Toxicological profile for

Cellulose acetate

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

No data available to us at this time.

1.2. Synonyms

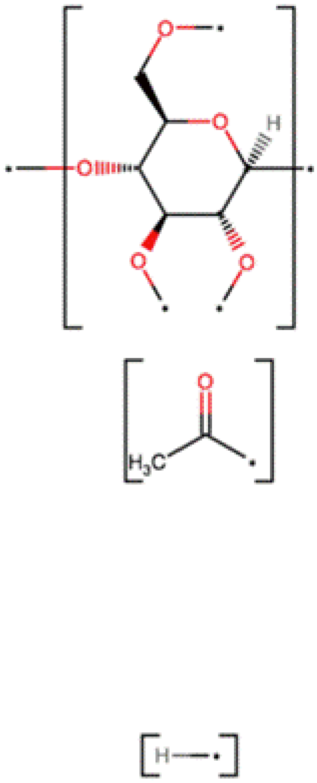
Cellulose acetate; EASTMAN cellulose acetate CA 398-10NF; A 432-130B; Acetate cotton; Acetate ester of cellulose; Acetic acid, cellulose ester; Acetose; Acetyl 35; Acetylcellulose; Allogel; Ampacet C/A; Bioden; Ca (cellulose acetate); Cellidor; Cellidor A; Cellit K 700; Cellit L 700; Cellulose 2,5-acetate; Cellulose monoacetate; Cellulose, 2,5-diacetate; Cellulose, acetate; Cellulose, diacetate; Cellulose, triacetate; Crellate; DP 02; DP 06; Duoflux; E 376-40; E 383-40; E 394-30; E 394-40; E 394-45; E 394-60; E 398-10; E-400-25; Eastman 298-10; Etrol OEM; HSDB 964; Monoacetylcellulose; Nicollembal; Nixon C/A; PP 612; PP 613; PP 628; Plastacele; Stripmix; Strux; Tenite I; UNII-3J2P07GVB6; Vladipor; t-Cellit; YM 10; Tenite acetate 105MS (ChemIDplus)

1.3. Molecular formula

C2 H4 O2.x-Unspecified (ChemIDplus)

1.4. Structural Formula

(ChemIDplus)



1.5. Molecular weight (g/mol)

minimum 28,000 (US EPA, 1995)

1.6. CAS registration number

1.7. Properties

1.7.1. Melting point

(°C): Approx 260; 230-250 (Ash & Ash, 2004)

1.7.2. Boiling point

(°C): Not applicable.

1.7.3. Solubility

Almost insoluble in water.

1.7.4. pKa

No data available to us at this time.

1.7.5. Flashpoint

(°C): >300

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): 304 (Ash & Ash, 2004)

1.7.9. Stability

Stable at normal temperatures and pressure.

1.7.10. Vapor pressure

Not applicable

1.7.11. log Kow

No data available to us at this time.

2. General information

2.1. Exposure

Probable Routes of Human Exposure:

Dry-spinning is simpler operation & gives greater production but solvents evaporated in dry-spinning must be exhaust ventilated to avoid risk of fire & explosion & possible health hazard to workers because of their toxic nature. /artificial fibers/ [International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 526] **PEER REVIEWED**

As taken from HSDB (2002), available at https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

Industrial processes with risk of exposure: leather tanning and processing; paintings (pigments, binders and biocides); plastic composites manufacturing; sewer and wastewater treatment; textiles (printing, dyeing, or finishing). Activities with risk of exposure: preparing and mounting animal skins (taxidermy).

As taken from HazMap, 2018 available at https://hazmap.nlm.nih.gov/

Uses:

Excipient for pharmaceuticals, enteric coatings, in coatings for leather, paper, glass, plastic, wire screen and electrical wiring, in adhesives, paint removers, as barrier and release coatings for pressure-sensitive tape, in food contact materials, paper, paperboard, waterproofing and sizing of textiles, photographic film and in closures for sealing gaskets for food containers (Ash M and Ash I, 2004).

Cellulose acetate is reported to be used in cosmetics at concentrations of 0.01-5% with the highest levels found in foundations and suntan preparations (CIR, 2009).

Used as a film-forming agent in cosmetics in the EU. As taken from CosIng (Cosmetic substances and ingredients database). Available at http://ec.europa.eu/growth/tools-databases/cosing/, accessed May 2019.

“Cellulose acetate (CA) has been a material of choice for spectrum of utilities across different domains ranging from high absorbing diapers to membrane filters. Electrospinning has conferred a whole new perspective to polymeric materials including CA in the context of multifarious applications across myriad of niches. In the present review, we try to bring out the recent trend (focused over last five years' progress) of research on electrospun CA fibers of nanoscale regime in the context of developmental strategies of their blends and nanocomposites for advanced applications. In the realm of biotechnology, electrospun CA fibers have found applications in biomolecule immobilization, tissue engineering, bio-sensing, nutraceutical delivery, bioseparation, crop protection, bioremediation and in the development of anti-counterfeiting and pH sensitive material, photocatalytic self-cleaning textile, temperature-adaptable fabric, and antimicrobial mats, amongst others. The present review discusses these diverse applications of electrospun CA nanofibers.” As taken from Konwarh R et al. 2013. Biotechnol. Adv. 31(4), 421-37. PubMed, 2014 available at http://www.ncbi.nlm.nih.gov/pubmed/23318668

“Cellulose plastic materials are used extensively in display packaging, irrigation pipe, frames for eyeglasses, and in rayon and acetate textiles.”

As taken from Wilson and McCormick, 1955. Ind. Med. Surg. 24, 491-496.

National Occupational Exposure Survey (1981 - 1983)
Estimated Numbers of Employees Potentially Exposed to Cellulose Acetate (CAS RN 9004-35-7) by Occupation*

Code	Occupation Description (1980)	Total # Employees (Male & Female)	Total # Female Employees
019	MANAGERS AND ADMINISTRATORS, N.E.C.	130	130
073	CHEMISTS, EXCEPT BIOCHEMISTS	1,690	682

075	GEOLOGISTS AND GEODESISTS	28	
083	MEDICAL SCIENTISTS	63	49
095	REGISTERED NURSES	30,741	22,212
096	PHARMACISTS	111	47
103	PHYSICAL THERAPISTS	210	180
188	PAINTERS, SCULPTORS, CRAFT-ARTISTS, AND ARTIST PRINTMAKERS	108	72
203	CLINICAL LABORATORY TECHNOLOGISTS AND TECHNICIANS	1,596	336
207	LICENSED PRACTICAL NURSES	3,727	3,680
213	ELECTRICAL AND ELECTRONIC TECHNICIANS	18	
308	COMPUTER OPERATORS	2,260	282
335	FILE CLERKS	331	
426	GUARDS AND POLICE, EXC. PUBLIC SERVICE	32	
446	HEALTH AIDES, EXCEPT NURSING	780	514
447	NURSING AIDES, ORDERLIES, AND ATTENDANTS	1,773	1,624
453	JANITORS AND CLEANERS	843	36
515	AIRCRAFT MECHANICS, EXC. ENGINE	76	
547	SPECIFIED MECHANICS AND REPAIRERS, N.E.C.	365	28
575	ELECTRICIANS	263	
633	SUPERVISORS, PRODUCTION OCCUPATIONS	188	28

637	MACHINISTS	2,156	431
706	PUNCHING AND STAMPING PRESS MACHINE OPERATORS	32	
709	GRINDING, ABRADING, BUFFING, AND POLISHING MACHINE OPERATORS	251	100
719	MOLDING AND CASTING MACHINE OPERATORS	2,234	1,685
735	PHOTOENGRAVERS AND LITHOGRAPHERS	50	4
736	TYPESETTERS AND COMPOSITORS	6,095	1,292
737	MISCELLANEOUS PRINTING MACHINE OPERATORS	271	36
743	TEXTILE CUTTING MACHINE OPERATORS	97	32
744	TEXTILE SEWING MACHINE OPERATORS	4,063	4,063
756	MIXING AND BLENDING MACHINE OPERATORS	781	
759	PAINTING AND PAINT SPRAYING MACHINE OPERATORS	257	43
769	SLICING AND CUTTING MACHINE OPERATORS	13,049	5,176
774	PHOTOGRAPHIC PROCESS MACHINE OPERATORS	63	16
777	MISCELLANEOUS MACHINE OPERATORS, N.E.C.	1,373	619
785	ASSEMBLERS	5,465	3,628
796	PRODUCTION INSPECTORS, CHECKERS, AND EXAMINERS	86	13
859	MISCELLANEOUS MATERIAL MOVING EQUIPMENT OPERATORS	263	148
888	HAND PACKERS AND PACKAGERS	97	97
889	LABORERS, EXCEPT CONSTRUCTION	1,493	

TOTAL	83,508	47,285

*(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/20111028115705/http://www.cdc.gov/noes/noes2/x6205occ.html

2.2. Combustion products

No data available to us at this time.

2.3. Ingredient(s) from which it originates

HYDROLYSIS OF CELLULOSE TRIACETATE IN AQUEOUS ACETIC ACID USING A SULFURIC ACID CATALYST [SRI] **PEER REVIEWED**

Reacting cellulose (wood pulp or cotton linters) with acetic acid or acetic anhydride, with sulfuric acid catalyst. The cellulose is fully acetylated (three acetate groups per glucose unit) and at the same time the sulfuric acid causes appreciable degradation of the cellulose polymer so that the product contains only 200-300 glucose units per polymer chain. [Lewis, R.J., Sr (Ed.). Hawley's Condensed Chemical Dictionary. 13th ed. New York, NY: John Wiley & Sons, Inc. 1997., p. 228] **PEER REVIEWED**

Cellulose acetates obtained by treating cellulose with acetic anhydride at various temps for different lengths of time to produce amorphous white solid material in granular, flake, or powder form from which fibers may be formed by extrusion. [Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 2018] **PEER REVIEWED**

As taken from HSDB (2002), available at https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

3. Status in legislation and other official guidance

FIFRA Requirements:

Cellulose acetate is exempted from the requirement of a tolerance when used as a pesticide rate-release regulating agent in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only. [40 CFR 180.1001(d) (7/1/2000)] **PEER REVIEWED**

As taken from HSDB (2002), available at https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

Cellulose acetate can be used as an inert ingredient in pesticide products that are exempt from Federal regulation under the Minimum Risk Exemption regulations in 40 CFR 152.25(f) (US EPA 2019). It is also listed in the US EPA Inert Finder Database (2019) as approved for food and non-food use pesticide products. For food use, it is regulated under 40 CFR Part 180.950e (Tolerances and Exemptions for Pesticide Chemical Residues in Food. Tolerance exemptions for minimal risk active and inert ingredients) (US EPA, 2019).

Cellulose acetate is included on the FDA's list of Substances Added to Food (formerly EAFUS) as an emulsifier or emulsifier salt and a stabilizer or thickener, and is covered under 21 CFR sections 175.300 (Resinous and polymeric coatings) and 182.90 (Substances migrating to food from paper and paperboard products) (FDA, 2019a,b).

Cellulose, acetate is pre-registered under REACH ("envisaged registration deadline 31 May 2018") (ECHA, 2018).

Cellulose, acetate (CAS RN 9004-35-7) is not classified for packaging and labelling under Regulation (EC) No. 1272/2008 (ECHA, 2019).

Cellulose acetate (CAS RN 9004-35-7) is listed in the US EPA Toxic Substances Control Act (TSCA) inventory and is exempt from reporting under TSCA CDR (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 2016 CDR Full Exempt list are available at https://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do

Cellulose acetate (CAS RN 9004-35-7) is included on the US FDA's list of inactive ingredients for approved drug products. It is permitted for use as an ingredient in various products, at the following maximum potency per unit doses:

Inactive Ingredient	**Route**	**Dosage Form**	**CAS Number**	**UNII**	**Maximum Potency per unit dose**
CELLULOSE ACETATE	ORAL	CAPSULE	9004357	3J2P07GVB6	22.15MG

CELLULOSE ACETATE	ORAL	TABLET	9004357	3J2P07GVB6	25.2mg
CELLULOSE ACETATE	ORAL	TABLET (IMMED./COMP. RELEASE), UNCOATED, CHEWABLE	9004357	3J2P07GVB6	6.86MG
CELLULOSE ACETATE	ORAL	TABLET, CONTROLLED RELEASE	9004357	3J2P07GVB6	27.72MG
CELLULOSE ACETATE	ORAL	TABLET, EXTENDED RELEASE	9004357	3J2P07GVB6	50.16MG
CELLULOSE ACETATE	ORAL	TABLET, SUSTAINED ACTION	9004357	3J2P07GVB6	37.32MG
CELLULOSE ACETATE	ORAL	TABLET, SUSTAINED ACTION, COATED	9004357	3J2P07GVB6	44.6MG

As taken from FDA, 2019c

Cellulose acetate (CAS RN 9004-35-7) has been “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).

Cellulose, acetate (CAS RN 9004-35-7) is included on the New Zealand Inventory of Chemicals and may be used as a single component chemical under an appropriate group standard (NZ EPA, 2006).

4. Metabolism/Pharmacokinetics

4.1. Metabolism/metabolites

No data available to us at this time.

4.2. Absorption, distribution and excretion

“The minimum number average molecular weight of cellulose acetate is 28,000. Substances with molecular weights greater than 400 generally are not absorbed through the intact skin, and substances with molecular weights greater than 1,000 generally are not absorbed through the intact gastrointestinal tract. Chemicals not absorbed through skin or GI tract generally are incapable of eliciting a toxic response.” As taken from US EPA. 1995. Federal Register 60(163), 43738 available at https://www.gpo.gov/fdsys/pkg/FR-1995-08-23/pdf/95-20889.pdf

4.3. Interactions

No data available to us at this time.

5. Toxicity

5.1. Single dose toxicity

Range of Toxicity:

These agents are considered not to be a toxic hazard in the quantities available through normal exposure or package size. [Rumack BH POISINDEX(R) Information System Micromedex, Inc., Englewood, CO**,** 2009**;** CCIS Volume 142, edition expires Nov, 2009. Hall AH & Rumack BH (Eds): TOMES(R) Information System Micromedex, Inc., Englewood, CO, 2009; CCIS Volume 142, edition expires Nov, 2009.] **PEER REVIEWED**

As taken from HSDB (2002), available at https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

5.2. Repeated dose toxicity

Subchronic Oral Toxicity of Cellulose Acetate in Rats (Abstract). The potential of cellulose-acetate (9004-35-7) to produce adverse effects was evaluated in CD-Sprague-Dawley-rats. Rats were fed concentrations of cellulose-acetate in their diets equivalent to 500, 2500, or 5000mg/kg for 94 to 96 consecutive days. No mortality or compound related toxicity was observed. Autopsies were conducted at week 13. The results of physical observations, ophthalmology, body weight, food consumption, hematology, clinical chemistry, organ to body weight ratios, gross pathology and histopathology revealed no evidence of an adverse effect related to treatment with cellulose-acetate**.** As in other studies of cellulose derivatives, the only consistent effect of very high doses in the feed appeared to be a reduction in the nutritional value of the feed which was manifested as a decrease in body weight gain or an increase in food consumption. The authors conclude that cellulose-acetate is nontoxic in rats at doses up to 5000mg/kg/day or an equivalent concentration of 7.2 to 10.0% of the diet . As taken from Thomas WC et al. Food and Chemical Toxicology, 1991, Vol. 29, No. 7, pages 453-458. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/1894211?dopt=Abstract

Human Toxicity Excerpts:

TOXICITY IS NOT ASSOC WITH THESE POLYMERS. SYNTHETIC PROCESS MAY INVOLVE EXPOSURE TO SOLVENTS & ORG ACID COMPD WHICH MAY RESULT IN SKIN REACTIONS. /CELLULOSICS/ [Hamilton, A., and H. L. Hardy. Industrial Toxicology. 3rd ed. Acton, Mass.: Publishing Sciences Group, Inc., 1974., p. 337] **PEER REVIEWED**

As taken from HSDB (2002), available at https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

5.3. Reproduction toxicity

Species	Test conditions	Effects	Reference
Rat, white (11 treated, 19 control females)	Early Soviet paper, translated for the US Environmental Protection Agency. Throughout pregnancy, animals were given an aqueous extract of a cellulose acetate film treated with formamide. Animals killed on the 19th day of pregnancy and embryos examined. An inadequate and poorly described study. The dose was not specified, nor was the exposure route (possibly the extract was given as a drinking water substitute). No further details available.	Reported increase in embryonic death, especially preimplantation, and reduced foetal length. This was a test on extractable material rather than on cellulose acetate molecule itself, and the chemicals potentially responsible for the reported effects were not identified.	Shtannikov et al. 1972.

5.4. Mutagenicity

In vivo				
Species	**Test conditions**	**Endpoint**	**Result**	**Reference**

Mouse, NMRI (3 males per group)	A comet assay study of compounds' ability to inhibit DNA damage caused by subsequent exposure to tobacco smoke. Test chemicals were given, by gavage, in a vehicle (0.5% aqueous cellulose acetate). A control group received the vehicle only (equivalent to a cellulose acetate dose of 50 mg/kg bw) daily for 8 days. 45 min after each dose, the animals were exposed for 10 min to either fresh air or cigarette smoke. DNA damage was assessed in the lymphocytes, liver and lung. There was no untreated control group.	DNA damage	-ve The use of cellulose acetate as a vehicle suggests it was without effect.	Villard et al. 1998.
Rat, white, numbers unspecified	Early Soviet paper translated for the US Environmental Protection Agency. Bone marrow mitotic index was measured in rats given brief access to diet containing 1% of two cellulose acetate polymers. No further details were available. Study is irrelevant but is included here because the investigators claimed (incorrectly) that a change in mitotic index was an indication of mutation.	None	Not relevant Mitotic index was not affected but this is not relevant to genotoxicity	Shtannikov et al. 1972.
Drosophila melanogaster	Early Soviet paper, translated for the US Environmental Protection Agency. Aqueous extracts of two cellulose acetate film samples (described as treated with formamide or pyridine) were added to the feed at concentrations of 0.8, 4 and 20%. Treated males and females were mated, the offspring raised on untreated nutrient and cross-bred to produce a third generation. Offspring were assessed for mutations (white eye mutants and sex-linked recessive lethal [SLRL] mutations, indicated by reduced viability). The study explored the toxicity of extractable material (not further specified) rather than the cellulose acetate polymer molecule itself. A poorly described study.	Mutation	? No effect on eye colour mutation rate. Dose-related decreases in offspring viability, possible effect on SLRL rate, in third generation. The extracted chemicals responsible were not identified.	Shtannikov et al. 1972.
+ve, positive; -ve, negative; ?, equivocal; with, with metabolic activation; without, without metabolic activation				

5.5. Cytotoxicity

“REACTION OF VAGINAL TISSUE OF RABBITS TO INSERTED SPONGES MADE OF ACETYLCELLULOSE. VAGINAL WALL & ITS MUCOSAL LINING SHOWED SIGNS OF CYTOTOXICITY, EXTRACTS OF SPONGES TESTED FOR CYTOTOXICITY SHOWED SIGNIFICANT INHIBITION OF (3)H-THYMIDINE UPTAKE. [CHVAPIL M ET AL; J BIOMED MATER RES 13 (1): 1-13 (1979)] **PEER REVIEWED.”

As taken from HSDB (2002), available at https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

“Based on accumulating evidence that the 3D topography and the chemical features of a growth surface influence neuronal differentiation, we combined these two features by evaluating the cytotoxicity, proliferation, and differentiation of the rat PC12 line and human neural stem cells (hNSCs) on chitosan (CS), cellulose acetate (CA), and polyethersulfone (PES)-derived electrospun nanofibers that had similar diameters, centered in the 200-500 nm range. None of the nanofibrous materials were cytotoxic compared to 2D (e.g., flat surface) controls; however, proliferation generally was inhibited on the nanofibrous scaffolds although to a lesser extent on the polysaccharide-derived materials compared to PES....” As taken from Du J et al. 2014. Carbohydr. Polym. 99, 483-90. PubMed, 2014 available at http://www.ncbi.nlm.nih.gov/pubmed/24274534?dopt=AbstractPlus

5.6. Carcinogenicity

Species	Test conditions	Evidence of carcinogenicity	Reference
Humans (approximately 9000 men)	A prospective cohort study of men employed at a chemical plant in Tennessee manufacturing chemicals, fibres and plastics. Workers employed on 31st December 1971 were followed until 1982 and the cancer mortality rates were compared with those for the general population of Tennessee state, the United States, and a group of non-exposed employees from the same company. The mean and median lengths of employment for the cohort were 24.8 and 22 years respectively. Workers employed in the acetate yarn, cellulose esters, filter products and tenite plastics	None Total number of cancer deaths (176) was lower than that predicted from the general state (227) and national population (224), and similar to that expected for non-exposed workers (179). No specific cancer type was increased. Lung/respiratory cancer deaths (63) were significantly lower than would be expected based on state (94.3) and national (88.0) rates, and not significantly higher than expected based on non-exposed employees (51.6). Similar results were reported for a subcohort of workers employed for at least 20 years at the start of the study.	Pifer et al. 1986.

	divisions were exposed to cellulose acetate amongst other chemicals; the primary exposures in the tenite plastics division being to cellulose esters and plasticizers.	Analysis by work division found similar decreases in all cancer and lung cancer mortality rates amongst subcohorts working with acetate yarn, cellulose esters, filter products and tenite plastics (when compared with state rates).	
Human (7,487 men and 2,724 women)	A retrospective cohort study of workers employed in a Quebec plant producing fibres made from extruding cellulose acetate and manufactured textiles from these fibres. Workers employed at the plant for at least 1 year and either working on 1 January 1947 or employed between 1 January 1947 and 31 December 1977, were followed until 31 December 1986. Standard mortality rates (SMRs) were calculated (for “inception” and “prevalent” subcohorts, as well as combined) based on the entire province of Quebec. Mean length of employment was 12.5 years for males and 6.3 years for females. No data on exposure levels were given, although workers in the cellulose acetate fibre manufacturing unit were mainly exposed to acetone, cellulose acetate dust, pyrolysis fumes from cellulose acetate and noise.	No clear evidence SMR for reticulum cell sarcoma was significantly increased (SMR 2.82, 95% CI 1.03-6.13) for men in the prevalent subcohort only. There were small, non-significant increases in deaths from malignant melanoma, reticulum cell sarcoma, multiple myeloma and leukaemias in men, and rectal cancer, breast cancer and leukaemias in women, but these were based on small numbers (1-8). Risk of dying from “any cancer” (RR 1.32, 95% CI 1.03-1.67) or non-Hodgkin’s lymphomas (RR 4.28, 95% CI 1.18-14.89; 6 cases) were increased in those who had ever worked in the cellulose acetate fibre manufacturing unit. Non-significant increases in risk of death were found for reticulum cell sarcoma and liver and gallbladder cancer but the actual numbers were small (3-4). There was no association between cancer and duration of employment.	Goldberg & Thériault, 1994a.
Human (7,487 men and 2,724 women)	A standard mortality and nested case-control analyses of colorectal cancer amongst the cohort of synthetic textiles workers described above. The status of the workers was ascertained from January 1 1947 until December 31 1986 and the number of deaths from colorectal cancer compared with the mortality rates for the province of Quebec. In the case-control analyses, the incidence of, and mortality from, colon tumours, rectal cancers and combined colorectal cancers (at any age) amongst the cohort were assessed. Each case was matched and compared with 5 controls selected from the cohort.	Some, not convincing, evidence for a possible association with work in the cellulose acetate fibre manufacturing unit. In the whole cohort, there was no increase in SMR in men (0.69, 95% CI 0.52-0.92, 50 deaths) or women (1.02, 95% CI 0.57-1.69, 15 deaths). For men, the relative risk tended to increase with length of employment. A non-significant increase in risk of mortality from colorectal cancer was reported for men (RR 1.83, 95% CI 0.87-3.57) and women (RR 2.92, 95% CI 0.52-10.81) ever employed in the cellulose acetate fibre manufacturing unit when compared with all other processing units combined, but risk	Goldberg & Thériault, 1994b.

	91 cases of colorectal cancer were identified amongst the males and 18 cases amongst the females. 18 cases occurred in males employed in the cellulose acetate manufacturing unit	was not related to duration of employment. In the case-control analyses, RRs for the cellulose acetate unit (using 10-yr lag models) for each length of duration category were above unity, but not to a statistically significant degree.	

“Foreign-body (FB) carcinogenesis is a classic model of multistage tumour development in rodents. Previous studies have demonstrated that the physical characteristics of the implant, and not the chemical composition, are the critical determinants of tumour development. The recent controversy over silicone breast implants has raised questions regarding the potential carcinogenicity of lifetime tissue exposure to silicone products. The present study was designed to determine whether the inflammatory and fibrotic reactions associated with silicone implants are due to a non-specific foreign-body reaction or whether these responses reflect the unique chemical composition of silicone. F344 rats were implanted subcutaneously with one of three biomaterials: silicone elastomer (Group 1); impermeable cellulose acetate filters (Group 2, positive control); or porous cellulose acetate filters (Group 3, negative control). “The silicone and cellulose implants of Groups 1 and 2 have been previously shown to induce fibrosarcomas in rodents, whereas the porous cellulose acetate implants of Group 3 have been shown to be non-carcinogenic. One week and two months after implantation, the pericapsular tissues were evaluated using histopathological and in situ immunohistochemical analyses. Endpoints included expression of leucocyte antigens CD4 (T helper/inducer), CD8 (T suppressor/cytotoxic) and CD11 b/c (macrophage), proliferating cell nuclear antigen (PCNA) as an indicator of proliferation, and in situ end-labelling (ISEL) of 3'OH DNA strand breaks as an indicator of DNA damage and apoptosis. The results indicated that the acute and chronic cellular responses to silicone (Group 1) were not different from impermeable cellulose filters (Group 2) of identical size and shape, suggesting that these responses were not unique to silicone. The inflammatory response to the carcinogenic cellulose and silicone implants (Groups 1 and 2) was attenuated and associated with the formation of a thick fibrotic capsule. In contrast, the porous cellulose filters (Group 3) induced a markedly different cellular response in which the inflammatory reaction was more extensive, prolonged and associated with minimal fibrosis. Within the fibrotic capsule surrounding the tumorigenic implants, but not the non-tumorigenic implants, cell proliferation and apoptotic cell death were increased and associated with persistent DNA strand breaks. Taken together, the results suggest that the micrometre-scale surface morphology of the implant determines the nature of the subsequent cellular response which may predispose to tumour development. Further, these studies serve to emphasize the critical importance of appropriate physical controls in studies designed to evaluate carcinogenic or autoimmune manifestations associated with silicone implants in order to rule out the contribution of the chronic foreign-body reaction”. As taken from James SJ et al. Biomaterials. 1997, May; 18(9):667-75. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/9151998

5.7. Irritation/immunotoxicity

Effect of cellulose acetate materials on the oxidative burst of human neutrophils (Abstract). Following adverse clinical events involving seven patients undergoing renal dialysis using 12-year-old cellulose acetate hemodialyzers, this in vitro study was proposed in an effort to characterize the inflammatory response to the constituent cellulose acetate (CA) fiber materials. Chemiluminescence (CL) and apoptosis assays were used to determine whether human neutrophils were activated by CA fiber materials and/or are sensitive to degradation/alteration of these fibers over time. Furthermore, the study examined in vitro assays with human neutrophils using a CA film, the solvents used in the film preparation and CA resin. The film could be cut to identical sized pieces in an effort to compare hemodialysis material effects in standardized amounts. For the CL assays, 60-min exposure was followed by secondary stimulation with n-formyl-met-leu-phe (fMLP) or phorbol-12-myristate-13-acetate (PMA). Short-term exposure (60-min postintroduction to CA materials) increased the inflammatory response as measured by the respiratory burst of neutrophils (p < or =.05), with CA fiber exposure significantly compared with cells alone. There was a trend toward an increased response with exposure to older fibers with secondary PMA stimulation. Apoptosis was increased 12% with exposure to the more aged fibers versus 2% with the new fibers. The fiber storage component, glycerol, significantly inhibited the oxidative response (p < or =.001; > or =80% suppression with concentrations of 5-20%). The solvents used in film preparation, N,N-dimethylacetamide and tetrahydrofuran, produced greater than a 70% and 60% suppression, respectively, of CL activity for all concentrations > or =1%. More work is needed to determine the specific nature of the interaction of inflammatory cells with CA materials, but early evidence suggests that neutrophils are activated by CA and display an altered response to more aged fibers. As taken from Moore MA et al. J Biomed Mater Res. 2001, Jun 5; 55(3):257-65. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/11255178

“In September 1996, seven patients at Hospital A suffered conjunctivitis, hearing loss, diminished vision, and headaches 7-24 h after hemodialysis treatment. Eleven-year-old dialysis modules were identified as a common link between these patients. Degradation of the cellulose acetate (CA) material was identified as the cause of this incident. Degradation products were characterized from retrieved CA dialysis membranes. A series of synthesized CA degradation products was tested in vitro to assess toxicity. Based on the toxicity of the material preparations to the cells, animal tests were performed on selected CA degradation extracts and compared to extracts from actual dialysis membranes. Rabbits were IV-injected with extracts from a 13-year-old dialyzer, synthesized model compounds, and compared to controls. Ophthamological evaluation of the rabbits showed eye injury (iritis/ciliary flush) when the animals were treated with the old dialyzer or synthesized model compounds. Isolation and characterization of a toxic fraction from both of these extracts strongly indicated that oxidative stress at some point in the storage or manufacture of CA dialyzers created degradation products that reproduced some of the patient symptoms identified at Hospital A”. As taken from Lucas AD et al. J Biomed Mater Res. 2000, Sep; 53(5):449-56. PubMed, 2009 available at https://www.ncbi.nlm.nih.gov/pubmed/10984691

“Ulcerative colitis and Crohn's disease are the two most prevalent inflammatory bowel diseases. In both cases, the medically refractory and steroid-dependent type presents a therapeutic challenge. To help resolve this problem, a mainly Japanese team developed a new therapeutic option. There are two systems, both of which are able to selectively remove the main mediators of the disease, namely the activated pro-inflammatory cytokineproducing granulocytes and monocytes/macrophages, from the patient's blood circulation (GMA = granulocyte monocyte apheresis). One of the two systems is the Adacolumn((®)) (Immunoresearch Laboratories, Takasaki, Japan) consisting of the ADA-monitor and a single-use column, which contains approximately 35,000 cellulose acetate beads. The exact mode of action is not yet sufficiently understood, but however, a modulation of the immune system takes place. As a result, less pro-inflammatory cytokines are released. Furthermore, the production of anti-inflammatory interleukin-1 receptor antagonist is increased, and the apoptosis of granulocytes boosted. The decreased LECAM-1-expression on leukocytes impedes the leukotaxis to the inflamed tissue, and CD10-negative immature granulocytes appear in the peripheral blood. Another effect to be mentioned is the removal of the peripheral dendritic cells and the leachate of regulatory T cells (T-regs). The second system is the Cellsorba((®)) FX Filter (Asahi Medical, Tokyo, Japan). The range of efficiency, the indication, and the procedure are very similar to the Adacolumn. Solely the additional removal of lymphocytes can possibly limit the implementation since lymphopenia can increase the risk of autoimmune disease. Both systems provide a low-risk therapy with few adverse reactions. ASFA recommendations for GMA in inflammatory bowel disease are 2B due to the fact that not enough randomized double-blind studies are available to proof the efficacy of this treatment". As taken from Leitner G et al. 2012. Trans. med. Hemother. 339, 246-252. PubMed, 2013 available at http://www.ncbi.nlm.nih.gov/pubmed/22969694

Sensitization

The literature contains a few papers reporting cases of allergic contact dermatitis provoked by spectacle frames containing cellulose acetate, or by a cellulose acetate membrane (Caravaca et al. 1987; Hausen & Jung, 1985; Kalensky & Jiraskova, 1980; Nakada & Maibach, 1998).

5.8. All other relevant types of toxicity

Cigarettes with defective filters marketed for 40 years: what Philip Morris never told smokers (Abstract).

"BACKGROUND: More than 90% of the cigarettes sold worldwide have a filter. Nearly all filters consist of a rod of numerous (> 12 000) plastic-like cellulose acetate fibres. During high speed cigarette manufacturing procedures, fragments of cellulose acetate that form the mouthpiece of a filter rod become separated from the filter at the end face. The cut surface of the filter of nearly all cigarettes has these fragments. In smoking a cigarette in the usual manner, some of these fragments are released during puffing. In addition to the cellulose acetate fragments, carbon particles are released also from some cigarette brands that have a charcoal filter. Cigarettes with filters that release cellulose acetate or carbon particles during normal smoking conditions are defective.

OBJECTIVE: Specific goals were to review systematically the writings of tobacco companies to: (a) identify papers that would document the existence of defective filters; (b) characterise the extent of the defect; (c) establish when the defect became known; (d) determine whether the defect exists on cigarettes marketed currently; (e) assess the prevalence of the defect on cigarettes manufactured by different companies; (f) define whether the knowledge of the defect had been withheld by the tobacco company as confidential and not disclosed publicly; and (g) ascertain the feasibility of correcting or preventing the defect.

METHODS: Document searches utilised databases of the scientific literature, medical journals, chemical abstracts, US Patents, Tobacco Abstracts, papers presented at tobacco meetings and court documents. RESULTS: Sixty one documents of Philip Morris, Inc were selected for study because they disclosed specifically the "fall-out" of cellulose acetate filter fibres and, for cigarettes with charcoal filters, carbon particles from cigarette filters. The term "fall-out" was defined in 1985 laboratory protocols of Philip Morris, Inc. as "loose fibers (or particles) that are drawn out of the filter during puffing of the cigarette". As early as 1957, the health concern of inhaling cellulose acetate fibres released from cigarette filters was addressed by Philip Morris, Inc. A 1962 document reported the results of laboratory tests conducted by Phillip Morris, Inc that compared the "fall-out" of cellulose acetate fibres from the filters of their cigarettes (Marlboro) and cigarettes of their competitor (Liggett & Meyers). A 1997 overview by Phillip Morris of documents addressing the "fallout of carbon particles and cellulose acetate fibers from filters" stated that they were "essentially routine reports" of cigarette filter assays, and referenced a "Filter Fallout" memo written in 1961-more than 40 years ago. Most likely these tests are being conducted presently as illustrated by a 1999 report that details the revisions of the "fall-out" protocol of Phillip Morris, Inc and reports the results of tests that measured the discharge of cellulose acetate fibres and silica gel from beta cigarettes with a new type of filter. Our analysis of the "fall-out" tests results presented in the 61 "fall-out" documents showed that filter fibres and carbon particles were discharged from the filters of all types of cigarettes tested. These cigarette types (n = 130) included both coded cigarettes and popular brand name cigarettes. No publications were found in the scientific literature of the "fall-out" studies. Thus, the results of the "fall-out" studies are thought to have been withheld as confidential to Philip Morris, Inc. We have identified also other companies that have tested recently cigarettes for defective filters. In addition, our searches have shown that simple, expedient, and inexpensive technologies for decontaminating cigarette filters of loose cellulose acetate fibres and particles from the cut surface of the filter have been developed and described in 1997 and 1998 US patents. What is more important is that these patents also define methods for preventing or reducing the broken plastic-like fibres that arise during cigarette making. Many US patents (n = 607; 1957 to 2001) have been awarded for cigarette filters. Some of these inventions describe novel materials and unique filtration schemes that would eliminate or minimise the discharge of filter materials into mainstream smoke.

CONCLUSIONS: We have shown that: (a) the filter of today's cigarette is defective; (b) Philip Morris, Inc has known of this filter defect for more than 40 years; (c) the existence of this filter defect has been confirmed by others in independent studies; (d) many methods exist to prevent and correct the filter defect, but have not been implemented; and (e) results of investigations substantiating defective filters have been concealed from the smoker and the health community. The tobacco industry has been negligent in not performing toxicological examinations and other studies to assess the human health risks associated with regularly ingesting and inhaling non-degradable, toxin coated cellulose acetate fragments and carbon microparticles and possibly other components that are released from conventional cigarette filters during normal smoking. The rationale for harm assessment is supported by the results of consumer surveys that have shown that the ingestion or inhalation of cigarette filter fibres are a health concern to nearly all smokers". As taken from

Pauly JL et al. Tob Control. 2002, Mar; 11 Suppl 1:I51-61. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/11893815

6. Functional effects on

6.1. Broncho/pulmonary system

Aerodynamic diameter measurement of cellulose acetate fibers from cigarette filters: what is the potential for human exposure? (Abstract). Aerodynamic diameter is a major determinant of particle and fiber deposition and toxicity in the respiratory tract. To characterize cellulose acetate fibers released from the filter end of cigarettes puffed under conditions approximating smoking, we designed multistage impactors to determine the aerodynamic diameters of large fibers with circumscribed diameters between 20 and 35 microm and aspect ratios ranging from subfiber ratios up to 40. This range of diameters encompasses all of the cellulose acetate fiber sizes that are commercially manufactured. When commercially available cigarettes with filters made from acetate fibers in this circumscribed diameter range were puffed directly into the impactor, on average 10 fibers/cigarette were released and their aerodynamic diameters were determined. In our studies, we found that the aerodynamic diameters of the cellulose acetate fibers were always greater than 23 microm. Using standard lung deposition models, we concluded that the fibers are nonrespirable with a very low probability of penetration to the distal lung. Our findings, which demonstrate release of only a small number of these large fibers with an extremely low likelihood of reaching the distal lung, indicate that these fibers are not a risk for human lung disease." As taken from Collazo H et al. Inhal Toxicol. 2002 Mar;14(3):247-62. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12028815&query_hl=19&itool=pubmed_docsum

Assessment of the elution of charcoal, cellulose acetate, and other particles from cigarettes with charcoal and activated charcoal/resin filters (Abstract). This experiment was designed to study the release of cellulose acetate fibers, charcoal, and other particles from cigarettes with charcoal and activated charcoal/resin filters. For the first time in such studies, efforts were made to identify the particles that were eluted using other analytical techniques in addition to light microscopy. Other corrective measures were also implemented. During the studies it was found that trimming of larger filters to fit smaller filter housings introduced cellulose acetate-like particles from the fibers of the filter material. Special, custom made-to-fit filters were used instead. Tools such as forceps that were used to retrieve filters from their housings were also found to introduce fragments onto the filters. It is believed that introduction of such debris may have accounted for the very large number of cellulose acetate and charcoal particles that had been reported in the literature. Use of computerized particle-counting microscopes appeared to result in excessive number of particles. This could be because the filter or smoke pads used for such work do not have the flat and level surfaces ideal for computerized particle-counting microscopes. At the high magnifications that the pads were viewed for particles, constant focusing of the microscope would be essential. It was also found that determination of total particles by using extrapolation of particle count by grid population usually gave extremely high particle counts compared to the actual number of particles present. This could be because particle distributions during smoking are not uniform. Lastly, a less complex estimation of the thickness of the particles was adopted. This and the use of a simple mathematical conversion coupled with the Cox equation were utilized to assess the aerodynamic diameters of the particles. Our findings showed that compared to numbers quoted in the literature, only a small amount of charcoal, cellulose acetate shards, and other particles are released. It was also shown that those particles would have a low likelihood of reaching the lung.

As taken from Agyei-Aye K et al. Inhal Toxicol. 2004, Aug; 16(9):615-35. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/16036754

6.2. Cardiovascular system

"Cellulose acetate has been found to possess the ability to activate platelets of patients hemodialysed with dialyzer containing a cellulose acetate membrane, as well as other cellulosic membranes." As taken from Cases A et al. Artif Organs. 1997 Apr;21(4):330-4. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9096808&query_hl=15&itool=pubmed_docsum

"Gene expression of transforming growth factor-beta (TGF-beta) is needed to induce expression of transcription factor forkhead box P3 (Foxp3), which is required for the development and function of regulatory T (Treg) cells. The number of circulating Treg cells and the level of Foxp3 expression increase during granulocyte and monocyte apheresis (GMA), a useful therapy for ulcerative colitis. However, the mechanism underlying GMA-induced Foxp3 expression is unknown. We found that the level of TGF-beta mRNA in peripheral blood mononuclear cells (PBMCs) was augmented just after treatment of peripheral blood with a GMA carrier, cellulose acetate beads, in vitro and that Foxp3 expression in PBMCs increased after culturing these cells for 5 days after the treatment. The augmentation of TGF-beta expression was observed in CD3(-) PBMCs but not in CD3(+) T cells. Furthermore, the increase in Foxp3 expression in T cells depended on co-culture with CD3(-) PBMCs. We conclude that cellulose acetate beads have an ability to induce Foxp3 expression in peripheral blood T cells via augmentation of TGF-beta expression in CD3(-) PBMCs". As taken from Jimma F et al. 2010. J. Clin. Apher. 25, 216-222. PubMed, 2013 available at http://www.ncbi.nlm.nih.gov/pubmed/20544711?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

"REACTION OF VAGINAL TISSUE OF RABBITS TO INSERTED SPONGES MADE OF ACETYLCELLULOSE. VAGINAL WALL & ITS MUCOSAL LINING SHOWED SIGNS OF CYTOTOXICITY, EXTRACTS OF SPONGES TESTED FOR CYTOTOXICITY SHOWED SIGNIFICANT INHIBITION OF (3)H-THYMIDINE UPTAKE."

As taken from HSDB (2002), available at https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

"We studied the action of rinse solutions from cellulose acetate hemodialyzers on isolated mitochondria. We showed that concentrates from the rinses impaired the adenosine 5'-triphosphate (ATP) synthesis as reflected by the decrease in respiration during state 3 and in P/O ratio. This impairment results from a calcium release from mitochondria that is induced by rinse solution concentrates. The release, triggering the mitochondrial calcium carrier, would explain the decrease in ATP synthesis. Moreover, rinse solution concentrates hinder mitochondrial calcium storage. The rise in cytosolic calcium in hemodialyzed patients may be related, at least in part, to these findings, since a lack of ATP impairs the ATP-dependent cellular calcium-extrusion pumps. We also showed that calcium channel blockers, at therapeutically relevant doses, restore ATP synthesis and calcium storage in mitochondria impaired by rinse solution concentrates. Finally, these in vitro results were confirmed by experiments on cells in culture proving that Diltiazem counteracts the cytotoxicity of rinse solution concentrates. These findings are consistent with observations that these drugs suppress the increase in leukocyte cytosolic calcium in dialyzed patients. Moreover, this would help explain the efficiency of calcium channel blockers in cells without L-calcium channels." As taken from Tabouy LJ et al. Kidney Int. 1997 Nov; 52(5):1381-9. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9350663&query_hl=17&itool=pubmed_docsum

"Following adverse clinical events involving seven patients undergoing renal dialysis using 12-year-old cellulose acetate hemodialyzers, this in vitro study was proposed in an effort to characterize the inflammatory response to the constituent cellulose acetate (CA) fiber materials. Chemiluminescence (CL) and apoptosis assays were used to determine whether human neutrophils were activated by CA fiber materials and/or are sensitive to degradation/alteration of these fibers over time. Furthermore, the study examined in vitro assays with human neutrophils using a CA film, the solvents used in the film preparation and CA resin. The film could be cut to identical sized pieces in an effort to compare hemodialysis material effects in standardized amounts. For the CL assays, 60-min exposure was followed by secondary stimulation with n-formyl-met-leu-phe (fMLP) or phorbol-12-myristate-13-acetate (PMA). Short-term exposure (60-min postintroduction to CA materials) increased the inflammatory response as measured by the respiratory burst of neutrophils ($p \leq .05$), with CA fiber exposure significantly compared with cells alone. There was a trend toward an increased response with exposure to older fibers with secondary PMA stimulation. Apoptosis was increased 12% with exposure to the more aged fibers versus 2% with the new fibers. The fiber storage component, glycerol, significantly inhibited the oxidative response (p < or =.001; > or =80% suppression with concentrations of 5-20%). The solvents used in film preparation, N,N-dimethylacetamide and tetrahydrofuran, produced greater than a 70% and 60% suppression, respectively, of CL activity for all concentrations > or =1%. More work is needed to determine the specific nature of the interaction of inflammatory cells with CA materials, but early evidence suggests that neutrophils are activated by CA and display an altered response to more aged fibers." As taken from Moore MA et al. J Biomed Mater Res. 2001 Jun 5; 55(3):257-65. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11255178&query_hl=21&itool=pubmed_docsum

"Dramatic improvements in clinical symptoms of rheumatoid arthritis and ulcerative colitis were observed after patients received granulocyte and monocyte adsorptive apheresis with a column containing cellulose acetate (CA) beads as adsorptive carriers. This study was to investigate the effect of CA beads on the generation of anti-inflammatory and pro-inflammatory cytokines in human blood. We incubated human whole blood with CA beads at 37 degrees C for up to 2 h and measured tumour necrosis factor-alpha (TNF-alpha) interleukin-1beta (IL-1beta) and IL-1 receptor antagonist (IL-1ra) produced by leucocytes. IL-1ra was also measured at the inflow and outflow of a column containing CA beads as leucocyte adsorptive carriers for the treatment of patients with ulcerative colitis. CA beads induced significant release of IL-1ra from leucocytes, but not TNF-alpha or IL-1beta. In contrast, all three cytokines were released when leucocytes were stimulated with lipopolysaccharide. IL-1ra was also markedly elevated in the outflow of the leucocyte apheresis column. These results indicate that CA beads selectively induce IL-1ra release from leucocytes which should contribute to the anti-inflammatory effect of granulocyte and monocyte adsorptive apheresis with CA beads as apheresis carriers." As taken from Takeda Y et al. Inflamm Res. 2003 Jun; 52(7):287-90. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12861393&query_hl=25&itool=pubmed_docsum

7. Addiction

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

8. Burnt ingredient toxicity

No data available to us at this time.

9. Heated/vapor emissions toxicity

No data available to us at this time.

10. Ecotoxicity

10.1. Environmental fate

Biodegradation:

The influence of degree of substitution on blend miscibility and biodegradation of cellulose acetate blends (Abstract). In this account, we report our findings on blends of cellulose acetate having a degree of substitution (DS) of 2.49 (CA2.5) with a cellulose acetate having a DS of 2.06 (CA2.0). This blend system was examined over the composition range of 0-100% CA2.0 employing both solvent casting of films (no plasticizer) and thermal processing (melt-compressed films and injection molding) using poly(ethylene glycol) as a common plasticizer. All thermally processed blends were optically clear and showed no loss in optical quality after storage for several months. Thermal analysis and measurement of physical properties indicate that blends in the middle composition range are partially miscible, while those at the ends of the composition range are miscible. We suggest that the miscibility of these cellulose acetate blends is influenced primarily by the monomer composition of the copolymers. As taken from BUCHANAN CM et al. JOURNAL OF ENVIRONMENTAL POLYMER DEGRADATION; 4 (3). 1996. 179-195 available at http://www.springerlink.com/content/m057j3h070g03242/

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that cellulose acetate is of uncertain persistence in the environment.

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

10.2. Aquatic toxicity

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that cellulose acetate is not inherently toxic to aquatic organisms and is of low ecotoxicological concern.

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

10.3. Sediment toxicity

Biodegradation of cellulose acetate by Neisseria sicca (Abstract) Bacteria capable of assimilating cellulose acetate**,** strains SB and SC, were isolated from soil on a medium containing cellulose acetate as a carbon source, and identified as Neisseria sicca. Both strains degraded cellulose acetate membrane filters (degree of substitution, DS, mixture of 2.8 and 2.0) and textiles (DS, 2.34) in a medium containing cellulose acetate (DS, 2.34) or its oligomer, but were not able to degrade these materials in a medium containing cellobiose octaacetate. Biodegradation of cellulose acetate (DS, 1.81 and 2.34) on the basis of biochemical oxygen demand reached 51 and 40% in the culture of N. sicca SB and 60 and 45% in the culture of N. sicca SC within 20 days. A decrease in the acetyl content of degraded cellulose acetate films and powder was confirmed by infrared and nuclear magnetic resonance analyses. After 10-day cultivation of N. sicca SB and SC, the number-average molecular weight of residual cellulose acetate decreased by 9 and 5%, respectively. Activities of enzymes that released acetic acid and produced reducing sugars from cellulose acetate were mainly present in the culture supernatant. Reactivity of enzymes for cellulose acetate (DS, 1.81) was higher than that for cellulose acetate (DS, 2.34).

As taken from Sakai K et al. Biosci Biotechnol Biochem. 1996, Oct; 60(10):1617-22. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/8987659

10.4. Terrestrial toxicity

“Birds are known to respond to nest-dwelling parasites by altering behaviours. Some bird species, for example, bring fresh plants to the nest, which contain volatile compounds that repel parasites. There is evidence that some birds living in cities incorporate cigarette butts into their nests, but the effect (if any) of this behaviour remains unclear. Butts from smoked cigarettes retain substantial amounts of nicotine and other compounds that may also act as arthropod repellents. We provide the first evidence that smoked cigarette butts may function as a parasite repellent in urban bird nests. The amount of cellulose acetate from butts in nests of two widely distributed urban birds was negatively associated with the number of nest-dwelling parasites. Moreover, when parasites were attracted to heat traps containing smoked or non-smoked cigarette butts, fewer parasites reached the former, presumably due to the presence of nicotine. Because urbanization changes the abundance and type of resources upon which birds depend, including nesting materials and plants involved in self-medication, our results are consistent with the view that urbanization imposes new challenges on birds that are dealt with using adaptations evolved elsewhere". As taken from Suarez-Rodrigues M et al. 2012. Biol. Letts 9. PubMed 2013 available at http://www.ncbi.nlm.nih.gov/pubmed/23221874

10.5. All other relevant types of ecotoxicity

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that cellulose acetate has uncertain bioaccumulative potential in the environment.

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

11. References for conventional products

- Agyei-Aye K et al. (2004). Inhal Toxicol. 2004, Aug; 16(9):615-35. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/16036754
- Ash M and Ash I (2004). Handbook of Green Chemicals. Synapse Information Sources, Inc. ISBN No. 1-890595-79-9
- Buchanan CM et al. (1996). Journal of environmental polymer degradation; 4 (3). 1996. 179-195 available at http://www.springerlink.com/content/m057j3h070g03242/
- Caravaca F *et al* (1987). Hypersensitivity reactions related to acetate dialyzate and cellulose acetate membrane. Nephron, 45, 158-159.
- Cases A et al. (1997). Artif Organs. 1997 Apr;21(4):330-4. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9096808&query_hl=15&itool=pubmed_docsum
- ChemIDplus. Accessed May 2019. Available at https://chem.nlm.nih.gov/chemidplus/
- CIR (2009). Final Report of the Cosmetic Ingredient Review Expert Panel. Amended safety assessment of cellulose and related polymers as used in cosmetics. 23 March 2009. Available at: http://www.beauty-review.nl/wp-content/uploads/2014/08/Amended-Safety-Assessment-of-Cellulose-and-Related-Polymers-as-used-in-Cosmetics.pdf
- Collazo H et al. (2002). Inhal Toxicol. 2002 Mar; 14(3):247-62. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12028815&query_hl=19&itool=pubmed_docsum

- CosIng. Cosmetic substances and ingredients database. Record for cellulose acetate. Undated, accessed May 2019. Available at http://ec.europa.eu/growth/tools-databases/cosing/
- Du J et al. (2014). Comparative evaluation of chitosan, cellulose acetate, and polyethersulfone nanofiber scaffolds for neural differentiation. Carbohydr. Polym. 99, 483-90. PubMed, 2014 available at http://www.ncbi.nlm.nih.gov/pubmed/24274534?dopt=AbstractPlus
- ECHA (2018). European Chemicals Agency. Information on Chemicals. Record for cellulose, acetate. Last updated 7 February 2018. Available at https://echa.europa.eu/information-on-chemicals/pre-registered-substances
- ECHA (2019). European Chemicals Agency. Classification and Labelling (C&L) Inventory database. Last updated 8 May 2019. Available at: https://echa.europa.eu/information-on-chemicals/cl-inventory-database
- FDA (2019a). US Food and Drug Administration. Substances Added to Food (formerly EAFUS). Last updated 22 April 2019. Accessed May 2019. Available at: https://www.accessdata.fda.gov/scripts/fdcc/?set=FoodSubstances
- FDA (2019b). US Food and Drug Administration. Electronic Code of Federal Regulations (eCFR). Current as of 7 May 2019. Available at https://www.ecfr.gov/cgi-bin/ECFR?page=browse
- FDA (2019c). US Food and Drug Administration. Inactive Ingredient Database. Data valid through 15 March 2019. Accessed May 2019. Available at https://www.accessdata.fda.gov/scripts/cder/iig/index.cfm
- Goldberg M S & Thériault G (1994a). Retrospective cohort study of workers of a synthetic textiles plant in Quebec: I. General mortality. American Journal of Industrial Medicine, 25, 889-907.
- Goldberg M S & Thériault G (1994b). Retrospective cohort study of workers of a synthetic textiles plant in Quebec: II. Colorectal cancer mortality and incidence. American Journal of Industrial Medicine, 25, 909-922.
- Hausen B M & Jung H D (1985). Spectacle frame dermatitis. Aktuelle Dermatologie, 11, 119-123.
- HazMap (2018). Record for cellulose acetate. US National Library of Medicine, Specialized Information Services. National Institute of Health. Last updated October 2018. Accessed May 2019. Available at https://hazmap.nlm.nih.gov/
- HSDB (2002). Record for cellulose acetate. Hazardous Substances Databank Number: 964. Last Revision Date: 15 May 2002. Accessed May 2019. Available at https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm
- James SJ et al. (1997). Biomaterials. 1997, May; 18(9):667-75. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/9151998
- Jimma F et al. (2010). Induction of Foxp3 expression in T cells by cellulose acetate beads in vitro. J. Clin. Apher. 25, 216-222. PubMed, 2013 available at http://www.ncbi.nlm.nih.gov/pubmed/20544711?dopt=AbstractPlus
- Kalensky J & Jiraskova M (1980). Contact allergic eczema caused by glass frames, and its differential diagnosis. Ceskoslovenska Dermatologie, 55, 309.
- Konwarh R et al. (2013). Electrospun cellulose acetate nanofibers: the present status and gamut of biotechnological applications. Biotechnol. Adv. 31(4), 421-37. PubMed, 2014 available at http://www.ncbi.nlm.nih.gov/pubmed/23318668

- Leitner G et al. (2012). Selective granulocyte and monocyte apheresis as a non-pharmacological option for patients with inflammatory bowel disease. Trans. med. Hemother. 339, 246-252. PubMed, 2013 available at http://www.ncbi.nlm.nih.gov/pubmed/22969694
- Lucas AD et al (2000). J Biomed Mater Res. 2000, Sep; 53(5):449-56. PubMed, 2009 available at https://www.ncbi.nlm.nih.gov/pubmed/10984691
- Moore MA et al., (2001), J Biomed Mater Res. 2001 Jun 5;55(3):257-65. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/11255178
- Nakada T & Maibach H I (1998). Eyeglass allergic contact dermatitis. Contact Dermatitis 39(1), 1-3.
- NICNAS (2018). Australian National Industrial Chemicals Notification and Assessment Scheme. Tier I Human Health Assessments. Inventory Multi-tiered Assessment and Prioritisation (IMAP) Framework. 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 cellulose acetate. Available at https://web.archive.org/web/20111028115705/http://www.cdc.gov/noes/noes2/x6205occ.html
- NZ EPA (2006). New Zealand Environmental Protection Authority. Inventory of Chemicals. Record for cellulose, acetate (CAS RN 9004-35-7). Date added to inventory: 1 December 2006. Accessed May 2019. Available at https://www.epa.govt.nz/database-search/new-zealand-inventory-of-chemicals-nzioc/view/37110
- OECD (undated). Organisation for Economic Cooperation and Development. The Global Portal to Information on Chemical Substances (eChemPortal). Cellulose acetate (CAS RN 9004-35-7). Accessed March 2017. Available at: http://webnet.oecd.org/CCRWeb/Search.aspx
- Pauly JL et al. (2002). Control. 2002, Mar; 11 Suppl 1:I51-61. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/11893815
- Pifer J W *et al* (1986). Mortality study of men employed at a large chemical plant, 1972 through 1982. Journal of Occupational Medicine, 28, 438-444.
- Sakai K et al. Biosci Biotechnol Biochem. 1996, Oct; 60(10):1617-22. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/8987659
- Shtannikov E V *et al* (1972). Mutagenic activity of several polymers used in the demineralization of water. Gigiena i Sanitaria, 37, 17-22.
- Suarez-Rodrigues M et al. (2012). Incorporation of cigarette butts into nests reduces nest ectoparasite load in urban birds: new ingredients for an old recipe? Biol. Letts 9. PubMed, 2013 available at http://www.ncbi.nlm.nih.gov/pubmed/23221874
- Tabouy LJ et al., (1997), Kidney Int. 1997 Nov; 52(5):1381-9. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9350663&query_hl=17&itool=pubmed_docsum
- Takeda Y et al., (2003), Inflamm Res. 2003 Jun; 52(7):287-90. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12861393&query_hl=25&itool=pubmed_docsum

- Thomas WC et al., (1991), Food Chem Toxicol. 1991 Jul;29(7):453-8. PubMed, 2009 available at http://www.ncbi.nlm.nih.gov/pubmed/1894211?dopt=Abstract
- US EPA (1995). Cellulose Acetate. Tolerance Exemption. Federal Register 60(163), 43738. Available at https://www.gpo.gov/fdsys/pkg/FR-1995-08-23/pdf/95-20889.pdf
- US EPA (2019). US Environmental Protection Agency. Electronic Code of Federal Regulations (eCFR). Current as of 7 May 2019. Accessed May 2019. Available at https://www.ecfr.gov/cgi-bin/ECFR?page=browse
- US EPA 2016 TSCA CDR (Chemical Data Reporting Rule) Exempt list. Accessed May 2019. Available at https://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do
- US EPA Inert Finder Database (2019). Last updated 16 April 2019. Accessed May 2019. Available at https://iaspub.epa.gov/apex/pesticides/f?p=INERTFINDER:1:0::NO:1::
- US EPA TSCA inventory. Accessed May 2019. Available at https://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do
- Villard P-H *et al* (1998). Effects of tobacco smoke on the gene expression of the *Cyp1a, Cyp2b, Cyp2e,* and *Cyp3a* subfamilies in mouse liver and lung: Relation to single strand breaks of DNA. Toxicology and Applied Pharmacology, 148, 195-204.
- Wilson RH and McCormick WE (1955). Plastics - the toxicology of synthetic resins. Ind. Med. Surg. 24, 491-496.

12. Other information

- Formella et al. 1992. Beiträge zur Tabakforschung International 15(3), 123-128. Available at http://www.degruyter.com/view/j/cttr.1992.15.issue-3/cttr-2013-0627/cttr-2013-0627.xml?rskey=d275nl&result=5

  Lakritz et al. 1969. Beiträge zur Tabakforschung International 5(3), 104-08. Available at http://www.degruyter.com/view/j/cttr.1969.5.issue-3/cttr-2013-0224/cttr-2013-0224.xml?rskey=d275nl&result=15

  Stedman et al. 1969. Beiträge zur Tabakforschung International 5(1), 13-17. Available at http://www.degruyter.com/view/j/cttr.1969.5.issue-1/cttr-2013-0207/cttr-2013-0207.xml?rskey=d275nl&result=16

  Klus H et al. 2012. Beiträge zur Tabakforschung International 25(3), 412-493. Available at http://www.degruyter.com/view/j/cttr.2012.25.issue-3/cttr-2013-0921/cttr-2013-0921.xml?rskey=d275nl&result=18

13. Last audited

June 2019

Substance	*ID Code*	*Rpt No.*	*Year*	*Conclusion**	*21 CFR Section*
Cellulose acetate	9004-35-7	25	1973	2	182.90

SCOGS Opinion:

Cellulose is a major constituent of many foods of plant origin. As such it is a significant portion of the diet, but is neither degraded nor absorbed. Cellulose derivatives considered in this report are virtually unabsorbed and little or no degradation of absorbed and little or no degradation of absorbable products occurs in the human digestive tract. In man, consumption of large amounts appears to have no effect other than providing dietary bulk, reducing the nutritive value of such foodstuffs and possibly exerting a laxative effect. However, the existence of certain data and the different categorization of cellulose and the several cellulose derivatives on the GRAS list suggest that the Select Committee should render a separate opinion on each substance considered in this report.

A. CELLULOSE, MICROCRYSTALLINE CELLULOSE

Although pure cellulose and regenerated cellulose, including microcrystalline cellulose are not on the GRAS list, there is nothing in the available information to suggest that such forms of cellulose have significantly different biological properties that distinguish these forms of cellulose from those currently considered as GRAS or from naturally occurring cellulose. In view of the foregoing, the Select Committee concludes that: There is no evidence in the available information on pure and regenerated cellulose, including microcrystalline cellulose, that demonstrates, or suggests reasonable grounds to suspect, a hazard to the public when they are used at levels that are now current, or that might reasonably be expected in future.

B. METHYL CELLULOSE

In humans, virtually 100 percent of orally ingested methyl cellulose can be recovered in the feces withihn four days, indicating that absorption does not occur. However, in pregnant mice, very high doses of methyl cellulose, while not teratogenic, cause a significant increase in maternal mortality and retardation of fetal maturation. Such increased maternal and fetal toxicity does not occur at a dose of methyl cellulose which is 26-fold (or more) greater than that estimated to be the average daily adult dietary intake. It is noteworthy in this regard that similar toxic effects have been observed in identical tests performed by the same investigators on a large number of other polysaccharides fed at very high doses. The relative sensitivity of the several animal species to these effects varies, depending on the particular polysaccharide tested, but in all cases very large doses are required. Until these effects have been adequately explained, it appears to be inappropriate to conclude that unrestricted use of such substances in food would be without hazard. In the light of the foregoing, the Select Committee concludes that: There is no evidence in the available information on methyl cellulose that demonstrates, or suggests reasonable grounds to suspect, a hazard to the public when it is used at levels that are now current and in the manner now practiced. However, it is not possible to determine, without additional data, whether a significant increase in consumption would constitute a dietary hazard.

C. CARBOXYMETHYL CELLULOSE

Carboxymethyl cellulose is converted spontaneously to a salt in alkaline solution, and it is probable that the distinction between carboxymethyl cellulose and its salts is artificial. However, carboxymethyl cellulose is liested as GRAS as a substance migrating to food from cotton or cotton fabrice used in dry foods packaging, while its sodium salt is listed as GRAS as a miscellaneous or general purpose food additive. In view of the separate listing of carboxymethyl cellulose, the Select Committee concludes that: There is no evidence in the available information on carboxymethyl cellulose that demonstrates, or suggests reasonable grounds to suspect, a hazard to the public when it is used in dry food packaing materials originating from cotton or cotton fabrics as now practed or as it might reasonably be expected to be used for such purposes in future.

D. SODIUM CARBOXYMETHYL CELLULOSE

Despite the probable lack of distinction between sodium carboxy methyl cellulose and its parent compound, carboxymethyl cellulose, only the sodium carboxymethyl cellulose is GRAS as a miscellaneous and general purpose food additive. As such, there are no data that suggest it reacts differently than pure and regenerated cellulose or carboxymethyl cellulose. In view of the foregoing the Select Committee concludes that: There is no evidence in the available information on sodium carboxymethyl cellulose that demonstrtes, or suggests reasonable grounds to suspect, a hazard to the public when it is used at levels that are now current or that might reasonably be expected in future.

E. HYDROXYPROPYLMETHYL CELLULOSE

Hydroxypropylmethyl cellulose is not listed as GRAS. It is a food additive used as a thickening agent, stabilizer and emulsifier. Hydroxypropylmethyl cellulose is sinthesized from methyl cellulose by the action of alkali and propylene oxide. There are no data available to suggest that hydroxypropylmethyl cellulose possesses adverse health effects; however, teratology studies dimilar to those conducted with mehtyl cellulose are not available for its hydroxypropyl derivative. Therefore, it is suggested that, in due course, appropriate studies should be conducted with hydroxypropylmethyl cellulose. The Select Committee has weighed the foregoing and concludes that: There is no evidence in the available information on hydroxypropylmethyl cellulose that demonstrates, or suggested reasonable grounds to suspect, a hazard to the public when it is used at levels that are now current and in the manner now practiced (21 CFR 121.1021)

F. ETHYL CELLULOSE AND CELLULOSE ACETATE

There is a paucity of data concerning possible adverse health effects of ethyl cellulose and cellulose acetate. both are included in the GRAS list as substances migrating to food from paper or paperboard products used in food packaging. According to the NRC survey (6), very small amounts of ethyl cellulose also appear to be used in hard candy and chewing gum. In the GRAS context, the quantity of ethyl cellulose or cellulose acetate migrating to foods from packaging would be orders of magnitude below the levels of cellulose and cellulose derivaties now known to occur in foods. In the light of the foregoing, the Select Committee concludes that: There is no evidence in the available information on ethyl cellulose and cellulose acetate that demonstrates, or suggests reasonable grounds to suspect, a hazard to the public when they are used in food packaging materials as now practiced or as they might be expeccted to be used for such purposes in future.

SAFETY DATA SHEET

Revision Date 19-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Cellulose acetate**

Cat No. : **AC177780000; AC177780250; AC177785000**

Synonyms Acetic Acid, Cellulose Ester.

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Combustible dust	Yes

Label Elements

Signal Word
Warning

Hazard Statements
May form combustible dust concentrations in air

Precautionary Statements
Storage
Store in a well-ventilated place. Keep container tightly closed
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Cellulose, acetate	9004-35-7	100

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Obtain medical attention.

Inhalation Remove from exposure, lie down. Move to fresh air. Obtain medical attention.

Ingestion Clean mouth with water. Get medical attention.

Most important symptoms and effects No information available.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. Chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature Not applicable
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Dust can form an explosive mixture in air. Fine dust dispersed in air may ignite.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
0	1	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions See Section 12 for additional ecological information.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Do not let this chemical enter the environment.

7. Handling and storage

Handling Avoid contact with skin and eyes. Do not breathe dust. Do not ingest.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed.

8. Exposure controls / personal protection

Exposure Guidelines	This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.
Engineering Measures	None under normal use conditions.

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory Protection	No protective equipment is needed under normal use conditions.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	White
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	260 °C / 500 °F
Boiling Point/Range	No information available
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	negligible
Vapor Density	Not applicable
Specific Gravity	1.27
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable
Decomposition Temperature	No information available
Viscosity	Not applicable

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products.
Incompatible Materials	Strong oxidizing agents, Strong bases
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO_2)
Hazardous Polymerization	Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product
Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Mist LC50 Based on ATE data, the classification criteria are not met. ATE > 5 mg/l.
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cellulose, acetate	LD50 > 5 g/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Cellulose, acetate	9004-35-7	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains. .

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT	Not regulated
TDG	Not regulated
IATA	Not regulated
IMDG/IMO	Not regulated

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Cellulose, acetate	X	X	-	-	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b)	Not applicable
SARA 313	Not applicable
SARA 311/312 Hazard Categories	See section 2 for more information
CWA (Clean Water Act)	Not applicable
Clean Air Act	Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA	Not applicable
California Proposition 65	This product does not contain any Proposition 65 chemicals
U.S. State Right-to-Know Regulations	Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade	No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date	19-Jan-2018
Print Date	19-Jan-2018
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS