Guidelines for Review of Population Health Studies

Epidemiological or population studies look at diseases in humans or animals and which factors encourage or protect against them. With respect to pesticides, these studies can help determine any association or disassociation with health conditions. But not all population studies are created equally. Poorly designed or conducted ones do more public harm than good so it's important to go through the following checklist to see if a study's findings are news you should use or lose:

1) Remember hazard x exposure = risk. A product's risk is based on the type of hazard it poses in relationship to the likelihood of exposure to this hazard. So, in the absence if either hazard or exposure, there is no risk. Make sure a study evaluates both.

2) The determination of pesticide risk in a study should include:

- Hazard identification, establishing the toxicity of the pesticide
- Exposure assessment, determining the type, level and duration of exposure to the pesticide
- Dose-response assessment, identifying the amount of pesticide absorbed by those exposed to it in a certain way
- Risk characterization, estimating the level and likelihood of adverse effects based on assessment of the above three factors

3) Look at scientific principles. Researchers can only analyze what they have measured. Each epidemiological study should describe how it was designed and conducted, including the:

- hypothesis that was tested
- type of study
- way exposure was measured
- type of group(s) used for analysis
- statistical analysis
- sample size calculation

If these principles were not followed, the researchers should explain how and why not and the implications on results. The study should be independently peer-reviewed before it is published or considered for media coverage.

4) Consider how exposure is measured. Is it done with self-reporting, biomonitoring or by location? The range of exposure levels can be vast among study participants and difficult to compare. These need to be accounted for in the study analysis. With self-reporting, participants may not be able to accurately recall their level and duration of exposure. There is also information bias in participants who have a health condition in question; they tend to claim greater exposure than healthy subjects. Others may have had interruptions in exposure, thus biasing data collection, or their records may not be accurate. Therefore, findings from any study need replication and confirmation before drawing any firm conclusions.

5) Research the context of the study. In epidemiology, there is power in numbers. The scientific literature may have examples of previous studies on similar subjects or by the same research team. If there is consistency among these studies, you can have more confidence in their findings. However, if there is a lack of consensus or inconsistency, further research may be required. It is also helpful to look at the quality of any previous studies done by the authors.

6) Be wary of how journalists interpret studies. Sometimes the media exaggerates or overinterprets actual findings due to lack of understanding how to evaluate them and/or use of incorrect terms. For example, use of the word "link" by journalists can leave readers unclear about the strength or consistency of an association.

7) Recognize that population studies have several limitations. These include their observational nature, reliance on records or human recall of exposure, determination of levels of exposure and multiple, potentially confounding (distorting) risk factors. Most population studies are observational for ethical reasons; epidemiologists cannot intentionally expose humans to potentially dangerous substances. The availability of records on exposed populations, exposures, disease levels, time periods and other variables often determine the type of study that can be performed and the extent to which results may be statistically significant. But it can be difficult to determine the level and type of exposures.

Population studies can help identify risk factors for disease, particularly where exposure is high and data is consistent over time. They also help identify correlations between certain substances and health outcomes. Examples include the positive effect of folic acid in preventing spina bifida or the negative effect of smoking on lung cancer risk.

But for most diseases, the causes are not well understood or known at all. In addition, most diseases emerge from a variety of risk factors, including both internal (e.g., genetic susceptibility and lifestyle) and external (e.g., exposure to a substance). When the level of an exposure is low, poorly defined or inconsistent among studies, it is difficult to interpret associations. Since epidemiology is subject to chance and natural variation in the presence of other risk factors, firm conclusions can only be drawn after a series of studies has been conducted with all reporting relatively consistent findings.