Toxicological profile for

Ethylene-vinyl acetate copolymer

This ingredient has been assessed to determine potential human health effects for the consumer. It was considered not to increase the inherent toxicity of the product and thus is acceptable under conditions of intended use.

1. Name of substance and physico-chemical properties

1.1. IUPAC systematic name

Ethene, ethenyl acetate (PubChem)

1.2. Synonyms

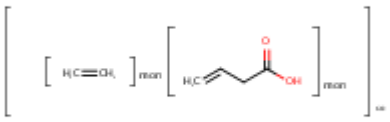
Acetic acid, ethenyl ester, polymer with ethene; Ethylene/VA copolymer; Ethylenevinylacetate copolymer; Ethylene vinyl acetate polymer; Vinyl acetate, ethene polymer; Vinyl acetate, ethylene polymer; Ethylene, polymer with vinyl acetate; Ethylene-vinyl acetate copolymer emulsion; UNII-3H390O24SI; UNII-4OKC630HS6; UNII-8ILA5X28VS; UNII-JK6142KK4O; UNII-L5F16ZG4ZU; UNII-V9BQI51YUL; Vinyl acetate-ethylene copolymer, minimum number average molecular weight (in amu), 69,000 (ChemIDplus); Cevilen; Cevilene; Elvax; Elvax 40P; Elvax-40; EVA 260; Sevilene; poly(ethylene-co-vinyl acetate); polyethylene vinyl acetate (PubChem)

1.3. Molecular formula

(C4-H6-O2.C2-H4)x- (ChemIDplus)

1.4. Structural Formula

(ChemIDplus)



1.5. Molecular weight (g/mol)

(114.14)n. The copolymer has a weight averaged molecular weight (Mw) above 6,000 Da, a number averaged molecular weight (Mn) above 2,000 Da, and a molecular mass range of 200 – 10,000 Da (EFSA, 2014)

1.6. CAS registration number

24937-78-8

1.7. Properties

1.7.1. Melting point

(°C): No data available to us at this time.

1.7.2. Boiling point

(°C): No data available to us at this time.

1.7.3. Solubility

Negligible

1.7.4. pKa

No data available to us at this time.

1.7.5. Flashpoint

(°C): No data available to us at this time.

1.7.6. Flammability limits (vol/vol%)

No data available to us at this time.

1.7.7. (Auto)ignition temperature

(°C): No data available to us at this time.

1.7.8. Decomposition temperature

(°C): Starts decomposing at >230 (EFSA, 2014)

1.7.9. Stability

Stable/Hazardous polymerization will not occur.

1.7.10. Vapor pressure

No data available to us at this time.

1.7.11. log Kow

No data available to us at this time.

2. General information

2.1. Exposure

Migration of Irganox 1010 from ethylene-vinyl acetate films to foods and food-simulating liquids (Abstract). In a series of experiments on the migration of the antioxidant Irganox 1010 from ethylene-vinyl acetate (EVA) films into food-simulating liquids and foods, the antioxidant was found to migrate rapidly from EVA film into n-heptane, 100% ethanol and corn oil. The rate of migration into these media was greater from EVA than from low-density polyethylene (LDPE) under comparable conditions. In contrast, little migration of Irganox 1010 was recorded on exposure of the EVA film to aqueous media, whereas migration from LDPE into such media was relatively high.

As taken from Schwope AD et al. Food Chem Toxicol. 1987, Apr; 25(4):327-30. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/3583159

Ethylene/VA copolymer is used as a binding, emulsion stablising and film forming agent in cosmetics in the EU. As taken from Cosing (Cosmetic substances and ingredients database), accessed March 2020.

Ethyl vinyl acetate copolymer (CAS RN 24937-78-8) is included on the International Fragrance Association's list of ingredients reported as used in fragrance materials (IFRA).

"Used in orthotics, surfboard and skimboard traction pads, to make artificial flowers, to enhance grip in plastic wraps, improve cold flow of diesel fuel, in HEPA filters, and to make thermoplastic mouthguards and vaginal contraceptives; [REPROTOX] Used for plastic film, laminating, molding, and coating; [Westlake Polymers MSDS] Permitted for use as an inert ingredient in non-food pesticide products [EPA]."

"**Industrial processes with risk of exposure:** Plastic composites manufacturing."

As taken from Haz-Map (2020), available at https://haz-map.com/

Ethylene/Vinyl acetate co-polymer (CAS RN 24937-78-8) is listed as an ingredient (at given concentrations, where specified) in home maintenance (0.13-100%), inside the home (10-30%) and personal care products by the CPID.

US Army Military exposure guidelines (MEGs) for Short-Term exposures to chemicals in ambient air:

1 hour Critical Air MEG 2.5E+02 mg/m^3

1 hour Marginal Air MEG 5.0E+01 mg/m^3

1 hr Negligible air MEG 3.0E+01 mg/m^3

As taken from US EPA ACToR database, 2015.

National Occupational Exposure Survey (1981 - 1983)
Estimated Numbers of Employees Potentially Exposed to Acetic Acid Vinyl Ester, Polymer with Ethylene (CAS RN 24937-78-8) by Occupation*

Code	Occupation Description (1980)	Total # Employees (Male & Female)	Total # Female Employees
019	MANAGERS AND ADMINISTRATORS, N.E.C.	45	
048	CHEMICAL ENGINEERS	16	
073	CHEMISTS, EXCEPT BIOCHEMISTS	1,441	432
084	PHYSICIANS	49	33
095	REGISTERED NURSES	440	420
099	OCCUPATIONAL THERAPISTS	270	249
103	PHYSICAL THERAPISTS	1,220	920
185	DESIGNERS	78	78
189	PHOTOGRAPHERS	309	
215	MECHANICAL ENGINEERING TECHNICIANS	123	
216	ENGINEERING TECHNICIANS, N.E.C.	1,187	27
224	CHEMICAL TECHNICIANS	5,282	1,942
225	SCIENCE TECHNICIANS, N.E.C.	1,423	368
235	TECHNICIANS, N.E.C.	576	199
313	SECRETARIES	615	615
327	ORDER CLERKS	184	92
335	FILE CLERKS	553	484
345	DUPLICATING MACHINE OPERATORS	61	26
356	MAIL CLERKS, EXC. POSTAL SERVICE	1,226	350
363	PRODUCTION COORDINATORS	1,095	143
364	TRAFFIC, SHIPPING, AND RECEIVING CLERKS	2,296	794
365	STOCK AND INVENTORY CLERKS	353	
379	GENERAL OFFICE CLERKS	292	
385	DATA-ENTRY KEYERS	722	
447	NURSING AIDES, ORDERLIES, AND ATTENDANTS	30	10
453	JANITORS AND CLEANERS	16,909	1,497
505	AUTOMOBILE MECHANICS	2,197	
507	BUS, TRUCK, AND STATIONARY ENGINE MECHANICS	516	
515	AIRCRAFT MECHANICS, EXC. ENGINE	4,075	

516	HEAVY EQUIPMENT MECHANICS	436	
518	INDUSTRIAL MACHINERY REPAIRERS	4,553	
519	MACHINERY MAINTENANCE OCCUPATIONS	902	736
535	CAMERA, WATCH, AND MUSICAL INSTRUMENT REPAIRERS	6	
547	SPECIFIED MECHANICS AND REPAIRERS, N.E.C.	1,540	401
549	NOT SPECIFIED MECHANICS AND REPAIRERS	2,246	
566	CARPET INSTALLERS	1,658	
567	CARPENTERS	13,579	
575	ELECTRICIANS	387	
579	PAINTERS, CONSTRUCTION AND MAINTENANCE	2,552	
583	PAPERHANGERS	387	
585	PLUMBERS, PIPEFITTERS, AND STEAMFITTERS	4,655	
593	INSULATION WORKERS	738	138
633	SUPERVISORS, PRODUCTION OCCUPATIONS	2,529	83
634	TOOL AND DIE MAKERS	197	
637	MACHINISTS	5,631	460
647	PRECIOUS STONES AND METALS WORKERS (JEWELERS)	1,252	1,252
653	SHEET METAL WORKERS	213	128
657	CABINET MAKERS AND BENCH CARPENTERS	1,926	498
658	FURNITURE AND WOOD FINISHERS	532	
668	UPHOLSTERERS	259	155
669	SHOE REPAIRERS	44	
675	HAND MOLDERS AND SHAPERS, EXCEPT JEWELERS	149	118
676	PATTERNMAKERS, LAY-OUT WORKERS, AND CUTTERS	118	
679	BOOKBINDERS	6,537	3,023
683	ELECTRICAL AND ELECTRONIC EQUIPMENT ASSEMBLERS	1,405	421
684	MISCELLANEOUS PRECISION WORKERS, N.E.C.	395	
696	STATIONARY ENGINEERS	512	
703	LATHE AND TURNING MACHINE SET-UP OPERATORS	23	
704	LATHE AND TURNING MACHINE OPERATORS	6	
709	GRINDING, ABRADING, BUFFING, AND POLISHING MACHINE OPERATORS	2,640	368
713	FORGING MACHINE OPERATORS	501	
719	MOLDING AND CASTING MACHINE OPERATORS	14,015	9,776
723	METAL PLATING MACHINE OPERATORS	903	303
725	MISCELLANEOUS METAL AND PLASTIC PROCESSING MACHINE OPERATORS	6	
727	SAWING MACHINE OPERATORS	9,127	2,061
733	MISCELLANEOUS WOODWORKING MACHINE OPERATORS	2,844	292
734	PRINTING MACHINE OPERATORS	9,152	3,069
735	PHOTOENGRAVERS AND LITHOGRAPHERS	54	18
736	TYPESETTERS AND COMPOSITORS	733	146
737	MISCELLANEOUS PRINTING MACHINE OPERATORS	2,705	1,675
744	TEXTILE SEWING MACHINE OPERATORS	1,478	1,478
745	SHOE MACHINE OPERATORS	179	48
749	MISCELLANEOUS TEXTILE MACHINE OPERATORS	7,288	525
753	CEMENTING AND GLUING MACHINE OPERATORS	3,144	1,752
754	PACKAGING AND FILLING MACHINE OPERATORS	8,782	1,585
755	EXTRUDING AND FORMING MACHINE OPERATORS	2,891	386
756	MIXING AND BLENDING MACHINE OPERATORS	4,347	1,039
759	PAINTING AND PAINT SPRAYING MACHINE OPERATORS	5,265	540
763	ROASTING AND BAKING MACHINE OPERATORS, FOOD	28	

765	FOLDING MACHINE OPERATORS	3,386	2,486
766	FURNACE, KILN, AND OVEN OPERATORS, EXC. FOOD	3,688	
768	CRUSHING AND GRINDING MACHINE OPERATORS	314	
769	SLICING AND CUTTING MACHINE OPERATORS	2,521	1,286
774	PHOTOGRAPHIC PROCESS MACHINE OPERATORS	303	72
777	MISCELLANEOUS MACHINE OPERATORS, N.E.C.	19,481	5,413
779	MACHINE OPERATORS, NOT SPECIFIED	33,952	8,995
783	WELDERS AND CUTTERS	3,078	
784	SOLDERERS AND BRAZERS	12	6
785	ASSEMBLERS	25,386	7,400
787	HAND MOLDING, CASTING, AND FORMING OCCUPATIONS	1,136	150
796	PRODUCTION INSPECTORS, CHECKERS, AND EXAMINERS	2,777	2,197
797	PRODUCTION TESTERS	688	58
804	TRUCK DRIVERS, HEAVY	204	
856	INDUSTRIAL TRUCK AND TRACTOR EQUIPMENT OPERATORS	842	46
859	MISCELLANEOUS MATERIAL MOVING EQUIPMENT OPERATORS	8,325	3,966
869	CONSTRUCTION LABORERS	3,464	
873	PRODUCTION HELPERS	3,710	1,970
878	MACHINE FEEDERS AND OFFBEARERS	540	267
883	FREIGHT, STOCK, AND MATERIAL MOVERS, HAND, N.E.C.	111	79
888	HAND PACKERS AND PACKAGERS	44,965	25,745
889	LABORERS, EXCEPT CONSTRUCTION	7,022	103
TOTAL		340,934	101,390

*(1) The estimates for each occupation apply across the surveyed industries in which the agent was observed. Not all industries were surveyed, and not all agents were observed in all surveyed industries. (2) When using the estimates, standard errors associated with estimates should be considered. (3) Potential exposures to a chemical agent are categorized as actual (i.e., the surveyor observed the use of the specific agent) or tradename (i.e., the surveyor observed the use of a tradename product known to contain the specific agent). The estimates presented in the table combine both categories.

As taken from NIOSH, available at https://web.archive.org/web/20111028105738/http://www.cdc.gov/noes/noes2/x6619occ.html

2.2. Combustion products

Polymer degradation and stability

A Purser furnace has been used to investigate the combustion toxicity of ethylene-vinyl acetate copolymer (EVA) with and without fire retardants, under different fire conditions. Steady state flaming combustion has been studied at equivalence ratios Φ varying from 0.5 to 1.5 by driving the materials through the furnace at 750 °C. Yields of CO and CO2 for EVA containing 27% vinyl acetate, and its fire retarded composites, containing fire retardant fillers are presented. The materials contained 30% EVA and 70% hydrated aluminium oxide

(ATH), or 65% ATH and 5% zinc hydroxystannate (ZS), or 5% magnesium borate (MgB) or 5% zinc borate (ZB). In each case the same mass of EVA was used in the determination. The yields of CO per g of polymer from the EVA-fire retardant composite samples showed very similar yields of CO under well ventilated conditions to the pure EVA, but generally higher CO yields than the base polymer under the most toxic fuel rich conditions. The exception to this was the sample containing ATH and zinc borate, which did not take up all the available oxygen under fuel rich conditions, and gave a much lower CO yield, corresponding to an eight-fold reduction in the combustion toxicity. Under fuel rich conditions for EVA, 60% of the carbon was lost as volatile organic species other than CO and CO2. For the sample containing zinc borate, this was 50% and for the remaining samples it varied from 20 to 38%. Evidence is presented which indicates that organic material trapped in the solid alumina residue is oxidised to CO, except in the presence of zinc borate, when it appears to be lost as organic carbon.

As taken from HULL T. Richard et al. Polymer degradation and stability ISSN 0141-3910 CODEN PDSTDW . Congrès, European Conference on Fire Retardant Polymers N°8, Alessandria, ITALIE (06/2001) 2002, vol. 77, n°2 (169 p.) (11 ref.), pp. 235-242

2.3. Ingredient(s) from which it originates

No data available to us at this time.

3. Status in legislation and other official guidance

Ethylene-vinyl acetate appears in the latest synoptic list of monomers/additives for use in food-contact materials. The EU Scientific Committee on Food has not given an ADI figure but stated that polymers with a molecular weight above 1000 daltons are very unlikely to be absorbed from the gastrointestinal tract and thus considered not to present a toxicological risk [from use in food packaging] (Commission 2005).

Poly(ethylene-co-vinyl acetate) (CAS RN 24937-78-8) is included on the US FDA list of Indirect Additives used in Food Contact Substances and is covered under Title 21 of the US Code of Federal Regulations (21 CFR), sections 175.105 (Adhesives), 175.300 (Resinous and polymeric coatings), 176.180 (Components of paper and paperboard in contact with dry food), 177.1200 (Cellophane), 177.1210 (Closures with sealing gaskets for food containers), 177.1350 (Ethylene-vinyl acetate copolymers), 177.1390 (Laminate structures for use at

temperatures of 250 °F and above), 178.1005 (Hydrogen peroxide solution) and 179.45 (Packaging materials for use during the irradiation of prepackaged foods).

As taken from FDA, 2019, 2020a.

Copolymer of ethylene and vinyl acetate is listed in the US EPA InertFinder Database (2020) as approved for food and non-food use pesticide products. For food use, it is regulated under Code of Federal Regulations Title 40, Protection of Environment; Part 180, Tolerances and exemptions for pesticide chemical residues in food; Section 180.960 - Polymers; exemptions from the requirement of a tolerance (US EPA, 2020).

“The CEF Panel concluded that the substance ethylene-vinyl acetate copolymer wax does not represent a safety concern for the consumer if the substance is only to be used as an additive up to 2% w/w in polyolefin materials and articles and the migration of low molecular weight oligomeric fraction below 1 000 Da does not exceed 5 mg/kg food.”

As taken from EFSA, 2014.

Acetic acid ethenyl ester, polymer with ethene (CAS RN 24937-78-8) is pre-registered under REACH (“envisaged registration deadline 30 November 2010”) (ECHA).

Acetic acid, ethenyl ester, polymer with ethene (CAS RN 24937-78-8) is not classified for packaging and labelling under Regulation (EC) No. 1272/2008 (ECHA, 2020).

Ethylene vinyl acetate polymer is listed in the US EPA Toxic Substances Control Act (TSCA) inventory and also in the US EPA 2012 CDR and 2016 CDR Full Exempt lists (Chemical Data Reporting Rule). The Chemical Data Reporting (CDR) Rule requires companies that manufacture (including import) certain chemicals at certain volumes in the U.S. to report to EPA every four years through its CDR.

The TSCA inventory, and 2012 CDR and 2016 CDR Full Exempt lists are available at https://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do

Acetic acid ethenyl ester, polymer with ethene (CAS RN 24937-78-8) is included on the New Zealand Inventory of Chemicals and maybe used as a single component chemical under appropriate group standard (NZ EPA, 2006).

Ethylene-vinyl acetate copolymer (28% vinyl acetate) and ethylene-vinyl acetate copolymers are included on the US FDA’s list of inactive ingredients for approved drug products. They are permitted for use as ingredients in various products, at the following maximum potency per unit doses:

Inactive Ingredient	**Route**	**Dosage Form**	**CAS Number**	**UNII**	**Maximum Potency per unit dose**
ETHYLENE-VINYL ACETATE COPOLYMER (28% VINYL ACETATE)	SUBCUTANEOUS	IMPLANT	24937788	8ILA5X28VS	43mg

ETHYLENE-VINYL ACETATE COPOLYMER (28% VINYL ACETATE)	VAGINAL	INSERT	24937788	8ILA5X28VS	1677mg
ETHYLENE-VINYL ACETATE COPOLYMER (28% VINYL ACETATE)	VAGINAL	RING	24937788	8ILA5X28VS	1665mg
ETHYLENE-VINYL ACETATE COPOLYMER (9% VINYLACETATE)	VAGINAL	INSERT	24937788	4OKC630HS6	197mg
ETHYLENE-VINYL ACETATE COPOLYMER (9% VINYLACETATE)	VAGINAL	RING	24937788	4OKC630HS6	195.9mg
ETHYLENE-VINYL ACETATE COPOLYMERS	INTRAUTERINE	SUPPOSITORY, EXTENDED RELEASE	24937788	NA	160mg
ETHYLENE-VINYL ACETATE COPOLYMERS	OPHTHALMIC	INSERT, EXTENDED RELEASE	24937788	NA	14mg
ETHYLENE-VINYL ACETATE COPOLYMERS	OPHTHALMIC	SUPPOSITORY, EXTENDED RELEASE	24937788	NA	NA
ETHYLENE-VINYL ACETATE COPOLYMERS	SUBCUTANEOUS	IMPLANT	24937788	NA	61mg
ETHYLENE-VINYL ACETATE COPOLYMERS	TRANSDERMAL	FILM	24937788	NA	11.65mg
ETHYLENE-VINYL ACETATE COPOLYMERS	TRANSDERMAL	FILM, EXTENDED RELEASE	24937788	NA	NA

As taken from FDA, 2020b

Acetic acid, ethenyl ester, copolymer with ethene (CAS RN 24937-78-8) is a “polymer identified as low concern to human health by application of expert validated rules” and is “not considered to pose an unreasonable risk to the health of workers and public health on the basis of the Tier I IMAP assessment” (NICNAS, 2018).

Short-time Values - Protective Action Criteria

Value	PAC-1	PAC-2	PAC-3
Ethylene/vinyl acetate copolymer	30 mg/m³	330 mg/m³	2000 mg/m³

As taken from IGS, 2019

4. Metabolism/Pharmacokinetics

4.1. Metabolism/metabolites

No data available to us at this time.

4.2. Absorption, distribution and excretion

“In a 120-day oral toxicity study in rats no indication of accumulation was reported. The Panel concludes that no accumulation of ethylene-vinyl acetate copolymer wax in man is anticipated.”

As taken from EFSA, 2014.

4.3. Interactions

No data available to us at this time.

5. Toxicity

5.1. Single dose toxicity

No data available to us at this time.

5.2. Repeated dose toxicity

EVA was implanted subcutaneously in dogs for 1 year. A thin fibrous capsule consisting of fibrous cells with flat nuclei was formed around the substance, and fibroblasts were found sporadically in the internal layer of the capsule. No inflammatory reaction was found (Kojima 1975).

“An oral 120-day rat study on a polymeric additive with a vinyl acetate content of 12-13 % (w/w) and an ethylene content of 87-88 % (w/w) related to the ethylene vinyl acetate copolymer wax under evaluation (vinyl acetate content 6-15% and ethylene content 85-94 %) was performed in 1966. Data were reported on the following parameters: body weights, hematology, urinalysis, serum glutamate pyruvate transaminase levels, liver and kidney weights and histological examinations of 10 inner organs. No substance-related changes were observed in the above parameters in rats fed with a diet containing 50 000 or 100 000 mg/kg bw/day of the test substance compared to control rats (approx. 4 000 or 8 000 mg/kg bw/day), i.e. the NOAEL in this study was considered to be 8 000 mg/kg bw/day (the highest dose tested). Notwithstanding the limited end points of this study these data indicate that ethylene-vinyl acetate copolymer wax has a low sub-chronic toxicity. The LMWF content of that polymeric additive is not known, but given the similarity between the types of polymer, the content is anticipated to be similar to the LMWF content in the ethylene vinyl acetate copolymer under evaluation (i.e. approximately 10%). Nevertheless considering, conservatively, a LMWF content of only 1% in the polymeric additive used in the 120-day study, for the LMWF of that additive an NOAEL of 80 mg/kg bw/d can be estimated, (assuming that the more heavy fraction is completely non-toxic). The Panel concluded that this NOAEL value would provide a sufficiently large margin of safety of approximately 1000 compared to the exposure to the LMWF from the ethylene vinyl acetate copolymer under evaluation at a maximum migration level of 5 mg/kg food, bearing in mind that uncertainty due to read-across should also be taken into account. This conclusion is in line with supportive data from subchronic studies on oxidised polyethylene waxes evaluated by EFSA (EFSA, 2009). These data included five 90-day rat studies each on different commercial products, with the lowest NOAEL of 500 mg/kg bw/day and a reproduction and developmental toxicity diet rat study (OECD 421) on a LMWF of oxidised polyethylene waxes with a NOAEL of 1 000 mg/kg bw/day or higher.”

As taken from EFSA, 2014.

5.3. Reproduction toxicity

Development of a polymeric releasing device for 2'-carbomethoxyphenyl 4-guanidinobenzoate (a proteinase inhibitor): release rate, in vitro antifibrinolytic activity and in utero contraceptive effect (Abstract). A polymeric delivery system consisting of ethylene-vinyl acetate copolymer (EVAc) was developed for 2'-carbomethoxyphenyl 4-guanidinobenzoate (MSGB), a potent inhibitor of the sperm enzyme acrosin. The optimal device consists of copolymer with 40% vinyl acetate by weight (EVAc/40), 65% drug loading and MSGB with a particle size of 250-499 micron. This formulation yields a device that is highly flexible and can be shaped to many forms and sizes. Construction of the device does not alter the properties of MSGB. Well controlled release of MSGB from the device occurs in vitro and in the uteri of rats. The in vitro release rate under "infinite sink" conditions is essentially the same as the in vivo release rate. The contraceptive effect of the MSGB-releasing device was tested in rabbits by placing a blank (control) device in one uterine horn and an MSGB-releasing device in the contralateral horn. In contrast to blank devices, MSGB-releasing devices completely prevent pregnancy, not only by inhibiting fertilization but also by decreasing implantation. MSGB possesses high in vitro antifibrinolytic activity. These results indicate that a very flexible device can be constructed for uterine application which retains its contraceptive effect by release of MSGB. The antifibrinolytic activity of MSGB may further decrease the menorrhagia that can be associated with IUD use.

As taken from Burns JW et al . Contraception. 1988, Sep; 38(3):349-64. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/3168452?dopt=AbstractPlus

5.4. Mutagenicity

“The acetate groups in ethylene-vinyl acetate copolymer wax are expected to be hydrolysed by esterases, similarly to vinyl acetate, and this would leave an ethylene-vinyl alcohol copolymer chain. Neither the copolymer itself nor its hydrolysis product have structural alerts for genotoxicity. Overall, the Panel concluded that the ethylene-vinyl acetate copolymer wax does not raise concern for genotoxicity.”

As taken from EFSA, 2014.

5.5. Cytotoxicity

No data available to us at this time.

5.6. Carcinogenicity

No data available to us at this time.

5.7. Irritation/immunotoxicity

EVA was implanted subcutaneously in dogs for 1 year. A thin fibrous capsule consisting of fibrous cells with flat nuclei was formed around the substance, and fibroblasts were found sporadically in the internal layer of the capsule. No inflammatory reaction was found (Kojima 1975).

Elvax 40P (EVX), an ethylene vinyl-acetate copolymer, has been well characterised as an implant material that causes no inflammatory response and is capable of the sustained local release of a wide variety of undenatured macromolecules in vivo (Silberstein & Daniel 1982).

The vaginal immune response following controlled, local administration of a model antigen, ferritin, was determined by using ferritin-releasing ethylene-vinyl acetate copolymer (poly(ethylene-co-vinyl acetate)) vaginal rings to provide long term continuous antigen exposure in mice primed with subcutaneous (SC) or oral ferritin. SC primed mice receiving ferritin-loaded vaginal rings had ferritin-specific IgA in their mucus secretions, while mice receiving blank rings did not. Oral priming with ferritin-loaded polylactic acid (poly(lactic acid)) microspheres also produced significant levels of ferritin-specific IgA in the vaginal secretions, but required the presence of cholera toxin. It was concluded that controlled ferritin delivery to mucosal surfaces, either by oral, biodegradable microspheres or vaginal rings, provided a convenient and reliable method for enhancing vaginal IgA production in mice.

As taken from Wyatt TL et al.Controlled Release; VOL 50 ISS Jan 2 1998, P93-102.

A new method for local delivery of anti-adhesion monoclonal antibodies (MAbs) to an exposed mucosal surface was developed using ethylene-vinyl acetate copolymer (poly(ethylene-co-vinyl acetate) controlled-release devices and their prophylactic potential was evaluated by examining leukocyte adhesion to apical surfaces of T84 cells in the presence of MAbs to leukocyte surface proteins. MAbs against the MAC-1 adhesion receptor inhibited neutrophil attachment to T84 cells by as much as 97%. MAbs against murine leukocyte receptors were produced from several hybridomas and incorporated into the devices. During incubation in sodium chloride (saline) buffer, small polymer discs continuously released active MAbs for 10 days. After insertion into vaginal canals of mice, these polymer disks produced high levels of anti-MAC-1 MAb for several days. It was concluded that MAbs against leukocyte adhesion molecules significantly inhibit the ability of leukocytes to interact with mucosal epithelia in vitro and that these same MAbs can be

delivered directly to mucosal surfaces in an active form using polymeric controlled-release devices.

As taken from Parkhurst MR and Saltzman WM. J. Controlled Release; VOL 42 ISS Dec 1996, P273-288.

5.8. All other relevant types of toxicity

Release rates in rats of a macromolecule from an ethylene-vinyl acetate copolymer were shown to be indistinguishable from those of identical implants tested in vitro (Abstract). Ethylene is a low molecular weight hydrocarbon gas with few toxicological properties. In sufficient concentrations ethylene depletes the oxygen level of air and through this mechanism acts as an asphyxiant. No long term toxicological problems have been attributed directly to the gas. Ethylene does not have locally toxic effects (Doull *et al* 1980). Due to the paucity of information regarding ethylene-vinyl acetate copolymer, the remainder of the toxicological information presented concerns vinyl acetate.

As taken from Brown LR et al. J. Pharm. Sci.; VOL 72 ISS Oct 1983, P1181-1185.

Toxicology of polymers for implant contraceptives for women (Abstract). This article reviews the toxicology of polymers that are used in contraceptive implants. The two main classes of synthetic, nondegradable polymers used in the delivery of female contraceptives are silicone elastomers (e.g., Silastic) and ethylene co-vinyl acetate (EVA; ELVAX). The controversies surrounding the silicone breast implants have prompted several studies to evaluate the toxicity of silicones. The epidemiologic data obtained thus far have overwhelmingly concluded that no correlation exists between certain chronic symptoms, such as arthritis, in patients and silicone prosthesis. This conclusion has been echoed by the expert panel report by the Institutes of Medicine. Although the IOM report focused on the safety of silicone breast prosthesis, data emerging from the joint reconstruction area also suggests that Silastic is safe for in vivo use. The toxicological studies on EVA are few, and the conclusion thus far is that they elicit no adverse local or systemic response over extended periods in vivo. In conclusion, the prognosis for Silastic and ELVAX as of now is excellent. However, any future implant development using these polymers should place an emphasis on processing parameters to minimize potential small molecule leachants and establish safety as a function of both site and duration of implantation.

As taken from Shastri PV. Contraception. 2002, Jan; 65(1):9-13. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/11861050?dopt=AbstractPlus

PGE2 and angiogenesis (Abstract). The angiogenic capability of PGE2 was tested by implanting pellets of an ethylene vinyl acetate slow release polymer containing PGE2 on the chorioallantoic membrane of 8-day-old chicken embryos. Elvax pellets releasing approximately 0.2, 2.0, or 20 ng/day PGE2 were found to induce neovascular responses. In contrast, pellets releasing 2.0 or 20 ng/day of either PGA2, PGF2, or TXB2 did not appear to be angiogenic when compared with PGE2. These release rates of PGE2 are similar to those reported for a variety of tumors, activated macrophages, inflammatory exudates, and rheumatoid synovia, suggesting that PGE2 may be a key factor in various neovascular

reactions. As taken from DM; Auerbach R. Proc Soc Exp Biol Med. 1983, Feb; 172(2):214-8. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/6572402?dopt=AbstractPlus

Effect of PEG6000 on the in vitro and in vivo transdermal permeation of ondansetron hydrochloride from EVA1802 membranes (Abstract). The objective was to evaluate ethylene vinyl acetate (EVA) copolymer membranes with vinyl acetate content of 18% w/w (EVA1802) for transdermal delivery of ondansetron hydrochloride. The EVA1802 membranes containing selected concentrations (0, 5, 10 and 15% w/w) of PEG6000 were prepared, and subjected to in vitro permeation studies from a nerodilol-based drug reservoir. Flux of ondansetron from EVA1802 membranes without PEG6000 was 64.1 +/- 0.6 microg/cm(2.)h, and with 10%w/w of PEG6000 (EVA1802-PEG6000-10) it increased to 194.9 +/- 4.6 microg/cm(2.)h. However, with 15%w/w of PEG6000, EVA1802 membranes produced a burst release of drug which in turn decreased drug flux. The EVA1802-PEG6000-10 membrane was coated with an adhesive emulsion, applied to rat epidermis and subjected to in vitro permeation studies against controls. Flux of ondansetron from transdermal patch across rat epidermis was 111.7 +/- 1.3 microg/cm(2.)h, which is about 1.3 times the required flux. A TTS was fabricated using adhesive-coated EVA1802-PEG6000-10 membrane and other TTS components, and subjected to in vivo delivery in human volunteers against a control. It was concluded from the comparative pharmacokinetic study that TTS of ondansetron, prepared with EVA1802-PEG6000-10 membrane, provided average steady-state plasma concentration on par with multiple-dosed oral tablets, but with a low percent of peak-to-trough fluctuation.

As taken from Krishnaiah YS et al. Pharm Dev Technol. 2009; 14(1):50-61. PubMed, 2010 available at

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=retrieve&db=pubmed&list_uids=18819031&dopt=AbstractPlus

In vivo biocompatibility of three potential intraperitoneal implants (abstract). The intraperitoneal biocompatibility of PDMS, polyHEMA and pEVA was investigated in rats, rabbits and rhesus monkeys. No inflammation was evidenced by hematological analyses and measurement of inflammatory markers throughout the experiment and by post-mortem examination of the pelvic cavity. After 3 or 6 months, histological analysis revealed fibrous tissue encapsulating PDMS and PEVA implants in all species and polyHEMA implants in rabbits and monkeys. Calcium deposits were observed inside polyHEMA implants. The intraperitoneal biocompatibility of all 3 polymers makes them suitable for the design of drug delivery systems, which may be of great interest for pathologies confined to the pelvic cavity. As taken from Defrère et al. (2011). Macromol. Biosci. 11(10):1336-45. PubMed, 2012, available at http://www.ncbi.nlm.nih.gov/pubmed/21823236

6. Functional effects on

6.1. Broncho/pulmonary system

No data available to us at this time.

6.2. Cardiovascular system

Ethylene vinylacetate copolymer particles dissolved in polyvinyl alcohol (2,000-mer) solution as an embolic material for vascular anomalies. A preliminary study (Abstract).

We have prepared a new material for embolisation: ethylene vinylacetate copolymer dissolved in polyvinyl alcohol. When in contact with blood, polyvinyl alcohol rapidly becomes a soft gel, which is accompanied by wedging of the ethylene vinylacetate copolymer. We analysed the histopathology of intra-arterial microemboli in rats, after intracarotid injection of this material. We confirmed that it was applicable to embolisation for neurosurgical treatment.

As taken from Kinoshita A et al. Neuroradiology. 1994; 36(1):65-8. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/8108003?dopt=Abstract

Prevention of experimental cerebral vasospasm by intracranial delivery of a nitric oxide donor from a controlled-release polymer: toxicity and efficacy studies in rabbits and rats (Abstract).

BACKGROUND AND PURPOSE: A reduction in the local availability of nitric oxide (NO) may play a role in the etiology of chronic cerebral vasospasm after subarachnoid hemorrhage (SAH). We investigated the toxicity and efficacy of a locally delivered NO donor from a controlled-release polymer in preventing experimental cerebral vasospasm in rats and rabbits, respectively. METHODS: Diethylenetriamine/NO (DETA/NO) was incorporated into controlled release ethylene-vinyl acetate (EVAc) polymers. Twenty-eight rats were used in a dose-escalation toxicity study to establish a maximally tolerated dose of DETA/NO-EVAc polymer. In the efficacy experiment, 20 rabbits were assigned to 4 experimental groups (n=5 per group): sham operation; SAH only; SAH+empty EVAc polymer; and SAH+DETA/NO-EVAc polymer. Treatment was initiated 30 minutes after blood deposition. Basilar artery lumen patency was assessed 72 hours after hemorrhage to evaluate the efficacy of DETA/NO in preventing cerebral vasospasm. RESULTS: In the toxicity study, a dose of 3.4 mg/kg was identified as the LD(20) (dose with 20% mortality during the study period) of this DETA/NO formulation. Brain histology revealed hemorrhage and ischemic changes at the implantation site associated with high concentrations of DETA/NO. In the efficacy study, treatment with DETA/NO-EVAc polymer resulted in a significant decrease in basilar artery vasospasm compared with no treatment (93.0+/-4.9% versus 71.4+/-11.9%; P=0.035) or compared with treatment with blank EVAc polymer (93.0+/-4.9% versus 73.2+/-6.4%; P=0.003). CONCLUSIONS: Local delivery of DETA/NO prevents vasospasm in the rabbit basilar artery. Local delivery of DETA/NO via polymers is a safe and effective strategy for preventing cerebral vasospasm after SAH in this model.

As taken from Gabikian P; Clatterbuck RE et al. 2002, Nov; 33(11):2681-6. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/12411661?dopt=AbstractPlus

6.3. Nervous system

No data available to us at this time.

6.4. Other organ systems, dependent on the properties of the substance

No data available to us at this time.

7. Addiction

JTI is not aware of any information that demonstrates that this ingredient has any addictive effect.

8. Burnt ingredient toxicity

Endpoint	**Tested level (ppm)**	**Reference**
Smoke chemistry	-	JTI Internal Report
In vitro genotoxicity	-	JTI Internal Report
In vitro cytotoxicity	-	JTI Internal Report

In comparison with a CSC of a reference cigarette with sideseam adhesives/cigarette paper corresponding to representative specifications for the majority of commercial cigarettes no differences were observed either in the bacterial mutagenicity, cytotoxicity or mammalian cell genotoxicity of the smoke condensate prepared from cigarettes with sideseam adhesives/cigarette paper containing Ethylene Vinyl Acetate Coploymer at 1.886 mg/cig. The smoke chemistry data between test and reference cigarette revealed small changes towards both higher and lower yields per cigarette over all analytical groups. These differences were well within the variability of the analytical methods (JTI NTM Study Report(s)).

When EVA was added to the wrappers of experimental flue-cured tobacco samples, increases in HCN and aldehydes were observed. There was no change in the level of acrolein or formaldehyde (Anon 1986).

9. Heated/vapor emissions toxicity

No data available to us at this time.

10. Ecotoxicity

10.1. Environmental fate

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that acetic acid ethenyl ester, polymer with ethane (CAS RN 24937-78-8) is persistent in the environment.

Data accessed May 2017 on the OECD website: http://webnet.oecd.org/CCRWeb/Search.aspx

WATER FATE

Evaluation of poly(ethylene-co-vinyl acetate-co-carbon monoxide) and polydimethylsiloxane for equilibrium sampling of polar organic contaminants in water (Abstract). The aim of the present study was to develop a passive absorptive equilibrium sampler that would enable the determination of the concentrations of polar organic compound (POC) in water more efficiently than existing techniques. To this end, a novel plastic material, poly(ethylene-co-vinyl acetate-co-carbon monoxide) (PEVAC), was evaluated and the results were compared with an existing silicone-based passive absorptive equilibrium device. Seven compounds (imidacloprid, carbendazim, metoprolol, atrazin,

carbamazepine, diazinon, and chlorpyrifos), a mixture of pharmaceuticals, and pesticides with a logarithmic octanol-water partition coefficient ranging from 0.2 to 4.77 were selected as model substances for the experiments. The results showed that six of the seven selected POCs reached distribution equilibrium within 4 d in the two materials tested. A linear relation with a regression coefficient of more than 0.8906 between the established logarithmic absorbent-water partition coefficient and the calculated logarithmic dissociation partition coefficient of the selected compounds in the two polymers was observed. The correlation between these two coefficients was within one order of magnitude for the compounds that reached equilibrium in the two polymers, which demonstrates that both materials are suitable for mimicking biological uptake of POCs. The PEVAC material showed an enhanced sorption for all selected compounds compared to the silicone material and up to five times higher enrichment for the most polar compound. Fluorescence analysis of the sampler cross-section, following the uptake of fluoranthene, and proof that the sorption was independent of surface area variations demonstrated that the PEVAC polymer possessed absorptive rather than adsorptive enrichment of organic compounds.

As taken from Magnér JA et al. Environ Toxicol Chem. 2009**,** Sep; 28(9):1874-80. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/19938334?dopt=AbstractPlus

10.2. Aquatic toxicity

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that acetic acid ethenyl ester, polymer with ethane (CAS RN 24937-78-8) is not inherently toxic to aquatic organisms, giving a pivotal value for inherent toxicity of 14 mg/L.

Data accessed May 2017 on the OECD website: http://webnet.oecd.org/CCRWeb/Search.aspx

10.3. Sediment toxicity

No data available to us at this time.

10.4. Terrestrial toxicity

No data available to us at this time.

10.5. All other relevant types of ecotoxicity

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that acetic acid ethenyl ester, polymer with ethane (CAS RN 24937-78-8) is not bioaccumulative in the environment.

Data accessed May 2017 on the OECD website: http://webnet.oecd.org/CCRWeb/Search.aspx

11. References for conventional products

- Anon (1986). EVA – A cigarette paper additive. Submission to the Independent Scientific Committee on Smoking and Health. July 1986. Master file 121.4.53, A-Z/Ethylene Vinyl Acetate/1985 Onwards/E10
- Brown LR et al. (1983). J. Pharm. Sci.; VOL 72 ISS Oct 1983, P1181-1185.
- Burns JW et al. (1988). Development of a polymeric releasing device for 2'-carbomethoxyphenyl 4-guanidinobenzoate (a proteinase inhibitor): release rate, in vitro antifibrinolytic activity and in utero contraceptive effect. Contraception. 1988, Sep; 38(3):349-64. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/3168452?dopt=AbstractPlus
- ChemIDplus. Accessed March 2020. Available at https://chem.nlm.nih.gov/chemidplus/
- Commission (2005). Provisional list of monomers and additives notified to European Commission as substances which may be used in the manufacture of plastics or coatings intended to come into contact with foodstuffs. Synoptic Document (updated to June 2005). SANCO D3/AS D(2005). Available at http://www.contactalimentaire.com/fileadmin/ImageFichier_Archive/contact_alimentaire/Fichiers_Documents/Avis_de_AESA/synoptic_doc_en_-_version_June_2005.pdf
- CosIng. Cosmetic substances and ingredients database. Record for ethylene/VA copolymer. Undated, accessed March 2020. Available at https://ec.europa.eu/growth/tools-databases/cosing/
- CPID (undated). Consumer Product Information Database. Record for ethylene/vinyl acetate co-polymer (CAS RN 24937-78-8). Accessed March 2020. Available at https://www.whatsinproducts.com/
- Defrère et al. (2011). In vivo biocompatibility of three potential intraperitoneal implants Macromol. Biosci. 11(10):1336-45. PubMed, 2012. available at http://www.ncbi.nlm.nih.gov/pubmed/21823236

- ECHA (undated). European Chemicals Agency. Information on Chemicals. Record for acetic acid ethenyl ester, polymer with ethene (CAS RN 24937-78-8). Accessed March 2020. Available at: https://echa.europa.eu/information-on-chemicals/pre-registered-substances
- ECHA (2020). European Chemicals Agency. Classification and Labelling (C&L) Inventory database. Last updated 30 March 2020. Available at: https://echa.europa.eu/information-on-chemicals/cl-inventory-database
- EFSA (2014). EFSA CEF Panel (EFSA Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids). Scientific opinion on the safety assessment of the substance ethylene-vinyl acetate copolymer wax, CAS No 24937-78-8 for use in food contact materials. Question No EFSA-Q-2013-00282, adopted on 18 December 2013. EFSA Journal 12(2), 3555. Available at: http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3555/epdf
- FDA (2019). Food and Drug Administration. List of Indirect Additives Used in Food Contact Substances. Last updated 6 September 2019. Accessed March 2020. Available at https://www.accessdata.fda.gov/scripts/fdcc/?set=IndirectAdditives
- FDA (2020a). Food and Drug Administration. Electronic Code of Federal Regulations (eCFR). Current as of 27 March 2020. Available at https://www.ecfr.gov/cgi-bin/ECFR?page=browse
- FDA (2020b). US Food and Drug Administration. Inactive Ingredient Database. Data valid through 3 January 2020. Accessed March 2020. Available at https://www.accessdata.fda.gov/scripts/cder/iig/index.cfm
- Form DM and Auerbach R (1983). PGE2 and angiogenesis Proc Soc Exp Biol Med. 1983, Feb; 172(2):214-8. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/6572402?dopt=AbstractPlus
- Gabikian P et al. (2002). Prevention of experimental cerebral vasospasm by intracranial delivery of a nitric oxide donor from a controlled-release polymer: toxicity and efficacy studies in rabbits and rats. Stroke. 2002, Nov; 33(11):2681-6. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/12411661?dopt=AbstractPlus
- Haz-Map (2020). Record for ethylenevinylacetate copolymer (CAS RN 24937-78-8). Last updated 5 March 2020. Accessed March 2020. Available at https://haz-map.com/
- HULL et al. Polymer degradation and stability ISSN 0141-3910 CODEN PDSTDW . Congrès, European Conference on Fire Retardant Polymers No8, Alessandria, ITALIE (06/2001) 2002, vol. 77, no 2 (169 p.) (11 ref.), pp. 235-242
- IFRA (undated). International Fragrance Association. IFRA Transparency List. Accessed March 2020. Available at https://ifrafragrance.org/initiatives/transparency/ifra-transparency-list
- IGS (2019). Informationssystem für Gefährliche Stoffe. Public Version 11/2019. Record for Ethylen/Vinylacetat, Copolymer (CAS RN 24937-78-8) Accessed March 2020. Available at https://www.echemportal.org/echemportal/substance-search
- JTI Internal Report
- JTI NTM Study Report(s)
- Kinoshita A et al. (1994). Ethylene vinylacetate copolymer particles dissolved in polyvinyl alcohol (2,000-mer) solution as an embolic material for vascular anomalies.

A preliminary study. Neuroradiology. 1994; 36(1):65-8. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/8108003?dopt=Abstract

- Kojima K. (1975). Interaction Between Polymeric Materials and Tissue. Biodeterioration of Polymeric Materials. Bull. Tokyo Med. Dent. Univ., 22: 263-272
- Krishnaiah YS et al. (2009). Effect of PEG6000 on the in vitro and in vivo transdermal permeation of ondansetron hydrochloride from EVA1802 membranes. Pharm Dev Technol. 2009; 14(1):50-61. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=retrieve&db=pubmed&list_uids=18819031&dopt=AbstractPlus
- Liu Y et al. (2020). Highly efficient composite flame retardants for improving the flame retardancy, thermal stability, smoke suppression, and mechanical properties of EVA. Materials (Basel) 13(5), 1251. DOI: 10.3390/ma13051251. PubMed, 2020 available at https://pubmed.ncbi.nlm.nih.gov/32164212/
- Magnér JA et al (2009). Evaluation of poly(ethylene-co-vinyl acetate-co-carbon monoxide) and polydimethylsiloxane for equilibrium sampling of polar organic contaminants in water Environ Toxicol Chem. 2009, Sep; 28(9):1874-80. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/19938334?dopt=AbstractPlus
- NICNAS (2018). Australian Government Department of Health National Industrial Chemicals Notification and Assessment Scheme. Inventory Multi-Tiered Assessment and Prioritisation (IMAP) Framework. Tier I Human Health Assessments. Last updated 29 July 2018. Available at: https://www.nicnas.gov.au/chemical-information/imap-assessments/imap-assessments/human-health-assessments
- NIOSH. National Institute for Occupational Safety and Health. National Occupational Exposure Survey (1981-1983). Record for acetic acid vinyl ester, polymer with ethylene (CAS RN 24937-78-8). Available at https://web.archive.org/web/20111028105738/http://www.cdc.gov/noes/noes2/x6619occ.html
- NZ EPA (2006). New Zealand Environmental Protection Authority. Inventory of Chemicals. Record for acetic acid ethenyl ester, polymer with ethene (CAS RN 24937-78-8). Date added to inventory: 1 December 2006. Accessed March 2020. Available at: https://www.epa.govt.nz/database-search/new-zealand-inventory-of-chemicals-nzioc/view/3397
- OECD. Organization for Economic Cooperation and Development. The Global Portal to Information on Chemical Substances (eChemPortal). Acetic acid ethenyl ester, polymer with ethene (CAS No. 24937-78-8). Accessed May 2017. Available at http://webnet.oecd.org/CCRWeb/Search.aspx
- Parkhurst MR and Saltzman WM (1996). J. Controlled Release; VOL 42 ISS Dec 1996, P273-288.
- PubChem (2020). Record for acetic acid ethenyl ester, polymer with ethene, oxidized (CAS RN 24937-78-8). Created 9 August 2005. Last modified 28 March 2020. Available at https://pubchem.ncbi.nlm.nih.gov/compound/175988
- Schwope AD et al. (1987). Migration of Irganox 1010 from ethylene-vinyl acetate films to foods and food-simulating liquids., Food Chem Toxicol. 1987, Apr; 25(4):327-30.). PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/3583159

- Shastri PV (2002). Toxicology of polymers for implant contraceptives for women. Contraception. 2002, Jan; 65(1):9-13. PubMed, 2010 available at http://www.ncbi.nlm.nih.gov/pubmed/11861050?dopt=AbstractPlus
- Silberstein G. B. & Daniel C. W. (1982). Elvax 40P Implants: Sustained, Local Release of Bioactive Molecules Influencing Mammary Ductal Development. Developmental Biology, 93: 272-278.
- US EPA (2020). US Environmental Protection Agency. Electronic Code of Federal Regulations (eCFR). Current as of 27 March 2020. Available at https://www.ecfr.gov/cgi-bin/ECFR?page=browse
- US EPA 2012 CDR list (Chemical Data Reporting Rule). Accessed March 2020. Available at https://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do
- US EPA 2016 CDR Full Exempt list (Chemical Data Reporting Rule). Accessed March 2020. Available at https://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do
- US EPA ACToR database (2015). Version 2015Q3. Record for CAS RN 24937-78-8. Accessed March 2020. Available at https://actor.epa.gov/actor/chemical.xhtml?casrn=24937-78-8
- US EPA InertFinder Database (2020). Last updated 27 March 2020. Accessed March 2020. Available at: https://iaspub.epa.gov/apex/pesticides/f?p=INERTFINDER:1:0::NO:1::
- US EPA TSCA inventory. Accessed March 2020. Available at https://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do
- Wyatt TL et al. (1998). Controlled Release; VOL 50 ISS Jan 2 1998, P93-102.

12. Other information

No data available to us at this time.

13. Last audited

June 2020

European Food Safety Authority

EFSA Journal 2014;12(2):3555

SCIENTIFIC OPINION

Scientific Opinion on the safety assessment of the substance ethylene-vinyl acetate copolymer wax, CAS No 24937-78-8 for use in food contact materials[1]

EFSA Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids (CEF)[2, 3]

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

This scientific opinion of the EFSA Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids deals with the safety assessment of the polymeric additive ethylene-vinyl acetate copolymer wax, CAS No 24937-78-8, FCM substance No 00969 for use as a dispersing agent, lubricant, pigment carrier, and/or a processing aid in the production of plastic materials made from polymers such as polyethylene (PE), polypropylene (PP) or polyethylene terephthalate (PET). Final articles are intended for repeated contact with all types of foodstuffs at any conditions of time and temperature. The copolymer has a weight-averaged molecular weight higher than 6 000 Da and the low molecular weight fraction (LMWF) below 1 000 Da was estimated to be below 10 % w/w The copolymer starts decomposing at temperatures above 230 °C, which is above the maximum process temperature of PE and PP but it is below the maximum process temperature of PET. The Panel considered that in the absence of information on possible thermal decomposition products, the use of the substance in PET should be excluded. The specific migration of the LMFW from polyolefins was conservatively estimated to be up to approximately 5.8 mg/kg food. There is no evidence of genotoxicity of ethylene-vinyl acetate copolymer wax. A 120 day oral toxicity study in rats showed no indication of accumulation. Therefore, the CEF Panel concluded that the substance ethylene-vinyl acetate copolymer wax does not raise a safety concern for the consumer if it is used as additive up to 2 % in polyolefins and the migration of low molecular weight oligomeric fraction below 1 000 Da does not exceed 5 mg/kg food.

KEY WORDS

ethylene-vinyl acetate copolymer wax, CAS No 24937-78-8, FCM substance No 00969, food contact materials, safety assessment, evaluation

---

[1] On request from the Bundesamt für Verbraucherschultz und Lebensmittelsicherheit, Germany, Question No EFSA-Q-2013-00282, adopted on 18 December 2013.

[2] Panel members: Ulla Beckman Sundh, Mona-Lise Binderup, Claudia Bolognesi, Leon Brimer, Laurence Castle, Alessandro Di Domenico, Karl-Heinz Engel, Roland Franz, Nathalie Gontard, Rainer Gürtler, Trine Husøy, Klaus-Dieter Jany, Martine Kolf-Clauw, Catherine Leclercq (until July 2013), Jean-Claude Lhuguenot (until November 2012), Wim Mennes, Maria Rosaria Milana, Iona Pratt, Kettil Svensson, Maria de Fátima Tavares Poças, Fidel Toldrá and Detlef Wölfle. One member of the Panel did not participate in the discussion on the subject referred to above because of potential conflicts of interest identified in accordance with the EFSA policy on declarations of interests. Correspondence: cef@efsa.europa.eu

[3] Acknowledgement: The Panel wishes to thank the members of the Working Group on Food contact materials: Mona-Lise Binderup, Laurence Castle, Riccardo Crebelli, Alessandro Di Domenico, Roland Franz, Nathalie Gontard, Ragna Hetland Bogen, Martine Kolf-Clauw, Eugenia Lampi, Maria Rosaria Milana, Maria de Fátima Tavares Poças, Philippe Saillard, Kettil Svensson and Detlef Wölfle for the preparatory work on this scientific opinion.

Suggested citation: EFSA CEF Panel (EFSA Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids), 2014. Scientific Opinion on the safety assessment of the substance ethylene-vinyl acetate copolymer wax, CAS No 24937-78-8 for use in food contact materials. EFSA Journal 2014;12(2):3555, 9 pp. doi:10.2903/j.efsa.2014.3555

Available online: www.efsa.europa.eu/efsajournal

SUMMARY

Within the general task of evaluating substances intended for use in materials in contact with food according to the Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with foodstuffs, the CEF Panel received a request from the Bundesamt für Verbraucherschutz und Lebensmittelsicherheit, Germany, for safety assessment of the substance ethylene-vinyl acetate copolymer wax following a corresponding application from the applicant BASF SE, Germany.

The safety assessment of ethylene-vinyl acetate copolymer wax with CAS No 24937-78-8 and the FCM substance No 00969 was requested for use as additive in polymers such as polyethylene (PE), polypropylene (PP), or polyethylene terephthalate (PET) at a maximum use level of 2 % (w/w) in plastics. Final articles are intended for repeated contact with all types of foodstuffs at any condition of time and temperature.

The substance has not been evaluated by the SCF or AFC/CEF Panels. However, the comonomers, ethylene (85-94 %) with FCM substance No 00125 and vinyl acetate (6-15 %) with FCM substance No 00231, used to manufacture the copolymer are authorised as monomers for food contact materials with a specific migration limit (SML) of 12 mg/kg for vinyl acetate and no SML for ethylene.

The copolymer has a weight-averaged molecular weight higher than 6 000 Da and the low molecular weight fraction (LMWF) below 1 000 Da was estimated to be below 10 % w/w. The copolymer starts decomposing at temperatures above 230 °C, which is above the maximum process temperature of polyethylene and polypropylene but it is below the maximum process temperature of PET. The Panel considered that in the absence of information on possible thermal decomposition products, the use of the substance in PET should be excluded. Specific migration of the LMWF was estimated for extruded films of low density polyethylene (LDPE) containing copolymer wax (ethylene-vinyl acetate copolymer with a maximum content of 20 % of vinyl acetate). Tests were performed as time-dependent migration experiments using food simulants such as 95 % ethanol and olive oil. Migration of the LMWF from a worst-case polymer (i.e. LDPE) containing the highest intended concentration of the copolymer additive (i.e. 2%) was conservatively estimated to be up to approximately 5.8 mg/kg.

The substance is a polymeric additive without any structural alert for genotoxicity and it is manufactured using authorised monomers. In a 120-day oral toxicity study in rats no indication of accumulation was reported. The Panel concludes that no accumulation of ethylene-vinyl acetate copolymer wax in man is anticipated.

The CEF Panel concluded that the substance ethylene-vinyl acetate copolymer wax does not represent a safety concern for the consumer if the substance is only to be used as an additive up to 2 % w/w in polyolefin materials and articles and the migration of low molecular weight oligomeric fraction below 1 000 Da does not exceed 5 mg/kg food.

TABLE OF CONTENTS

Abstract 1
Summary 2
Table of contents 3
Background as provided by the legislation 4
Terms of reference as provided by the legislation 4
Assessment 5
1. Introduction 5
2. General information 5
3. Data available in the dossier used for this evaluation 5
4. Evaluation 6
4.1. Non-toxicological data 6
4.2. Toxicological data 6
Conclusions 8
Documentation provided to EFSA 8
References 8
Glossary and abbreviations 9

BACKGROUND AS PROVIDED BY THE LEGISLATION

Before a substance is authorised to be used in food contact materials and is included in a positive list EFSA´s opinion on its safety is required. This procedure has been established in Articles 8 and 9 of the Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food[4].

According to this procedure the industry submits applications to the Member States competent Authorities which in their turn transmit the applications to the EFSA for their evaluation. The application is supported by a technical dossier submitted by the industry following the SCF guidelines for the "presentation of an application for safety assessment of a substance to be used in food contact materials prior to its authorisation" (EC, 2001).

In this case, EFSA received an application from Bundesamt für Verbraucherschutz und Lebensmittelsicherheit, Germany, requesting the evaluation of the additive ethylene-vinyl acetate copolymer wax with the CAS No 24937-78-8 and the FCM substance No 00969.

TERMS OF REFERENCE AS PROVIDED BY THE LEGISLATION

EFSA is required to carry out assessment on the risks originating from the migration into food of the additive ethylene-vinyl acetate copolymer wax, intended to be used as an additive in plastic materials (PE, PP and PET) for food contact articles and to deliver a scientific opinion according to Regulation (EC) No 1935/2004 the European Parliament and of the Council on materials and articles intended to come into contact with food.

[4] Commission Regulation (EC) No 1935/2004 of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC. OJ C 117, 30.4.2004, p. 1.

ASSESSMENT

1. Introduction

The European Food Safety Authority was asked by the Bundesamt für Verbraucherschutz und Lebensmittelsicherheit, Germany, to evaluate the safety of ethylene-vinyl acetate copolymer wax with CAS No 24937-78-8 and FCM substance No 00969. The request has been included in the EFSA's register of received questions under number EFSA-Q-2013-00282. The dossier was submitted by the applicant, BASF SE, Germany.

2. General information

According to the applicant, the substance ethylene-vinyl acetate copolymer wax is a polymeric additive intended to be used as a dispersing agent, lubricant, pigment carrier, and/or processing aid, in the production of plastic materials made from polymers such as polyethylene (PE), polypropylene (PP) or polyethylene terephthalate (PET). The additive is intended to be used up to a maximum level of 2 % w/w in plastics for the food contact article. Final articles are intended for repeated contact with all types of foodstuffs under any conditions of time and temperature.

The substance has not been evaluated previously by the SCF or the AFC/CEF Panels. However, the co-monomers, ethylene (85-94 %) with FCM substance number 00125 and vinyl acetate (6-15 %) with FCM substance number 00231, used to manufacture the copolymer are authorised as monomers for food contact materials[5] with a specific migration limit (SML) of 12 mg/kg food for vinyl acetate and no SML for ethylene.

3. Data available in the dossier used for this evaluation

The studies submitted for evaluation followed the SCF guidelines for the presentation of an application for safety assessment of a substance to be used in food contact materials prior to its authorisation (EC, 2001).

Non-toxicity data:

- Data on identity
- Data on physical and chemical properties
- Data on intended use and authorisation
- Data on migration of the substance
- Data on residual content of the substance
- Data on oligomers
- Data on identification, quantification and migration of a reaction product

Toxicity data:

- Bacterial gene mutation test on oxidised polyethylene waxes
- *In vitro* mammalian cell gene mutation test on oxidised polyethylene waxes
- *In vitro* mammalian chromosome aberration test on oxidised polyethylene waxes
- 120-day oral toxicity study in rats
- 90-day oral toxicity rat studies on oxidised polyethylene waxes

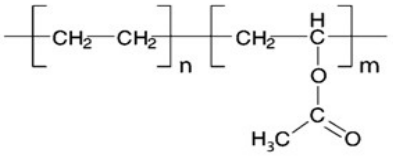
[5] Commission Regulation (EU) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food. Text with EEA relevance. OJ L 12, 15.1.20121, p. 1-89.

4. Evaluation

4.1. Non-toxicological data

Chemical formulae: $[C_2H_4]_n[C_4H_6O_2]_m$

Chemical structure:



The copolymer has a weight averaged molecular weight (Mw) above 6 000 Da, a number averaged molecular weight (Mn) above 2 000 Da, and a molecular mass range of 200 - 10 000 Da. The copolymer is insoluble in water and in *n*-octanol. The Log Po/w was not provided. The low molecular weight fraction below 1 000 Da (LMWF) is estimated to be below 10 % w/w in the copolymer, therefore below 0.2 % (2000 mg/kg) in final articles.

The purity is higher than 99.98 %. Residual ethylene and vinyl acetate monomers in the copolymer are estimated to be no more than 50 and 150 mg/kg respectively. Ethylene monomer residues are unlikely to be present in the final article due to the chemical's volatility and the high temperatures and degassing steps used in manufacturing of the copolymer. The amount of vinyl acetate potentially migrating into food was calculated to be at least two orders of magnitude below the SML of 12 mg/kg.

The copolymer starts decomposing at temperatures above 230 °C, which is above the maximum process temperature of polyethylene and polypropylene but below the maximum process temperature of PET. Therefore, thermal decomposition of the copolymer may occur during the manufacture of PET materials and articles containing the additive. The possible degradation products were not addressed by the applicant. The Panel considered that in the absence of information on possible thermal decomposition products, the use of the substance in PET should be excluded. Specific migration of the LMWF was estimated for extruded films of low density polyethylene (LDPE) containing the copolymer (maximum content of 20 % of vinyl acetate). Tests were performed as time-dependent migration experiments using food simulants such as 95 % ethanol and olive oil. By using analysis of the simulants by gas chromatography and by gel permeation chromatography, along with migration modelling calculations, migration of the LMWF from a worst-case polymer (i.e. LDPE) containing the highest intended concentration of the copolymer (i.e. 2 %) was conservatively estimated to be up to approximately 5.8 mg/kg. Approximately 90 % of the migrated amount consisted of oligomers with a molecular weight below 500 Da and the remaining 10 % was in the range of 500 to 1 000 Da.

4.2. Toxicological data

The substance is a polymeric additive manufactured using the monomers ethylene and vinyl acetate, evaluated by the SCF in 1999 (SCF, 1999) and authorised with no SML and with a SML of 12 mg/kg food, respectively.

Ethylene is considered non-genotoxic and of low toxicological potential (HSBD, 2006).

A risk characterization of vinyl acetate was performed in the context of Council Regulation (EEC) No 793/93[6] on the evaluation and control of existing substances (EU-RAR, 2008). According to the EU-RAR, vinyl acetate is rapidly hydrolysed by carboxylesterases to acetic acid and vinyl alcohol, which quickly rearranges to acetaldehyde. At high concentrations of vinyl acetate the detoxifying activity of

[6] Council Regulation (EEC) No 793/93 of 23 March 1993 on the evaluation and control of the risks of existing substances. OJ L 84, 5.4.1993, p. 1.

aldehyde dehydrogenases is overwhelmed, and non-physiological high intracellular concentrations of acetaldehyde are produced. Acetaldehyde is a metabolic intermediate with low background concentrations, with genotoxic and carcinogenic effects limited to non-physiologically high concentrations. Genotoxicity data on vinyl acetate are in line with the hypothesis that vinyl acetate genotoxicity is mediated by acetaldehyde: similarly to acetaldehyde, vinyl acetate is genotoxic *in vitro*, with a threshold nonlinear dose-response (Budinsky et al., 2013), and non-genotoxic *in vivo* when evaluated at non-lethal doses (Albertini, 2013). The EU-RAR concluded that genotoxicity of vinyl acetate is based on a threshold mode of action, and it is limited to toxic doses (EU-RAR, 2008).

Long-term inhalation or oral administration of vinyl acetate to experimental animals produced tumors at the primary site of exposure. According to the EU-RAR, carcinogenicity of vinyl acetate is based on a secondary mechanism, due to the intracellular accumulation of acetaldehyde at high concentrations of vinyl acetate which results in increased cell proliferation and possibly DNA damage. Thus vinyl acetate is considered a high dose, threshold carcinogen (EU-RAR, 2008).

The Panel agreed with the conclusions of the EU-RAR and considered the low amounts of vinyl acetate possibly migrating into food to be of no toxicological concern.

The acetate groups in ethylene-vinyl acetate copolymer wax are expected to be hydrolysed by esterases, similarly to vinyl acetate, and this would leave an ethylene-vinyl alcohol copolymer chain. Neither the copolymer itself nor its hydrolysis product have structural alerts for genotoxicity. Overall, the Panel concluded that the ethylene-vinyl acetate copolymer wax does not raise concern for genotoxicity.

An oral 120-day rat study on a polymeric additive with a vinyl acetate content of 12-13 % (w/w) and an ethylene content of 87-88 % (w/w) related to the ethylene vinyl acetate copolymer wax under evaluation (vinyl acetate content 6-15% and ethylene content 85-94 %) was performed in 1966. Data were reported on the following parameters: body weights, hematology, urinalysis, serum glutamate pyruvate transaminase levels, liver and kidney weights and histological examinations of 10 inner organs. No substance-related changes were observed in the above parameters in rats fed with a diet containing 50 000 or 100 000 mg/kg bw/day of the test substance compared to control rats (approx. 4 000 or 8 000 mg/kg bw/day), i.e. the NOAEL in this study was considered to be 8 000 mg/kg bw/day (the highest dose tested). Notwithstanding the limited end points of this study these data indicate that ethylene-vinyl acetate copolymer wax has a low sub-chronic toxicity. The LMWF content of that polymeric additive is not known, but given the similarity between the types of polymer, the content is anticipated to be similar to the LMWF content in the ethylene vinyl acetate copolymer under evaluation (i.e. approximately 10%). Nevertheless considering, conservatively, a LMWF content of only 1% in the polymeric additive used in the 120-day study, for the LMWF of that additive an NOAEL of 80 mg/kg bw/d can be estimated, (assuming that the more heavy fraction is completely non-toxic). The Panel concluded that this NOAEL value would provide a sufficiently large margin of safety of approximately 1000 compared to the exposure to the LMWF from the ethylene vinyl acetate copolymer under evaluation at a maximum migration level of 5 mg/kg food, bearing in mind that uncertainty due to read-across should also be taken into account. This conclusion is in line with supportive data from subchronic studies on oxidised polyethylene waxes evaluated by EFSA (EFSA, 2009). These data included five 90-day rat studies each on different commercial products, with the lowest NOAEL of 500 mg/kg bw/day and a reproduction and developmental toxicity diet rat study (OECD 421) on a LMWF of oxidised polyethylene waxes with a NOAEL of 1 000 mg/kg bw/day or higher.

In the absence of data on potential accumulation and taking account of the likely hydrolysis of the substance to an ethylene-vinyl alcohol copolymer chain, the Panel considered as supporting evidence results from the studies on oxidised polyethylene waxes, which have a very low solubility in water and octanol, similar to ethylene-vinyl acetate copolymer wax. The results of these studies do not indicate an accumulation potential of oxidised polyethylene waxes, i.e. no precipitation was observed in

sensitive tissues such as liver or lymph nodes (EFSA, 2009). Therefore, the Panel concluded that similarly no accumulation of ethylene-vinyl acetate copolymer wax in man is anticipated.

CONCLUSIONS

Having considered the above-mentioned data, the CEF Panel concluded that the substance ethylene-vinyl acetate copolymer wax does not raise a safety concern for the consumer if the substance is used as additive up to 2 % w/w in only polyolefin materials and articles and the migration of low molecular weight oligomeric fraction below 1 000 Da does not exceed 5 mg/kg food.

DOCUMENTATION PROVIDED TO EFSA

1. Ethylene Vinyl Acetate, Copolymer Wax/eg A-C, Luwax. February 2013. Submitted by BASF SE.

REFERENCES

Albertini RJ, 2013. Vinyl acetate monomer (VAM) genotoxicity profile: relevance for carcinogenicity. Critical Reviews in Toxicology, 43, 8, 671-706.

Budinsky R, Gollapudi B, Albertini R J, Valentine R, Stavanja M, Teeguarden J, Fensterheim R, Rick D, Lardie T, McFadden L, Green A and Recio L, 2013. Nonlinear responses for chromosome and gene level effects induced by vinyl acetate monomer and its metabolite, acetaldehyde in TK6 cells. Environmental and Molecular Mutagenesis, 54, 9, 755-768.

EC (European Commission), 2001. Guidelines of the Scientific Committee on Food for the presentation of an application for safety assessment of a substance to be used in food contact materials prior its authorisation; http://ec.europa.eu/food/fs/sc/scf/out82_en.pdf

EFSA (European Food Safety Authority), 2009. Scientific Opinion of the Panel on food contact materials, enzymes, flavourings and processing aids (CEF) on a request related to a 23rd list of substances for food contact materials. The EFSA journal 2009, 1027-1029, 1-14.

EU-RAR (European Union Risk Assessment Report), 2008. Vinyl acetate CAS No 108-05-4 EINECS No 203-545-4. Summary Risk Assessment Report. Final report, 2008. http://echa.europa.eu/documents/10162/a3c24f78-4c8d-44e9-a424-24ac30c9c8aa

SCF (Scientific committee for food), 1999. Reports of the Scientific Committee for food (42nd series). Compilation of the evaluations of the scientific committee for food on certain monomers and additives used in the manufacture of plastics materials intended to come into contact with foodstuffs until 21 March 1997. 279pp. http://ec.europa.eu/food/fs/sc/scf/reports/scf_reports_42.pdf

HSBD (Hazardous Substances Data Bank) online, (last revision 2006/04/14). Ethylene. Available online: http://www.toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~ywjXpn:1

GLOSSARY AND ABBREVIATIONS

AFC	Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food
CAS	Chemical Abstracts Service
CEF	Scientific Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids
Da	Dalton
EC	European Commission
EEC	European Economic Community
EFSA	European Food Safety Authority
EU	European Union
EU-RAR	European Union Risk Assessment Report
FCM	Food Contact Materials
LDPE	Low Density Polyethylene
LMWF	Low Molecular Weight Fraction
Mn	Averaged Molecular Weight
Mw	Molcular Wight
NOAEL	No Observed Adverse Effect Level
OECD	Organisation of Economic Co-operation and Development
SCF	Scientific Committee on Food
SML	Specific Migration Limit
PE	Polyethylene
PET	Polyethylene Terephthalate
Po/w	Octanol/Water partition coefficient
PP	Polypropylene

SAFETY DATA SHEET

DOW CHEMICAL COMPANY LIMITED

Safety Data Sheet according to Reg. (EU) No 2015/830

Product name: ELVAX™ 770 Ethylene Vinyl Acetate Copolymer

Revision Date: 13.02.2020
Version: 4.0
Date of last issue: 05.05.2019
Print Date: 18.03.2020

DOW CHEMICAL COMPANY LIMITED encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier
Product name: ELVAX™ 770 Ethylene Vinyl Acetate Copolymer

Chemical name of the substance: Acetic acid ethenyl ester, polymer with ethene
CASRN: 24937-78-8
REACH Registration Number: Exempt

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: A polyethylene plastic - For industrial conversion as a raw material for manufacture of articles or goods.
Uses advised against: We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

1.3 Details of the supplier of the safety data sheet
COMPANY IDENTIFICATION
DOW CHEMICAL COMPANY LIMITED
STATION ROAD, BIRCH VALE, HIGH PEAK
DERBYSHIRE
England
SK22 1BR
UNITED KINGDOM

Customer Information Number: +44 (0) 1663 746518
SDSQuestion@dow.com
Fax: +44 (0) 1663 746605

1.4 EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 0031 115 694 982
Local Emergency Contact: 00 31 115 69 4982

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008:
Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008:
Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.3 Other hazards
Slipping hazard.
Dust contact with the eyes can lead to mechanical irritation.
Contact with dust can cause mechanical irritation or drying of the skin.
May form combustible dust concentrations in air.
This product contains no substances assessed to be PBT or vPvB at levels of 0.1% or higher.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

This product is a substance.
Substance name: Acetic acid ethenyl ester, polymer with ethene
CASRN: 24937-78-8
EC-No.: Polymer
No hazardous ingredients

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures
General advice:
First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air and keep comfortable for breathing; consult a physician.

Skin contact: Wash off with plenty of water. Seek first aid or medical attention as needed. If molten material comes in contact with the skin, do not apply ice but cool under ice water or running stream of water. DO NOT attempt to remove the material from skin. Removal could result in severe tissue damage. Seek medical attention immediately. Suitable emergency safety shower facility should be immediately available.

Eye contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Ingestion: If swallowed, seek medical attention. May cause gastrointestinal blockage. Do not give laxatives. Do not induce vomiting unless directed to do so by medical personnel.

4.2 Most important symptoms and effects, both acute and delayed:

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

4.3 Indication of any immediate medical attention and special treatment needed
Notes to physician: If burn is present, treat as any thermal burn, after decontamination. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media: Water spray. Alcohol-resistant foam. Carbon dioxide (CO2). Dry chemical.

Unsuitable extinguishing media: None known..

5.2 Special hazards arising from the substance or mixture

Hazardous combustion products: Carbon oxides.

Unusual Fire and Explosion Hazards: Exposure to combustion products may be a hazard to health.. Product can accumulate electrostatic charges. Static discharge in the presence of volatile or flammable mixtures presents a potential fire or explosion hazard.. May form combustible dust concentrations in air (during processing).. Molten polyethylene tends to flow or drip and will propagate fire..

5.3 Advice for firefighters

Fire Fighting Procedures: Use water spray to cool unopened containers.. Evacuate area.. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.. If material is molten, do not apply direct waterstream. Use fine water spray or foam..
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Remove undamaged containers from fire area if it is safe to do so.

Special protective equipment for firefighters: Wear self-contained breathing apparatus for firefighting if necessary.. Use personal protective equipment..

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures: Spilled material may cause a slipping hazard. Follow safe handling advice and personal protective equipment recommendations.

6.2 Environmental precautions: Discharge into the environment must be avoided. Prevent further leakage or spillage if safe to do so. Retain and dispose of contaminated wash water. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and materials for containment and cleaning up: Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable. Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

6.4 Reference to other sections:
See sections: 7, 8, 11, 12 and 13.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling: Do not breathe dust. Minimize dust generation and accumulation. Keep container closed when not in use. Keep away from heat and sources of ignition. Take precautionary measures against static discharges. Take care to prevent spills, waste and minimize release to the environment. Do not get molten material in eyes, on skin or clothing. Avoid breathing process fumes. Handle in accordance with good industrial hygiene and safety practice. Use with adequate ventilation.
Use only with adequate ventilation. This material can accumulate static charge due to its inherent physical properties and can therefore cause an electrical ignition source to vapors. In order to prevent a fire hazard, as bonding and grounding may be insufficient to remove static electricity, it isnecessary to provide an inert gas purge before beginning transfer operations. Static electricity may accumulate and ignite suspended dust causing an explosion. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres.

7.2 Conditions for safe storage, including any incompatibilities: Keep in properly labelled containers. Store in accordance with the particular national regulations.

Do not store with the following product types: Strong oxidizing agents.
Unsuitable materials for containers**:** None known.

7.3 Specific end use(s): See the technical data sheet on this product for further information.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
If exposure limits exist, they are listed below. If no exposure limits are displayed, then no values are applicable.

8.2 Exposure controls
Engineering controls: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines. Local exhaust ventilation is preferred for most operations.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields). Safety glasses (with side shields) should be consistent with EN 166 or equivalent. If there is a potential for exposure to particles which could cause eye discomfort, wear chemical goggles. Chemical goggles should be consistent with EN 166 or equivalent. If exposure causes eye discomfort, use a full-face

respirator (meeting standard EN 136) with organic vapor cartridge (meeting standard EN 14387).

Skin protection

Hand protection: Chemical protective gloves should not be needed when handling this material. Consistent with general hygienic practice for any material, skin contact should be minimized. Use gloves to protect from mechanical injury. Selection of gloves will depend on the task. Use gloves with insulation for thermal protection (EN 407), when needed.

Other protection: No precautions other than clean body-covering clothing should be needed.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. Use an approved air-purifying respirator when vapors are generated at increased temperatures or when dust or mist is present.
Use the following CE approved air-purifying respirator: When dust/mist are present use a/an Particulate filter, type P2 (meeting standard EN 143). When combinations of vapors, acids, or dusts/mists are present use a/an Organic vapor cartridge with a particulate pre-filter, type AP2 (meeting standard EN 14387).

Environmental exposure controls
See SECTION 7: Handling and storage and SECTION 13: Disposal considerations for measures to prevent excessive environmental exposure during use and waste disposal.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	
Physical state	pellets
Color	clear
Odor	ester-like
Odor Threshold	No data available
pH	Not applicable
Melting point/range	No data available
Freezing point	No data available
Boiling point (760 mmHg)	Not applicable
Flash point	**open cup** 260 °C *Cleveland open cup - COC*
Evaporation Rate (Butyl Acetate = 1)	Not applicable
Flammability (solid, gas)	May form combustible dust concentrations in air during processing, handling or other means.
Lower explosion limit	Not applicable
Upper explosion limit	Not applicable
Vapor Pressure	Not applicable
Relative Vapor Density (air = 1)	Not applicable
Relative Density (water = 1)	0.93

Water solubility	negligible
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	No data available
Decomposition temperature	>230 °C Decomposition can occur with extended residence time in the extruder.
Dynamic Viscosity	Not applicable
Kinematic Viscosity	Not applicable
Explosive properties	No data available
Oxidizing properties	The substance or mixture is not classified as oxidizing.

9.2 Other information

Molecular weight	No data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity: Not classified as a reactivity hazard.

10.2 Chemical stability: Stable under normal conditions.

10.3 Possibility of hazardous reactions: Dust can form an explosive mixture in air.

10.4 Conditions to avoid: None known.

10.5 Incompatible materials: Incompatible with strong bases and oxidizing agents.

10.6 Hazardous decomposition products:
Decomposition products can include and are not limited to: Carbon monoxide. Hydrocarbons. Organic acids. Aldehydes. Acrolein. Alcohols. Ketones.

SECTION 11: TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

11.1 Information on toxicological effects

Information on likely routes of exposure
Eye contact, Skin contact, Ingestion.

Acute toxicity (represents short term exposures with immediate effects - no chronic/delayed effects known unless otherwise noted)

Acute oral toxicity
Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts. May cause choking if swallowed.

As product: Single dose oral LD50 has not been determined.

Typical for this family of materials.
LD50, Rat, > 5,000 mg/kg Estimated.

Acute dermal toxicity
No adverse effects anticipated by skin absorption.

As product: The dermal LD50 has not been determined.

Typical for this family of materials.
LD50, Rabbit, > 2,000 mg/kg Estimated.

Acute inhalation toxicity
No adverse effects are anticipated from single exposure to dust. Vapors released during thermal processing may cause respiratory irritation.

As product: The LC50 has not been determined.

Skin corrosion/irritation
Typical for this family of materials.
Prolonged contact is essentially nonirritating to skin.
Mechanical injury only.
Under normal processing conditions, material is heated to elevated temperatures; contact with the material may cause thermal burns.

Serious eye damage/eye irritation
Typical for this family of materials.
Solid or dust may cause irritation or corneal injury due to mechanical action.
Elevated temperatures may generate vapor levels sufficient to cause eye irritation. Effects may include discomfort and redness.

Sensitization
For skin sensitization:
No relevant data found.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Aspiration Hazard
Based on physical properties, not likely to be an aspiration hazard.

Chronic toxicity (represents longer term exposures with repeated dose resulting in chronic/delayed effects - no immediate effects known unless otherwise noted)

Specific Target Organ Systemic Toxicity (Repeated Exposure)
No relevant data found.

Carcinogenicity

No relevant data found.

Teratogenicity
No relevant data found.

Reproductive toxicity
No relevant data found.

Mutagenicity
No relevant data found.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

General Information
No data is available on the product itself. Toxicity is expected to be low based on insolubility in water.

12.1 Toxicity

Acute toxicity to fish
Not expected to be acutely toxic, but material in pellet or bead form may mechanically cause adverse effects if ingested by waterfowl or aquatic life.

12.2 Persistence and degradability

Biodegradability: This water-insoluble polymeric solid is expected to be inert in the environment. Surface photodegradation is expected with exposure to sunlight. No appreciable biodegradation is expected.

12.3 Bioaccumulative potential

Bioaccumulation: No bioconcentration is expected because of the relatively high molecular weight (MW greater than 1000).

12.4 Mobility in soil

In the terrestrial environment, material is expected to remain in the soil.
In the aquatic environment, material is expected to float.

12.5 Results of PBT and vPvB assessment

This substance has not been assessed for persistence, bioaccumulation and toxicity (PBT).

12.6 Other adverse effects

No relevant data found.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
For uncontaminated material the disposal options include mechanical and chemical recycling or energy recovery. In some countries landfill is also allowed. For contaminated material the options remain the same, although additional evaluation is required. For all countries the disposal methods must be in compliance with national and provincial laws and any municipal or local by-laws. All

disposal methods must be in compliance with the EU framework Directives 2008/98/EC and their subsequent adaptations, as implemented in National Laws and Regulations, as well as EU Directives dealing with priority waste streams. Transboundary shipment of wastes must be in compliance with Regulation (EC) No 1013/2006 and subsequent modifications.

The definitive assignment of this material to the appropriate EWC group and thus its proper EWC code will depend on the use that is made of this material. Contact the authorized waste disposal services.

SECTION 14: TRANSPORT INFORMATION

Classification for ROAD and Rail transport (ADR/RID):

14.1	**UN number**	Not applicable
14.2	**UN proper shipping name**	Not regulated for transport
14.3	**Transport hazard class(es)**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not considered environmentally hazardous based on available data.
14.6	**Special precautions for user**	No data available.

Classification for SEA transport (IMO-IMDG):

14.1	**UN number**	Not applicable
14.2	**UN proper shipping name**	Not regulated for transport
14.3	**Transport hazard class(es)**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not considered as marine pollutant based on available data.
14.6	**Special precautions for user**	No data available.
14.7	**Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code**	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

14.1	**UN number**	Not applicable
14.2	**UN proper shipping name**	Not regulated for transport
14.3	**Transport hazard class(es)**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not applicable
14.6	**Special precautions for user**	No data available.

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional

transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

REACh Regulation (EC) No 1907/2006
Polymers are exempted from registration under REACH. All relevant starting materials and additives have been either registered, or are exempt from registration according to Regulation (EC) No. 1907/2006 (REACH)., The aforementioned indications of the REACH registration status are provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. It is the buyer´s/user´s responsibility to ensure that his/her understanding of the regulatory status of this product is correct.

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.
Listed in Regulation: Not applicable

15.2 Chemical safety assessment
No Chemical Safety Assessment has been carried out for this substance/mixture.

SECTION 16: OTHER INFORMATION

Other information
Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling.

Revision
Identification Number: 89003050 / A279 / Issue Date: 13.02.2020 / Version: 4.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Full text of other abbreviations
ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road; AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration

associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Information Source and References
This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DOW CHEMICAL COMPANY LIMITED urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.
GB