

Toxicity Data and Pollution Prevention

Kirsten Rosselot, PE

What Is Pollution Prevention?

1. Source reduction
2. In-process recycling
3. On-site recycling
4. Off-site recycling
5. Waste treatment
6. Secure disposal
7. Direct release

Pollution Prevention Players

- Agency initiatives
- Waste reduction efforts by facilities
- Green purchasing efforts of consumers

Making P2 Choices

- Legacy of decisions that were made in response to environmental disasters (lists of banned substances, lists of hazardous waste-generating processes)
- Pollutant notoriety (volume, highly publicized cases)
- Ease (focus on cases where checklists work wonders)

Screening for P2 Priorities

Use quantitative schemes that factor in

- a measure of the quantity of a chemical released or used,
- its toxicity, and
- perhaps some exposure factor/persistence factor/transport factor

The Bilko Index Calculator

- Visitors fill out a product usage survey that immediately calculates their Bilko Index (a measure of the chronic toxicity of pesticides and cleansers used in the home)
- Teaches consumers what the toxic ingredients are in products they use, what factors influence the potential for harm
- Allows consumers to see how their Bilko Index changes if they choose to use other products

How the Bilko Index Is Calculated

1. Fill in the amount of product you typically use at any given time. A reasonable estimate is better than no information at all.

(Indicate whether the amount you entered is in pounds or ounces.)

2. Click on the button that reflects the frequency with which you use the product.

3. Indicate whether the product is left in place after you use it, whether you wipe it off or vacuum it up, or if it is rinsed down the drain.

4. Click on the button that shows where you use the product (indoors, outdoors, or a combination of indoors and outdoors).

PRODUCT NAME / FORMULATION	USAGE AMOUNT	USAGE FREQUENCY	WHAT HAPPENS TO PRODUCT AFTER APPLICATION	AREA OF USE	
Frontline Top Spot for Cats / liquid	<input type="text"/> <input type="checkbox"/> ounces or <input type="checkbox"/> pounds are applied	<input type="checkbox"/> daily or <input type="checkbox"/> weekly or <input type="checkbox"/> monthly or <input type="checkbox"/> yearly or <input type="checkbox"/> <input type="text"/> times per year.	Product is <input type="checkbox"/> left in place or <input type="checkbox"/> wiped off or vacuumed up or <input type="checkbox"/> rinsed down the drain after use.	Product is used <input type="checkbox"/> always indoors or <input type="checkbox"/> always outdoors or <input type="checkbox"/> <input type="text"/> % indoors.	<input type="button" value="Finished With this Product"/> This product's contribution to your home's Bilko Index is <input type="text"/>
Frontline Top Spot for Dogs / liquid	<input type="text"/> <input type="checkbox"/> ounces or <input type="checkbox"/> pounds are applied	<input type="checkbox"/> daily or <input type="checkbox"/> weekly or <input type="checkbox"/> monthly or <input type="checkbox"/> yearly or <input type="checkbox"/> <input type="text"/> times per year.	Product is <input type="checkbox"/> left in place or <input type="checkbox"/> wiped off or vacuumed up or <input type="checkbox"/> rinsed down the drain after use.	Product is used <input type="checkbox"/> always indoors or <input type="checkbox"/> always outdoors or <input type="checkbox"/> <input type="text"/> % indoors.	<input type="button" value="Finished With this Product"/> This product's contribution to your home's Bilko Index is <input type="text"/>

Read the label for the products you use carefully: products with similar names can have very different ingredients. Raid House & Garden Bug Killer, for example, has different ingredients than Raid House & Garden Bug Killer Formula 7.

Click on this button to calculate the product's contribution to your home's Bilko Index.

Each time you click on a "Finished With this Product" button, a window will pop up that tells you your home's total Bilko Index for the products you have entered so far. This feature is particularly useful for seeing how your home's Bilko Index changes when you switch to different products. Click on the "OK" button to close the popup window and continue adding products.

In Equation Form

$$\text{Bilko Indicator}_i = \frac{\sum_j \text{Concentration}_{i,j} \times \text{Mass}_j \times \text{Usage Factor}_j \times \text{Place Factor}_j}{\text{Bilko Dose}_i}$$

$$\text{Bilko Index} = \sum_i \text{Bilko Indicator}_i$$

The Bilko Dose of a Chemical

$$\text{Inhalation Noncancer Bilko Dose}_i = \frac{\text{RfC}_i \times 20 \frac{\text{m}^3}{\text{day}} \times 365 \frac{\text{day}}{\text{yr}}}{1000 \frac{\text{mg}}{\text{g}}}$$

$$\text{Inhalation Cancer Bilko Dose}_i = \frac{20 \frac{\text{m}^3}{\text{day}} \times 365 \frac{\text{days}}{\text{yr}} \times 2.5 \times 10^{-4}}{\text{inhalation unit risk}_i \times 1000 \frac{\text{mg}}{\text{g}}}$$

$$\text{Bilko Dose}_i = \text{minimum}\{\text{Ingestion Noncancer Bilko Dose}_i, \text{Inhalation Noncancer Bilko Dose}_i, \text{Ingestion Cancer Bilko Dose}_i, \text{Inhalation Cancer Bilko Dose}_i\}$$



Does HPVIS Help?

Chemical	HPV Challenge List?	Chronic Mammalian Toxicity Values in HPVIS
Sulfluramid	No	Not applicable
Ethylene diamine tetraacetic acid (EDTA)	Yes (1990)	Not in HPVIS
Sodium dodecyl benzene sulfonate	Yes (1990)	No (acute only)
N-alkyl dimethyl benzyl ammonium chloride	Yes (1990)	Not in HPVIS (some quats are)
Hydroxyacetic acid	Yes (1990)	Yes (no concentrations calculated)
Sodium hypochlorite	No	Not applicable
Alkyl dimethyl benzyl ammonium saccharinate	No	Not applicable

Conclusions

- Taking toxicity into account when practicing pollution prevention is necessary, but toxicity values are not available for many chemicals, including HPV chemicals
- The data that are available in HPVIS might be helpful to pollution prevention practitioners
- The data that are available in HPVIS need to be assessed and adopted by agencies who promulgate health assessment factors