Compound		Data collection sheet		
N°CAS 79-09-4	CLP: Skin Corr. 1B (H314)			
Organisation name	ACGIH	SCOEL	SWEA (Swedish Work Environment Authority)	REACH registrants
Risk value name	TLV	OEL	OEL	DNEL (general population, inhalation, local effect, long-term)
Risk value (µg/m ³)	30000	31000	30000	3700
Risk value (ppb)	10000	10000	10000	not stated
Reference period	chronic	chronic	chronic	chronic
Year	2001	1993	2015	2016
Key study	data poor substance, TLV set on analogy with acetic acid	analogy to acetic acid, supported by similar rat LD50 values	not stated	not stated
Study type	not applicable	not applicable	not stated	not stated
Species	human	human	not stated	not stated
Duration of exposure in key study	not applicable	not applicable	not stated	not stated
Critical effect	not applicable	irritation of mucous membranes	not stated	irritation (respiratory tract)
Critical dose value	not applicable	not applicable	not stated	not stated
Adjusted critical dose	not applied	not applied	not stated	not stated
Single assessment factors (see table R.8.6)	no factors used	no factors used	not stated	not stated
Other effects				

Compound		Propionic acid	Factsheet
Parameter	Note	Comments	Value / descriptor
EU-LCI value and status			
EU-LCI value	1	Mass/volume [µg/m ³]	1500
EU-LCI status	2	Draft/final	Final
EU-LCI year of issue	3	Year when the EU-LCI value was issued	2016
General information			
CLP Index No	4	INDEX	607-089-00-0
EC No	5	EINECS — ELINCS — NLP	201-176-3
CAS No	6	Chemical Abstracts Service number	79-09-4
Harmonised CLP classification	7	Human Health Risk related classification	Skin Corr. 1B (H314)
Molar mass and conversion factor	8	[g/mol] and [ppm — mg/m ³]	74.08 1 ppm = 3.05 mg/m ³
Key data / database			
Key study, author(s), year	9	Critical study with lowest relevant effect level	Van Thriel et al., 2008 Hey et al., 2009
Read-across compound	10	Where applicable	-
Species	11	Rat etc. / human	Human
Route/type of study	12	Inhalation, oral feed, etc.	Inhalation, exposure chamber
Study length	13	Days, subchronic, chronic	Acute
Exposure duration	14	Hours/day, days/week	4 hours
Critical endpoint	15	Effect(s), site of	Sensory irritation
Point of departure (POD)	16	LOAEC*L, NOAEC*L, NOEC*L, benchmark dose, etc.	LOAEC
POD value	17	[mg/m ³] or [ppm] or [mg/kg _{BW} ×d]	10 ppm
Assessment factors (AF)	18		
Adjustment for exposure duration	19	Study exposure hours/day, days/week	1
Study length	20	$sa \rightarrow sc \rightarrow c$ (R8-5)	1
Route-to-route extrapolation factor	21		1
Dose-response	22 a	Reliability of dose-response, LOAEL → NOAEL	2
	22 b	Severity of effect (R 8-6d)	1
Interspecies differences	23 a	Allometric Metabolic rate (<i>R8-3</i>)	1
	23 b	Kinetic + dynamic	1
Intraspecies differences	24	Kinetic + dynamic Worker — general population	10
AF (sensitive population)	25	Children or other sensitive groups	1
Other adjustment factors Quality of whole database	26	Completeness and consistency Reliability of alternative data (<i>R8-6 d,e</i>)	1

Result				
Summary of assessment factors	27	Total Assessment Factor (TAF)	20	
POD/TAF	D/TAF 28 Calculated value (µg/m ³ and ppb)		$1525~\mu g/m^3$ and $500~ppb$	
Molar adjustment factor	29	Used in read-across	-	
Rounded value	30	[µg/m³]	1500	
Additional comments	31			
Lowest published absolute odour threshold is 0.0057 ppm (17 μ g/m ³ at 23 °C), Nagata (2003)				

Rationale section	32	

A REACH registrant (consortium) has published a DNEL (inhalation, irritation) for workers of 31 mg/m³, the POD being a NOAEC exposure (no further explanations were given). No DNEL was set for the general population (exposure based waiving).

Eight-hour OELs in Europe and USA are generally 10 ppm (31 mg/m³).

Propionic acid is formed endogenously by human metabolism and exhaled at low concentrations. Furthermore, propionic acid is widely used as a food preservative.

The critical effect is irritation, systemic toxicity only appears at doses that are several orders of magnitude higher. Thus, rat oral and rabbit dermal LD50 values were reported to be 4.3 and 0.5 g/kg, respectively. No lethality was observed among rats exposed for 8 hours to a saturated atmosphere of propionic acid (Smyth et al. 1962).

Van Thriel et al. (2008) exposed 12 healthy males and 11 healthy female volunteers to 0.3, 5 or 10 ppm propionic acid for 4 hours at rest. The self-reported ratings were slightly increased at both 5 and 10 ppm, verbally corresponding to 'weak'. The ratings for odour and annoyance declined over the 4 hours; however, a slight increase was seen for eye irritation. Only the 10 ppm condition had statistically significant increases in ratings, compared to control. No objective signs of irritation (eye blink frequency, nasal resistance, substance P in nasal lavage) were seen.

The publication of Hey et al. is based on the same experiments as van Thriel et al. 2008. It reports the same chemosensory aspects, but also results of cognitive tests. Only 10 ppm acute PA exposure affected the response accuracy of one of the four neurobehavioral task.

Based on these two studies, mild irritation appearing at 10 ppm (30.5 mg/m³, LOAEC) is taken as the point of departure (POD).

Choice of assessment factors

As the effect seen at the POD is marginal an AF of 2 is applied to account for LOAEC to NOAEC extrapolation. The effect (sensory irritation) is of low severity allowing for an AF of 1. No AFs are applied for study length or exposure duration, since sensory irritation develops within minutes. Further, no AFs were necessary for route-to-route and interspecies extrapolations, since the effect is local in the airways and the POD is based on inhalation exposure of humans. However, since the chamber exposure studies were carried out with a limited number of healthy volunteers, an AF of 10 is used to account for variability in the general population (intraspecies factor). This factor is thought to be sufficient for sensitive populations.

Conversion factor for 23 °C: 1 ppm = 3.05 mg/m^3

The total AF is thus (2x10) 20 and the EU-LCI value (POD/TAF=10 ppm/20=) 500 ppb or 1525μg/m³, rounded to 1500 μg/m³.

The derived EU-LCI value of 1500 μ g/m³ is above the reported absolute odour threshold of 17 μ g/m³ Nagata (2003), but would be associated with a low odour (other published odour thresholds were 86 μ g/m³ (Ruth, 1986) and 820 μ g/m³ (Kendal-Reed et al., 1998).

References

Ernstgård L, Iregren A, Sjögren B, Johanson G (2006) Acute effects of exposure to vapours of acetic acid in humans. Tox Lett 165: 22-30. Hey K, Juran S, Schäper M, Kleinbeck S, Kiesswetter E, Blaszkewicz M, Golka K, Brüning T, van Thriel Ch (2009) Neurobehavioral effects during exposures to propionic acid—An indicator of chemosensory distraction? Neurotoxicol 30: 1223-1232.

Kendal-Reed M, Walker JC, Morgan WT, LaMacchio M, Lutz RW (1998). Human responses to propionic acid. I. Quantification of within- and between-participant variation in perception by normosmics and anosmics. Chem Senses 1998; 23:71-82.

Nagata (2003) Measurement of Odour Threshold by Triangle Odour Bag Method. Odour measurement review. Office of Odour, Noise and Vibration, Environmental Management Bureau, Ministry of Environment, Tokyo, Japan, pp. 118-127.

Ruth JH (1986) Odor thresholds and irritation levels of several chemical substances: A review. Am J Ind 57: A142-A151.

Smyth HF Jr, Carpenter CP, Weil CS, Pozzani UC, Striegel JA (1962) Range-finding toxicity data: List VI. Am Ind Hyg Assoc J 23:95-107.

van Thriel C, Blaszkewicz M, Juran SA, Kiesswetter E, Stefan Kleinbeck S, Schäper M, Brüning T (2008) Reizwirkungen durch organische Carbonsäuren — Ergebnisse experimenteller Expositionsstudien. Deutsche Gesellschaft für Arbeitsmedizin und Umweltmedizin, e. V. 48. Wissenschaftliche Jahrestagung, Hamburg. ISSN 1861-6577, ISBN 978-3-9811784-1-8.