

## Pesticides are safe: Proving the improvable

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Pesticides are probably the most tested and closely regulated substances in Canada today. An entire agency in Ottawa, not to mention a host of provincial regulators, oversee their approval, their movement in commerce, who may use them, where and when they may be used. Why then, are cities and towns - most with no source of expertise to judge health or environmental effects of these substances - enacting bans on their use by city employees and private citizens? They do this because they see this as the will of the public - the citizens who have elected them and some of whom believe that pesticides are causing illness in us and our environment.

As a scientist who practices the scientific method, I am, in part, to blame. As a scientist, I cannot offer absolute and irrefutable proof that pesticides are safe. All that science can do is say that one thing is more likely to happen and another, much more or much less likely, but never 100 percent for certain. No matter how well designed an experiment, no matter how many mice or fish are used, the scientist will always report the result with some uncertainty.

This means that, even if there is no real effect of the substance on the liver, in some experiments a very small adverse effect will be seen, while in others, a non-adverse effect will occur. This is because of natural variability and random events. The average of all these is close to zero but for those who believe that an adverse effect should exist, the positive studies will be absolute proof.

The scientific method, the test of the null hypothesis, is designed to keep scientists honest and detached from whatever their beliefs may be. No scientist is pleased to find that nothing is happening; it is much more exciting and satisfying to find interesting responses and effects. As was pointed out nearly four centuries ago by Francis Bacon, the father of the scientific method, it is human nature to diminish negative evidence and exaggerate the significance of positive evidence. Because of this, we tend to ignore the negative evidence and focus on the positive, evidence that is, in the analogy described above,

essentially anecdotal. Some people believe in ghosts, the paranormal and in visitations of aliens, despite the countless years of study that have failed to show any evidence in support of these phenomena. They do so because they choose to believe in anecdotal evidence. The media are of little help because the possibility that some facet of our daily life may cause injury or worse is the substance of headlines and increased circulation. This is a likely reason for the common misperception that pesticides cause all types of diseases in humans. As discussed above, a study may report an association (link) between pesticide use and a disease such as cancer in humans. However, one positive study does not prove a cause-and-effect between the pesticide use and disease. Only if most studies consistently show this linkage and other lines of evidence also support the conclusion would this association be accepted as showing causality.

Pesticides are one of many tools in pest management toolbox. They may be more efficient than other methods, but they are not absolutely necessary. As someone who does not live in Halifax, or in other towns where bans have been proposed, I do not care one way or the other if they choose not to use pesticides. However, I do care when this is done in the name of science and concern for health effects when, realistically, these do not exist. If the town councils and the citizens do not want pesticides used in their homes and gardens, then all I ask is that they have the courage to admit that they do this for reasons of belief or politics, not on the basis of science.

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