BEYOND PESTICIDES
701 E Street, SE ▪ Washington DC 20003
202-543-5450 phone ▪ 202-543-4791 fax
info@beyondpesticides.org ▪ www.beyondpesticides.org

IPM: A HISTORICAL PERSPECTIVE

Integrated Pest Management (IPM) is a common sense approach that provides an effective species management framework. IPM practices reduce dependency upon toxic pesticides, subsequently mitigating exposure to these hazardous chemicals. IPM, when practiced proficiently, is truly a method of ecosystem stewardship that combines cultural, physical and biological methods to keep the populations of undesirable species in balance at tolerable levels. Ideally, IPM involves using chemical control methods only as a last resort and when used, incorporating the least-toxic control method available after exhausting all possible alternatives. Unfortunately, the concept of IPM has often become elusive in regulatory language and adulterated in practice.

Evolution of IPM. IPM concepts have been used and developed since the dawn of agriculture and permanent settlements. Biological, physical and cultural methods have been applied for millennia. There is evidence that a few chemical controls, such as the use of sulfur, were also employed at different points in history. However, what many think of as "conventional" pest management (e.g. calendar spraying of pesticides), is a relatively recent development in species management.

Chemical experimentation in the late 19th and early 20th Centuries led to the development of modern pesticides, producing mixtures with properties that were favorable for the control of unwanted species. Paris green (an arsenic compound) was one of the first chemical pesticides produced, marking the beginning of chemical insecticide use in the United States in 1867. Historically, the agricultural use of inorganic pesticides during the early 20th Century triggered some of the first pesticide food regulations over arsenic and lead residues.[i] Thousands of synthetic pesticides have been developed since, some of which have become synonymous with environmental degradation.[ii]

The search for new insecticides shortly before World War II led to the development of nerve agents (e.g. the nerve gas Sarin), the most toxic chemical warfare agents known to date. This process also led to the development of other organophosphate chemicals, several of which are still used today as pesticides.[iii] The commercialization of

synthetic organic chemicals (e.g. 2,4-D, DDT) after World War II, introduced the public to many new agricultural, home, garden and other chemical pest control products. As chemical methods became readily available, the simplicity of pesticide use displaced many of the time-tested, non-chemical management techniques. From 1951 to 1977, production of synthetic organic pesticides in the U.S. increased from 464,000 to 1.4 billion pounds. By the 1970s, the chemical pesticide industry swelled to include thousands of companies ranging from those that produce raw ingredients to packagers to distributors to application equipment manufacturers.[iv] Internationally, the green revolution, a predominantly foreign-aid based, large-scale change in agricultural systems toward monocultures, subsequently led to the introduction of chemically intensive methods around the world during this era as well.[v]

As chemical controls became more and more common in agricultural, public health and nuisance applications throughout the first half of the 20th Century, a myriad of problems were being discovered. Chemically reliant methods had quickly resulted in pesticide resistance within the target species, harm to non-target species (including natural predators of the target species), water contamination, food contamination, overall ecological degradation, and public health problems.

Several target species have developed resistance (i.e. have become immune), making pesticides ineffective. Pesticide resistance was reported as early as 1908,[vi] and DDT resistance was reported as early as 1946.[vii] By 1984, at least 17 insect species were reported as resistant to all major insecticide classes. A single species has been reported to be resistant to as many as 71 synthetic insecticides.[viii] Today, over five hundred species of insects, including disease vectors such as mosquitoes, and mites are resistant to one or more pesticides. Additionally, over 270 species of undesirable plants, 150 plant pathogens, and approximately half a dozen of rat species have been reported as resistant to at least one pesticide.[ix]

Numerous health and environmental reasons to use non-toxic alternatives to pesticides exist. Health ailments include cancer; endocrine disruption; birth defects; reproductive effects; neurotoxicity; liver and kidney damage; immune suppression; respiratory problems, such as asthma; sensitization and irritation. Environmental effects

include ubiquitous water contamination; toxicity to birds, fish and other aquatic organisms, and bees; and bioaccumulation throughout the food chain.[x]

Subsequently, as the downfalls of "conventional," chemically dependent pest control methods were being discovered, the roots of the environmental movement were forming. In 1962, Rachel Carson published *Silent Spring*, playing a major role in introducing the dangers of pesticides to the public conscience. Around this time, several scientists also began to look at pest control from an ecological systems perspective, ultimately coining the term Integrated Pest Management in the mid-1960s. The name stuck and has evolved into a formal concept. IPM dialogue, although initially dominated by those interested in insect control, has grown to include management methods for all undesirable species.[xi] The term has become commonplace internationally, following the trail of synthetic chemical use around the world.

To date, several countries, including Canada, European nations and others, have institutionalized the practice of IPM at some level and IPM projects have been launched around the world.[xii] IPM has received the most attention in the agricultural context. The 1992 United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, set agricultural IPM as an international goal for program development.[xiii] The United Nations' Food and Agriculture Organization (FAO), Development Programme (UNDP), Environment Programme (UNEP), the World Bank and other international organizations have provided support for IPM programs.[xiv]

In the U.S., IPM has received attention at the federal, state and local level, and in cooperative extension offices. IPM is also increasingly being used in the public and private realms. The governments of Seattle and San Francisco, the Air Force and others have all employed IPM as a tool to reach pesticide reduction and pollution prevention goals.[xv]

Still, the U.S. presently produces an estimated 1.6 billion pounds of active pesticide ingredient, excluding industrial wood preservatives, specialty biocides and chlorine/hypochlorites (e.g. bleach). It is estimated approximately 1.2 billion pounds of active ingredient are used annually in the U.S. and over 5 billion worldwide.[xvi] In the U.S., that

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means in 2000, using the most current census data, there were over four pounds of active pesticide ingredient used per capita (again, this figure does not include industrial wood preservatives, specialty biocides, chlorine/hypochlorites, and "inert" ingredients). These figures indicate IPM has yet to reach its full potential as a pesticide reduction method.

Federal IPM Policy. As public awareness has grown about the dangers of pesticides, IPM has increasingly made its way into U.S. policy. In 1972, President Richard Nixon was the first president to use the term Integrated Pest Management when he asked several federal agencies to commit to developing and promoting the concept. Although he noted that chemical pesticides have "produced unintended and unanticipated harm," his scope was limited to protecting environmental quality in the context of agriculture and forest management.[xvii]

President Jimmy Carter asked the federal government to broaden its IPM efforts in 1979 by specifically including an extensive base of governmental agencies in his memorandum, such as the departments of Housing and Urban Development, Defense and Transportation. President Carter recognized IPM, "has both economic and environmental benefits and should be encouraged in both research and operational programs of federal agencies." He formed an IPM Coordinating Committee as well to assure the implementation of his directive.[xviii]

President Bill Clinton encouraged IPM on all federal landscaped grounds as a means of pollution prevention,[xix] and his administration directed EPA and the Department of Agriculture (USDA) to expand their IPM programs.[xx] The *Food Quality Protection Act* (FQPA) of 1996 was also enacted during his administration. FQPA states, "Federal agencies shall use Integrated Pest Management techniques in carrying out pest management activities and shall promote Integrated Pest Management through procurement and regulatory policies, and other activities."[xxi]

The result of these calls to action from the executive branch has been a fractured adoption of IPM in federal agencies. EPA and USDA are in especially important positions regarding IPM as their authority and responsibilities can and do have an immense impact on pesticide use. Both agencies have made publicized efforts to adopt and promote IPM:

- EPA: EPA's charge to protect human health and the environment, and its subsequent role in regulating pesticides, positions the agency to be a prime advocate of IPM. IPM is an important risk mitigation strategy EPA can use to reduce pesticide use. EPA has provided support for the implementation of IPM in schools, and provides household and agricultural IPM guidance. However, EPA's discussion of IPM is inconsistent, defining IPM as "an approach to pest control that offers a means to reduce the risk from – and in some cases, the amount of – chemical pesticides needed" on one page, and IPM as a program that "takes advantage of all pest management strategies, including the judicious and careful use of pesticides when necessary" on another page.[xxii] EPA also continues to allow the registration of many pesticides that have not been thoroughly tested and often fails to act diligently on know hazards, seldom using its authority to ban hazardous pesticides from the market despite the existence of safer alternatives.
- USDA: The federal IPM paradigm has tended to focus on the utility of IPM in agricultural fields. In 1993, under guidance from the Clinton Administration, USDA adopted a goal to implement IPM on 75 percent of the total crop acreage in the U.S. by 2000. USDA estimated that they almost reached this goal at 70 percent. However, the U.S. GAO reported in 2001 that agricultural IPM implementation rates were much lower than reported. This was due to USDA's characterization of individual IPM components (e.g. monitoring) as IPM implementation, instead of IPM practices that actually reduce pesticide use. GAO reported, "IPM as implemented to this point has not yet yielded nationwide reductions in chemical pesticide use. In fact, total use of agricultural pesticides, measured in pounds of active ingredient, has actually increased since the beginning of USDA's IPM initiative." GAO goes on to state, "[N]o one is effectively in charge of federal IPM efforts; coordination of IPM efforts is lacking among federal agencies and with the private sector; the intended results of these efforts have not been clearly articulated or prioritized; and methods for measuring IPM's environmental and economic results have not been developed."[xxiii]

These efforts generally leave more to be desired in regards to maximizing pesticide reduction, and while some agencies have strived to develop IPM programs, others have done little to comply with the FQPA requirement. For example, under the Department of the Interior, the National Park Service claims it began implementing IPM in 1979 in response to President Carter's Presidential Memorandum and has an established program employing multiple IPM coordinators.[xxiv] In contrast, the Department of Housing and Urban Development (HUD) has neglected its duties to implement IPM in public housing - six state attorneys general filed suit against HUD in 2004 after the Department denied a petition to require HUD-funded public housing developments to adopt and implement IPM.[xxv] This brief overview shows the federal government needs to renew its commitment to IPM and redefine IPM as a tool to reduce pesticide dependence.

In lieu of a strong and consistent federal stance on IPM, state legislative bills and state pesticide acts, administrative code, and local ordinances have taken up the issue. In this arena, schools have had the highest success rate of incorporating IPM into state and local policies, which is an encouraging trend considering children are particularly vulnerable to pesticides. As of 2007, approximately 20 states have statewide policies that recommend or require the implementation of IPM programs for school structural and/or grounds management. Several states also have similar provisions for childcare facilities. Many additional states have one or more schools/school districts with independent IPM/pesticide reduction policies and/or programs. Other areas addressed in IPM policy include the management of health care facilities, public buildings, rights of way, golf courses, forests and ecologically sensitive areas.[xxvi] While it is beneficial to implement all of these IPM policies, and many states and localities have done so, they represent a piecemeal approach to IPM. As mounting scientific evidence verifies the widespread environmental health impacts of pesticides, the switch to socially responsible pest

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management must be undergone on a broad scale in order to protect the environment and public health.

Switching to IPM. A very practical reason for non-toxic species management is economic cost. Pesticides were initially cheap, however, the actual price tag of pesticide products, as well as the external costs related to lost environmental services and public health issues, has swelled the price of these 'quick fix' chemicals. In fact, IPM frequently costs less than chemical controls. EPA reports, "Schools across the nation that have adopted such programs report successful, cost-effective conversion to IPM. IPM can reduce the use of chemicals and provide economical and effective pest suppression … [P]reliminary indications from IPM programs … suggest that long term costs of IPM may be less than a conventional pest control program."[xxvii] Eliot Spitzer, former Attorney General of New York, has stated, "In case after case, schools and other institutions have reduced their pest control costs early in the transition, often in the first year."[xxviii] Governments have experienced win-win outcomes. For example, the City of Santa Monica, California, was able to reduce the city's pest control costs by 30 percent by switching to IPM while providing excellent pest control, reducing the number of pest complaints and reducing the hazards associated with pesticides.[xxix]

Regardless, industry influence has remained strong due to the public's familiarity with pesticide products, large marketing campaigns and lobbying efforts. At the beginning of this decade, industry was averaging around $32 billion and $11.5 billion of sales at the user level worldwide and in the U.S., respectively.[xxx] With approximately a third of industry income coming from U.S. sales, it is no surprise that industry has been very engaged in Washington politics. Millions of dollars have been spent on lobbying efforts. Responsible Industry for a Sound Environment poured $15 million in to hire over 200 lobbyists, including former Senators, in 1996 alone. Tens of millions of dollars have historically made their way from industry members to congressional candidates in the form of campaign contributions. Scientific studies have been manipulated, industry has misled the public and regulators, many perks have been provided for Capitol Hill lawmakers – and the list goes on.

Whether these efforts have swayed lawmakers and regulators or not, government efforts to protect public health when it comes to pesticides has often been disappointing.

From 1988 to 1995, Congress did not pass one of the 65 bills proposed to strengthen pesticide regulations.[xxxi] However, there is a very real need to strengthen regulations. Pesticides are often not fully tested, registered and reregistered by EPA with data gaps, are allowed to stay on the market even though knowledge of health and environmental effects is incomplete, and when harmful effects are deemed to be above the agency's level of concern, lengthy phase-out periods often ensue. Many existing shortcomings of the regulatory process have been reported to Congress by GAO since at least 1975, addressing deficiencies such as the lack of efficacy data; incomplete safety data; the need to test actual product formulations and synergistic effects; full testing of inert ingredients; adequate label compliance; and timely regulatory actions.[xxxii] EPA has also been slow to develop new and important health screens, such as endocrine disruption assays, which have not been implemented in the ten years that have passed since mandated by Congress.[xxxiii] The ethical standing of the agency has also come into question in recent years. For example, a moratorium on human pesticide testing was overturned in 2003, after which the agency began accepting data from several ethically and scientifically questionable studies conducted or sponsored by industry.[xxxiv] Additionally, the agency has repeatedly experienced budget cuts, spreading resources thin for agency programs.

The Future. All of the above considerations illustrate why using pesticide reduction techniques in and around your home, workplace and/or school, and community is a wise shift in ecological stewardship. Recent market trends show the public is increasingly recognizing the need to go pesticide-free as organic sales are growing for virtually every commodity, from vegetables to pet food[xxxv] to lawn care products.[xxxvi] Adopting IPM practices that emphasize pesticide reduction, and organic practices, provide real-world solutions for a healthier environment.

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