Appendix H

Fate and Transport Tables

Table H.1

Environmental Fate and Transport Criteria

PERSISTENCE: The tendency of a chemical substance to persist (survive) in the environment without transformation into another chemical form.

PERSISTENCE		
Measure (Potential Utility)	**Comment**	**Regulatory Endpoint**
Hydrolysis Half-Life	Degradation in water. Measured at pH 5, 7, and 9 (acidic, neutral, and alkaline) at 25° C using ^{14}C material.	Half-life > 25 weeks
Aerobic and anaerobic soil metabolism	Degradation due to the biological and physical/chemical properties of the soil. Uses radiolabeled material. The specific metabolites are identified, and persistent ones could require additional toxicology, ecotoxicity, and E-fate safety evaluations.	Half-life >2-3 weeks
Photolysis	Degradation due to sunlight. Done in either soil or aqueous environment with radiolabeled chemical substance.	Half-life > 1 week (but this criterion is only important while the pesticide is on the surface

Table H.2

Environmental Fate and Transport Criteria

MOBILITY: Ability to move in air and/or potentially leach into ground water. This potential is altered by the compound's persistence.

MOBILITY		
Measure (Potential Utility)	**Comment**	**Regulatory Endpoint**
Volatility, Henry's Law Constant	Calculated by the ratio of the chemical's vapor pressure to its solubility in water. Indicator of volatilization potential when pesticide is dissolved in water.	$< 10^{-2}$ atm-m^{-3}/mol
K_d, K_{oc} K_d is soil-specific. K_{oc} is normalized to % organic carbon (oc) in soil, the component most responsible for sorption.	Tendency of a chemical to be sorbed to soil.	K_d <5 and usually less than 1 to 2. Can vary widely depending on the soil type. K_{oc} <300 to 500
Ground Water Ubiquitous Score or (GUS)	Empirical evaluation GUS = log soil 1/2 life x (4-log K_{oc}). (Log soil half life)	<1.8 is improbable leacher, 1.8 - 2.8 is transitional zone, and >2.8 is a probable leacher.
Aged Soil Column Leaching	Lab experiment to estimate the leaching potential of parent and significant soil metabolite(s) in various soil types.	No quantitative trigger. Presence of parent and/or metabolites in the column leachate indicates potential to contaminate ground water.
Terrestrial Field Dissipation Studies	The rate of dissipation of the pesticide after application. Measures soil degradation in the environment (various soils). Expensive, long-term and involved.	Half Life of 2 to 3 weeks is considered persistent, and detection at 90 cm (30 inch) indicates leaching

Table H.3

Environmental Fate and Transport Criteria

BIOACCUMULATION: The capacity of a chemical to accumulate (be stored in the tissue) in an organism as a result of uptake from all environmental sources.

BIOACCUMULATION		
Measure (Potential Utility)	**Comment**	**Regulatory Endpoint**
Octanol Water Partition Coefficient (K_{OW})	Ability of a chemical substance to partition between an aqueous and lipid phase. Classic and easy measure which is used as an indication of a chemical's potential for bioconcentration by aquatic organisms.	Log K_{OW} > 3 indicates that the substance has the propensity to accumulate in fat.
Bioaccumulation Factor (BCF)	Used to help assess risks to fish and to non-target organisms (including humans) above them in the food chain. During an accumulation test, at any time during the uptake phase, the concentration of test substance (in ppm) in/on fish, or specified tissues thereof, divided by the concentration of the chemical in the surrounding medium = BCF. BCF tests are required for chemicals that have log K_{OW} values >3.0. Remediation required if EPA water branch finds pesticide or chemical at certain levels in fish during random sampling.	BCF > 1000
Animal Metabolism	This is part of mammalian toxicology, but information on metabolism and excretion can be useful to flag potential for bioaccumulation. Uses radiolabeled material. Excretion of 90%+ of all compound in the first 24 hours is desirable.	

1. The bioaccumulation potential is considered significant if the substance has a log K_{ow} of 3 and triggers a fish bioaccumulation test.

Literature Cited

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