Session E:
C1-C4 halogenated chemicals NOL:
A focus on refrigerants

TURI
TOXICS USE REDUCTION INSTITUTE
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Overview

Planners will have a new category of reportable chemicals to consider in calendar year 2019: **C1-C4 halogenated hydrocarbons/halocarbons not otherwise listed**.

This session will touch upon the listing process for this category and the hazards associated with these substances.

We will then focus on the alternatives associated with one of the common uses of chemicals in this category - **refrigeration**.

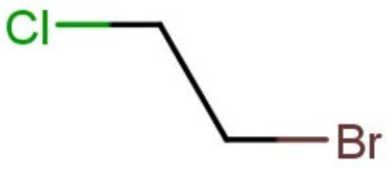
Origination of C1-C4 Halogenated Hydrocarbons

- Stemmed from SAB review of nPB for listing in 2009
- It was noted that 2-bromopropane more hazardous than 1-bromopropane
- Also noted that other halogenated substances would likely be similar

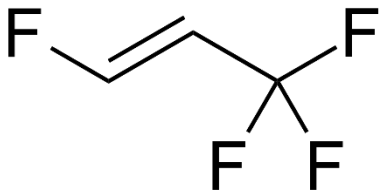
Structures

- Bromochloromethane (C1)

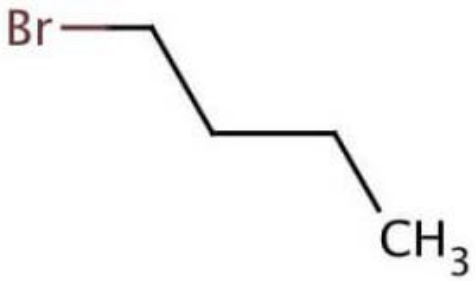
- 1-bromo-2-chloroethane (C2)



- 1,3,3,3-Tetrafluoropropene (HFO-1234ze(E)) (C3)



- 1 bromo butane, n butyl bromide (C4)



Defining a potential category

- 4 or fewer carbons
- At least one halogen
- Only hydrogen as other constituent
- (Yes) there are substances that meet these criteria which are already listed

SAB approach

- Initially, TURI created a list of 136 chemicals meeting the chemical structure criteria for inclusion in the group.
- Approximately half of these chemicals were already on the TURA list, making it possible to compare toxic effects.

Collect Standard EHS info on substances

- Physical properties (FP, VP, etc)
- Acute toxicity
- Reproductive/developmental toxicity
- Liver toxicity/Target organs
- Carcinogenicity
- Neurotoxicity
- PBT

Standard EHS Info

TSCA Inventory ?	TURA List?	CAS/Chemical Number	Chemical Name	chemical formula (Yellow highlighting indicates multiple halogens could be substituted to create other possible substances)	molecular wt. (mainly from ChemID Plus)	Physical State at Room Temperature (HSDB, RTECS, CICAD, CHRIS)	Vapor Pressure mmHg at ~20C (HSDB, MSDS, ICSC)	PBT						IARC (Need to input from MS work)	Neurotoxicity (Scorecard)	Other recognized (R) or suspected health effects (Scorecard)	Reproductive Effects (Prop 65 list? C = Cancer, D = Developmental); ReproEXPERT	Target Organ (HAZMAP)			LD50 (ChemID Plus, RTECS)	LC50 (ChemID Plus, RTECS)	Flash point (HSDB, MSDS, ICSC, CHRIS)
								Water	Soil	Sediment	Air	BCF	Fish ChV					CNS	Liver	Other			
Y	Y	56-23-5	Carbon tetrachloride	CCl_4	153.82	Liquid	91.3 MM HG	60	120	540	180	34	5.2	2B	S	Cardiovascular/Blood, Developmental, Endocrine, Gastrointestinal or Liver, Kidney, Reproductive, Respiratory, Skin or Sense Organ	Y - C; REPROTOX info; NTP studies; RTECS DATA	Y	Y	Kidney, possible carcinogen	Oral, mse, 8263mg/kg; Oral, rat, 2350 mg/kg	Oral, mse, 9526ppm/8H; Oral, rat, 8000ppm/4H	Not flammable
N	N	75-73-0	Carbon tetrafluoride	CF_4	88.0043	Gas	n/f	15	30	140	180	2.8	35	n/f	n/f	n/f	N	n/f	n/f	n/f	n/f	Inh, Rat, LCLo, 895000ppm/15M	Not flammable
N	N	507-25-5	Methane, tetraiodo-	CI_4	519.6286	n/f	No MSDS	60	120	540	180	410	0.34	n/f	n/f	n/f	N	n/f	n/f	Irritant may be absorbed through skin	Mse, IV, 178 mg/kg	No MSDS	n/f
	Y	67-66-3	Chloroform	CHCl3	119.38	Liquid	160 @ 20C (68F); 197 mm Hg at 25 deg C	38	75	340	150	9.3	24	2B	S	Cardiovascular/Blood, Developmental, Endocrine, Gastrointestinal or Liver, Kidney, Reproductive, Respiratory	Y- C, D	Y	Y	Kidney, Reproductive, possible carcinogen	Oral, mse, 36 mg/kg; Oral, rat, 695 mg/kg	Rat, Inh, 47702 mg/m3/4H	Not flammable
Y	N	75-46-7	Methane, trifluoro-	CHF3	70.0138	Gas (Liquified Gas)	3.53X10+4 mm Hg at 25 deg C /from experimentally-derived coefficients/	15	30	140	10000	3.2	91	n/f; Trifluoromethane may cause mutations (genetic changes). Whether or not it poses a cancer or reproductive hazard needs further study. [NJDHSS]	n/f	n/f	N	Y	n/f	Simple Asphyxiant	n/f	Rat, inh, >663000ppm/4H	n/f
N	N	75-47-8	Methane, triiodo-	CHI3	393.7321	Solid	No information found	38	75	340	54	47	4.2	n/f	S	Respiratory	N	n/f	Y	n/f	Oral, mse, 470 mg/kg; Oral, rat, 355 mg/kg	Rat, Inh, 165ppm/7H	Not considered fire hazard.
Y	Y	74-83-9	Bromomethane	CH3Br	94.94	Gas	1620 mm Hg @ 25 deg C	15	30	140	420	2.8	0.12	3	S	Cardiovascular/Blood, Gastrointestinal or Liver, Kidney, Reproductive, Respiratory, Skin or Sense Organ	Y - D (as a structural fumigant)	Y	Y	Toxic Pneumonitis, Dermatotoxin, Other CNS Neurotoxin	Oral, rat, 214 mg/kg	Mse, Inh, 1540mg/m3/2H; Rat, Inh, 302ppm/8H	None
N	N	593-53-3	Methyl fluoride	CH3F	34.0329	n/f	No information found	15	30	140	1200	3.2	30	n/f	n/f	n/f	N	Y	n/f	Simple Asphyxiant	No MSDS	No MSDS	n/f
Y	Y	74-88-4	Methyl iodide	CH3I	141.939	Liquid	4.05X10+2 mm Hg @ 25 deg C; 400 @ 25C (77F)	15	30	140	220	4.6	25	3	S	Kidney, Respiratory, Skin or Sense Organ	Y - C	Y	Y	Toxic Pneumonitis, Dermatotoxin, Other CNS Neurotoxin, Lacrimator	Subcutaneous, mse, 110 mg/kg; Oral, rat, 76 mg/kg	Mse, Inh, 5gm/m3/57M-C; Rat, Inh, 1300mg/m3/4H	Practically not flammable
Y	Y	74-87-3	Chloromethane	CH3Cl	50.49	Gas (Compresses to Liquid)	Vapour pressure, kPa at 21◆C: 506	15	30	140	310	3.2	24	3	S	Carcinogen, Cardiovascular/Blood, Gastrointestinal or Liver, Kidney, Reproductive, Respiratory, Skin or Sense Organ	Y - D, Male Repro	Y	Y	Kidney, Reproductive	Oral, rat, 1800 mg/kg	Mse, Inh, 2200ppm/6H; Rat, Inh, 5300mg/m3/4H	Flammable Gas

Effects of highest concern

- Neurotoxicity
- Persistence
- Reproductive/Developmental
- Carcinogenicity
- Ozone depletion/ or greenhouse gases

TURI Review

- More comprehensive list of refrigerants

- TURI checked neurotoxicity data & verified that nearly all have evidence of neurotoxicity, consistent with the findings of the substances reviewed by SAB.

Uses

- solvents
- propellants
- refrigerants
- blowing agents
- fire extinguishing agents,
- chemical intermediates,
- and a variety of other uses, including mixed use

Tier II Data

Table 1: 2015 Tier II data		
Chemical name	Tier II reports	Expected number of TURA filers
1,1,1-Trifluoroethane [HFC-143a]	1	1
1,1,1,2-Tetrafluoroethane [R134a]*	21	5
1,1-difluoroethane [HFC-152a]	1	1
Fluoroform [HFC-23]	2	0
Pentafluoroethane	1	1
Refrigerant (NOS**)	35	3
R-410	2	0
Solvent (NOS**)	10	3
Tetrafluoromethane [PFC-14]	3	0
Total	76	14

This table shows Tier II reports for chemicals that meet the chemical structure criteria for the C1-C4 NOL category and are not already reportable individually under TURA. To develop an expected number of TURA filers, TURI limited the Tier II data set based on TURA reportable SIC codes, employee numbers, and quantity of chemical reported.
*Banned in the EU for use in specified automotive air conditioning systems.
** Not otherwise specified

Tier II

- 76 records, majority of these records are for refrigerants, and fewer refer to solvents.
- Narrow based on employee count, amount, SIC
- There could be facilities that would be subject to TURA reporting requirements that may not appear under Tier II, either due to reporting errors or due to threshold considerations

Process

- SAB reviews science & recommends
- TURI develops policy analysis
- Advisory committee reviews
- Administrative council makes decision
- Regulatory process

Guidance

- For the 2019 Reporting Year, C1-C4 Halogenated Hydrocarbons/Halocarbons, NOL category will be reportable under TURA.
- This category is defined as chemicals with 4 or fewer carbons, at least one halogen, and only hydrogen as the other constituent, that are not already individually listed on the TURA chemical list.

Guidance, continued

- This includes fully halogenated chemicals that contain no hydrogen. Halogens are further defined as fluorine, chlorine, bromine, and iodine.
- Chemicals that meet the definition of this category, but were already listed, remain individually reportable.