

Chemical Selection Planning

Gail Krowech, Ph.D.

Office of Environmental Health Hazard Assessment

Presentation to Scientific Guidance Panel

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Purpose of agenda item

- ▶ Update Panel on OEHHA's research on possible candidates for designation
- ▶ Initiate discussion on general chemical selection questions
- ▶ Address one technical listing issue

Candidates researched so far

- ▶ Plasticizers
- ▶ Non-halogenated flame retardant
- ▶ Emerging disinfection byproducts
- ▶ Organotins
- ▶ Nonylphenols and ethoxylates
- ▶ Pesticides

Examples of plasticizers replacing common phthalates

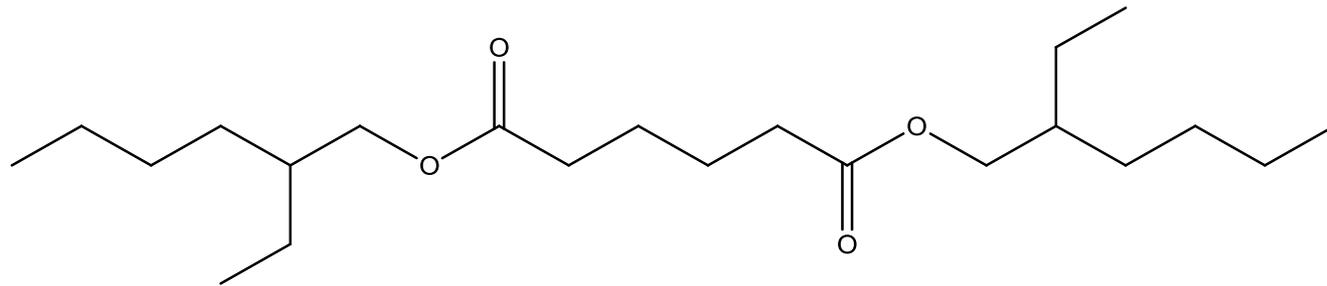
- ▶ Adipates, sebacates and azelates
- ▶ Benzoates and dibenzoates
- ▶ Citrates
- ▶ Epoxidized vegetable oils
- ▶ Maleates
- ▶ Phosphates
- ▶ Terephthalates
- ▶ Trimellitates

Examples of high volume substitutes

US Volume
in 2006 (lbs)

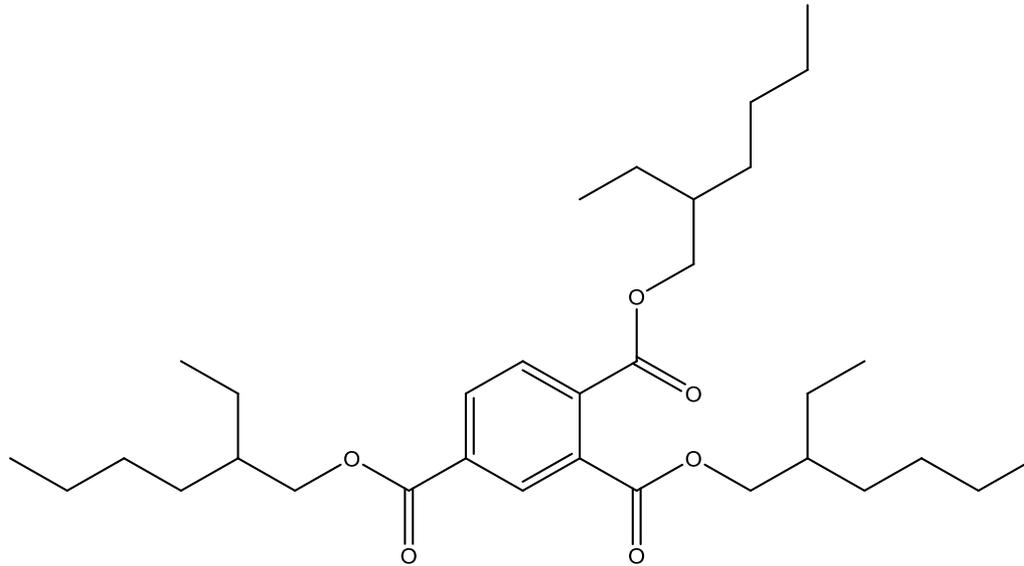
Epoxidized soybean oil	100–500 mil
Di(2-ethylhexyl) adipate (DEHA)	50–100 mil
Di(2-ethylhexyl) terephthalate (DEHT)	50–100 mil
2,2,4,-Trimethyl 1,3-pentandiol diisobutyrate	50–100 mil
Di-2-ethylhexyl maleate	10–50 mil
Dipropylene glycol dibenzoate	10–50 mil
Tri-2-ethylhexyl trimellitate	10–50 mil

Di(2-ethylhexyl) adipate (DEHA)



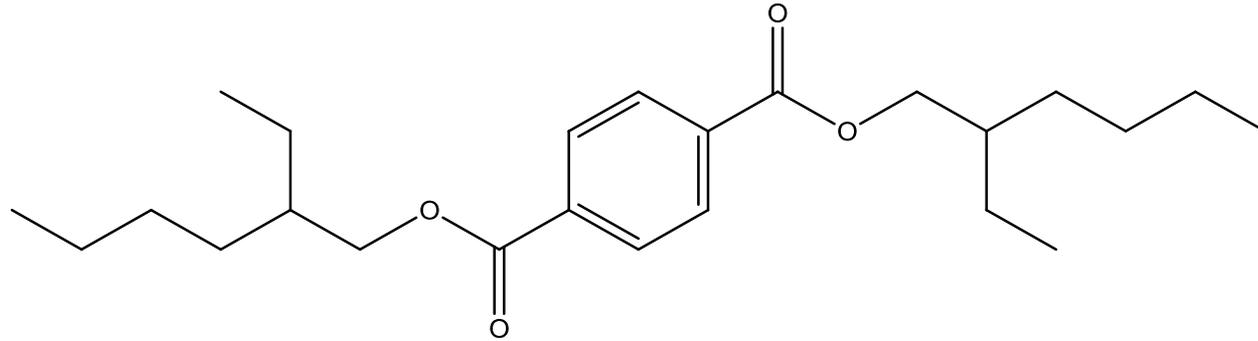
- ▶ Food wrap film and plastic packaging, glue, transparent tape, vinyl flooring, carpet backing, wood veneer, coated fabrics, toys, deodorant, air freshener, cleaners
- ▶ Found in air of 100% of homes in Richmond and Bolinas: $\sim 7-76 \text{ ng/m}^3$
- ▶ Biomonitoring study in China, $n = 10$
 - ▶ In serum: $227.9 \pm 154.3 \text{ ng/ml}$ (97.3–336.9 ng/ml)

Tri(2-ethylhexyl) trimellitate (TOTM)



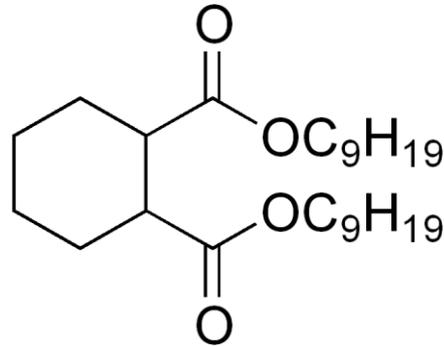
- ▶ Electrical cable insulation, medical products, car interiors, food contact materials
- ▶ TOTM regarded as less likely to migrate from products (CPSC, 2010)
- ▶ Recent studies with medical tubing still indicate leaching

Di(2-ethylhexyl) terephthalate (DEHT)



- ▶ Vinyl flooring, toys, coatings for clothes, bottle caps, medical devices
- ▶ Increase in U.S. volume:
 - ▶ 1986–1994: 10–50 mil lbs
 - ▶ 1998, 2002, 2006: 50–100 mil lbs
- ▶ Levels in house dust: Germany
 - ▶ 2003/2006: <20% of households, mean: 3 mg/kg
 - ▶ 2009: 94% of households, mean: 6.1 mg/kg

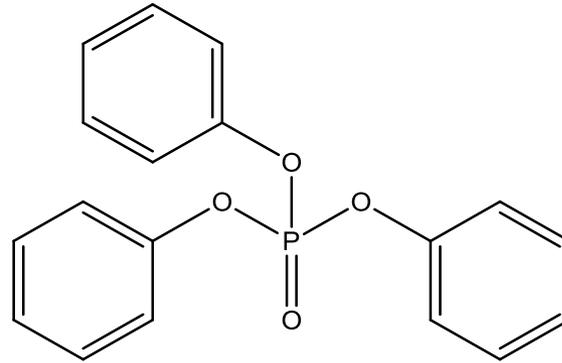
DINCH – Diisononyl cyclohexane-1,2-dicarboxylate



- ▶ Medical products, toys, foodwrap film, artificial corks, adhesives, cosmetics, textile coatings
- ▶ Migration into food with high fat content
- ▶ Levels in house dust – Germany
 - 2004: <20% of households, mean: 0.83 mg/kg
 - 2005–2006: 44%, mean: 2.0 mg/kg
 - 2009: 97%, mean: 12 mg/kg

Questions?

Triphenyl phosphate



- ▶ Flame retardant, also used as plasticizer
 - Polyurethane foam, component of Firemaster 550
 - Polyester, paints, varnishes, lacquer
- ▶ U.S. volume in 2006: 10–50 mil lbs
- ▶ House dust – 50 men recruited from an infertility clinic
 - Dust: 7.36 $\mu\text{g/g}$ geometric mean (max 1,798 $\mu\text{g/g}$)
 - Levels in house dust associated with decreased sperm concentration and increased serum prolactin

Questions?

Emerging disinfection byproducts (DBPs): Background

- ▶ U.S. EPA regulates these drinking water byproducts from chlorine disinfection:

Trihalomethanes (THMs)	Haloacetic acids (HAAs)
Chloroform	Dichloroacetic acid
Bromodichloromethane	Trichloroacetic acid
Chlorodibromomethane	Chloroacetic acid
Bromoform	Bromoacetic acid
	Dibromoacetic acid

- ▶ Regulation has driven switch to alternative disinfectants (e.g., ozone, chloramine)

Example: Chloramination

- ▶ Ammonia reacts with hypochlorous acid to produce chloramine:



- ▶ Produces significantly lower levels of regulated THMs and HAAs
- ▶ Widely used in California water treatment (e.g., Bay Area, Los Angeles, San Diego, Long Beach)

Chloramination (cont.)

Compared to chlorination, chloramination may increase:

- ▶ N-Nitrosodimethylamine (NDMA)
- ▶ Nitrogen-containing DBPs (e.g., halonitromethanes)
- ▶ Iodine-containing DBPs (e.g., iodoacetic acid)
- ▶ Haloaldehydes

CDC studies on emerging DBPs

- ▶ Halonitromethane
 - Measurement of nitromethane in blood
 - Found in 100% of samples tested (n=632)
 - Range, 0.28–3.79 $\mu\text{g/L}$; median, 0.66 $\mu\text{g/L}$
- ▶ Iodine containing–THMs
 - Method for measurement in blood:
 - Dichloroiodomethane
 - Bromochloroiodomethane

Questions?

Tributyltin compounds

- ▶ Past use: Biocide in paints for underwater surfaces
- ▶ Current known uses: Biocide used in textile products (e.g., carpets), hospitals, livestock facilities; wood preservative
- ▶ One known exposure pathway – diet (from fish and shellfish)
- ▶ Concerns for adverse health effects
 - Endocrine disruptor
 - Obesogen
 - Tributyltin methacrylate listed as P65 dev tox
 - Immune suppression
- ▶ Biomonitoring: Central Michigan (1999), n=32
 - Found in 70% of subjects
 - mean 8.18 ± 15.4 ng/ml blood, max 85 ng/ml

Dibutyltin compounds

- ▶ Primary use: Stabilizers for PVC plastics; catalyst for silicone production
- ▶ Example exposures:
 - Drinking water from PVC pipes
 - Products prepared with silicone, e.g.
 - Baking parchment, 140 µg/g DBT;
cookies baked on parchment, 720 ng/g DBT
 - House dust – Albany, NY
 - Median 315 ng/g dust, range 12–12,000 ng/g
- ▶ Neurotoxicity, immune suppression
- ▶ Biomonitoring: Central Michigan (1999), n=32
 - Found in 81% of subjects, mean 4.94 ± 3.83 ng/ml blood

Questions?

Nonylphenol (NP) & ethoxylates (NPEs)

- ▶ Mixture of mostly branched NPs – not a single chemical
- ▶ U.S. production/import volume (2006) – 100–500 mil lbs
- ▶ NP: used to make NPE; stabilizers and antioxidants in plastics; degradation product of NPE
- ▶ NPEs: detergents, cleaners, degreasers, emulsifiers, adhesives, agrochemicals, indoor pesticides, cosmetics, medical tubing, paper and textile processing, paints and coatings
- ▶ Exposure:
 - House dust (Cape Cod, MA): NP & NPEs found in ~80% of homes
 - Indoor air CA: NP >95% of homes, median 53 ng/m³, max 89 ng/m³

NP & NPEs (cont.)

- ▶ CDC study in 2005 measured 4-*n*-NP in urine
 - Detected in 51% of samples
- ▶ Recent studies
 - Adipose tissue (Spain)
 - Pregnant women, blood (Canada)
 - Maternal and cord blood (Taiwan)
 - Breast milk (Italy)

Questions?

Selected Top 100 Pesticides	Pounds applied (CDPR, 2008)	Possible basis for consideration
Glyphosate	~ 6 mil	Potential endocrine disruption; non-agricultural use
Propanil	~ 1.7 mil	Dichloroaniline herbicide; propanil contaminant clearly carcinogenic in recent NTP studies
Oryzalin	~ 600 K	Proposition 65 cancer
Propargite	~ 380 K	Proposition 65 cancer, dev tox; recent study: role in Parkinson's disease?
Imidacloprid	~ 160 K	Consumer use as pet pesticide

Discussion questions

- ▶ Are there particular candidates for designation the Panel recommends we investigate further?
 - ▶ Plasticizers
 - ▶ Non-halogenated flame retardant
 - ▶ Emerging water disinfection byproducts
 - ▶ Organotins – tributyltin, dibutyltin
 - ▶ Nonylphenol and nonylphenol ethoxylates
 - ▶ Pesticides
 - ▶ Other?
- ▶ Are there particular criteria the Panel views as most important in selecting candidates (e.g., exposure, health effects)

Discussion questions (cont.)

- ▶ Priority chemicals
 - Reconsideration of priority PAHs planned
 - Are there other potential priority chemicals that you would like us to investigate?

Technical listing issue

- ▶ Chemicals newly measured by CDC in groupings previously recommended as priority by the SGP
 - Example - di-isodecyl phthalate
- ▶ Propose automatic addition to priority list