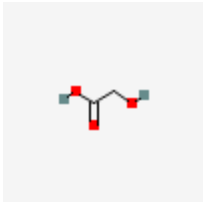
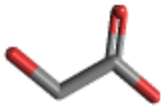
Glycolic acid

PubChem CID	757
Structure	Find Similar Structures  
Chemical Safety	Laboratory Chemical Safety Summary (LCSS) Datasheet  
Molecular Formula	$C_2H_4O_3$ or $HOCH_2COOH$
Synonyms	glycolic acid 2-Hydroxyacetic acid hydroxyacetic acid 79-14-1 Glycollic acid More...

Molecular Weight	76.05
Dates	• Modify 2022-11-12 • Create 2004-09-16

Glycolic acid is a 2-hydroxy monocarboxylic acid that is acetic acid where the methyl group has been hydroxylated. It has a role as a metabolite and a keratolytic drug. It is a 2-hydroxy monocarboxylic acid and a primary alcohol. It is functionally related to an acetic acid. It is a conjugate acid of a glycolate.

Glycolic acid is a metabolite found in the aging mouse brain.

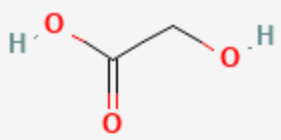
Glycolic acid is a metabolite found in or produced by Escherichia coli (strain K12, MG1655).

1Structures

1.12D Structure

Find Similar Structures

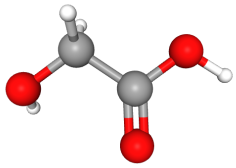
Chemical Structure Depiction



1.23D Conformer

Find Similar 3D Structures

Interactive Chemical Structure Model



2Names and Identifiers

2.1Computed Descriptors

2.1.1IUPAC Name

2-hydroxyacetic acid

Computed by Lexichem TK 2.7.0 (PubChem release 2021.10.14)

2.1.2InChI

InChI=1S/C2H4O3/c3-1-2(4)5/h3H,1H2,(H,4,5)

Computed by InChI 1.0.6 (PubChem release 2021.10.14)

2.1.3InChIKey

AEMRFAOFKBGASW-UHFFFAOYSA-N

Computed by InChI 1.0.6 (PubChem release 2021.10.14)

2.1.4Canonical SMILES

C(C(=O)O)O

Computed by OEChem 2.3.0 (PubChem release 2021.10.14)

2.2Molecular Formula

C2H4O3

HOCH2COOH

C2H4O3

Computed by PubChem 2.2 (PubChem release 2021.10.14)

2.3Other Identifiers

2.3.1CAS

79-14-1

26124-68-5

2.3.2Related CAS

26124-68-5

Compound: Glycolic acid polymer

1932-50-9 (mono-potassium salt)

25904-89-6 (unspecified potassium salt)

2836-32-0 (mono-hydrochloride salt)

35249-89-9 (mono-ammonium salt)

39663-84-8 (mono-lithium salt)

2.3.3Deprecated CAS

259744-22-4, 702627-33-6, 1033720-45-4, 1033720-48-7

1033720-45-4, 1033720-48-7, 702627-33-6

2.3.4European Community (EC) Number

201-180-5

815-723-4

2.3.5ICSC Number

1537

2.3.6NSC Number

166

2.3.7RTECS Number

MC5250000

2.3.8UN Number

3261

2.3.9UNII

0WT12SX38S

2.3.10DSSTox Substance ID

DTXSID0025363

DTXSID001011020

2.3.11Wikidata

Q409373

2.3.12NCI Thesaurus Code

C83737

2.3.13RXCUI

587318

2.4Synonyms

2.4.1MeSH Entry Terms

glycolate

glycolic acid

glycolic acid, 1-(14)C-labeled

glycolic acid, 2-(14)C-labeled

glycolic acid, calcium salt

glycolic acid, monoammonium salt

glycolic acid, monolithium salt

glycolic acid, monopotassium salt

glycolic acid, monosodium salt

glycolic acid, potassium salt

hydroxyacetic acid

potassium glycolate

2.4.2Depositor-Supplied Synonyms

glycolic acid

2-Hydroxyacetic acid

hydroxyacetic acid

79-14-1

Glycollic acid

Hydroxyethanoic acid

Acetic acid, hydroxy-

glycolate

Caswell No. 470

Glycocide

alpha-Hydroxyacetic acid

Kyselina glykolova

Kyselina glykolova [Czech]

Kyselina hydroxyoctova

HOCH2COOH

2-Hydroxyethanoic acid

Kyselina hydroxyoctova [Czech]

EPA Pesticide Chemical Code 000101

GlyPure

HSDB 5227

NSC 166

Acetic acid, 2-hydroxy-

AI3-15362

MFCD00004312

GlyPure 70

BRN 1209322

NSC-166

Acetic acid, hydroxy-, homopolymer

.alpha.-Hydroxyacetic acid

GLYCOLLATE

0WT12SX38S

NSC166

26124-68-5

CHEBI:17497

Polyglycollic acid

GOA

glycolicacid

Dexon (polyester)

Poly(L-glycolic acid)

Glypure 70 homopolymer

Glycolic acid homopolymer

EINECS 201-180-5

UNII-0WT12SX38S

Hydroxyacetic acid homopolymer

Hydroxyethanoate

a-Hydroxyacetate

CCRIS 9474

hydroxy-acetic acid

2-Hydroxyaceticacid

alpha-Hydroxyacetate

a-Hydroxyacetic acid

Acetic acid, 2-hydroxy-, homopolymer

Glycolic Acid 70%

Glycolic acid solution

2-hydroxy acetic acid

2-hydroxy-acetic acid

omega-Hydroxy fatty acid

2-hydroxyl ethanoic acid

Glycolic acid, polyesters

HO-CH2-COOH

DSSTox_CID_5363

bmse000245

WLN: QV1Q

EC 201-180-5

GLYCOLIC ACID [MI]

DSSTox_RID_77763

Glycolic acid (7CI,8CI)

DSSTox_GSID_25363

GLYCOLIC ACID [INCI]

4-03-00-00571 (Beilstein Handbook Reference)

GLYCOLIC ACID [VANDF]

Glycolic acid, p.a., 98%

GLYCOLIC ACID [MART.]

Acetic acid, hydroxy- (9CI)

CHEMBL252557

GLYCOLIC ACID [WHO-DD]

DTXSID0025363

Glycolic Acid, Crystal, Reagent

HYDROXYACETIC ACID [HSDB]

Glycolic acid solution, 56-58%

BCP28762

Glycolic acid, >=97.0% (T)

STR00936

ZINC4658557

Tox21_301298

s6272

STL197955

AKOS000118921

Glycolic acid, ReagentPlus(R), 99%

CS-W016683

DB03085

Glycolic acid 100 microg/mL in Water

Glycolic acid solution, puriss., 70%

HY-W015967

SB83760

CAS-79-14-1

NCGC00160612-01

NCGC00160612-02

NCGC00257533-01

Glycolic acid, 66-70% aqueous solution

Glycolic acid solution, CP, 70% in H2O

FT-0612572

FT-0669047

G0110

G0196

Glycolic acid 100 microg/mL in Acetonitrile

Glycolic acid, SAJ special grade, >=98.0%

C00160

C03547

D78078

Glycolic acid, Vetec(TM) reagent grade, 98%

HYDROXYACETIC ACID; HYDROXYETHANOIC ACID

Glycolic acid, BioXtra, >=98.0% (titration)

Glycolic acid solution, technical, ~55% in H2O

Q409373

J-509661

F2191-0224

Glycolic acid solution, high purity, 70 wt. % in H2O

Hydroxyacetic acid; Hydroxyethanoic acid; Glycollic acid

Z1259155884

287EB351-FF9F-4A67-B4B9-D626406C9B13

Glycolic acid solution, technical grade, 70 wt. % in H2O

Glycolic acid, certified reference material, TraceCERT(R)

Glycolic acid, anhydrous, free-flowing, Redi-Dri(TM), ReagentPlus(R), 99%

Glycolic Acid, Pharmaceutical Secondary Standard; Certified Reference Material

O7Z

3Chemical and Physical Properties

3.1Computed Properties

Property Name	Property Value	Reference
Molecular Weight	76.05	Computed by PubChem 2.2 (PubChem release 2021.10.14)
XLogP3	-1.1	Computed by XLogP3 3.0 (PubChem release 2021.10.14)
Hydrogen Bond Donor Count	2	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Hydrogen Bond Acceptor Count	3	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)

Property Name	Property Value	Reference
Rotatable Bond Count	1	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Exact Mass	76.016043985	Computed by PubChem 2.2 (PubChem release 2021.10.14)
Monoisotopic Mass	76.016043985	Computed by PubChem 2.2 (PubChem release 2021.10.14)
Topological Polar Surface Area	57.5 Å²	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Heavy Atom Count	5	Computed by PubChem
Formal Charge	0	Computed by PubChem
Complexity	40.2	Computed by Cactvs 3.4.8.18 (PubChem release 2021.10.14)
Isotope Atom Count	0	Computed by PubChem
Defined Atom Stereocenter Count	0	Computed by PubChem
Undefined Atom Stereocenter Count	0	Computed by PubChem
Defined Bond Stereocenter Count	0	Computed by PubChem
Undefined Bond Stereocenter Count	0	Computed by PubChem
Covalently-Bonded Unit Count	1	Computed by PubChem
Compound Is Canonicalized	Yes	Computed by PubChem (release 2021.10.14)

3.2Experimental Properties

3.2.1Physical Description

DryPowder; Liquid; PelletsLargeCrystals

Colorless, odorless crystals; [HSDB] Hygroscopic; Commonly available commercially as 70% solution; [ICSC]

Solid

COLOURLESS HYGROSCOPIC CRYSTALS.

3.2.2Color/Form

Colorless, translucent solid

Datta R, Bost JC; Hydroxycarboxylic Acids. Kirk-Othmer Encyclopedia of Chemical Technology. (1999-2014). New York, NY: John Wiley & Sons. Online Posting Date: Dec 17, 2004

Solid glycolic acid forms colorless, monoclinic, prismatic crystals.

Miltenberger K; Hydroxycarboxylic Acids, Aliphatic. Ullmann's Encyclopedia of Industrial Chemistry. 7th ed. (1999-2014). New York, NY: John Wiley & Sons. Online Posting Date: June 15, 2000.

Orthorhombic needles from water; leaves from diethyl ether

Haynes, W.M. (ed.). CRC Handbook of Chemistry and Physics. 94th Edition. CRC Press LLC, Boca Raton: FL 2013-2014, p. 3-284

3.2.3Odor

Odorless

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Cambridge, UK: Royal Society of Chemistry, 2013., p. 832

3.2.4Boiling Point

100 °C

Haynes, W.M. (ed.). CRC Handbook of Chemistry and Physics. 94th Edition. CRC Press LLC, Boca Raton: FL 2013-2014, p. 3-284

BP: decomposes

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 670

3.2.5Melting Point

79.5 °C

PhysProp

78-80 °C (alpha-modification); 63 °C (beta-modification, metastable)

Miltenberger K; Hydroxycarboxylic Acids, Aliphatic. Ullmann's Encyclopedia of Industrial Chemistry. 7th ed. (1999-2014). New York, NY: John Wiley & Sons. Online Posting Date: June 15, 2000.

MP: 79.5 °C

Haynes, W.M. (ed.). CRC Handbook of Chemistry and Physics. 94th Edition. CRC Press LLC, Boca Raton: FL 2013-2014, p. 3-284

75 - 80 °C

80 °C

3.2.6Solubility

In water, 1X10+6 mg/L at 25 °C (est)

US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.11. Nov, 2012. Available from, as of Apr 29, 2014: https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm

Soluble in ethanol, ethyl ether

Haynes, W.M. (ed.). CRC Handbook of Chemistry and Physics. 94th Edition. CRC Press LLC, Boca Raton: FL 2013-2014, p. 3-284

Soluble in methanol, acetone, acetic acid

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Cambridge, UK: Royal Society of Chemistry, 2013., p. 832

Solubility in water: very good

3.2.7Density

1.49 at 25 °C/4 °C

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA13: 509 (1989)

Relative density (water = 1): 1.49

3.2.8Vapor Density

Relative vapor density (air = 1): 2.6

3.2.9Vapor Pressure

0.02 [mmHg]

2.0X10-2 mm Hg at 25 °C (extrapolated)

Daubert, T.E., R.P. Danner. Physical and Thermodynamic Properties of Pure Chemicals Data Compilation. Washington, D.C.: Taylor and Francis, 1989.

3.2.10LogP

-1.11

HANSCH,C ET AL. (1995)

log Kow = -1.11

Hansch, C., Leo, A., D. Hoekman. Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society., 1995., p. 4

-1.11

HANSCH,C ET AL. (1995)

3.2.11Henry's Law Constant

Henry's Law constant = 8.5X10-8 atm-cu m/mol at 25 °C (est)

US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.11. Nov, 2012. Available from, as of Apr 29, 2014: https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm

3.2.12Stability/Shelf Life

Stable under recommended storage conditions.

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

3.2.13Decomposition

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

When heated to decomposition it emits acrid smoke and irritating fumes.

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 1873

100 °C

3.2.14Corrosivity

Corrosive

Miltenberger K; Hydroxycarboxylic Acids, Aliphatic. Ullmann's Encyclopedia of Industrial Chemistry. 7th ed. (1999-2014). New York, NY: John Wiley & Sons. Online Posting Date: June 15, 2000.

3.2.15Heat of Combustion

-697.23 kJ/mole

Miltenberger K; Ullmann's Encyclopedia of Industrial Chemistry. 7th ed. (2008). NY, NY: John Wiley & Sons; Hydroxycarboxylic Acids, Aliphatic. Online Posting Date: June 15, 2000.

3.2.16pH

pH = 2.5 (0.5%); 2.33 (1.0%); 2.16 (2.0%); 1.91 (5.0%); 1.73 (10.0%)

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Cambridge, UK: Royal Society of Chemistry, 2013., p. 832

3.2.17Dissociation Constants

pKa

3.83

SERJEANT,EP & DEMPSEY,B (1979)

pKa = 3.6

Sangster J; LOGKOW Database. A databank of evaluated octanol-water partition coefficients (Log P). Available from, as of Apr 29, 2014: https://logkow.cisti.nrc.ca/logkow/search.html

pKa = 3.83 at 25 °C

Serjeant, E.P., Dempsey B.; Ionisation Constants of Organic Acids in Aqueous Solution. International Union of Pure and Applied Chemistry (IUPAC). IUPAC Chemical Data Series No. 23, 1979. New York, New York: Pergamon Press, Inc., p. 21

3.2.18Other Experimental Properties

Hygroscopic

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Cambridge, UK: Royal Society of Chemistry, 2013., p. 832

Heat of combustion: 697.1kJ/mole; heat of solution: -11.5 kJ/mole

Datta R, Bost JC; Hydroxycarboxylic Acids. Kirk-Othmer Encyclopedia of Chemical Technology. (1999-2014). New York, NY: John Wiley & Sons. Online Posting Date: Dec 17, 2004

Light, straw-colored lliquid, odor like burnt sugar; density: 1.27; mp: 10 °C /Commercial 70% solution/

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 670

When heated to decomposition it emits acrid smoke and irritating fumes.

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 1873

Hydroxyl radical reaction rate constant = 3.11X10-12 cu cm/molecule-sec at 25 °C (est)

US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.11. Nov, 2012. Available from, as of Apr 29, 2014: https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm

3.2.19Chemical Classes

Other Classes -> Organic Acids

4Spectral Information

4.11D NMR Spectra

1D NMR Spectra	1H NMR: 6411 (Sadtler Research Laboratories Spectral Collection)

1D NMR Spectra	NMRShiftDB Link

4.1.11H NMR Spectra

Showing 2 of 5

View More

Spectra ID	1089
Instrument Type	Varian
Frequency	500 MHz
Solvent	Water
pH	7.00
Shifts [ppm]:Intensity	3.94:100.00

Thumbnail	

Spectra ID	2650
Instrument Type	JEOL
Frequency	300 MHz
Solvent	D2O
Shifts [ppm]:Intensity	4.20:1000.00
Thumbnail	

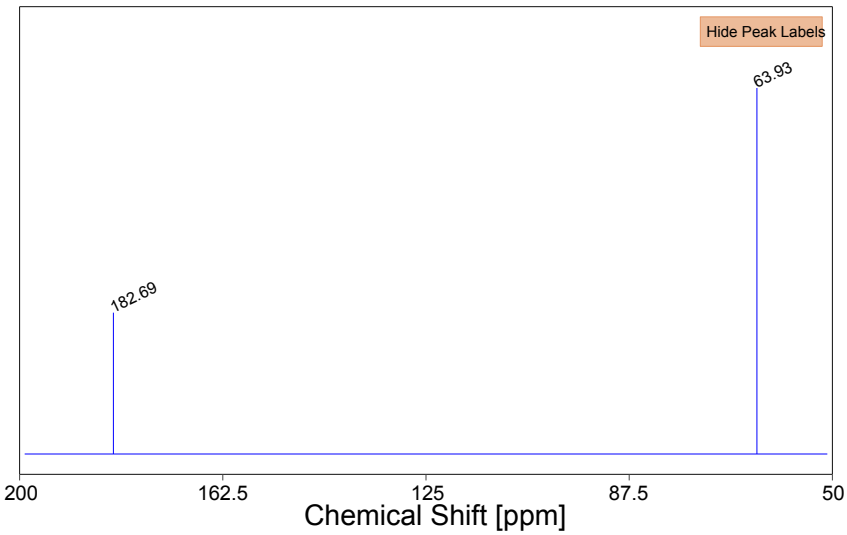
4.1.213C NMR Spectra

Showing 2 of 4

View More

Spectra ID	3336
Instrument Type	Varian
Frequency	25.16 MHz
Solvent	D2O
Shifts [ppm]:Intensity	177.04:925.00, 60.16:1000.00
Thumbnail	

Spectra ID	4970
Instrument Type	Bruker
Solvent	D2O
pH	7.4
Shifts [ppm]:Intensity	182.69:42.19, 63.93:109.25



Thumbnail

4.22D NMR Spectra

4.2.11H-13C NMR Spectra

2D NMR Spectra Type	1H-13C HSQC
Spectra ID	1147
Instrument Type	Bruker
Frequency	600 MHz
Solvent	Water
pH	7.00
Shifts [ppm] (F2:F1):Intensity	3.93:64.00:1.00
Thumbnail	

4.3Mass Spectrometry

4.3.1GC-MS

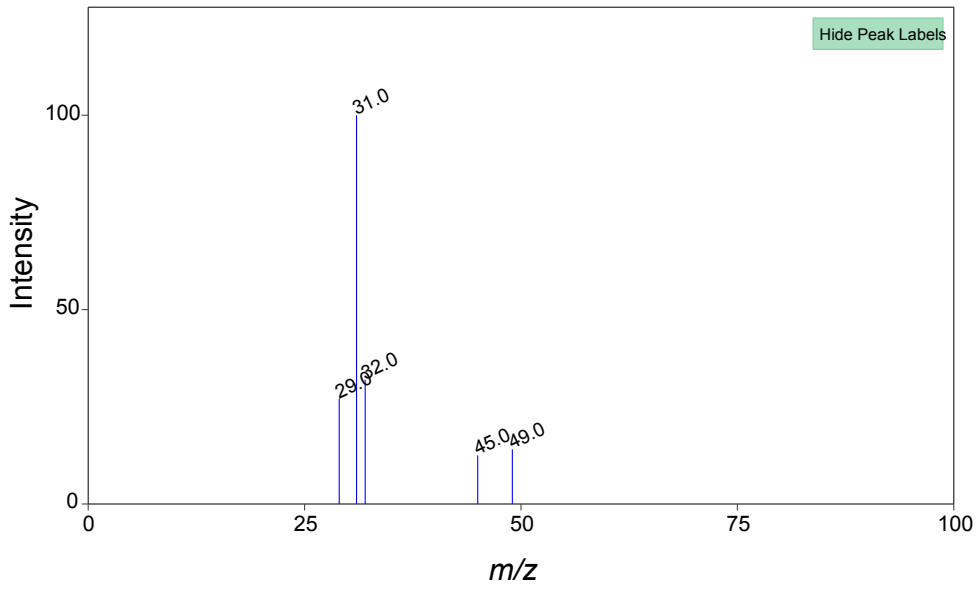
Showing 2 of 17

View More

Spectra ID	29929
Instrument Type	EI-B
Ionization Mode	positive
SPLASH	splash10-001i-9000000000-cadf899be6b15d008330
Top 5 Peaks	31.0 99.99 32.0 33.88 29.0 26.11 45.0 14.09 30.0 5.59
Thumbnail	
Notes	instrument=HITACHI M-2500

Spectra ID	29930
Instrument Type	EI-B
Ionization Mode	positive
SPLASH	splash10-001i-9000000000-e66ed28d8419895e0fb4

	31.0 99.99
	32.0 31.97
	29.0 27.06
	49.0 14.08
Top 5 Peaks	45.0 12.50



Thumbnail

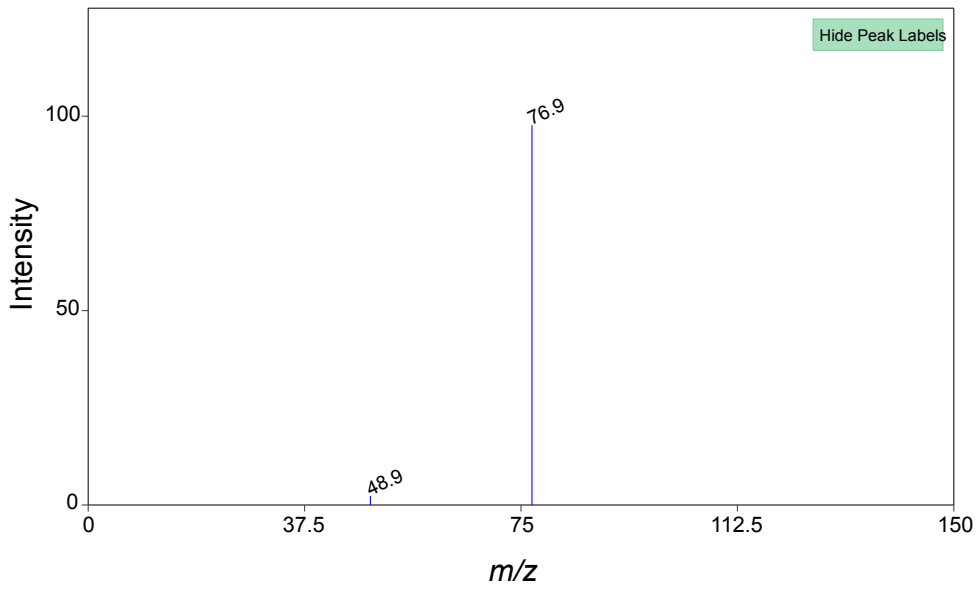
Notes	instrument=HITACHI M-2500

4.3.2MS-MS

Showing 2 of 6

View More

Spectra ID	1474283
Instrument Type	QqQ
Ionization Mode	positive

SPLASH	splash10-004i-9000000000-fa715ee3ce9abbc94edb
Top 5 Peaks	76.9 97.66 48.9 2.34
Thumbnail	
Notes	adduct_type [M+H]+ original_collision_energy 1 CannabisDB spectra from NIST14 2020 June Micromass Quattro Micro

Spectra ID	1474284
Instrument Type	QqQ
Ionization Mode	positive
SPLASH	splash10-004i-9000000000-ace3c5f526d28fd24de9
Top 5 Peaks	76.9 93.15 48.9 6.85
Thumbnail	

Notes	adduct_type [M+H]+ original_collision_energy 2 CannabisDB spectra from NIST14 2020 June Micromass Quattro Micro

4.3.3LC-MS

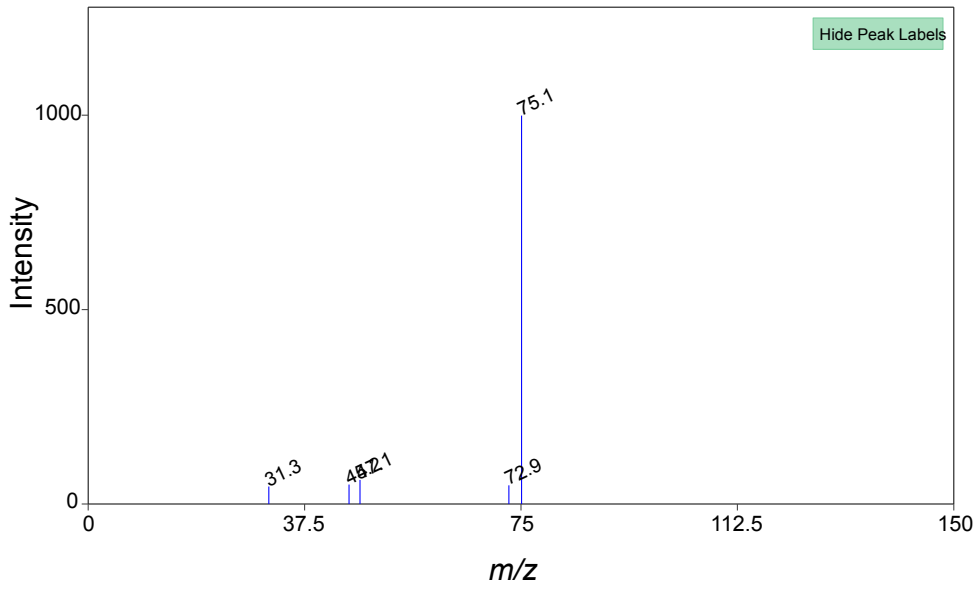
Showing 2 of 9

View More

Accession ID	MSBNK-Keio_Univ-KO000832
Authors	Kakazu Y, Horai H, Institute for Advanced Biosciences, Keio Univ.
Instrument	API3000, Applied Biosystems
Instrument Type	LC-ESI-QQ
MS Level	MS2
Ionization Mode	NEGATIVE
Collision Energy	10 V
Precursor m/z	75
Precursor Adduct	[M-H]-
Top 5 Peaks	74.9 999 73 6 46.7 3 44.9 3 31.3 2
SPLASH	splash10-00di-9000000000-88af2b259f82cd1d8938
Thumbnail	
License	CC BY-NC-SA

Accession ID	MSBNK-Keio_Univ-KO000833

Authors	Kakazu Y, Horai H, Institute for Advanced Biosciences, Keio Univ.
Instrument	API3000, Applied Biosystems
Instrument Type	LC-ESI-QQ
MS Level	MS2
Ionization Mode	NEGATIVE
Collision Energy	20 V
Precursor m/z	75
Precursor Adduct	[M-H]-
Top 5 Peaks	75.1 999 47.1 62 45.2 50 72.9 48 31.3 45
SPLASH	splash10-004i-9000000000-c968a24f0640b154325b



Thumbnail	
License	CC BY-NC-SA

4.3.4Other MS

Showing 2 of 5

View More

Other MS	MASS: 381 (NIST/EPA/MSDC Mass Spectral Database, 1990 Version)

Accession ID	MSBNK-Fac_Eng_Univ_Tokyo-JP011908
Authors	YAMAMOTO M, DEP. CHEMISTRY, FAC. SCIENCE, NARA WOMEN'S UNIV.
Instrument	HITACHI M-2500
Instrument Type	EI-B
MS Level	MS
Ionization Mode	POSITIVE

Ionization	ENERGY 70 eV
Top 5 Peaks	31 999 32 339 29 261 45 141 30 56
SPLASH	splash10-001i-9000000000-cadf899be6b15d008330
Thumbnail	
License	CC BY-NC-SA

4.4IR Spectra

IR Spectra	IR: 6254 (Coblentz Society Spectral Collection)

4.4.1FTIR Spectra

Instrument Name	Bio-Rad FTS
Technique	KBr0
Source of Spectrum	Forensic Spectral Research
Copyright	Copyright © 2012-2021 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

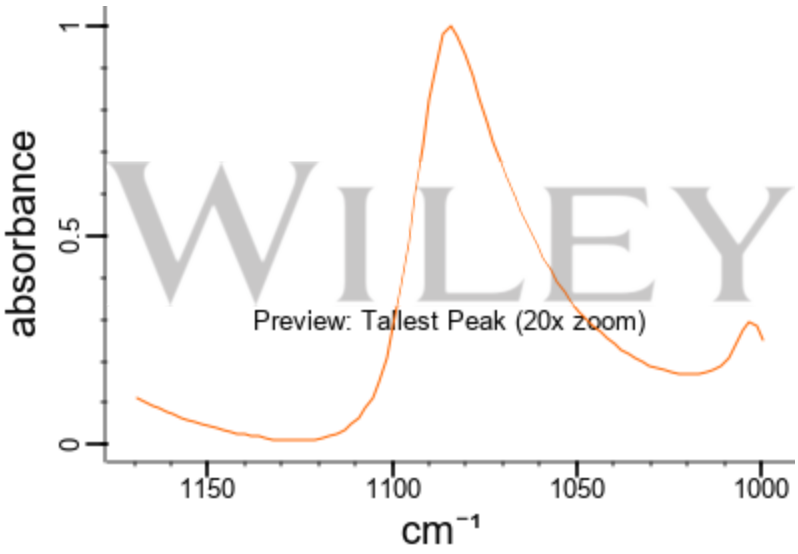
Instrument Name	Bruker IFS 85
Technique	KBr-Pellet

Source of Sample	Merck-Schuchardt Hohenbrunn
Copyright	Copyright © 1989, 1990-2021 Wiley-VCH Verlag GmbH & Co. KGaA. All Rights Reserved.
Thumbnail	

4.4.2ATR-IR Spectra

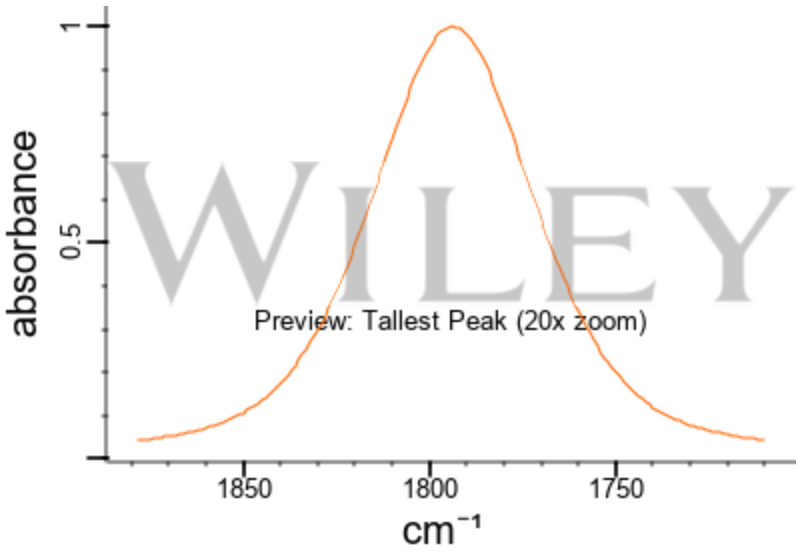
Instrument Name	PerkinElmer SpectrumTwo
Technique	ATR-IR
Copyright	Copyright © 2013-2021 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

Source of Sample	Sigma-Aldrich
Catalog Number	124737
Copyright	Copyright © 2018-2021 Sigma-Aldrich Co. LLC. - Database Compilation Copyright © 2018-2021 John Wiley & Sons, Inc. All Rights Reserved.



Thumbnail

4.4.3Vapor Phase IR Spectra

Instrument Name	Bruker IFS 85
Technique	Gas-GC
Copyright	Copyright © 1989, 1990-2021 Wiley-VCH Verlag GmbH & Co. KGaA. All Rights Reserved.
Thumbnail	

4.5Raman Spectra

Technique	FT-Raman
Source of Spectrum	Forensic Spectral Research
Copyright	Copyright © 2015-2021 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

Catalog Number	124737
Copyright	Copyright © 2017-2021 Sigma-Aldrich Co. LLC. - Database Compilation Copyright © 2017-2021 John Wiley & Sons, Inc. All Rights Reserved.
Thumbnail	

5Related Records

5.1Related Compounds with Annotation

5.2Related Compounds

Same Connectivity	13 Records
Same Parent, Connectivity	389 Records
Same Parent, Exact	372 Records
Mixtures, Components, and Neutralized Forms	2,457 Records
Similar Compounds	110 Records
Similar Conformers	788 Records

5.3Substances

5.3.1Related Substances

All	4,624 Records
Same	353 Records

Mixture	4,271 Records

5.3.2Substances by Category

5.4Entrez Crosslinks

PubMed	1,086 Records
Protein Structures	69 Records
Taxonomy	2 Records
Gene	9 Records

5.5NCBI LinkOut

Chemical Information: molecular interactions	Ingenuity Pathways Analysis

6Chemical Vendors

DC Chemicals
PubChem SID: 438519552
Purchasable Chemical: DC33817
BOC Sciences
PubChem SID: 254785082
Purchasable Chemical: 79-14-1
TCI (Tokyo Chemical Industry)
PubChem SID: 87570311
Purchasable Chemical: G0110
Alfa Chemistry
PubChem SID: 376010537
Purchasable Chemical: 79-14-1
Thermo Fisher Scientific

PubChem SID: 459197668
Purchasable Chemical: GID_900000000174535
VladaChem
PubChem SID: 381001494
Purchasable Chemical: VL163170
Sigma-Aldrich
PubChem SID: 329749632
Purchasable Chemical: 12-1290_SAJ
BLD Pharm
PubChem SID: 377355179
Purchasable Chemical: BD34957
Clearsynth
PubChem SID: 313055711
Purchasable Chemical: CS-T-55444
CymitQuimica
PubChem SID: 470544051
Purchasable Chemical: CQ_26124-68-5
Starshine Chemical
PubChem SID: 464737278
Purchasable Chemical: starbld0570147 (URL not provided...)

Finetech Industry Limited
PubChem SID: 164797727
Purchasable Chemical: FT-0612572
LGC Standards
PubChem SID: 438644746
Purchasable Chemical: DRE-A14037500AL-100
Chemenu Inc.
PubChem SID: 443635026
Purchasable Chemical: CM000158
Acadechem
PubChem SID: 321907015
Purchasable Chemical: ACDS-018584
Norris Pharm
PubChem SID: 383226212
Purchasable Chemical: NSTH-D23687 (URL not provided...)

A2B Chem
PubChem SID: 443827129
Purchasable Chemical: AB28446
abcr GmbH
PubChem SID: 316396194

Purchasable Chemical: AB116948
Yuhao Chemical
PubChem SID: 347738744
Purchasable Chemical: RT1010
Ambeed
PubChem SID: 376254376
Purchasable Chemical: A701706
ChemFish Tokyo co.,ltd
PubChem SID: 441238080
Purchasable Chemical: 757
RR Scientific
PubChem SID: 472460279
Purchasable Chemical: R001091
AA BLOCKS
PubChem SID: 374164284
Purchasable Chemical: AA002R6Q
Life Chemicals
PubChem SID: 315361211
Purchasable Chemical: F2191-0224
MuseChem
PubChem SID: 355170706
Purchasable Chemical: R050390
Vitas-M Laboratory
PubChem SID: 374889109
Purchasable Chemical: STL197955
MedChemexpress MCE
PubChem SID: 375986927
Purchasable Chemical: HY-W015967
LabNetwork, a WuXi AppTec Company
PubChem SID: 346693383
Purchasable Chemical: LN00193631
3B Scientific (Wuhan) Corp
PubChem SID: 375081612
Purchasable Chemical: 3B4-0502
Synblock Inc
PubChem SID: 471337328
Purchasable Chemical: SB83760
AstaTech, Inc.
PubChem SID: 445668009
Purchasable Chemical: D78078
Yick-Vic Chemicals & Pharmaceuticals (HK) Ltd.
PubChem SID: 441083665

Purchasable Chemical: SPI-0592A (URL not provided...)

labseeker
PubChem SID: 253652601
Purchasable Chemical: SC-26092
BioChemPartner
PubChem SID: 375570508
Purchasable Chemical: BCP28762
MolCore BioPharmatech
PubChem SID: 277296105
Purchasable Chemical: CS19334
LEAPCHEM
PubChem SID: 439965994
Purchasable Chemical: LP097214 (URL not provided...)

BenchChem
PubChem SID: 445527316
Purchasable Chemical: B1673462
AbaChemScene
PubChem SID: 375987741
Purchasable Chemical: CS-W016683
eNovation Chemicals
PubChem SID: 376052406
Purchasable Chemical: D619821
Biosynth
PubChem SID: 332838126
Purchasable Chemical: J-509661
OtavaChemicals
PubChem SID: 441630031
Purchasable Chemical: 2825300
Sinfoo Biotech
PubChem SID: 404781460
Purchasable Chemical: S002927
Aaron Chemicals LLC
PubChem SID: 406859648
Purchasable Chemical: AR002RYI
Key Organics/BIONET
PubChem SID: 249742046
Purchasable Chemical: STR00936
VWR, Part of Avantor
PubChem SID: 384255513
Purchasable Chemical: 101181-004

Chem-Space.com Database
PubChem SID: 434440106
Purchasable Chemical: CSSB00000210174
Oakwood Products
PubChem SID: 312597662
Purchasable Chemical: 058235
MolPort
PubChem SID: 88519970
Purchasable Chemical: MolPort-000-871-981
Selleck Chemicals
PubChem SID: 404640286
Purchasable Chemical: S6272
SHANDONG OCTAGON CHEMICALS LIMITED
PubChem SID: 440063844
Purchasable Chemical: OC-glycolic acid
BydoneChem
PubChem SID: 469967429
Purchasable Chemical: BD08458 (URL not provided...)

J&H Chemical Co.,ltd
PubChem SID: 469621909
Purchasable Chemical: JH482271
Hairui Chemical
PubChem SID: 375668075
Purchasable Chemical: HR128939
Combi-Blocks
PubChem SID: 374063331
Purchasable Chemical: QE-9207
Parchem
PubChem SID: 316962750
Purchasable Chemical: 13012
CSNpharm
PubChem SID: 440820528
Purchasable Chemical: CSN25194
Enamine
PubChem SID: 335391407
Purchasable Chemical: Z1259155884
AKos Consulting & Solutions
PubChem SID: 104667344
Purchasable Chemical: AKOS000118921
TargetMol
PubChem SID: 443842722

Purchasable Chemical: T5985
Achemo Scientific Limited
PubChem SID: 316959151
Purchasable Chemical: AC-77042
001Chemical
PubChem SID: 375787867
Purchasable Chemical: NO19334
Angene Chemical
PubChem SID: 173137618
Purchasable Chemical: AGN-PC-00G6WL
ZINC
PubChem SID: 257357090
Purchasable Chemical: ZINC4658557
Alichem
PubChem SID: 378042340
Purchasable Chemical: 471001103

7Drug and Medication Information

7.1Drug Effects during Lactation

Summary	No information is available on the clinical use of glycolic acid (hydroxyacetic acid) on the skin during breastfeeding. Because it is unlikely to be appreciably absorbed or appear in breastmilk, it is considered safe to use during breastfeeding.[1,2] Avoid application to areas of the body that might come in direct contact with the infant's skin or where the drug might be ingested by the infant via licking.
PubMed	29999971
NCBI Books	NBK500912

7.2FDA National Drug Code Directory

GLYCOLIC ACID is an active ingredient in 4 products including: 'ANUBIS BARCELONA NEW EVEN', 'GLYCOLIC ACID', and ANUBISMED.

7.3Clinical Trials

7.3.1ClinicalTrials.gov

7.3.2NIPH Clinical Trials Search of Japan

2 items

CTID	Title	Phase	Status	Date
UMIN000020247	Effectiveness of glycolic acid for the treatment of the pigmented lesion; Prospective, randomized, and split-face comparative study		Complete: follow-up complete	2015-12-17
UMIN000004376	The effect of glycolic acid peeling for acne vulgaris: a double-blind, randomized, left-right comparison study		Complete: follow-up complete	2010-10-12

7.4Therapeutic Uses

Keratolytic Agents

National Library of Medicine's Medical Subject Headings online file (MeSH, 1999)

Glycolic acid is a member of the alpha-hydroxy acid (AHA) family, which ... has been used for centuries as a cutaneous rejuvenation treatment. Recently it has proved to be a versatile peeling agent and it is now widely used to treat many defects of the epidermis and papillary dermis in a variety of strengths, ranging from 20% to 70%, depending on the condition being treated. People of almost any skin type and color are candidates, and almost any area of the body can be peeled...

PMID:7600706
Murad H et al; Dermatol Clin 13 (2): 285-307 (1995)

Glycolic acid has been used by dermatologists for years to treat skin disorders and is a component of many over-the-counter personal care products. No systemic toxicity has been noted as a result of these uses.

Hayes AW, Stadler JC; Toxicologist 78 (1-S): 160 (2004)

Chemical peeling, also known as chemoexfoliation or dermapeeling, is performed to improve the skin's appearance as it reduces the wrinkles caused by aging and the features of photoaged skin. Although the best results are obtained with deep /phenol/ peels, the medium-depth peels allow to obtain excellent results without the dangerous side effects of deep peels. Medium-depth peelings are performed with trichloroacetic acid (TCA) at 35-50% alone or at 35% in combination with Jessner's solution, 70% glycolic acid, and solid CO(2)...

PMID:17166210
Camacho FM; J Cosmet Dermatol 4 (2): 117-28 (2005)

For more Therapeutic Uses (Complete) data for HYDROXYACETIC ACID (27 total), please visit the HSDB record page.

7.5Drug Warnings

FDA has considered evidence that suggests that topically applied cosmetic products containing alpha hydroxy acids (AHAs) as ingredients may increase the sensitivity of skin to the sun while the products are used and for up to a week after use is stopped, and that this increased skin sensitivity to the sun may increase the possibility of sunburn. ... As an interim measure, while FDA continues to review the data on AHAs to address the potential for this increased skin sensitivity to the sun, FDA is recommending that the labeling of a cosmetic product that contains an AHA as an ingredient and that is topically applied to the skin or mucous membrane bear a statement that conveys the following information. The information in the AHA labeling statement is consistent with FDA's current thinking on sun protection. Sunburn Alert: This product contains an alpha hydroxy acid (AHA) that may increase your skin's sensitivity to the sun and particularly the possibility of sunburn. Use a sunscreen, wear protective clothing, and limit sun exposure while using this product and for a week afterwards. /Alpha hydroxy acids/

FDA; Center for Drug Evaluation and Research; Guidance for Industry. Labeling for Topically Applied Cosmetic Products Containing Alpha Hydroxy Acids as Ingredients. (January 10, 2005). Available from, as of July 30, 2008: https://www.cfsan.fda.gov/~dms/ahaguid2.html

1989-1996 Consumer adverse experience reports that were submitted to FDA headquarters and to FDA district offices on alpha hydroxy acid (AHA)-containing products /were evaluated/. Typical adverse reactions included "severe redness, swelling (especially in the

area of the eyes), burning, blistering, bleeding, scarring, rash, itching, contact dermatitis, skin discoloration (reportedly permanent), and adverse neurological responses." Some of the individuals submitting an adverse experience report were seen by a physician, and at least one adverse report involved professional application and at least one involved a product prescribed by a dermatologist. FDA's submittal stated that "in addition to consumer reports of adverse reactions, letters have also been received from dermatologists treating patients suffering from injuries resulting from the use of these (AHA-containing) products". /Alpha hydroxy acids/

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998)

7.6Biomarker Information

13 items

View More Rows & Details

Specific Condition	Biofluid	Disease Concentration	Evidence PMID
Fumarase Deficiency	Urine	5.9 umol/mmol creatinine	26078636
Normal	Urine	193.3 umol/mmol creatinine	26078636
Glycolic Aciduria	Urine	229.0 umol/mmol creatinine	
Normal	Urine	128.0 umol/mmol creatinine	2242313
Eosinophilic Esophagitis	Urine	47.0 (21.0-73.0) umol/mmol creatinine	

1

8Food Additives and Ingredients

8.1FDA Inventory of Effective Food Contact Substance Notifications - FCN

Food Contact Substance	Polyglycolic acid (CAS Reg. No. 26124-68-5).
Manufacturer	Kureha Corporation
Effective Date	Jun 2, 2010
Intended Use	(1) As an internal nonfood-contact layer separated from food by one or more polyethylene terephthalate (PET) layers in PET food contact articles, or by one or more polylactic acid (PLA) layers in PLA food contact articles. (2) In blends with PET.
Limitations/Specifications	(1) The maximum thickness of the FCS layer, in relationship to the minimum thickness of the PET or PLA food-contact layer, shall follow the relationship: y=0.1802e0.1493x, where y is the PGA thickness in μm and x is the PET or PLA thickness in μm. The finished food-contact articles may be used in contact with Food Types I, II, III, IVA, IVB, V, VIA, VIB, VIC (up to 15 percent alcohol), VIIA, VIIB, VIII, and IX under Conditions of Use C through G as described in Tables 1 and 2, except that when PLA is the food-contact layer the finished food-contact articles will be used at temperatures no greater than 60°C. (2) The FCS may be used at levels up to 2.5 percent by weight of the blend with PET, provided that the difference in the measured haze is no greater than a value of 2.5, when determined on PET samples containing PGA and the same grade of PET without PGA, with both samples in the same physical form, using ASTM D 1003. The finished food-contact articles may be used in contact with Food Types I, II, III, IVA, IVB, V, VIA, VIB, VIC (up to 15 percent alcohol), VIIA, VIIB, VIII, and IX under Conditions of Use C through G as described in Tables 1 and 2.
National Environmental Policy Act	Categorical Exclusion 25.32(i), (j), and Environmental Assessment (in PDF, 2.17 MB)
FDA Decision	Categorical Exclusion Memo/Finding of No Significant Impact (FONSI)
Notification	According to Section 409(h)(1)(C) of the Federal Food, Drug, and Cosmetic Act, food contact substance notifications (FCNs) are effective only for the listed manufacturer and its customers. Other manufacturers must submit their own FCN for the same food contact substance and intended use.

Food Contact Substance	Polyglycolic acid (CAS Reg. No. 26124-68-5).
Manufacturer	Kureha Corporation
Effective Date	Apr 14, 2006
Intended Use	As the non food-contact layer of multi-layer, polyethylene terephthalate (PET) beverage bottles.
Limitations/Specifications	The FCS shall be no more than 28 um thick and separated from food by a layer of PET having a thickness of at least 90 um, which will contact non-fatty food types (i.e., I, II, IV-B, VI-A, VI-B, VI-C (up to 15 percent alcohol content) VIIB, and VIII under Conditions of Use C through G, as described in Table 2.
National Environmental Policy Act	Environmental Assessment (in PDF, 516 kB)
FDA Decision	Finding of No Significant Impact (FONSI)
Notification	According to Section 409(h)(1)(C) of the Federal Food, Drug, and Cosmetic Act, food contact substance notifications (FCNs) are effective only for the listed manufacturer and its customers. Other manufacturers must submit their own FCN for the same food contact substance and intended use.

8.2FDA Indirect Additives used in Food Contact Substances

Indirect Additives	GLYCOLIC ACID
Title 21 of the U.S. Code of Federal Regulations (21 CFR)	175.105

9Pharmacology and Biochemistry

9.1MeSH Pharmacological Classification

Keratolytic Agents

Agents that soften, separate, and cause desquamation of the cornified epithelium or horny layer of skin. They are used to expose mycelia of infecting fungi or to treat corns, warts, and certain other skin diseases. (See all compounds classified as Keratolytic Agents.)

9.2Absorption, Distribution and Excretion

The penetration of 10% aq. glycolic acid, adjusted to pH 3.8 using either ammonium or sodium hydroxide, was examined using separated Yucatan minipig epidermis and full thickness hairless mouse skin. A 200 uL-aliquot of each formulation was applied to an area of a Franz diffusion cell, and glycolic acid was analyzed using liquid scintillation counting. Using an occlusive patch, penetration was linear with a lag time of less than 15 mm. After 8 hr, 0.8 and 1.6% of the ammonium and sodium salts penetrated, respectively, using the pig skin model and 1.8 and 2.3% of the ammonium and sodium salts penetrated, respectively, using the mouse skin model. Under open patch conditions, penetration was not linear and lag time was greater than 15 mm. Using the pig skin model, 1.1 and 0.7% of the ammonium and sodium salts penetrated, respectively, and using the mouse skin model, 0.6 and 0.9% of the ammonium and sodium salts penetrated, respectively.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

The skin penetration of (14)C-glycolic acid was studied using an in vitro system in which a cream formulation was applied to pig skin at a dose of 5 mg/0.79 sq cm skin without an occlusive patch. It was determined that 3.1% of the applied glycolic acid penetrated the skin.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

Two female rhesus monkeys were dosed orally with 4 mL/kg of 500 mg/kg homogenous 1-(14)C-glycolic acid, 0.73 uC/mmol, in aq. solution via stomach tube. Urine was collected at intervals of 0-8, 8-24, 24-48, 48-72, and, for one monkey, 72-96 hr. Over a 72 hr period one animal excreted, as a percentage of the dose, 53.2% (14)C, 51.4% of which was excreted in the urine; 51.4% of the dose was excreted in the first 24 hr. The second animal excreted a total of 42.2% (14)C over 96 hr, 36.6% of which was excreted in the urine; 34.1% of the dose was

excreted in the first 24 hr. (The greater amount of fecal radioactivity observed for this monkey could have been due to urinary radioactivity contamination.) Very little of the dose was converted to radioactive glyoxylic, hippuric, or oxalic acid.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

Skin penetration of 10% aq. Glycolic acid was determined in vitro using human female (age 87 years) abdominal skin. The aq. solution was prepared by adding 0.8 mL 12.473% glycolic acid solution to 0.2 mL of (2-(14)C) glycolic acid solution, 44 mCi/mmol or 250 iCi/mL that contained 0.216 mg glycolic acid. The pH of a mixture containing 0.8 mL of the 12.473% glycolic acid solution and 0.2 mL of water was 3.72. Skin integrity was assessed by determining the permeability coefficient of tritiated water. Twenty uL of 10% aq. glycolic acid solution, 2 mg active, was placed on the stratum corneum surface; 13 replicates were used. Samples of 200 uL, which were taken 1, 2, 4, 6, 8, and 24 hr after application, were counted using a liquid scintillation counter. The skin surface was rinsed 3 times after the 24 hr sample was taken. The average total absorption over 24 hr 2.6 +/= 0.37 ug/sq cm representing 0.15 +/= 0.02% of the applied dose. A lag time of approximately 3.8 hr was followed by a period of steady-state diffusion at a rate of 0.13 ug/sq cm/hr. After 24 hr, 48 +/= 0.05% of the dose was recovered in the skin and 0.15 +/= 0.02% was found in the receptor phase. Total recovery was 102.9% +/= 2.9%.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

For more Absorption, Distribution and Excretion (Complete) data for HYDROXYACETIC ACID (14 total), please visit the HSDB record page.

9.3Metabolism/Metabolites

The kinetics of orally administered ethylene glycol (EG) and its major metabolites, glycolic acid (GA) and oxalic acid (OX), in pregnant (P; gestation day 10 at dosing, GD 10) rats were compared across doses, and between pregnant and nonpregnant (NP) rats. Groups of 4 jugular vein-cannulated female rats were administered 10 (P and NP), 150 (P), 500 (P), 1000 (P), or 2500 (P and NP) mg (13)C-labelled EG/kg body weight. Serial blood samples and urine were collected over 24-hr postdosing, and analyzed for EG, GA, and OX using GC/MS

techniques. Pharmacokinetic parameters including Cmax, Tmax, AUC, and beta-t(1/2) were determined for EG and GA. Pregnancy status (GD 10-11) had no impact on the pharmacokinetic parameters investigated. Blood levels of GA were roughly dose-proportional from 10 to 150 mg EG/kg, but increased disproportionately from 500 to 1000 mg EG/kg. EG and GA exhibited dose-dependent urinary elimination at doses > or = 500 mg EG/kg, probably due to saturation of metabolic conversion of EG to GA, and of GA to downstream metabolites. The shift to nonlinear kinetics encompassed the NOEL (500 mg EG/kg) and LOEL (1000 mg EG/kg) for developmental toxicity of EG in rats, providing additional evidence for the role of GA in EG developmental toxicity. The peak maternal blood concentration of GA associated with the LOEL for developmental toxicity in the rat was quite high (363 microg/g or 4.8 mM blood). OX was a very minor metabolite in both blood and urine at all dose levels, suggesting that OX is not important for EG developmental toxicity.

PMID:11399788
Pottenger LH et al; Toxicol Sci 62 (1): 10-9 (2001)

The disposition of dichloroacetic acid (DCA) was investigated in Fischer 344 rats over the 48 hr after oral gavage of 282 mg/kg of 1- or 2-(14C)DCA (1-DCA or 2-DCA) and 28.2 mg/kg of 2-DCA... The major urinary metabolites were glycolic acid, glyoxylic acid, and oxalic acid. DCA and its metabolites accumulated in the tissues and were eliminated slowly....

PMID:8421320
Lin EL et al; J Toxicol Environ Health 38 (1): 19-32 (1993)

The accumulation of glycolate and the elimination kinetics of ethylene glycol (EG) /was examined in/ ... male Sprague-Dawley rats and mixed breed dogs... . EG was administered by gavage ... . The peak plasma level of EG occurred at 2 hr after dosing and that of glycolate between 4-6 hr. The rate of EG elimination was somewhat faster in rats with a half-life of 1.7 hr compared to 3.4 hr in dogs. The maximum plasma level of glycolate was greater in rats, although the pattern of accumulation was similar to that in dogs. Glycolate disappeared from the plasma at the same time as EG, suggesting a slower rate of elimination of the metabolite than that of EG. Renal excretion of EG was an important route for its elimination, accounting for 20-30% of the dose. Renal excretion of glycolate represented about 5% of the dose... /Glycolate/

PMID:2929116
Hewlett TP et al; Vet Hum Toxicol 31 (2): 116-20 (1989)

1,2-(14)C-Ethylene glycol (EG) was given to female CD (Sprague-Dawley) rats and CD-1 mice in order to determine tissue distribution and metabolic fate after intravenous (iv), peroral (po), and percutaneous (pc) doses. Rats were given doses of 10 or 1000 mg/kg by each route, and additional pc doses of 400, 600 or 800 mg/kg. Mice were also given iv and po doses of 10 or 1000 mg/kg, and intermediate po doses of 100, 200 or 400 mg/kg. Mice were given po

doses of 100 or 1000 mg/kg, and both species were given a 50% (w/w) aqueous po dose to simulate antifreeze exposure. For both species, EG is very rapidly and almost completely adsorbed after po doses. ... The tissue distribution of EG following either iv or po routes was essentially the same, with similar percentages recovered for each dose by both routes and for either species. Cutaneously-applied EG was slowly and rather poorly adsorbed in both species, in comparison with po-dose administration, and urinalysis after undiluted po doses indicated that EG probably penetrates rat skin in the parent form. There was an absence in both species of dose-dependent changes in disposition and elimination following the pc application of EG. (14)C-labelled EG, glycolic acid and/or oxalic acid accounted for the majority of the detectable radioactivity in the urine samples from all dose routes in the rat, while glycoaldehyde and glyoxylic acid were not detected in any of the urine fractions evaluated. Similar increases in glycolate production with increasing dose were also observed in mouse urine samples from iv and po dosing. Also, glyoxylate and oxalate were absent from mouse urine...

PMID:8948094
Frantz SW et al; Xenobiotica 26 (11): 1195-220 (1996)

For more Metabolism/Metabolites (Complete) data for HYDROXYACETIC ACID (9 total), please visit the HSDB record page.

9.4Biological Half-Life

... ethylene glycol and glycolate were distributed in total body water with plasma half-lives of 8.4 and 7.0 hr respectively.

Jacobsen D et al; Am J Med 84: 145-52 (Jan) (1988)

Rats given 1, 5, and 10 mL/kg diethylene glycol eliminated diethylene glycol in their urine with half lives of 6, 6, and 12 hr assuming first order kinetics. More detailed analysis showed that 6, 9, and 18 hr after dosing with 1, 5, and 10 mL/kg diethylene glycol elimination of (14)C activity followed zero order kinetics then changed to first order kinetics with a half life of 3 hr. Rats dosed with 3 and 5 mL/kg ethylene glycol excreted unchanged ethylene glycol in their urine with half lives of 4.5 and 4.1 hr respectively.

PMID:2815837
Lenk W et al; Xenobiotica 19 (9): 961-79 (1989)

9.5Mechanism of Action

Ethylene glycol toxicity results from its metabolism to glycolic acid and other toxic metabolites. The accumulation of glycolate and the elimination kinetics of ethylene glycol and its metabolites are not well understood, so studies with male Sprague-Dawley rats and mixed breed dogs have been carried out. Ethylene glycol was administered by gavage to rats and dogs which were placed in metabolic cages for urine and blood sample collection at timed intervals. The peak plasma level of ethylene glycol occurred at 2 hr after dosing and that of glycolate between 4-6 hr. The rate of ethylene glycol elimination was somewhat faster in rats with a half-life of 1.7 hr compared to 3.4 hr in dogs. The maximum plasma level of glycolate was greater in rats although the pattern of accumulation was similar to that in dogs. Glycolate disappeared from the plasma at the same time as ethylene glycol, suggesting a slower rate of elimination of the metabolite than that of ethylene glycol. Renal excretion of ethylene glycol was an important route for its elimination accounting for 20-30% of the dose. Renal excretion of glycolate represented about 5% of the dose. Ethylene glycol induced an immediate, but short lived diuresis compared to that in control rats. Minimal clinical effects (mild acidosis with no sedation) were noted at these doses of ethylene glycol (1-2 g/kg) in both rats and dogs. The results indicate that the toxicokinetics of ethylene glycol and glycolate were similar in both species.

PMID:2929116
Hewlett TP et al; Vet Hum Toxicol 31 (2): 116-20 (1989)

The effect of 0.35 to 0.8 mmol/kg glycolic acid and 1.0 to 4.4 mmol/kg sodium glycolate on cyclopropane-epinephrine induced cardiac arrhythmias was examined using dogs. Doses of 0.35 to 0.5 mmol/kg glycolic acid increased the duration of arrhythmias in the 13 dogs tested, whereas doses >0.5 mmol/kg decreased or totally eliminated the arrhythmias in each of 11 dogs. Depression was observed for many of the dogs at higher doses. Sodium glycolate was much less effective in decreasing the arrhythmias, with 3 mmol/kg being required and its action being transient.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

9.6Human Metabolite Information

9.6.1Tissue Locations

Bladder

Epidermis

Fibroblasts

Liver

9.6.2Cellular Locations

Mitochondria

Peroxisome

9.7Biochemical Reactions

150 items

View More Rows & Details

Reaction	PubChem Pathway	Source	Taxonomy
a ω-hydroxy fatty acid + O_2 → hydrogen peroxide + an ω-oxo fatty acid	fatty acid ω-oxidation	BioCyc	Trypanosoma brucei
a fatty acid → a ω-hydroxy fatty acid	fatty acid ω-oxidation	BioCyc	Trypanosoma brucei
2-phosphoglycolate + H2O → phosphate + glycolate	Metabolism and regulation	Plant Reactome	Selaginella moellendorffii
2-phosphoglycolate + H2O → phosphate + glycolate	PCO cycle	Plant Reactome	Selaginella moellendorffii
2-phosphoglycolate + H2O → phosphate + glycolate	Metabolism and regulation	Plant Reactome	Vigna radiata

- 1
- ...

10Use and Manufacturing

10.1Uses

EPA CPDat Chemical and Product Categories

44 items

View More

Category	Category Description	Categorization Type
acid		Reported Functional Use
antibacterial, cleaner		Reported Functional Use
buffering		Reported Functional Use
cleaner		Reported Functional Use
cleaning agent - organic acid		Reported Functional Use

- 1
- ...

The Chemical and Products Database, a resource for exposure-relevant data on chemicals in consumer products, Scientific Data, volume 5, Article number: 180125 (2018), DOI:10.1038/sdata.2018.125

Sources/Uses

Used as a cheap organic acid to manufacture adhesives; to dye, print, and crease-proof textiles; to clean metals, water wells, and dairy equipment; and to delime hides and process furs; Also used in leather dyeing, adhesives, electroplating, pH control, copper pickling, printed wire board flux, oil well acidification, biodegradable polymers, soldering compounds, iron chelating, chemical milling, etching lithographic plates, and dermatology; [HSDB]
Active product registrations for uses in cleaning products; [NPRIS]

Industrial Processes with risk of exposure

Acid and Alkali Cleaning of Metals [Category: Clean]

Electroplating [Category: Plate]

Petroleum Production and Refining [Category: Industry]

Soldering [Category: Heat or Machine]

Working with Glues and Adhesives [Category: Other]

Leather Tanning and Processing [Category: Industry]

Fur Dressing and Dyeing [Category: Industry]

Textiles (Printing, Dyeing, or Finishing) [Category: Industry]

Activities with risk of exposure

Lithography printing [Category: Hobbies]

For hydroxyacetic acid (USEPA/OPP Pesticide Code: 000101) ACTIVE products with label matches. /SRP: Registered for use in the USA but approved pesticide uses may change periodically and so federal, state and local authorities must be consulted for currently approved uses./

National Pesticide Information Retrieval System's Database on Hydroxyacetic Acid (79-14-1). Available from, as of June 27, 2014: https://npirspublic.ceris.purdue.edu/ppis/

The active ingredient is no longer contained in any registered pesticide products ... "cancelled."

United States Environmental Protection Agency/ Prevention, Pesticides and Toxic Substances; Status of Pesticides in Registration, Reregistration, and Special Review. (1998) EPA 738-R-98-002, p. 314

In skin care products as exfolliant and keratolytic. In biopolymers for absorbable sutures and drug delivery systems. In the processing of textiles, leather, and metals; in pH control, in the manufacture of adhesives, in copper brightening, decontamination cleaning, dyeing, electroplating, in pickling, cleaning and chemical milling of metals.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Cambridge, UK: Royal Society of Chemistry, 2013., p. 832

Leather dyeing and tanning; textile dyeing; cleaning, polishing, and soldering compounds; copper pickling; adhesives; electroplating; breaking of petroleum emulsions; chelating agent for iron; chemical milling; pH control

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 670

For more Uses (Complete) data for HYDROXYACETIC ACID (7 total), please visit the HSDB record page.

10.1.1Use Classification

Cosmetics -> Buffering

S13 | EUCOSMETICS | Combined Inventory of Ingredients Employed in Cosmetic Products (2000) and Revised Inventory (2006) | DOI:10.5281/zenodo.2624118

10.1.2Industry Uses

Dyes

Intermediates

Oxidizing/reducing agents

Photosensitive chemicals

Plating agents and surface treating agents

Processing aids, not otherwise listed

Processing aids, specific to petroleum production

Solvents (for cleaning and degreasing)

Solvents (which become part of product formulation or mixture)

repackaging into containers for distribution

https://www.epa.gov/chemical-data-reporting

10.1.3Consumer Uses

Building/construction materials not covered elsewhere

Cleaning and furnishing care products

Fabric, textile, and leather products not covered elsewhere

Paper products

Personal care products

Water treatment products

https://www.epa.gov/chemical-data-reporting

10.1.4Household Products

Household & Commercial/Institutional Products

Information on 107 consumer products that contain Hydroxyacetic acid in the following categories is provided:

• Auto Products

• Commercial / Institutional

• Home Maintenance

• Inside the Home

• Personal Care

• Pet Care

10.2Methods of Manufacturing

Hydroxyacetic acid is produced commercially in the United States (Du Pont) by treating formaldehyde or trioxymethylene with carbon monoxide and water in the presence of acid catalysts at >30 MPa.

Miltenberger K; Hydroxycarboxylic Acids, Aliphatic. Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2014). NY, NY: John Wiley & Sons. Online Posting Date: June 15, 2000

Glycolic acid is usually produced by hydrolysis of molten monochloroacetic acid with 50% aqueous sodium hydroxide at 90-130 °C. The resulting glycolic acid solution has a concentration of ca. 60% and contains 12-14% sodium chloride. The salt may be removed by evaporative concentration, followed by extraction of the acid with acetone. Attempts have also been made to conduct the hydrolysis with acid catalysts at 150-200 °C with water or

steam under pressure. In this case, the byproduct is hydrogen chloride, rather than sodium chloride, which can be removed by distillation. The principal disadvantage of the method is the need for relatively large volumes of water.

Miltenberger K; Hydroxycarboxylic Acids, Aliphatic. Ullmann's Encyclopedia of Industrial Chemistry 7th ed. (1999-2014). NY, NY: John Wiley & Sons. Online Posting Date: June 15, 2000

Made by action of sodium hydroxide on monochloroacetic acid; also by electrolytic reduction of oxalic acid.

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 2006., p. 777

From chloroacetic acid by reaction with sodium hydroxide, or by reduction of oxalic acid.

Lewis, R.J. Sr.; Hawley's Condensed Chemical Dictionary 15th Edition. John Wiley & Sons, Inc. New York, NY 2007., p. 670

For more Methods of Manufacturing (Complete) data for HYDROXYACETIC ACID (7 total), please visit the HSDB record page.

10.3Formulations/Preparations

GRADES: TECHNICAL, 70% SOLN; PURE CRYSTALS. AVAIL COMMERCIALLY AS 70% SOLN.

Sax, N.I. and R.J. Lewis, Sr. (eds.). Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987., p. 620

Available commercially as either a 57% (Hoechst) or a 70% (Du Pont) aqueous solution

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA13 513

Clorox Patch (Clorox Co., The): Active ingredient: glycolic acid 1.5%.

National Pesticide Information Retrieval System's Database on Glycolic Acid (79-14-1). Available from, as of June 27, 2014: https://npirspublic.ceris.purdue.edu/ppis/

CBW (Clorox Co., The): Active ingredient: glycolic acid 11.185%.

National Pesticide Information Retrieval System's Database on Glycolic Acid (79-14-1). Available from, as of June 27, 2014: https://npirspublic.ceris.purdue.edu/ppis/

For more Formulations/Preparations (Complete) data for HYDROXYACETIC ACID (10 total), please visit the HSDB record page.

10.4Consumption Patterns

Total annual consumption worldwide is ca. 2000-3000 t of solution

Gerhartz, W. (exec ed.). Ullmann's Encyclopedia of Industrial Chemistry. 5th ed.Vol A1: Deerfield Beach, FL: VCH Publishers, 1985 to Present., p. VA13 513

10.5U.S. Production

Aggregated Product Volume (EPA CDR 2016)

10,000,000 - 50,000,000 lb

https://www.epa.gov/chemical-data-reporting

Acetic acid, hydroxy- is listed as a High Production Volume (HPV) chemical (65FR81686). Chemicals listed as HPV were produced in or imported into the U.S. in >1 million pounds in 1990 and/or 1994. The HPV list is based on the 1990 Inventory Update Rule. (IUR) (40 CFR part 710 subpart B; 51FR21438).

EPA/Office of Pollution Prevention and Toxics; High Production Volume (HPV) Challenge Program. Acetic acid, hydroxy- (79-14-1). Available from, as of June 28, 2014: https://www.epa.gov/hpv/pubs/general/opptsrch.htm

Production volumes for non-confidential chemicals reported under the Inventory Update Rule.

Year	Production Range (pounds)
1986	>10 million - 50 million
1990	>10 million - 50 million
1994	>10 million - 50 million
1998	>10 million - 50 million
2002	>10 million - 50 million

US EPA; Non-confidential Production Volume Information Submitted by Companies for Chemicals Under the 1986-2002 Inventory Update Rule (IUR). Acetic acid, hydroxy- (79-14-1). Available from, as of June 28, 2014: https://epa.gov/cdr/tools/data/2002-vol.html

Production volume for non-confidential chemicals reported under the 2006 Inventory Update Rule. Chemical: Acetic acid, 2-hydroxy-. Aggregated National Production Volume: 10 to < 50 million pounds.

US EPA; Non-Confidential 2006 Inventory Update Reporting. National Chemical Information. Acetic acid, 2-hydroxy- (79-14-1). Available from, as of June 28, 2014: https://cfpub.epa.gov/iursearch/index.cfm

Non-confidential 2014 Chemical Data Reporting (CDR) information on the production and use of chemicals manufactured or imported into the United States. Chemical: Acetic acid, 2-hydroxy-. National Production Volume: 25,532,497 lb/yr.

USEPA/Pollution Prevention and Toxics; 2014 Chemical Data Reporting Database. Acetic acid, 2-hydroxy- (79-14-1). Available from, as of June 28, 2014: https://java.epa.gov/oppt_chemical_search/

10.6General Manufacturing Information

Industry Processing Sectors

All other basic organic chemical manufacturing

All other chemical product and preparation manufacturing

Computer and electronic product manufacturing

Construction

Oil and gas drilling, extraction, and support activities

Paper manufacturing

Petroleum lubricating oil and grease manufacturing

Petroleum refineries

Plastic material and resin manufacturing

Soap, cleaning compound, and toilet preparation manufacturing

Textiles, apparel, and leather manufacturing

Utilities

Wholesale and retail trade

EPA TSCA Commercial Activity Status

Acetic acid, 2-hydroxy-: ACTIVE

https://www.epa.gov/tsca-inventory

EPA TSCA Commercial Activity Status

Acetic acid, 2-hydroxy-, homopolymer: ACTIVE

https://www.epa.gov/tsca-inventory

EPA TSCA Regulatory Flag

XU - indicates a substance exempt from reporting under the Chemical Data Reporting Rule, (40 CFR 711).

https://www.epa.gov/tsca-inventory

Constituent of sugar cane juice

O'Neil, M.J. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Cambridge, UK: Royal Society of Chemistry, 2013., p. 832

Hydroxyacetic acid is produced commercially in the United States as an intermediate in the manufacture of ethylene glycol

Kirk-Othmer Encyclopedia of Chemical Technology. 3rd ed., Volumes 1-26. New York, NY: John Wiley and Sons, 1978-1984., p. V13 91

11Identification

11.1Analytic Laboratory Methods

Separations and determinations of organic acids in pulp waste water by liquid chromatography using a heat detector.

KABEYA H ET AL; NIPPON KAGAKU KAISHI ISS 11, 1910 (1975)

Glycolic acid may be detected qualitatively by the violet color formed with 2,7-dihydroxynaphthalene. The preferred method of quantitative analysis (in the absence of other acidic or hydrolyzable substances) is acidimetric titration. Because of the tendency of lactide formation free and total acid must be determined separately.

Ullmann's Encyclopedia of Industrial Chemistry. 6th ed.Vol 1: Federal Republic of Germany: Wiley-VCH Verlag GmbH & Co. 2003 to Present, p. V17 321 (2003)

11.2Clinical Laboratory Methods

The misuse of the commonly used chemical diethylene glycol (DEG) has led to many poisonings worldwide. Methods were developed for analysis of DEG and its potential metabolites; ethylene glycol, glycolic acid, oxalic acid, diglycolic acid and hydroxyethoxy acetic acid in human urine, serum and cerebrospinal fluid samples, collected following a DEG-associated poisoning in the Republic of Panama during 2006. In addition, methods were developed for rat blood, urine, kidney and liver tissue to support toxicokinetic analysis during the conduct of DEG acute toxicity studies in the rat. Sample analysis was conducted using two techniques; ion chromatography with suppressed conductivity and negative ion electrospray ionization with MS detection or with gas chromatography using electron impact ionization or methane negative chemical ionization with MS detection. Stable-isotope-labeled analogs of each analyte were employed as quantitative internal standards in the assays.

PMID:24668490
Perala AW et al; J Anal Toxicol 38 (4): 184-93 (2014)

Colorimetric and gas chromatographic procedures for glycolic acid in serum.

PMID:8355316
Fraser AD, MacNeil W; J Toxicol Clin Toxicol 31:397-405 (1993)

12Safety and Hazards

12.1Hazards Identification

12.1.1GHS Classification

Showing 1 of 4

View More

Pictogram(s)	 
Signal	Danger
GHS Hazard Statements	H302 (86.11%): Harmful if swallowed [Warning Acute toxicity, oral] H314 (99.97%): Causes severe skin burns and eye damage [Danger Skin corrosion/irritation] H318 (25.16%): Causes serious eye damage [Danger Serious eye damage/eye irritation] H332 (27.21%): Harmful if inhaled [Warning Acute toxicity, inhalation]
Precautionary Statement Codes	P260, P261, P264, P264+P265, P270, P271, P280, P301+P317, P301+P330+P331, P302+P361+P354, P304+P340, P305+P354+P338, P316, P317, P321, P330, P363, P405, and P501 (The corresponding statement to each P-code can be found at the GHS Classification page.)
ECHA C&L Notifications Summary	*Aggregated GHS information provided by 3229 companies from 31 notifications to the ECHA C&L Inventory. Each notification may be associated with multiple companies.* *Reported as not meeting GHS hazard criteria by 10 of 3229 companies. For more detailed information, please visit ECHA C&L website.* *Of the 30 notification(s) provided by 3219 of 3229 companies with hazard statement code(s).* *Information may vary between notifications depending on impurities, additives, and other factors. The percentage value in parenthesis indicates the notified classification ratio from companies that provide hazard codes. Only hazard codes with percentage values above 10% are shown.*

12.1.2Hazard Classes and Categories

Showing 2 of 3

View More
Acute Tox. 4 (86.11%)

Skin Corr. 1B (99.97%)

Eye Dam. 1 (25.16%)

Acute Tox. 4 (27.21%)

Flam. Sol. 2 (50%)

Self-heat. 2 (50%)

Skin Irrit. 2 (50%)

Eye Irrit. 2 (50%)

STOT SE 3 (50%)

12.1.3Fire Hazards

Combustible.

12.1.4Hazards Summary

Corrosive to skin; [Quick CPC] 70% technical solutions cause severe burns of the skin and eyes. [HSDB] Corrosive to skin and eyes; A respiratory tract irritant; May have effects on kidneys, leading to kidney failure; [ICSC] Causes burns; Inhalation may cause corrosive injuries to upper respiratory tract and lungs; Harmful by ingestion; [Alfa Aesar MSDS]

Quick CPC - Forsberg K, Mansdorf SZ. Quick Selection Guide to Chemical Protective Clothing, 5th Ed. Hoboken, NJ: Wiley-Interscience, 2007.

12.1.5Fire Potential

Combustible.

International Program on Chemical Safety/Commission of the European Union; International Chemical Safety Card on HYDROXYACETIC ACID (79-14-1). Available from, as of 05.06.2014: https://www.inchem.org/documents/icsc/icsc/eics1537.htm

12.1.6Skin, Eye, and Respiratory Irritations

Skin contact may cause severe skin irritation with discomfort or rash. Higher or prolonged exposure may cause skin burns or ulceration. Eye contact may cause eye corrosion with corneal or conjunctival ulceration. Permanent eye damage can occur. /70% Glycolic acid/

Dupont; Material Safety Data Sheet for GLYCLEAN(R)AN, MSDS No. 6342CR. 8 pp. (November 15, 2005) Available from, as of August 5, 2008: https://msds.dupont.com/msds/Mediator

Toxicity results indicate that glycolic acid (70%) causes effects that are typical of a strong acid, such as dermal and eye irritation; however, concentrations of < 5%, typically used in cleaning formulations, are not irritating to the skin.

Hayes AW, Stadler JC; Toxicologist 78 (1-S): 160 (2004)

Mild irritant to skin, mucous membranes.

The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 583

It produces very severe burns of skin or eye in 70% technical solution.

Patty, F. (ed.). Industrial Hygiene and Toxicology: Volume II: Toxicology. 2nd ed. New York: Interscience Publishers, 1963., p. 1803

A severe eye irritant. A skin and mucous memmbrane irritant.

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 1873

Glycolic acid is a strong acid and, at high concentration in solution (~70%) is expected to cause severe skin and eye irritation/corrosion.

USEPA; Hazard Characterization Document, Screening level Hazard Characterization for Glycolic Acid (79-14-1). P. 11. Available from as of May 7, 2014: https://www.epa.gov/chemrtk/hpvis/hazchar/79141_Glycolic%20Acid_June%202010.pdf

12.2First Aid Measures

12.2.1Inhalation First Aid

Half-upright position. Fresh air, rest. Refer for medical attention.

12.2.2Skin First Aid

First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again.

12.2.3Eye First Aid

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

12.2.4Ingestion First Aid

Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

12.3Fire Fighting

Use water spray, powder, foam, carbon dioxide.

12.3.1Fire Fighting Procedures

Suitable extinguishing media: Use water spray, alcohol - resistant foam, dry chemical or carbon dioxide.

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Special protective equipment for firefighters Wear self contained breathing apparatus for fire fighting if necessary.

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Use water spray, powder, foam, carbon dioxide.

International Program on Chemical Safety/Commission of the European Union; International Chemical Safety Card on HYDROXYACETIC ACID (79-14-1). Available from, as of 05.06.2014: https://www.inchem.org/documents/icsc/icsc/eics1537.htm

12.3.2Firefighting Hazards

Emits toxic fumes under fire conditions. /99% Glycolic acid/

Sigma-Aldrich; Material Safety Data Sheet for Glycolic acid, 99% (PN: 124737) 6 pp. (February 1, 2006) Available from, as of August 1, 2008: https://www.sigmaaldrich.com/catalog/search/ProductDetail/SIAL/124737

12.4Accidental Release Measures

12.4.1Spillage Disposal

Personal protection: chemical protection suit including self-contained breathing apparatus. Sweep spilled substance into covered containers.

12.4.2Cleanup Methods

Accidental Release Measures. Personal precautions, protective equipment and emergency procedures: Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. Environmental precautions: Do not let product enter drains. Methods and materials for containment and clean up: Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Do not contaminate water, food, or feed by ... disposal. ... Do not re-use empty container. Wrap empty bottle and put in trash or recycle. /5% Glycolic acid/

USEPA; Pesticide Product Label System (PPLS). Search for Company 71654, Product No. 5, Dupont (TM) KleanIT Label Approved May 9, 2006. Available from, as of August 5, 2008: https://www.epa.gov/pesticides/pestlabels/

Neutralize spills with lime or soda ash. /70% Glycolic acid/

Dupont; Material Safety Data Sheet for GLYCLEAN(R)AN, MSDS No. 6342CR. 8 pp. (November 15, 2005) Available from, as of August 5, 2008: https://msds.dupont.com/msds/Mediator

12.4.3Disposal Methods

SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational harm/injury/toxicity or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal and plant life; and conformance with environmental and public health regulations.

SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a permitted wastewater treatment facility is acceptable only after review by the governing authority and assurance that "pass through" violations will not occur. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must be evaluated in accordance with EPA 40 CFR Part 261, specifically Subpart B, in order to determine the appropriate local, state and federal requirements for disposal.

Waste Treatment Methods. Product: Offer surplus and non - recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipp ed with an afterburner and scrubber. Contaminated packaging: Dispose of as unused product.

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

12.4.4Preventive Measures

SRP: The scientific literature for the use of contact lenses by industrial workers is inconsistent. The benefits or detrimental effects of wearing contact lenses depend not only upon the substance, but also on factors including the form of the substance, characteristics and duration of the exposure, the uses of other eye protection equipment, and the hygiene of

the lenses. However, there may be individual substances whose irritating or corrosive properties are such that the wearing of contact lenses would be harmful to the eye. In those specific cases, contact lenses should not be worn. In any event, the usual eye protection equipment should be worn even when contact lenses are in place.

SRP: Contaminated protective clothing should be segregated in a manner such that there is no direct personal contact by personnel who handle, dispose, or clean the clothing. The completeness of the cleaning procedures should be considered before the decontaminated protective clothing is returned for reuse by the workers. Contaminated clothing should not be taken home at the end of shift, but should remain at employee's place of work for cleaning.

SRP: Local exhaust ventilation should be applied wherever there is an incidence of point source emissions or dispersion of regulated contaminants in the work area. Ventilation control of the contaminant as close to its point of generation is both the most economical and safest method to minimize personnel exposure to airborne contaminants. Ensure that the local ventilation moves the contaminant away from the worker.

When chemicals containing glycolic acid are used on a daily basis, protection for the skin and eyes is advised to prevent localized irritation. Child-proof packaging is available to prevent children from ingesting these products. Overall, the evidence indicates there is minimal risk of adverse health effects from glycolic acid during the normal use of commercially available cleaning products.

Hayes AW, Stadler JC; Toxicologist 78 (1-S): 160 (2004)

For more Preventive Measures (Complete) data for HYDROXYACETIC ACID (14 total), please visit the HSDB record page.

12.5Handling and Storage

12.5.1Safe Storage

Separated from strong oxidants, metals, sulfides, cyanides, strong bases and food and feedstuffs. Dry.

12.5.2Storage Conditions

Separated from strong oxidants, metals, sulfides, cyanides, strong bases and food and feedstuffs. Dry.

International Program on Chemical Safety/Commission of the European Union; International Chemical Safety Card on HYDROXYACETIC ACID (79-14-1). Available from, as of 05.06.2014: https://www.inchem.org/documents/icsc/icsc/eics1537.htm

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

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Do not contaminate water, food, or feed by storage ... . Store out of reach of children.

USEPA; Pesticide Product Label System (PPLS). Search for Company 71654, Product No. 5, Dupont (TM) KleanIT Label Approved May 9, 2006. Available from, as of August 5, 2008: https://www.epa.gov/pesticides/pestlabels/

12.6Exposure Control and Personal Protection

12.6.1Inhalation Risk

A harmful concentration of airborne particles can be reached quickly on spraying or when dispersed, especially if powdered.

12.6.2Effects of Short Term Exposure

The substance is corrosive to the skin and eyes. The substance is irritating to the respiratory tract. Corrosive on ingestion. The substance may cause effects on the kidneys. This may result in kidney failure.

12.6.3Effects of Long Term Exposure

Repeated or prolonged contact with skin may cause dermatitis.

12.6.4Personal Protective Equipment (PPE)

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Face shield and safety glasses. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (witho ut touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Where risk assessment shows air - purifying respirators are appropriate use a full - face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full - face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Engineering Controls: Use sufficient ventilation to keep employee exposure below recommended limits. Personal Protective Equipment: Chemical splash goggles and rubber gloves. Wear a butyl rubber acid suit and NIOSH permissible respiratory protection if there is a reasonable possibility for exposure. /70% Glycolic acid/

Dupont; Material Safety Data Sheet for GLYCLEAN(R)AN, MSDS No. 6342CR. 8 pp. (November 15, 2005) Available from, as of August 5, 2008: https://msds.dupont.com/msds/Mediator

12.6.5Fire Prevention

NO open flames.

12.6.6Inhalation Prevention

Avoid inhalation of dust and mist.

12.6.7Skin Prevention

Protective gloves.

12.6.8Eye Prevention

Wear safety goggles or eye protection in combination with breathing protection.

12.6.9Ingestion Prevention

Do not eat, drink, or smoke during work.

12.7Stability and Reactivity

12.7.1Hazardous Reactivities and Incompatibilities

Materials to avoid Bases, Oxidizing agents, Reducing agents

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

Contact with active metals may produce flammable hydrogen gas (solid).

EPA/Office of Pollution Prevention and Toxics; High Production Volume Information System (HPVIS). Available from the Database Query page at: on Hydroxyacetic acid as of August 1, 2008. https://www.epa.gov/hpvis/index.html

12.8Transport Information

12.8.1Packaging and Labelling

Do not transport with food and feedstuffs.

12.8.2UN Classification

UN Hazard Class: 8; UN Pack Group: II

12.9Regulatory Information

12.9.1FIFRA Requirements

As the federal pesticide law FIFRA directs, EPA is conducting a comprehensive review of older pesticides to consider their health and environmental effects and make decisions about their continued use. Under this pesticide reregistration program, EPA examines newer health and safety data for pesticide active ingredients initially registered before November 1, 1984, and determines whether the use of the pesticide does not pose unreasonable risk in accordance to newer saftey standards, such as those described in the Food Quality Protection Act of 1996. Pesticides for which EPA had not issued Registration Standards prior to the effective date of FIFRA '88 were divided into three lists based upon their potential for human exposure and other factors, with List B containing pesticides of greater concern than those on List C, and with List C containing pesticides of greater concern than those on List D. Glycolic acid is found on List D. Case No: 4045; Pesticide type: antimicrobial; Case Status: No products containing the pesticide are actively registered ... The case /is characterized/ as "cancelled." Under FIFRA, pesticide producers may voluntarily cancel their registered products. EPA also may cancel pesticide registrations if registrants fail to pay required fees or make/meet certain reregistration commitments, or if EPA reaches findings of unreasonable adverse effects.; Active ingredient (AI): Glycolic acid; AI Status: The active ingredient is no longer contained in any registered pesticide products ... "cancelled."

United States Environmental Protection Agency/ Prevention, Pesticides and Toxic Substances; Status of Pesticides in Registration, Reregistration, and Special Review. (1998) EPA 738-R-98-002, p. 314

12.9.2FDA Requirements

Hydroxyacetic acid is an indirect food additive for use as a component of adhesives.

21 CFR 175.105 (USFDA); U.S. National Archives and Records Administration's Electronic Code of Federal Regulations. Available from, as of June 26, 2014: https://www.ecfr.gov

12.10Other Safety Information

12.10.1Toxic Combustion Products

Hazardous decomposition prod ucts formed under fire conditions. - Carbon oxides

Sigma-Aldrich; Material Safety Data Sheet for glycolic acid, Product Number: 124737, Version 4.2 (Revision Date 11/26/2012). Available from, as of May 1, 2014: https://www.sigmaaldrich.com/united-states.html

12.10.2Special Reports

DHHS/NTP; NTP Technical Report on the Photocarcinogenesis Study of Glycolic Acid and Salicylic Acid (CAS NOS. 79-14-1 and 69-72-7) in SKH-1 Mice (Simulated Solar LIght and Topical Application Study). NTP TR-524 244 pp. (September 2007)[Available from, as of July 31, 2008: http://ntp.niehs.nih.gov/files/524_web1.pdf]

DHHS/NTP-CERHR; Monograph on the Potential Human Reproductive and Developmental Effects. 51: (11): 1-III36. January 2004. NTP-CERHR monographs are available electronically in PDF format on the CERHR web site and in printed text or CD-ROM from the CERHR (National Institute of Environmental Health Sciences, P.O. Box 12233, MD EC-32, Research Triangle Park, NC; fax: 919-316-4511).[Available from, as of July 3, 2008: http://cerhr.niehs.nih.gov]

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998)

13Toxicity

13.1Toxicological Information

13.1.1Toxicity Summary

IDENTIFICATION AND USE: Hydroxyacetic (glycolic) acid is an odorless, colorless and translucent solid. The primary uses of hydroxyacetic acid are in cleaning and metal processing. Other specialized applications include biomedical uses, printed wire board flux, adhesives, textiles, hydrogen sulfide abatement, tanning, oil well acidification, and biodegradable polymers and copolymers for absorbable sutures and drug delivery systems. It is also used in skin care products as exfolliant and keratolytic. HUMAN EXPOSURE AND TOXICITY: Inhalation may cause irritation of mucous membranes with upper respiratory and bronchial irritation. Skin contact may cause severe skin irritation with discomfort or rash. Higher or prolonged exposure may cause skin burns or ulceration. Eye contact may cause eye corrosion with corneal or conjunctival ulceration. Permanent eye damage can occur. Ingestion may cause corrosion of mucous membranes with stomach discomfort, nausea, and prostration. Kidney damage or fatality may occur from gross overexposure. ANIMAL TOXICITY STUDIES: A basal diet with 3% glycolic acid for 3 weeks in rats resulted in a high incidence of oxalate urolithiasis (mostly in the kidneys, but some animals also had uroliths in the ureter and urinary bladder. Also, fine crystalline depositions were present throughout the cortex and medulla and clusters of concretions were on the surface or embedded in the renal papilla. In dogs given daily oral doses of 1000 mg glycolic acid for 35 days, no abnormal secretions of oxalic acid were found and no damage to the gastroenteric tract or kidneys was reported. In other experiment, rats were administered up to 600 mg/kg/day of the test substance by gavage for 90 days. Two deaths occurred in males at 600 mg/kg/day. Decreased mean body weight, overall body weight gain, food consumption, and food efficiency occurred in males and females of the 300 and 600 mg/kg/day groups. Microscopic findings of oxalate crystal nephrosis and unilateral hydronephrosis, and hyperplasia of the transitional epithelium of the renal pelvis were also observed (in males only) at these dose levels. No organ weight, gross or microscopic findings indicative of systemic toxicity were observed in female rats exposed to 300 or 600 mg/kg/day. The developmental toxicity of glycolic acid was assessed in rats over days 7-21 of gestation. Groups of mated female rats were gavaged at daily dose levels of up to 600 mg/kg. Clear evidence of maternal toxicity was demonstrated at 600 mg/kg. There was marked evidence of developmental toxicity at 600 mg/kg. Mean fetal weight was statistically significantly reduced while the incidences of skeletal (ribs, vertebra, and sternebra) malformations and variations were statistically significantly increased. Glycolic acid was not found to be genotoxic based on negative Ames test with and without activation using Salmonella typhimurium TA98, TA100, TA1535, TA1537, and TA1538. ECOTOXICITY STUDIES: Green Algae were exposed to glycolic acid for 72 hours. At the end of the exposure period, a control replicate and samples from the test concentrations exhibiting a 50% or greater inhibition of cell counts were selected for a recovery test and exposed to nutrient medium for an additional 144 hours. The effects upon growth rate and biomass were found to be algistatic. Fathead minnows were exposed to glycolic acid for 96 hours under static conditions. All deaths occurred within 24 hours. Daphnia magna were exposed to glycolic acid for 48 hours under static conditions. There were no sublethal effects observed in the surviving daphnids.

13.1.2NIOSH Toxicity Data

13.1.3Exposure Routes

The substance can be absorbed into the body by inhalation and by ingestion.

13.1.4Inhalation Symptoms

Cough. Shortness of breath. Sore throat.

13.1.5Skin Symptoms

Redness. Pain. Serious skin burns.

13.1.6Eye Symptoms

Redness. Pain. Blurred vision. Severe deep burns.

13.1.7Ingestion Symptoms

Abdominal pain. Burning sensation. Shock or collapse.

13.1.8Adverse Effects

Nephrotoxin - The chemical is potentially toxic to the kidneys in the occupational setting.

Dermatotoxin - Skin burns.

13.1.9Acute Effects

13.1.10Toxicity Data

LC50 (rat) = 7.1 mg/m3/4hr

13.1.11Interactions

The effect of 0.35 to 0.8 mmol/kg glycolic acid and 1.0 to 4.4 mmol/kg sodium glycolate on cyclopropane-epinephrine induced cardiac arrhythmias was examined using dogs. Doses of 0.35 to 0.5 mmol/kg glycolic acid increased the duration of arrhythmias in the 13 dogs tested, whereas doses >0.5 mmol/kg decreased or totally eliminated the arrhythmias in each of 11 dogs. Depression was observed for many of the dogs at higher doses. Sodium glycolate was much less effective in decreasing the arrhythmias, with 3 mmol/kg being required and its action being transient.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

... This study was performed in order to determine whether short-term dermal treatment with glycolic acid, a representative alpha-hydroxy acid (AHA), can enhance the damaging effects of UV light. The duration of the effect of AHAs on the sensitivity of skin to UV light was also examined. ... The backs of 29 Caucasian subjects were treated, once daily, 6 days per week with either 10% glycolic acid (pH 3.5) or placebo in a randomized double-blinded study. At the end of 4 weeks, sites within each treated area were exposed to 1.5 MED of UV light, determined on previously untreated skin. Specimens were obtained for enumeration of sunburn cells (SBCs) in the first group of subjects (n = 16), whereas cyclobutyl pyrimidine dimers (CPDs) in DNA were determined in the second group (n = 13). The minimal erythema dose (MED) in each site was also determined in the first group of subjects. Sunburn cells and MEDs were re-evaluated in the first group 1 week after discontinuing AHA applications. ... Glycolic acid caused enhanced sensitivity to UV light measured as increased SBC induction and lowered MEDs. Cyclobutyl pyrimidine dimers were elevated but not to a statistically significant level. No differences in SBCs or MEDs were evident after a week of discontinued treatments...

PMID:12713551
Kaidbey K et al; Photodermatol Photoimmunol Photomed 19 (1): 21-7 (2003)

Hairless mice were irradiated thrice weekly for 10 weeks with UVB. In the 10-week postirradiation period, the mice were treated topically five times per week with tretinoin (0.05%), glycolic acid (10%), benzalkonium chloride (1.0%), sodium lauryl sulfate (5%), croton oil (5%) and the water - propylene glycol vehicle... Tretinoin-treated skin had increased amounts of collagen and type III procollagen whereas irritant- and peeling agent-treated skins were similar to vehicle-treated controls.

PMID:8919045
Kligman LH et al; Arch Dermatol Res 288 (10): 615-20 (1996)

Glycolic acid, a depressant antagonizing the convulsant action of strychnine in spinal cord of cats.

BANNA NR; IRCS LIBR COMPEND 1 (5): 7.10.7 (1973)

For more Interactions (Complete) data for HYDROXYACETIC ACID (11 total), please visit the HSDB record page.

13.1.12Antidote and Emergency Treatment

Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Organic acids and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3rd revised edition, Elsevier Mosby, St. Louis, MO 2007, p. 176

Basic treatment: Establish a patent airway (oropharyngeal or nasopharyngeal airway, if needed). Suction if necessary. Watch for signs of respiratory insufficiency and assist respirations if necessary. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for pulmonary edema and treat if necessary ... . Monitor for shock and treat if necessary ... . For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with 0.9% saline (NS) during transport ... . Do not use emetics. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Activated charcoal is not effective ... . Do not attempt to neutralize because of exothermic reaction. Cover skin burns with dry, sterile dressings after decontamination ... . /Organic acids and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3rd revised edition, Elsevier Mosby, St. Louis, MO 2007, p. 176-7

Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in severe respiratory distress. Early intubation, at the first sign of upper airway obstruction, may be necessary. Positive-pressure ventilation techniques with a bag valve mask device may be beneficial. Consider drug therapy for pulmonary edema ... . Consider administering a beta agonist such as albuterol for severe bronchospasm ... . Monitor cardiac rhythm and treat arrhythmias as necessary ... . Start IV administration of D5W /SRP: "To keep open", minimal flow rate/. Use 0.9% saline (NS) or lactated Ringer's (LR) if signs of hypovolemia are present. For

hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if patient is hypotensive with a normal fluid volume. Watch for signs of fluid overload ... . Use proparacaine hydrochloride to assist eye irrigation ... . /Organic acids and related compounds/

Currance, P.L. Clements, B., Bronstein, A.C. (Eds).; Emergency Care For Hazardous Materials Exposure. 3rd revised edition, Elsevier Mosby, St. Louis, MO 2007, p. 177

13.1.13Human Toxicity Excerpts

/HUMAN EXPOSURE STUDIES/ A human contact phototoxicity study was performed in which 5 uL of cream containing 4.0% glycolic acid, pH 3.7, was applied under occlusive patches at duplicate sites to the lower midback of 10 subjects. Twenty-four hr after application, one patch was removed and the test site was immediately exposed to 30 J/sq cm of UVA (320-400 nm); the light source was a 150 W compact xenon arc source that used a 1 mm thick Schott WG-345 to eliminate UVB wavelengths and a 1 mm thick UG11 filter to remove reflected infrared and visible radiation. The other test site served as a nonirradiated control. An adjacent skin site, which served as a control, was treated with Hydrophilic Ointment USP and exposed to UVA. Reactions were scored immediately, 24 hr, and 48 hr after irradiation. The cream (4.0% glycolic acid, pH 3.7) was not phototoxic.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998)

/HUMAN EXPOSURE STUDIES/ The photosensitization potential of two creams containing 4 and 5% glycolic acid, pH 3.7 and 3.9, respectively, was evaluated with a maximization test using 25 subjects/test. The Minimal Erythema Dose (MED) of each subject was determined by exposing one side of the midback to a series of exposures 1 cm in diameter in 25% increments using a xenon arc simulator (150 W). The induction phase consisted of applying for 10 uL/sq cm of test material to a site on the lower back under an occlusive patch for 24 hr and then, upon patch removal, exposing the site to three MEDs from the xenon arc solar simulator. This procedure was repeated after 48 hr the same site; the sequence was done twice weekly for 3 weeks. Ten to 14 days after the last induction exposure, the test material was applied as before to two previously untreated sites under an occlusive patch. After 24 hr patch was removed and the site was irradiated with 4 J/sq cm of UVA using a 1 mm thick Schott WG-345 filter (50% cut-off at about 335 nm); the second site was not irradiated and served as a control. The test sites were scored 48 and 72 hr after UVA exposure. Neither of the glycolic acid creams produced a sensitization reaction at the irradiated or non-irradiated sites.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998)

/HUMAN EXPOSURE STUDIES/ A lactic acid sting test was performed ... using 12 subjects that demonstrated moderate stinging to 5.0% lactic acid. Subjects were placed in an environmental chamber until profuse sweating was induced and a non-encapsulated and a liposome-encapsulated formula containing 7.0% glycolic acid, pH 3.25, were applied to the nasolabial fold and cheek areas. At 2.5 and 5.0 min after application, the subjects evaluated sting potential on a scale of 0-3. Four subjects had a sting response to the non-encapsulated glycolic acid formulation and one subject had a sting response to the encapsulated formulation. Stinging was correlated with irritancy in a lactic acid sting test. Comparative irritancy of four AHAs, including glycolic and lactic acid, at concentrations of 5 and 15%, was determined by 24 hr occlusive patch tests on the forearms of three stingers. Glycolic acid was more irritating than lactic acid, with 15% glycolic acid producing severe erythema and vesiculation. Correspondingly, glycolic acid produced more stinging than lactic acid, and the difference was not pH-related.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998)

/HUMAN EXPOSURE STUDIES/ A sting test was performed ... with a lotion containing 1.5% glycolic acid using 20 female subjects who had reacted at least moderately to a 5% aq. lactic acid solution. The test solution was applied ... either /to/ the left or right nasolabial fold and cheek using a finger cot; a commercial alpha hydroxy acid (AHA) lotion was applied to the opposite side. Stinging was evaluated at 10 sec and 2.0, 5.0, and 8.0 min. Four subjects, 20%, had a moderate sting response to the test article and it was concluded that it "exhibits a potential for a sting response".

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998)

For more Human Toxicity Excerpts (Complete) data for HYDROXYACETIC ACID (29 total), please visit the HSDB record page.

13.1.14Non-Human Toxicity Excerpts

/LABORATORY ANIMALS: Acute Exposure/ Glycolic acid was classified as a primary skin irritant when 70% technical glycolic acid, 0.5 mL applied undiluted to abraded and intact skin of one rabbit resulted in primary skin irritation bordering on corrosive. Strong erythema and mild edema were seen on the intact skin and strong erythema and necrosis were seen along the lines of abrasion; these observations were not visible at 72 hr. However, in another study in which the same dose was applied to the intact skin of six rabbits under an occlusive patch for 4 hr and then washed, skin corrosion was not observed at 24 or 48 hr.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

/LABORATORY ANIMALS: Acute Exposure/ The 4 hr inhalation LC50 of glycolic acid for rats was 7.7-14 mg/L. Clinical signs increased in severity with increased concentration. During exposure, labored breathing, gasping, red ocular and nasal discharge, and salivation were observed. Post-exposure, moderate to severe weight loss, gasping, lung noise, labored breathing, cloudy eyes, ocular discharge, red and clear nasal discharges, stained and ruffled haircoat, lacerations of the face and nose, a wet perineal area, and pallor were observed.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates, Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

/LABORATORY ANIMALS: Acute Exposure/ The oral LD50 of a 5% aq glycolic acid solution was 1950 and 1920 mg/kg for rats and guinea pigs, respectively. The oral LD50 of a 20% aq. solution for the rat was 1600-3200 mg/kg. Female white Holtzman rats were dosed orally with an approximately lethal dose of glycolic acid (reported to be of "high purity") and killed after 24 hr. The kidneys, liver, and brain were examined microscopically. Of the six animals dosed with 5000 mg/kg, severe toxic effects were observed for all of the animals, three of the animals died 8-12 hr after dosing, and all had severe renal tubular oxalosis; no crystals were found in the brain. None of the four animals dosed with 3000 mg/kg glycolic acid developed any signs of toxicity or oxalosis.

Cosmetic Ingredient Review; Final Report on the Safety Assessment of Glycolic Acid, Ammonium, Calcium, Potassium, and Sodium Glycolates, Methyl, Ethyl, Propyl, and Butyl Glycolates, and Lactic Acid, Ammonium, Calcium, Potassium, Sodium, and TEA-Lactates,

Methyl, Ethyl, Isopropyl, and Butyl Lactate, and Lauryl, Myristyl, and Cetyl Lactates; Journal of American College of Toxicology 17(Suppl 1):1-242 (1998).

/LABORATORY ANIMALS: Acute Exposure/ In laboratory animals, glycolic acid is harmful by single-dose ingestion or inhalation of high doses. Depending on concentration and pH, it may be corrosive or irritating to the skin, eyes and respiratory system.

NICNAS: Priority existing chemical assessment report Vol:12 (2000) 128 p

For more Non-Human Toxicity Excerpts (Complete) data for HYDROXYACETIC ACID (53 total), please visit the HSDB record page.

13.1.15Non-Human Toxicity Values

LD50 Rat oral 4240 mg/kg bw

European Commission, ESIS; IUCLID Dataset, Hydroxyacetic acid (79-14-1) p. 36 (2000 CD-ROM edition). Available from as of May 5, 2014 the Database Query page at: https://esis.jrc.ec.europa.eu/.

LD50 Rat oral 1,600-3200 mg/kg bw

European Commission, ESIS; IUCLID Dataset, Hydroxyacetic acid (79-14-1) p. 36 (2000 CD-ROM edition). Available from as of May 5, 2014 the Database Query page at: https://esis.jrc.ec.europa.eu/.

LD50 Rat oral 1,950 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 1873

LD50 Guinea pig oral 1,920 mg/kg

Lewis, R.J. Sr. (ed) Sax's Dangerous Properties of Industrial Materials. 11th Edition. Wiley-Interscience, Wiley & Sons, Inc. Hoboken, NJ. 2004., p. 1873

For more Non-Human Toxicity Values (Complete) data for HYDROXYACETIC ACID (17 total), please visit the HSDB record page.

13.1.16Ecotoxicity Values

LC50; Species: Pimephales promelas (Fathead minnows); Conditions: static; Concentration: 164 mg/L for 96 hr (nominal)

USEPA; Hazard Characterization Document, Screening level Hazard Characterization for Glycolic Acid (79-14-1). P. 3. Available from as of May 7, 2014: https://www.epa.gov/chemrtk/hpvis/hazchar/79141_Glycolic%20Acid_June%202010.pdf

EC50; Species: Pseudokirchneriella subcapitata (Green algae); Conditions: static; Concentration: 21.6 mg/L for 72 hr; Effect: biomass

USEPA; Hazard Characterization Document, Screening level Hazard Characterization for Glycolic Acid (79-14-1). P. 3. Available from as of May 7, 2014: https://www.epa.gov/chemrtk/hpvis/hazchar/79141_Glycolic%20Acid_June%202010.pdf

EC50; Species: Pseudokirchneriella subcapitata (Green algae); Conditions: static; Concentration: 44.0 mg/L for 72 hr; Effect: growth rate

USEPA; Hazard Characterization Document, Screening level Hazard Characterization for Glycolic Acid (79-14-1). P. 3. Available from as of May 7, 2014: https://www.epa.gov/chemrtk/hpvis/hazchar/79141_Glycolic%20Acid_June%202010.pdf

LC50; Species: Lepomis sp. (sunfish); Concentration: 93 mg/L for 48 hr /Conditions of bioassay not specified in source examined/ /70% purity/

European Commission, ESIS; IUCLID Dataset, Hydroxyacetic acid (79-14-1) p. 22 (2000 CD-ROM edition). Available from as of May 5, 2014 the Database Query page at: https://esis.jrc.ec.europa.eu/.

For more Ecotoxicity Values (Complete) data for HYDROXYACETIC ACID (8 total), please visit the HSDB record page.

13.1.17Ecotoxicity Excerpts

/AQUATIC SPECIES/ /Green algae (Pseudokirchnerie lla subcapitata; 3 replicates/concentration) were exposed to /glycolic acid/ at mean measured concentrations of 7.52, 14.5, 30.3, 54.6 and 73.6 mg/L for 72 hours. At the end of the 72-hour exposure period, a control replicate and samples from the test concentrations exhibiting a 50% or greater inhibition of cell counts were selected for a recovery test and exposed to nutrient medium for an additional 144 hours. The effects upon growth rate and biomass were found to be algistatic. 72-hr EC50 (growth) = 44.0 mg/L; 72-hr EC50 (biomass) = 21.6 mg/L

USEPA; Hazard Characterization Document, Screening level Hazard Characterization for Glycolic Acid (79-14-1). P. 12. Available from as of May 7, 2014: https://www.epa.gov/chemrtk/hpvis/hazchar/79141_Glycolic%20Acid_June%202010.pdf

/AQUATIC SPECIES/ Fathead minnows (Pimephales promelas; 10/concentration) were exposed to /glycolic acid/ at nominal concentrations of 0.0064, 0. 0081, 0.010, 0.013, 0.016 or 0.020% (v/v) for 96 hours under static conditions. All deaths occurred within 24 hours. 96-hr LC50 = 164 mg/L.

USEPA; Hazard Characterization Document, Screening level Hazard Characterization for Glycolic Acid (79-14-1). P. 14. Available from as of May 7, 2014: https://www.epa.gov/chemrtk/hpvis/hazchar/79141_Glycolic%20Acid_June%202010.pdf

/AQUATIC SPECIES/ Water fleas (Daphnia magna; 5/replicate, 4 replicates/concentration) were exposed to /glycolic acid/ at nominal concentrations of 0, 25, 50, 100, 200, 400 or 800 mg/L for 48 hours under static conditions. There were no sublethal effects observed in the surviving daphnids. 48-hr EC50 = 141 mg/L.

USEPA; Hazard Characterization Document, Screening level Hazard Characterization for Glycolic Acid (79-14-1). P. 14. Available from as of May 7, 2014: https://www.epa.gov/chemrtk/hpvis/hazchar/79141_Glycolic%20Acid_June%202010.pdf

13.1.18Ongoing Test Status

EPA has released the first beta version (version 0.5) of the Interactive Chemical Safety for Sustainability (iCSS) Dashboard. The beta version of the iCSS Dashboard provides an interactive tool to explore rapid, automated (or in vitro high-throughput) chemical screening data generated by the Toxicity Forecaster (ToxCast) project and the federal Toxicity Testing in the 21st century (Tox21) collaboration. /The title compound was tested by ToxCast and/or Tox21 assays; See the data in Chemical Explorer/[USEPA; ICSS Dashboard Application; Available from, as of June 27, 2014: http://actor.epa.gov/dashboard/]

The following link will take the user to the National Toxicology Program (NTP) Test Agent Search Results page, which tabulates all of the "Standard Toxicology & Carcinogenesis Studies", "Developmental Studies", and "Genetic Toxicity Studies" performed with this chemical. Clicking on the "Testing Status" link will take the user to the status (i.e., in review, in progress, in preparation, on test, completed, etc.) and results of all the studies that the NTP has done on this chemical.[Available from, as of June 30, 2014: http://ntp-apps.niehs.nih.gov/ntp_tox/index.cfm?fuseaction=ntpsearch.searchresults&searchterm=79-14-1]

13.1.19National Toxicology Program Studies

Glycolic acid and salicylic acid are two of the more commonly used active ingredients of skin peels and are used in cosmetics to treat photoaged skin. ...The effects of synthetic solar light on the skin of hairless mice that had been treated with creams containing glycolic acid or

salicylic acid /were studied by applying/ creams containing 4% or 10% glycolic acid, or 2% or 4% salicylic acid, to groups of 18 male and 18 female hairless mice in the mornings; other groups received creams containing no acids. Additional groups of 36 male and 36 female mice were not exposed to cream. In the afternoon, groups of animals were exposed to one of three strengths of synthetic solar light for four hours. Other groups were not exposed to light and were control groups. In total, there were 38 groups of mice (18 male and 18 female, or 36 male and 36 female), each receiving one combination of cream and light exposure level. The treatment and exposures were performed five days per week for 40 weeks, during which time the animals were monitored for development of skin cancers. ... Greater strengths of light increased the incidences of skin cancers in mice not given a cream or a cream with no acid included. Creams containing glycolic acid had no effect on this effect of the simulated solar light. Creams containing salicylic acid did decrease the incidence of skin tumors in mice receiving the lower of the two light intensities. /It was concluded/ that glycolic acid did not affect the photocarcinogenesis of simulated solar light, and salicylic acid did have some protective effect against the photocarcinogenicity of light at lower intensities.

DHHS/NTP; NTP Technical Report on the Photocarcinogenesis Study of Glycolic Acid and Salicylic Acid (CAS NOS. 79-14-1 and 69-72-7) in SKH-1 Mice (Simulated Solar LIght and Topical Application Study). NTP TR-524 244 pp. (September 2007) Available from, as of July 31, 2008: https://ntp.niehs.nih.gov/files/524_web1.pdf

13.2Ecological Information

13.2.1Environmental Fate/Exposure Summary

Hydroxyacetic acid's production and use in the processing of textiles, leather, and metals; in pH control, in the manufacture of adhesives, in copper brightening, decontamination cleaning, dyeing, electroplating, in pickling, cleaning and chemical milling of metals; in skin care products as exfolliant and keratolytic; in biopolymers for absorbable sutures and drug delivery systems may result in its release to the environment through various waste streams. Hydroxyacetic acid occurs naturally in many plants. If released to air, an extrapolated vapor pressure of 0.02 mm Hg at 25 °C indicates hydroxyacetic acid will exist solely as a vapor in the atmosphere. Vapor-phase hydroxyacetic acid will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 3.4 days. Hydroxyacetic acid does not contain chromophores that absorb at wavelengths >290 nm and, therefore, is not expected to be susceptible to direct photolysis by sunlight. If released to soil, hydroxyacetic acid is expected to have very high mobility based upon an estimated Koc of 0.14. The pKa of hydroxyacetic acid is 3.6, indicating that this compound will exist almost entirely in anion form in the environment and anions generally do not adsorb more strongly to soils containing organic carbon and clay

than their neutral counterparts. Volatilization of hydroxyacetic acid from moist soil surfaces is not expected to be an important fate process because the compound exists as an anion and ions do not volatilize. Hydroxyacetic acid is not expected to volatilize from dry soil surfaces based upon its vapor pressure. Utilizing the Japanese MITI test, 86% of the Theoretical BOD was reached in 2 weeks indicating that biodegradation is an important environmental fate process in soil and water. If released into water, hydroxyacetic acid is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. A pKa of 3.6 indicates hydroxycaetic acid will exist almost entirely in the anion form at pH values of 5 to 9 and, therefore, volatilization from water surfaces is not expected to be an important fate process. An estimated BCF of 3 suggests the potential for bioconcentration in aquatic organisms is low. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions. Occupational exposure to hydroxyacetic acid may occur through inhalation and dermal contact with this compound at workplaces where hydroxyacetic acid is produced or used. Monitoring and use data indicate that the general population may be exposed to hydroxyacetic acid via inhalation of ambient air, ingestion of food and dermal contact with consumer products containing hydroxyacetic acid. (SRC)

13.2.2Natural Pollution Sources

Hydroxyacetic acid occurs naturally in sugar cane syrup(1) as well as many plants and vegetables(2).

(1) Lewis RJ Sr; Hawley's Condensed Chemical Dictionary. 15th ed. New York, NY: John Wiley & Sons, Inc., p. 670 (2007) (2) Dr. Duke's Phytochemical and Ethnobotanical Databases. Plants with a chosen chemical. Glycolic Acid. Washington, DC: US Dept Agric, Agric Res Service. Available from, as of Apr 30, 2014: https://www.ars-grin.gov/duke/

13.2.3Artificial Pollution Sources

Hydroxyacetic acid's production and use in the processing of textiles, leather, and metals; in pH control, in the manufacture of adhesives, in copper brightening, decontamination cleaning, dyeing, electroplating, in pickling, cleaning and chemical milling of metals as well as in skin care products as exfolliant and keratolytic, in biopolymers for absorbable sutures and drug delivery systems(1) may result in its release to the environment through various waste streams(SRC).

(1) O'Neil MJ, ed; The Merck Index. 15th ed. Whitehouse Station, NJ: Merck and Co., Inc. p. 670 (2013)

13.2.4Environmental Fate

TERRESTRIAL FATE: Based on a classification scheme(1), an estimated Koc value of 0.14(SRC), determined from a log Kow of -1.11(2) and a regression-derived equation(3), indicates that hydroxyacetic acid is expected to have very high mobility in soil(SRC). The pKa of hydroxyacetic acid is 3.6(4), indicating that this compound will exist almost entirely in the anion form in the environment and anions generally do not adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts(5). Volatilization of hydroxyacetic acid from moist soil surfaces is not expected to be an important fate process because the compound exists as an anion and ions do not volatilize. Hydroxyacetic acid is not expected to volatilize from dry soil surfaces(SRC) based upon an extrapolated vapor pressure of 0.02 mm Hg at 25 °C(6). Utilizing the Japanese MITI test, 86% of the Theoretical BOD was reached in 2 weeks(7) indicating that biodegradation is an important environmental fate process in soil(SRC).

(1) Swann RL et al; Res Rev 85: 17-28 (1983) (2) Hansch C et al; Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society., p. 4 (1995) (3) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of April 25, 2014: https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm (4) Sangster J; LOGKOW Database. A databank of evaluated octanol-water partition coefficients (Log P). Available from, as of Apr 29, 2014: https://logkow.cisti.nrc.ca/logkow/search.html (5) Doucette WJ; pp. 141-188 in Handbook of Property Estimation Methods for Chemicals. Boethling RS, Mackay D, eds. Boca Raton, FL: Lewis Publ (2000) (6) Daubert TE, Danner RP; Physical and Thermodynamic properties of Pure Chemicals: Data Compilation. Supplement 1. Design Institute for Physical Property Data, American Institute of Chemical Engineers, New York, NY: Hemisphere Pub. Corp. (1991) (7) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Ver 2006.01.30 Updated. National Institute of Technology and Evaluation. Tokyo, Japan. Hydroxyacetic acid. (79-14-1). Available from, as of Apr 29, 2014: https://www.safe.nite.go.jp/english/kizon/KIZON_start_hazkizon.html

AQUATIC FATE: Based on a classification scheme(1), an estimated Koc value of 0.14(SRC), determined from a log Kow of -1.11(2) and a regression-derived equation(3), indicates that hydroxyacetic acid is not expected to adsorb to suspended solids and sediment(SRC). A pKa of 3.6(4) indicates hydroxyacetic acid will exist almost entirely in the anion form at pH values of 5 to 9 and, therefore, volatilization from water surfaces is not expected to be an important fate process(SRC). According to a classification scheme(5), an estimated BCF of 3(SRC), from its log Kow(2) and a regression-derived equation(3), suggests the potential for bioconcentration in aquatic organisms is low(SRC). Utilizing the Japanese MITI test, 86% of the Theoretical BOD was reached in 2 weeks(6) indicating that biodegradation is an important environmental fate process in water(SRC).

(1) Swann RL et al; Res Rev 85: 17-28 (1983) (2) Hansch C et al; Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical

Society., p. 4 (1995) (3) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of April 25, 2014: https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm (4) Sangster J; LOGKOW Database. A databank of evaluated octanol-water partition coefficients (Log P). Available from, as of Apr 29, 2014: https://logkow.cisti.nrc.ca/logkow/search.html (5) Franke C et al; Chemosphere 29: 1501-14 (1994) (6) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Ver 2006.01.30 Updated. National Institute of Technology and Evaluation. Tokyo, Japan. Hydroxyacetic acid. (79-14-1). Available from, as of Apr 29, 2014: https://www.safe.nite.go.jp/english/kizon/KIZON_start_hazkizon.html

ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere(1), hydroxyacetic acid, which has an extrapolated vapor pressure of 0.02 mm Hg at 25 °C (2), is expected to exist solely as a vapor in the ambient atmosphere. Vapor-phase hydroxyacetic acid is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals(SRC); the half-life for this reaction in air is estimated to be 3.4 days(SRC), calculated from its estimated rate constant of 3.1X10-12 cu cm/molecule-sec at 25 °C(SRC) that was derived using a structure estimation method(3). Hydroxyacetic acid does not contain chromophores that absorb at wavelengths >290 nm(4) and, therefore, is not expected to be susceptible to direct photolysis by sunlight(SRC).

(1) Bidleman TF; Environ Sci Technol 22: 361-367 (1988) (2) Daubert TE, Danner RP; Physical and Thermodynamic properties of Pure Chemicals: Data Compilation. Supplement 1. Design Institute for Physical Property Data, American Institute of Chemical Engineers, New York, NY: Hemisphere Pub. Corp. (1991) (3) Meylan WM, Howard PH; Chemosphere 26: 2293-99 (1993) (4) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 8-12 (1990)

13.2.5Environmental Biodegradation

AEROBIC: Hydroxyacetic acid achieved 32% theoretical oxidation by acclimated activated sludge after 12 hours of aeration(1). The theoretical BOD for hydroxyacetic acid was reported to be 0.89 after 5 days using acclimated mixed microbial cultures(2). Hydroxyacetic acid, present at 100 mg/L, reached 86% of its theoretical BOD in 2 weeks using an activated sludge inoculum at 30 mg/L in the Japanese MITI test(3). Therefore this compound is expected to biodegrade rapidly in the environment(SRC).

(1) McKinney et al; Sewage Ind Waste 28: 547-57 (1956) (2) Babeu L, Vaishnav DD; J Ind Microbiol 2: 107-15 (1987) (3) NITE; Chemical Risk Information Platform (CHRIP). Biodegradation and Bioconcentration. Ver 2006.01.30 Updated. National Institute of Technology and Evaluation. Tokyo, Japan. Hydroxyacetic acid. (79-14-1). Available from, as of Apr 29, 2014: https://www.safe.nite.go.jp/english/kizon/KIZON_start_hazkizon.html

13.2.6Environmental Abiotic Degradation

The rate constant for the vapor-phase reaction of hydroxyacetic acid with photochemically-produced hydroxyl radicals has been estimated as 3.1X10-12 cu cm/molecule-sec at 25 °C(SRC) using a structure estimation method(1). This corresponds to an atmospheric half-life of about 3.44 days at an atmospheric concentration of 5X10+5 hydroxyl radicals per cu cm(1). Hydroxyacetic acid is not expected to undergo hydrolysis in the environment due to the lack of functional groups that hydrolyze under environmental conditions(2). Hydroxyacetic acid does not contain chromophores that absorb at wavelengths >290 nm(2) and, therefore, is not expected to be susceptible to direct photolysis by sunlight(SRC).

(1) Meylan WM, Howard PH; Chemosphere 26: 2293-99 (1993)(2) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington, DC: Amer Chem Soc pp. 7-4, 7-5, 8-12 (1990)

13.2.7Environmental Bioconcentration

An estimated BCF of 3 was calculated in fish for hydroxyacetic acid (SRC), using a measured log Kow of -1.11(1) and a regression-derived equation(2). According to a classification scheme(3), this BCF suggests the potential for bioconcentration in aquatic organisms is low(SRC).

(1) Hansch C et al; Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society., p. 4 (1995) (2) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Apr 25, 2014: https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm (3) Franke C et al; Chemosphere 29: 1501-14 (1994)

13.2.8Soil Adsorption/Mobility

The Koc of hydroxyacetic acid is estimated as 0.14(SRC), using a measured log Kow of -1.11(1) and a regression-derived equation(2). According to a classification scheme(3), this estimated Koc value suggests that hydroxyacetic acid is expected to have very high mobility in soil. The pKa of hydroxyacetic acid is 3.6(4), indicating that this compound will exist almost entirely in the anion form and anions generally do not adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts(5).

(1) Hansch C et al; Exploring QSAR - Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society., p. 4 (1995) (2) US EPA; Estimation Program Interface (EPI) Suite. Ver. 4.1. Nov, 2012. Available from, as of Apr 24, 2014: https://www.epa.gov/oppt/exposure/pubs/episuitedl.htm (3) Swann RL et al; Res Rev 85:

17-28 (1983) (4) Sangster J; LOGKOW Database. A databank of evaluated octanol-water partition coefficients (Log P). Available from, as of Apr 29, 2014: https://logkow.cisti.nrc.ca/logkow/search.html (5) Doucette WJ; pp. 141-188 in Handbook of Property Estimation Methods for Chemicals. Boethling RS, Mackay D, eds. Boca Raton, FL: Lewis Publ (2000)

13.2.9Volatilization from Water/Soil

A pKa of 3.6(1) indicates hydroxyacetic acid will exist almost entirely in the anion form at pH values of 5 to 9 and, therefore, volatilization from water surfaces is not expected to be an important fate process. Hydroxyacetic acid is not expected to volatilize from dry soil surfaces(SRC) based upon an extrapolated vapor pressure of 0.02 mm Hg(2).

(1) Sangster J; LOGKOW Database. A databank of evaluated octanol-water partition coefficients (Log P). Available from, as of Apr 29, 2014: https://logkow.cisti.nrc.ca/logkow/search.html (2) Daubert TE, Danner RP; Physical and Thermodynamic properties of Pure Chemicals: Data Compilation. Supplement 1. Design Institute for Physical Property Data, American Institute of Chemical Engineers, New York, NY: Hemisphere Pub. Corp. (1991)

13.2.10Environmental Water Concentrations

SEAWATER: Between 0-4.5 umole/L hydroxyacetic acid was detected in the Scheldt Estuary, the Belgian coastal zone of the North Sea, and the English Channel between 1978 and 1979(1). Hydroxyacetic acid concentrations of 0-78 ug/L were measured in Ipswich Bay, Gulf of Maine from 1972-1973(2).

(1) Billen G et al; Estuarine Coastal Mar Sci 11: 279-294 (1980) (2) Shah NM, Wright RT; Marine Biol 24: 121-124 (1974)

RAIN/SNOW/FOG: Hydroxyacetic acid was detected in rain and snow samples collected from Ithaca, New York at 1.6 uequiv/L(1). Hydroxyacetic acid was also detected in rain and snow samples collected from Hubbard Brook, New Hampshire and Ithaca, New York at 0.1 umol/94 cm precipitate to 0.1 umol/75 cm precipitate(1).

(1) Mazurek MA, Simoneit BRT; CRC Crit Rev Environ Control 16: 140 (1986)

13.2.11Effluent Concentrations

Hydroxyacetic acid was qualitatively detected in the influent and effluent of an aerated stabilization basin of a pulp and paper mill in Springfield, OR(1).

(1) Hrutfiord BF et al; Tappi 58: 98-100 (1975)

13.2.12Atmospheric Concentrations

URBAN/SUBURBAN: Aerosol particles collected in Sao Paulo, Brazil during the winter of July 1996 contained 0.01-0.22 ug/cu m hydroxyacetic acid(1).

(1) Souza SR et al; Atmos Environ 33: 2563-2574 (1999)

RURAL/REMOTE: Hydroxyacetic acid was detected in Canadian high arctic aerosol particles at a concentration of 2002 pg cu m(1).

(1) Fu et al; Environ Sci Technol 43: 4022-4088 (2009)

13.2.13Plant Concentrations

Plants containing hydroxyacetic acid(1).

Genus species	Common name	Part
Allium cepa	Onion	Bulb
Apium graveolens	Celery	Root
Arbutus unedo	Strawberry Tree	Leaf
Cynara cardunculus subsp cardunculus	Artichoke	Flower
Glycine max	Soybean	Root; seed; sprout seedling
Hibiscus sabdariffa	Jamaica Sorrel	Flower
Juniperus communis	Common Juniper	Fruit
Lupinus albus	White Juniper	Seed
Lycopersicon esculentum	Tomato	Fruit
Malus domestica	Apple	Plaant
Musa x paradisiaca	Banana	Leaf
Petroselinum crispum	Parsley	Root; seed
Pisum sativum	Pea	Seed
Ricinus communis	Castorbean	Seed

Genus species	Common name	Part
Rosmarinus officinalis	Rosemary	Plant
Ruscus aculeatus	Box-holly	Root
Theobroma caco	Cacao	Leaf
Zea mays	Corn	Silk; stigma; style

(1) Dr. Duke's Phytochemical and Ethnobotanical Databases. Plants with a chosen chemical. Glycolic Acid. Washington, DC: US Dept Agric, Agric Res Service. Available from, as of Apr 30, 2014: https://www.ars-grin.gov/duke/

13.2.14Probable Routes of Human Exposure

According to the 2006 TSCA Inventory Update Reporting data, the number of persons reasonably likely to be exposed in the industrial manufacturing, processing, and use of hydroxyacetic acid is 1000 or greater; the data may be greatly underestimated(1).

(1) US EPA; Inventory Update Reporting (IUR). Non-confidential 2006 IUR Records by Chemical, including Manufacturing, Processing and Use Information. Washington, DC: U.S. Environmental Protection Agency. Available from, as of Apr 25, 2014: https://cfpub.epa.gov/iursearch/index.cfm

NIOSH (NOES Survey 1981-1983) has statistically estimated that 1,911,563 workers (98,538) of these were female) were potentially exposed to hydroxyacetic acid in the US(1). Occupational exposure to hydroxyacetic acid may occur through inhalation or other consumer products containing hydroxyacetic acid and dermal contact with this compound at workplaces where hydroxyacetic acid is produced or used. Monitoring and use data indicate that the general population may be exposed to hydroxyacetic acid via inhalation of ambient air, ingestion of food and dermal contact with consumer products containing this compound(SRC).

(1) NIOSH; NOES. National Occupational Exposure Survey conducted from 1981-1983. Estimated numbers of employees potentially exposed to specific agents by 2-digit standard industrial classification (SIC). Available from, as of April 25, 2014: https://www.cdc.gov/noes/

14Associated Disorders and Diseases

Disease	References
Biliary atresia	PubMed: 7119120, 3944741, 16553252, 17875085, 11945837
Colorectal cancer	PubMed: 7482520, 22148915, 19006102, 23940645, 24424155, 20156336, 19678709, 25105552, 21773981, 25037050, 27015276, 27107423, 27275383, 28587349 Silke Matysik, Caroline Ivanne Le Roy, Gerhard Liebisch, Sandrine Paule Claus. Metabolomics of fecal samples: A practical consideration. Trends in Food Science & Technology. Vol. 57, Part B, Nov. 2016, p.244-255: http://www.sciencedirect.com/science/article/pii/S0924224416301984
D-2-hydroxyglutaric aciduria	PubMed: 8134166, 6774165, 11999977, 8981317 MetaGene: Metabolic & Genetic Information Center (MIC: http://www.metagene.de)
Ethylene glycol poisoning	PubMed: 3337119
Schizophrenia	PubMed: 115032, 7711000, 2480613, 7595563, 7126379, 11877547, 17276036, 12796220, 20814316, 25004141, 24713860, 23823132, 2415198, 1694425, 19390223, 22024767, 22007635, 21483431, 3741918, 11979513, 20206656, 436860, 19401681, 6184954, 26952797, 22800120, 24789758, 22944140, 22892715, 17440431, 25729574, 22257447
Fumarase deficiency	PubMed: 26078636, 20549362, 24182348, 6616883, 16972175 MetaGene: Metabolic & Genetic Information Center (MIC: http://www.metagene.de)
Glutaric acidemia type 2	PubMed: 8311084
Glycolic aciduria	PubMed: 1458609 Primary Hyperoxaluria Type 1. 2002 Jun 19 [Updated 2014 Jul 17]. In: Adam MP, Ardinger HH, Pagon RA, et al., editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2017. Available from: https://www.ncbi.nlm.nih.gov/books/NBK1283/
Hemodialysis	PubMed: 11380830, 2013627, 12738682, 11684545, 12092667, 15353324, 10838467, 16221095, 18085392, 4002227, 11325895, 18045861
Lung Cancer	PubMed: 18953024, 22157537, 25961003

Disease	References
Transurethral resection of the prostate	PubMed: 2253377
Primary hyperoxaluria I	PubMed: 705974
Eosinophilic esophagitis	Mordechai, Hien, and David S. Wishart
Branched-chain Keto Acid Dehydrogenase Kinase Deficiency	PubMed: 22956686

15Literature

15.1NLM Curated PubMed Citations

15.2Springer Nature References

15.3Thieme References

15.4Wiley References

15.5Depositor Provided PubMed Citations

15.6Synthesis References

David Y. Tang, Arthur M. Foster, "(3-Trifluoromethylphenyl)-alpha-hydroxyacetic acid and process for preparation." U.S. Patent US4296244, issued January, 1977.

Witzemann, Edgar J. Preparation of glycollic acid. Journal of the American Chemical Society (1917), 39 109-12.

15.7Metabolite References

15.8General References

Kawakami et al. Diverse backbone-cyclized peptides via codon reprogramming. Nature Chemical Biology, doi: 10.1038/nchembio.259, published online 25 October 2009 http://www.nature.com/naturechemicalbiology

Coggins et al. Prebiotic synthesis of phosphoenol pyruvate by alpha-phosphorylation-controlled triose glycolysis. Nature Chemistry, doi: 10.1038/nchem.2624, published online 10 October 2016

15.9Chemical Co-Occurrences in Literature

15.10Chemical-Gene Co-Occurrences in Literature

15.11Chemical-Disease Co-Occurrences in Literature

16Patents

16.1Depositor-Supplied Patent Identifiers

Link to all deposited patent identifiers

16.2WIPO PATENTSCOPE

Patents are available for this chemical structure:

https://patentscope.wipo.int/search/en/result.jsf?inchikey=AEMRFAOFKBGASW-UHFFFAOYSA-N

17Interactions and Pathways

17.1Protein Bound 3D Structures

View 69 proteins in NCBI Structure

17.1.1Ligands from Protein Bound 3D Structures

PDBe Ligand Code	GOA
PDBe Structure Code	1QKI
PDBe Conformer	

17.2Chemical-Target Interactions

17.3Pathways

18Biological Test Results

18.1BioAssay Results

19Taxonomy

Glycolic acid is a metabolite found in or produced by Escherichia coli (strain K12, MG1655).

Glycolate is a metabolite found in or produced by Escherichia coli (strain K12, MG1655).

WormJam Metabolites Local CSV for MetFrag | DOI:10.5281/zenodo.3403364
WormJam: A consensus C. elegans Metabolic Reconstruction and Metabolomics Community and Workshop Series, Worm, 6:2, e1373939, DOI:10.1080/21624054.2017.1373939

Zebrafish Pathway Metabolite MetFrag Local CSV (Beta) | DOI:10.5281/zenodo.3457553

glycolic acid is a metabolite found in or produced by Saccharomyces cerevisiae.

20Classification

20.1MeSH Tree

20.2NCI Thesaurus Tree

20.3ChEBI Ontology

20.4ChemIDplus

20.5ChEMBL Target Tree

20.6UN GHS Classification

20.7EPA CPDat Classification

20.8NORMAN Suspect List Exchange Classification

20.9EPA DSSTox Classification

20.10Consumer Product Information Database Classification

20.11LOTUS Tree

20.12FDA Drug Type and Pharmacologic Classification

20.13EPA Substance Registry Services Tree

21Information Sources

1. CAS Common Chemistry
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   Glycolic acid

   https://commonchemistry.cas.org/detail?cas_rn=79-14-1
   Glycolic acid polymer

   https://commonchemistry.cas.org/detail?cas_rn=26124-68-5

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   https://www.drugbank.ca/drugs/DB03085
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   https://echa.europa.eu/substance-information/-/substanceinfo/100.001.073
   Polyglycolide

   https://echa.europa.eu/information-on-chemicals
   Glycollic acid

   https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/22074
   Polyglycolide

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   https://www.fda.gov/about-fda/about-website/website-policies#linking
   GLYCOLIC ACID

   https://gsrs.ncats.nih.gov/ginas/app/beta/substances/0WT12SX38S

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   http://www.hmdb.ca/citing
   Glycolic acid

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   HMDB0000115_cms_29929

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