important in IPM. There is discussion among leaders in the industry about limiting preparation actions and tailoring these to the specific situation, however, this is a premium service in the private sector based on excellent detailed inspections, use of detection dogs, and a premium charge. This kind of approach is not practical in most settings and due to bed bug behaviour, a lack of proper preparation in most cases is a formula for failure. Preparation is, however, evolving in ways to ease some of the pressure on tenants and enable them to undertake reasonable but necessary measures that do not disrupt their lives for extended periods. The use of ancillary items such as bed leg protectors, mattress and box encasements and various plastic storage bags help to protect tenants from bites and assist in the elimination process.

Throwing out infested items .

As reported by a TPH Health Inspector, "The reality is most people throw out their furnishings and belongings before we even go there if they are physically able to do so. There is a yuck factor that people do not want to sleep on a mattress that had bed bugs in them even if it is covered with an encasement. We need to have a public education around this issue". Throwing out furniture such as mattresses and box springs is not necessary, and counterproductive. Most furniture can be treated and if things need to be discarded then a careful process is required. This area has be fraught with misinformation as well as an avenue to grants for new furniture. This does not help solve the problem. Money for new furniture is better spent on encasements and/or vacuums or assistance in preparation. If bedding is old and worn, then replacement should be undertaken AFTER treatment and protected by encasements,.

Quality and Cost of Services

There are many anecdotal stories of homeowners and housing providers paying extremely high costs for bed bug treatment with poor results due to failed promises of high quality. Landlords, property managers and their staff need to understand what is involved in a good service and that good work can be obtained at fair prices, but this is often lost in the force of budgetary considerations and "low-balling" of some pest control firms which results in poor services unless the client is on watch. A study published in *American Entomologist* in 2006 gave average prices from a survey of pest control providers in the U.S; which ranged from \$75 for a bachelor apartment to about \$200 for a two bedroom apartment, but these

are "average" prices. Cost of service varies depending on conditions and the degree of infestation so paying a much higher price can happen, but at the same time some firms will charge what the market bears. I have heard of \$500 per service for an inadequate service due to client not understanding that the greatest cost of service is time and if a service is only ½ hour for a one bedroom or larger apartment, it hardly is worth \$50 let alone \$500 and is likely worthless. Clients should be given estimated times for low to moderate infestations and if more time is needed, there should be a reasonable explanation. Details of treatment should be provided in writing to the housing provider or private client. An industry representative statement that "we'll spend as much time as is needed" rather than giving estimates of time for treatment is an empty promise. It is tantamount to an auto shop not having estimates for specific work but a promise of "spending as much time as is necessary". A responsible firm can explain when more time is needed that is beyond the estimate.

Preventive Measures

the main preventive measure is education of stakeholders including housing providers and tenants.

- Caution to tenants and general public about risks of picking up furniture on street, as well as second hand shopping and garage sale bargains.
- Protocols for disposal of infested materials in sites. These are available at TPH but specific protocols may be needed in a site relating to local practices.
- Encouragement of self help measures as part of preparation such as vacuuming and steaming are beneficial. This is readily available in the form of inexpensive units suitable for domestic

use. This needs to be carefully explained so that inappropriate measures are not recommended.³

- Early reporting without fear of being stigmatized.
- Caregiver organizations can be supported by protocols that will reduce risk of transfer to the organization or its staff - such as type of furnishings, passive monitors⁴, as well as carefully thought out procedures working with IPM consultants or pest control firms to reduce risk. In most situations the risk is actually low, so there is an important part of not increasing fear through over-reaction. One major support agency in Toronto reported to me that they have never had anyone quit because of bed bugs, and that training to reduce fear helped considerably⁵.
- Sealing of apartments as appropriate. i.e. if a partition wall is concrete or block, is it wise to try to seal a baseboard? Maybe yes, maybe not. This can depend on the type of baseboard. One does not want to create a harbourage by inappropriate sealing. While sealing is a good idea, this needs to be looked at carefully in each structure. Some homeowners have actually removed all baseboards to enable treatment. An expensive undertaking. This may enable better treatment as the entire potential space is exposed, but one must weigh the benefit against the expense. A detailed crack and crevice application may be sufficient. For vinyl baseboards, sealing may not work if

³ For example, some health department websites recommend steam cleaning of carpets. This is not only expensive, but is a useless endeavour as bed bugs are not on or under carpets in middle of rooms but would only be at perimeters. Recommending vacuuming on a daily basis is also an incorrect recommendation as it is of little to no value.. Targeted vacuuming in advance of treatment in specific locations as outlined in preparation instructions as possible by tenants is beneficial.

⁴ A passive bed bug monitor is a device that provides a harbourage for bed bugs at wall perimeter and has a border that will enable visualization of excreta. These are inexpensive and can be home-made, and inspected easily on a daily basis.

⁵ Personal Communication. Sandra Sagara, Training and Development, Toronto CCAC.

there is a natural gap at bottom of the wallboard, and sealing is inadequate. When units are vacant, this is the best time for these actions, but it is of benefit to review the details of the structure and establish a best practices protocol. Sealing of pipe penetrations may be more critical as containment if partition walls between units are concrete or block. In that case, this may be a better investment as access to all perimeters for sealing or replacement of baseboards can be difficult.

- Mattress/Box Spring Encasements are very helpful in protecting the bedding which is a major investment but also in reducing the hiding places where bed bugs can remain and which are hard to treat (especially inside the box spring), as well as prevent hatchling nymphs or surviving adults from emerging to bite again, but these can be quite costly. Attention to making these units less costly is an important item. More types need to be tested or at least affirmed for being "bed bug proof". Some units are tested in the U.S. by Richard Cooper (Bed Bug Central), but certifying these as being bed bug proof does not necessarily require live testing, but a careful review of the materials used and the construction of the encasements. This can be done locally. The goal is to make these devices more affordable. Some firms have managed to bring prices down, but the costs are still considerable. A cost of at least \$100 for a single mattress/box spring is not unusual. Most of these are imported from China with huge mark-ups, though there has been a drop in price, they are still costly (\$60 for a single bed encasement or \$120 for box and matt). Vinyl encasements are prone to tears, and in terms of the lifetime of the encasement, a better quality cotton or polyester encasement is a far better investment.
- Use of bed and sofa leg protectors both as defence and as early warning devices. It may seem curious to use humans as a bait source, but the detection of infestation or validation that an

infestation is eliminated can be difficult. The heat/CO2 detection devices on the market are very costly and slow in spite of claims of efficacy (i.e. reducing populations of bed bugs), but sometimes the most simple devices can provide good results in protection in the short term and in detection. The best lure is a human sleeping in a bed. There are new designs of leg protectors but these can cost about \$30 or more per bed. Home-made protectors are easy to obtain and should be offered as an alternative (cost is about \$5 per bed). Double sided carpet tape is also used, but will become ineffective if it gets dusty. Home-made leg protectors can easily be recharged with talc dust or vegetable oil.

- Disposal of infested items; for example items such as coffee tables, chests, bookshelf, armoire, etc... Many of these items do not need to be disposed of, as they can be treated very effectively. Further, the disposal of blankets and sheets and comforters is also in question as generally these items can be laundered and/or dried in clothes dryers. A nuance would be that people may get rid of some of these items for wrong reasons, or may get rid of them because of staining by heavy infestations, especially, the clothes items. The latter reason is a very justifiable of course. One of the worst outcomes from Ontario Works or Ontario Disability and Support Payments funds is using money to replace perfectly good bedding because of bed bugs when bedding should be replaced because it is old or inadequate to the needs of the clients. As reported by a TPH Health Inspector "People throw out belongings in most cases before we even get there. Plus the word is out that they can get money so people want it. Where TPH is involved we do state it is for vacuums, steamers, money to get laundry done, and encasements." Providing money to clients for vacuum cleaners or steam machines and mattress/box encasements has a much more beneficial result than replacing

mattresses because of bed bugs. The condition of the mattress and age is a more critical factor and then replacement should be undertaken only after second treatment and should include the encasements as a standard item.

Failure of Managing the Crisis

This is perhaps no one's fault, but it is clearly the responsibility of society at large. That is the emphasis of the IPM CAP "Chain of Accountability" concept in IPM as being implemented in TCHC IPM Program. The IPM CAP program clearly assigns duties, roles and responsibilities to all stakeholders so that a concerted effort can be undertaken. TCHC has developed Checklists to describe and assign responsibilities so that the effort is a true team response involving all key stakeholders from the Housing/Operating Unit/Property Manager to field staff (especially superintendents), tenants and agencies.

Stakeholder Sectors

Housing

Many organizations have little understanding of good pest control practices but are quickly learning. ONPHA working with HSI⁶ has taken a lead in this by providing educational videos as well as developing protocols for their members. These videos are available on ONPHA website and on You Tube. ONPHA also gave a live Webinar on Bed Bug management presented which I led for their members in 2009. This is available for members that include most non profit housing organizations as part of ONPHA's bed bug management program. Hopefully, they may make this available to a

⁶ Maintenance Division of Toronto Community Housing.

wider audience. TPH also has considerable resource items including industry pest control protocols and information details for landlords, property managers and housing providers. These were developed through the Toronto Bed Bug Project committees with input from the Structural Pest Management Association of Ontario.

Hospitality Industry

The leaders in the hospitality industry have very good practices and are supported by highly qualified specialists. This is a major threat to their business, but this does not apply to all. There are still large and small hospitality organizations that are at risk due to a lack of proper preventive protocols.

Support Services

Staff of support agencies are at risk and fearful of taking infestation home. This can be changed through frequent and thorough education.. We cannot over-emphasize how important supportive agencies are in being first alert people who know their clients and are aware of these problems. As mentioned earlier and reported to me as a personal communication "Lots stop providing services to their clients and do not say anything to property management leaving clients in a bad way." emphasis in training sessions to support agencies, good knowledge and awareness will help these people. Minimizing fear may assist in reducing bedbug related turnover. I do not know many pest control staff who have taken infestation home, though it could happen. Common sense works better than fear. In a situation in a home in which infestation exists or a client reveals that they have infestation, the response must be carefully measured, empathetic and supportive. Exceptional cases reported to me such as "I have also heard of a few instances when employers have asked

employees to leave because of bed bugs and return once they have had two treatments because they had live bed bugs on them “ need exceptional measures. Finding bed bugs on people is relatively uncommon but can happen in extreme cases. When this happens, there are ways to address this quickly and help people without treating them like lepers. Treating people with respect and compassion should be a first priority in these cases. Even extreme cases can be handled with effective measures. When a person comes to a organization or support site with bed bugs on their clothing, the greater risk has ALREADY HAPPENED, therefore, the approach should be to handle the situation with a prepared action plan that respects the victim and treats them with care, not rejection. We need more education around procedures which are not inherently complex to train staff in preventive measures for their own protection . Part of this is clearly reducing not increasing the fear factor by sensible education, thereby reducing not magnifying the risk because of personal revulsion and fears.

There have been some reports of bed bugs on people even in less severe infestations, but the fact remains that the more bed bugs present, the greater the risk.

Addressing these risk factors sensibly in a community agency or in any housing setting is critical, as stigmatization could discourage others from coming forward It is as if a patient came to see a doctor about bites, and the doctor’s reaction was revulsion and asked the patient to leave the office.

Moving Industry

I have not heard anything specific nor can I recall any actions relating to the moving industry in two sectors:

Movers who move people from one home to another, and vehicle rental of vans used in moving. Both of these sectors represent potential points of spread, both in the actual transportation of

infested possessions as well as in the vans posing risk to other clients. Both of these sectors offer an excellent stage at which infestation can be stopped both through in van heat treatments of possessions and assurance that the potential infestation in a van is eliminated before the next use. Treatment of a full van is dependent on education of clients and in cases in which the van is not treated, it would be prudent for the moving firm or rental firm to treat their vans preventively by vacuuming, and steam treatment and/or pesticide treatment.

Furniture Retailers

It is likely that such major sellers of bedding such as Sleep Country have already taken measures to address the issue especially in their program of donation of used bedding to needy people, but this needs to be pursued in order to establish codes of practice in this sector.

Used Furniture Retailers

This is an important sector for accessibility of all citizens to good items at bargain prices and offers recycling of useful items with a long life rather than increasing the waste in disposing of good things that have a long life. The nature of the business does increase the risk and the sector needs to be included as a stakeholder with clear practices.

Do stakeholders really understand IPM?

I find that most stakeholders do not really understand IPM well. Although the American NPMA and the Canadian and Ontario Pest

Associations speak of this, I know from being in the industry it is the truly exceptional firm that practices this as it should be practiced. Even some of the "stars" in the pantheon of bed bug experts place little emphasis on the concept.

What is IPM?

It is more than a variety of methods including pesticides WHEN NEEDED. IPM is an ***information based system*** meaning that relevant data is collected as part of the work and this data is used for follow up, for recommendations and for planning treatment. If that is missing from the definition, then it is not really IPM. The General Services Administration of the U.S. government implemented IPM for all public buildings and hired a Ph.D. Entomologist (Al Greene) to manage this. The hallmark of his program in addition to having qualified staff, was reporting of infestation by all staff in public buildings as an open and mandatory requirement so that any pest issues could then be addressed. He also used this as a means of measuring success by reduction in these incident reports. He demonstrated a dramatic reduction in incidents and achieved better control with fewer pesticides. IPM in the Housing Environment is many hundreds of times more difficult of course. Tenant surveys in housing are rarely done for fear by some of hearing how bad things might be, but this is an example of information gathering in an IPM context. This may seem elementary, but the gathering of information and review of this whether in a unit or for an entire building as part of the process makes IPM work. Encouraging tenants to report infestations without fear of stigmatization or blame is a key part of the survey process.

What about sustainability of control?

Sustainability of control is one of the major goals of IPM. We do not want situations such as happened in Hamilton and Winnipeg and elsewhere (I have never named the locations in my talks out of respect for the organizations, but now it is out I can say it), in which much expense and discomfort was expended and control failed within about 18 months or less. One of the key features of IPM is to SUSTAIN CONTROL, through proactive actions.

One of the goals of IPM is to reduce use of pesticides. Some in industry misinterpret this to mean, IPM practitioners want to eliminate all use of pesticides. If we can achieve control without pesticides ALL THE BETTER, but reality dictates that we need pesticides for bed bug control, but if good prevention and early warning and ongoing follow up and education can enable early discovery and early treatment and that means less units need to be treated or that the whole building does not need to be treated, than this is an IPM accomplishment. But it takes time and it is more expensive to sustain but better spend money on prevention through IPM than on discomfort in preparation and gallons and gallons of insecticide.

The narrow context of sustainability

Individual homes

The prospect of control is best in detached dwellings. This is becoming an issue of real estate and disclosure, and it may be that disclosure of bed bug infestation and some guaranty of elimination is needed in real estate deals as in the case of termites.

Apartments and neighbours

Control in apartments is more difficult because of risk of reinfestation; therefore the total IPM approach must monitor the situation on an ongoing basis through effective strategies of education, annual unit inspections and intelligent responses in partnership with pest control firms, and support agencies. This also applies to co-ops and condominium apartments with leadership through their boards and management organizations.

The wider context of sustainability

The entire building

Treating an entire building is very expensive and disruptive and hopefully is not needed. An entire apartment was treated with Vikane fumigant in Virginia and achieved success, but this is a very difficult undertaking. Absolute elimination was achieved, but of course without an IPM program the situation can return to the same levels fairly quickly.

Heat treatment holds promise as a total building treatment but it is also very costly especially in terms of preparation and disruption. I observed a total building heat treatment in Manitoba using Hydronic heating system. This has limitations and is fairly expensive, but is becoming more popular, however it is not desirable as a repetitive approach and it has some risks. Heat treatment may become a standard for treating moving vans to prevent spread of infestation from building to building.

Whole Building Inspections with Detection Dogs

A dog can do a full inspection of an apartment in mere minutes with 90% accuracy. While the cost of a dog for a single visit to a private home can be \$225 - \$275 - \$400 depending on the size of the home, the accuracy of detection is remarkable. In high rise situations, when

extensive monitoring is needed, the actual cost per unit is as low as \$12 - \$15 a unit, which is actually CHEAPER than a human inspector for time and for quality of result. Detection dogs are appropriate when a site has become infested in many units to enable appropriate treatment measures and to enable IPM decisions based on reasonable rules.

The community

It is clear that if infestations are reduced in the community then risk of spread also is reduced. I have seen discarded box springs from an apartment building with bed bugs, and learned at a training of care providers that a nearby building on the same street was also infested. In this case, a co-operative effort of both sites could reduce spread of infestation for both! Spread can occur through picking up furniture or through friendships, therefore eliminating all reservoirs is key; this includes hotels, student residences, hostels, apartments, community centres as needed and so on.

Understanding Pest Reservoirs

Defining a pest reservoir as an IPM term

An insect reservoir is a concentration of insects from which they can spread to other locations. This can be an apartment that is badly infested, or a hotel, or a university residence or an apartment building with multiple infested units that can cause spread to other buildings (tenant moves, furniture disposal, etc.,). Some call these source units, but this term adds a kind of stigma. A reservoir unit may become a source of spread of infestation, but it may not have been the original source, so the terminology needs to be used with some care. We also call severely infested units "focal" units as focus of infestation or "hazardous" units when conditions are so extreme that they may pose a fire hazard (hoarder

cases) or even the impact of very bad odour. As noted elsewhere it is not uncommon to have both roaches and bed bugs in these cases. The role of cockroaches in asthma and allergies in children has been confirmed many times in studies. Sometimes we can have severe infestations without there being clutter or hoarder extremes as well.

Stop spread by eliminating reservoirs

Whenever a major infestation has been eliminated it is a huge step in stopping spread. Therefore the investment in helping tenants to prepare through enterprises such as the Bug n' Scrub, Fresh Start or others, is more than just looking after individual units but it has benefits for the entire building.

Treat the whole building?

Some have suggested that annual treatment is the answer and even industry has suggested this in hotels as preventive quarterly treatments of every guest suite. This is really a bad economy of scale more due to the heavy use of pesticides than the actual treatment in the hotel. In the housing situation it means that tenants would be put to great discomfort to prepare properly on this frequency. These are not good ideas.

- b. Every year? NO
- c. Every few years? NO

Reaction Overkill versus IPM Decision Rules

This is sometimes a demand of frustrated tenants. A whole building treatment may be needed as an EXCEPTIONAL service, but this should be based on hard data either from statistics of treatment as analysis of the whole building or on basis of a dog survey of the entire building. If most

units are adjacent to an infested unit then this would indicate a full building treatment is needed. However, likely more often than not the scope of treatment may be limited to a much smaller percent - this is IPM in action. A decision based on information. This is called an IPM Decision Rule. Another example of an IPM Decision Rule would be Inspect adjacent units to unit being treated... if any infestation is found, treat adjacent units, and continue adjacent unit inspections of those until no infestation is found.

If an adjacent unit is highly infested, then extend the inspection to a full block inspection. (units adjacent and above and below in a full block of 9 units on three floors). the recommendation by Dogget on this is based on experience in the hotel industry in which linens are left in a hall and there is a fair risk of disturbed bed bugs moving to other side, but in most cases in multi-dwelling housing, this is not a common happening. More recent studies by Hwang from Rutgers University have suggested "across the hall spread of infestation, but in the study the site was 50% infested and the likelihood of an across the hall random effect was high. This could be valid in a very heavily infested situation, but bed bugs tend to follow easy paths rather than risky ones. This is about managing resources reasonably. If a treated unit is heavily infested, then the full block would be scheduled. But adding opposite units to the rule is costly and most often not necessary. This is a bit controversial and will be confirmed through studies, but at this time from consulting with experts as well as from reported field experience, this is unlikely as a common occurrence. If we found that bed bugs do indeed risk crossing an apartment hallway to another apartment, then of course, this would be valuable, but common sense tells us that bed bugs are secretive and this circumstance would be rare. We are always expectant of the way that insects adapt and utilize resources to survive and bed bugs are no different. In hotels, the major point of harbourage is behind headboards because linens are changed every day essentially and bed bugs do not like to be disturbed. In the IPM context, we need to be aware and use information to modify our strategies, but must also be

*cautious to transfer recommendations suitable in one situation and transfer it to others without a consideration of usage of resources. The risk of bed bugs in a hallway may be related to their falling off improperly protected items in the hallway for disposal, and in that circumstance, they would be looking to seek a host under the door. Sometimes newly hatched nymph cockroaches from garbage chute rooms, or from a severely infested unit can be mistaken as bed bugs. Notwithstanding the usual behaviour of bed bugs that is secretive and nocturnal, and the general rarity of finding bed bugs in a hallway, TPH inspectors have reported "In severely infested units I have seen bed bugs walking out of the units in the hallways and on the walls. Bed bugs have been reported travelling outside along a balcony and into the next unit."*⁷ This does not mean that these observations describe "common" occurrences, but rather that at extreme pressure, insect behaviour can change from the norm. Of course, adjustments need to be made, but opposite unit inspection may not be useful until it is shown that this happens "commonly", which is likely not the case.

Pesticides and Human Health

As we struggle to address the resurgence of bed bugs, we must not lose sight of the impact of repetitive pesticide applications inside people's homes. All pesticide products registered for use have undergone most careful scrutiny through an intensive research process with focus to ensure minimizing human exposure and ensuring that inadvertent human exposure has very low risk. The products registered for use in homes are considered safe by huge measures of research and statistical scrutiny, these are largely predictive on the basis of animal studies of toxicity and other effects as carcinogenicity, teratogenicity (cause of birth defects), mutagenesis, etc.. However, we know from a historical perspective as well

⁷ Personal Communication Alicia Lowe, TPH

as more recent studies that persistent exposure in an indoor environment of what are considered harmless levels may subsequently show up in newer studies as unacceptable risk. An example is a study in the last few years in New York City showing that level of chlorpyrifos (Dursban) levels in umbilical cords of new-borns was predictive of impaired cognitive abilities as measured up to three years of age. Dursban was a very commonly used product in homes for roach control and for other crawling insects. The idea then is to use pesticides with caution and carefully so that repetitive treatments beyond the usual norm do not happen and we don't hear of 6 and 7 or more treatments in units due to failure of control. In addition to concerns about repetitive treatments in homes by professional pest control firms, there are also concerns about private citizens doing home treatment for bed bugs without understanding what works and what does not, as well as misuse of pesticides "We see a lot of home spraying happening but people are not doing it properly either not following directions properly, not doing the preparation or very poorly and spraying every day"⁸.

Is it safe?

The studies required to register a product do give a wide margin of safety and indicate that products used are safe, but these are poisons and should be used with care. This is why good service is so critical.

How much is too much?

As part of an IPM approach, noting that a unit has been treated repetitively should be a signal that something different is needed to address the problem in that unit. This can often relate to quality of service, but

⁸ Personal Communication Alicia Lowe TPH

sometimes it is because of bed bugs that have found a particularly good hiding place that is not being treated. A focus on investigation may then be needed. If a product has been used in a site for a long time, it may be time to change to another product.

Cases of extensive repeat treatments of a unit should be seen as a red flag. Unfortunately we hear of cases of units being treated even up to a dozen times in a year without success... In any case in which more than 3 or 4 treatments have been undertaken by request (as opposed to addressing a known bad case), this should be investigated to determine why control is not succeeding.

It was considered safe yesteryear, why worry?

There has been a lot of pressure to bring back older products with some people aspiring to DDT being brought back and there are conservative lobbyists in the U.S. attacking EPA and regulators for banning products. Sometimes we learn things are more dangerous than we thought, and when a product is deemed to pose risks, it needs to be removed. The fact is that excess treatment is not rare, and is sometimes a compensating action to "patch" bad services. It takes time to do a proper treatment. We should focus on getting better products and using the IPM approach in all its measures – prevention, alternative methods, and pesticides carefully applied.

Remember the Risk/Benefit consideration

I have mentioned in this context of a case I was involved in which a tenant was so phobic about cockroaches that she sprayed her home on a weekly basis with diazinon. I was called to inspect the home as her toddler son was constantly ill. When I entered the apartment my eyes started to burn

and I asked the tenant what she was doing and she showed me a one gallon can of Diazinon that she was using at strength (undiluted). I explained what was happening to her in a compassionate way and when she realized that her spraying may have caused her son's illness, she was in tears, but she stopped doing this as I emphasized to her that we would address any pest issue she had and handle it. That re-assured her. This is an extreme case, but the model applies in terms about vulnerable populations. A study done in the U.S. in three states in the 70's comparing the detection of residual insecticides in low cost rental housing to that in detached homes showed that there was a much higher residue in the former and therefore children living in low cost rental housing were more at risk to exposure to these residues. Boston Housing Authority as late as the 80's and before their major shift to IPM was treating apartments four times annually with spray for roaches as a routine practice. By comparison, MTHA where the first IPM program was implemented in housing in Canada and likely in North America, was using IPM as a strategy at the same time as this happened.

The point is that we want to be careful about pesticide use, and one of the major goals of IPM is to reduce pesticide use as much as possible by the entire information, knowledge based approach and use of alternative methods and prevention as appropriate, with pesticide use as only part of the process when NECESSARY.

Applying IPM Effectively - Cost Effectively

There has been an ongoing debate about IPM with IPM specialists and regulators (notably EPA in the U.S.) working hard to demonstrate that IPM is ultimately cost effective and may cost no more than the conventional treatment, but I don't agree. IPM does cost more at the start up and a properly run program will cost a fair amount because pest control firms need to be paid for their work and even if a problem is solved and services to individual units are reduced, in order to maintain the program it costs money. The studies done to show lower costs of IPM in the long run are

university run and often the cost of the students who do education of tenants or who are involved in the research are not usual in IPM programs and the researchers goal is to show the improved efficacy of IPM (i.e. effectiveness of control). I believe that there needs to be a shift to IPM as a matter of best practice to reduce infestations AND to reduce the need for general treatment as well as for repetitive treatments. Costs may be higher in individual units to get the job done right and more costs in preventive measures, inspections and IPM review, and if this results in a lower cost overall due to reduced services,, good!, but the focus should be in the improvement of pest control through IPM and the benefits this brings to quality of life.

Setting IPM standards

is more appropriate as a developed standard at the Municipal Level that can then be applied province wide as a regulatory requirement. IPM standards can be defined in a general context, but as the Code of Practice by Doggett in Australia was developed initially for the Hotel Industry, and encompasses housing, it may be better to develop a general standard of IPM for all pests as a requirement in a variety of sectors, and then establish specific codes of practice for each sector based on research and input of the sector involved.

In this way, work with Ministry of Environment, as well as other Ministries such as Social Services and Health and Labour can establish the basic IPM standard common to all and then the specific standards that may be applicable. This can also impact restaurants and other foodservices in general pest management as roaches and rodent infestations are still most significant.

The Chain of Accountability Model extended (Circles of Synergy)

The Chain of Accountability in IPM, IPM CAP as developed by HSI seeks to defining roles carefully so all stakeholders have a clear understanding of their role to enable good practices of prevention and elimination of bed bugs. Circles of Synergy is a similar concept that emphasizes that a co-operative integrated effort by stakeholders has a greater impact than the sum of individual isolated efforts.

The regulatory requirements – at level of simplicity

As noted, by using the Municipal Property Standards regulations as the vehicle for communicating IPM standards and expectations, if there are violations or difficulties, then Property Standards Officers can address this from a regulatory perspective and Health Inspectors and other supportive groups can then be marshalled to help in specific cases, but this would be a good focus of establishing standards that can be enforced and encouraged. The requirement for IPM as clearly defined can be part of the Residential Tenancies Act with provision for supportive actions as needed an appropriate. This would cut down on horror cases of eviction. I have heard from some concerned agency professionals that there tends to be a focus by agencies on the landlord being accountable due to their responsibilities for providing pest control services under RTA, but at the same time landlords do not consider themselves social service providers and look to agency support. The best approach is when support agencies and landlords work together.

Educating ALL stakeholders effectively

This is a rather major undertaking, but once the key stakeholders are identified, this can be started quickly at low cost. There are currently well trained people available who can provide on site training, as well as online training. Much of this is already available in simple form from other jurisdictions.

Use of resources with intelligence not reactivity

Care is needed not to stigmatize victims of bed bug infestations or create fear. Reactive whole building treatment should be avoided although there will be times when this is unavoidably necessary.

It takes expertise.....

Measures of success as part of standards

Any standards should also include data analysis showing success. When a municipal inspector or a health inspector were to visit a site to review status perhaps based on client complaints, data analysis can show efforts or lack of efforts and as reported by a TPH Health Inspector "and we have seen this over and over again where it is found tenants are not receiving the second treatments or when they do it is months apart, no evidence of block inspections etc". Information collection and review is a critical element of an IPM program as has been noted elsewhere.

It is not a one time quick fix... it is ongoing

The old practice of annual treatment of all units in a building for roaches is an antiquity. This used to be a quick fix routine in the hope of "knocking them down", but reality is the realization that pest management in the IPM model is an ongoing process, and if we do our jobs well, then infestations will be rare and handled efficiently with least use of pesticides and prevention of spread. The bed bug resurgence shows what can happen when there is not a clear societal

response using best practices and intelligence to challenge the remarkable capability of insects – and this case a most amazing comeback of a pest that had been suppressed for nearly 50 years. The fix is not a 50 year old solution of heavy pesticide application that will likely fail, as well as potentially cause harm. IPM is the fix - not a one time fix, but an ongoing process.

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