



Danish Ministry of the Environment  
Environmental Protection Agency

# Survey of the occurrence of 1,6- hexanediol diglycidyl ether in food contact materials

A LOUS 2012-2015 follow-up project

Environmental project no. 1583, 2014

**Title:**

Survey of the occurrence of  
1,6-hexanediol diglycidyl ether  
in food contact materials

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**Published by:**

The Danish Environmental Protection Agency  
Strandgade 29  
1401 Copenhagen K  
Denmark  
[www.mst.dk/english](http://www.mst.dk/english)

**Year:**

2014

**ISBN no.**

978-87-93178-71-7

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Sources must be acknowledged.

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# Preface

The Danish Environmental Protection Agency (EPA) performs surveys in the period 2012-2015 of all 40 substances and substance groups on the List of Undesirable Substances (LOUS). The surveys include collection of available information on the use and occurrence of the substances, internationally and in Denmark, information on environmental and health effects, on alternatives to the substances, on existing regulation, on monitoring and exposure and information regarding ongoing activities under REACH among others.

The Danish EPA will on the basis of the surveys assess the need for any further regulation, substitution/phase out, classification and labelling, improved waste management, development of new knowledge or increased dissemination of information.

The initial survey of 1,6-hexanediol diglycidyl ether indicated a possible use of the substance in materials and articles intended to come into contact with food. The aim of this project is to explore this information further and if confirmed, in which types of materials the substance may be found. The relevance of a follow-up study with chemical analyses of relevant types of food contact materials sampled in Denmark will be based on the results of this project.

The preparation of this report has been supervised by a reference group consisting of:

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# Summary and conclusion

Based on information retrieved in an initial survey of 1,6-hexanediol diglycidyl ether within the LOUS-project, it cannot be excluded that the substance could be used in materials and articles intended to come into contact with food. The aim of this project was defined to be an exploration of the possible use of the substance in food contact materials.

The immediate information available on the use of the substance in food contact materials is limited. The information search strategy has included a broad spectrum of information sources: scientific literature; patent search; inventory lists from industry organisations and governmental institutions; international and national legislation regarding food contact materials; databases on the use of substances in products in Denmark, the Nordic countries and in Europe as well as informal contacts to relevant Danish companies.

All food contact materials (FCM's) are regulated by the framework EU regulation (EC) No 1935/2004. Moreover, a specific measure exists for materials and articles of plastics intended for food contact (Regulation (EU) No 10/2011). The substance 1,6-hexanediol diglycidyl ether is not on the positive list in the EU regulation for plastic food contact materials and articles. It may therefore not be used legally in these materials on the Danish market.

The substance is not listed on the US Food and Drug Administration (FDA) regulation lists (175 and 176) of indirect additives used in food contact materials or on the inventory list of printing inks prepared by an EFSA Scientific Cooperation (ESCO) Working Group. However; it is listed as a permitted additive and is on the list of solvent in the national regulation in Switzerland for printing inks. Also, the substance is listed on the inventory industry list of the European Trade Association for printing ink makers, EuPIA.

From searching in scientific literature and databases it was not possible to find information on actual use of the substance within food contact materials applications and the European Council of Paint and Printing Inks informed that the substance is not used for lacquers and inks for metal packaging for food. In patent applications the substance is mentioned in relation to coatings for drinking water tanks, paper wet strength agents, electronic packaging materials and coatings of medical devices.

In a correspondence a Danish company reported a possible use of the substance in preparations used for coatings of drinking water tanks and pipelines. Thus the use of 1,6-hexanediol diglycidyl ether for this type of application cannot be excluded. No information was found with regards to release of residual monomers of 1,6-hexanediol diglycidyl ether from epoxy coatings. To the extent that 1,6-hexanediol diglycidyl monomer residues are migrating from epoxy coatings it will be released to the water phase as it is soluble in water.

Except for water tanks no specific description of 1,6-hexandioldiglycidylether in relation to food contact materials was found in this survey.

# Sammenfatning og konklusion

I en tidligere kortlægning af 1,6-hexandiolglycidylether i forbindelse med LOUS-projektet kunne det ikke udelukkes, at stoffet bliver brugt i materialer, der kan komme i kontakt med fødevarer. Formålet med dette projekt blev defineret til at være en undersøgelse af den mulige brug af stoffet i materialer, der kommer i forbindelse med fødevarer.

Der er begrænset viden om brugen af stoffet i fødevarekontaktmaterialer og strategien for informationsøgningen har inkluderet et bredt spektrum af informationskilder: Videnskabelig litteratur, patentsøgninger, fortegnelser fra brancheorganisationer og offentlige institutioner, international og national lovgivning om fødevarekontaktmaterialer, produktregistre i Danmark, de nordiske lande og Europa, og uformelle kontakter til relevante danske virksomheder.

Stoffet 1,6-hexandiolglycidylether er ikke på EU-positivlisten for fødevarekontaktmaterialer af plast. Det er derfor ikke lovligt at bruge i artikler eller materialer på det danske marked.

Stoffet er heller ikke på US FDA's positivlister vedrørende indirekte additiver til brug i fødevarekontaktmaterialer eller en liste med trykfarver udarbejdet af en EFSA videnskabelig arbejdsgruppe (ESCO). Derimod optræder stoffet på den schweiziske stofliste for trykfarver, både som additiv og solvent, og på stoflisterne fra den europæiske brancheorganisation for trykfarver, EUPIA, henholdsvis som additiv og hærdende monomer.

Ved søgning i den videnskabelige litteratur og øvrige databaser blev der ikke fundet informationerne om brugen af 1,6-hexandiolglycidylether i fødevarekontaktmaterialer.

I patentansøgninger er stoffet nævnt i forbindelse med drikkevandstanke, vådstyrkemidler til papir, emballage til elektronik og overfladebehandling af medicinsk udstyr.

Ved en forespørgsel har en dansk virksomhed oplyst, at stoffet kan finde anvendelse ved epoxy coatings i drikkevandstanke og -rør, så anvendelse af 1,6-hexandiolglycidylether til disse formål kan derfor ikke udelukkes. Der er ikke blevet fundet oplysninger om afgivelse af restmonomere af 1,6-hexandiolglycidylether fra epoxy coatings. I det omfang at restmonomere migrerer fra epoxy coatings vil det blive tilgængeligt i vandfasen, da stoffet er vandopløseligt.

Bortset fra drikkevandstanke er der i denne undersøgelse ikke fundet specifik anvendelse for 1,6-hexandiolglycidylether i relation til fødevarekontaktmaterialer.

# 1. Introduction to the substance

A general survey of 1,6-hexanediol diglycidyl ether has previously been conducted. The survey describes the chemistry, manufacture, use and human health aspects of the substance. For an overview of chemical names, structure, properties, manufacture and main application areas of 1,6-hexanediol diglycidyl ether these information's are listed from the survey in this chapter (Hansen, et al., 2013).

## 1.1 Chemical name, structure and properties

1,6-hexanediol diglycidyl ether is an ether compound connected to ethylene oxide (oxirane) at both ends.

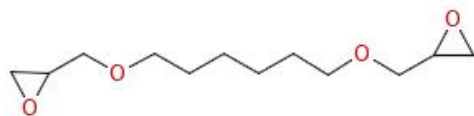
CAS No: 16096-31-4

EC No: 240-260-4

Relevant synonyms for 1,6-hexanediol diglycidyl ether include:

- hexane,1,6-bis(2,3-epoxypropoxy)
- 1,6-bis(2,3-epoxypropoxy)hexane
- 1,6-bis(glycidyloxy)hexane
- 1,6-hexamethylenediol diglycidyl ether
- hexamethylene diglycidyl ether
- hexamethylene glycol diglycidyl ether
- hexanediol diglycidyl ether
- HDDGE

Structural formula:



**FIGURE 1**  
STRUCTURAL FORMULA OF 1,6-HEXANEDIOL DIGLYCIDYL ETHER

The substance is a colourless and odourless liquid at room temperature and standard atmospheric pressure with the following physico-chemical properties:

Molecular Formula:  $C_{12}H_{22}O_4$

Molecular weight: 230.3

Melting point:  $-23.7^{\circ}C$

Boiling point:  $328.7^{\circ}C$

Flash point:  $120-179^{\circ}C$

Density: 1.076 g/cm<sup>3</sup>

Log Pow: 0.82 at 20 °C

Vapour pressure: 0.002 mg Hg (very low volatility)

The water solubility was in the general survey listed as insoluble in water but the substance is registered in REACH as very soluble under ambient conditions with a solubility of 11.9 g/L (ECHA, 2014). In the SciFinder chemical database (see chapter 3) the substance is reported to have solubility in water of 2.5 g/L at 25 C and pH 1-10. This value has been generated by chemical modelling software.

CAS No	EC No	Substance name	Registered, tonnage band (t/y)
16096-31-4	240-260-4	1,6-bis(2,3-epoxypropoxy)hexane	1,000-10,000

**TABLE 1**  
REGISTERED TONNAGE OF 1,6-HEXANEDIOL DIGLYCIDYL ETHER AT THE EUROPEAN CHEMICALS AGENCY

## 1.2 Function of the substance for the main application areas

The dominant function of the substance is as a reactive diluent in particular related to epoxy systems. A diluent is an organic liquid added to resin formulations, with no solvent power, to reduce viscosity and to ease flow movement or to improve consistency and applicability.



# 2. Information search strategy

The general survey (Hansen et al., 2013) found very little information on 1,6-hexanediol diglycidyl ether. Most applications appears to be in the building sector e.g. plasters, fillers, sealants, coatings and paints. However, its use in materials intended to come into contact with food (FCM) could not be excluded. Initial and preliminary information search in the scientific literature and other published information sources in this survey revealed no clear answers concerning the possible use of 1,6-hexanediol diglycidyl ether in FCM.

The final search strategy for information of the occurrence of 1,6-hexanediol diglycidyl ether in food contact materials has included a broad spectrum of information sources:

- Scientific literature
- Patent search
- International and national legislation regarding food contact materials
- Inventory lists from industry organisations and governmental institutions
- Databases on the use of substances in products in Denmark, in the Nordic countries and in Europe
- Informal contacts to relevant Danish companies

## 2.1 Scientific literature and patents

The search has been performed in the following databases:

- FindIt: DTU Library's general electronic information search tool. The search includes approx. 170 million references - mainly scientific articles, e-books, conference papers and journals in the technical-scientific and related disciplines.
- Web of Science: Web of Science consists of several databases containing information gathered from scientific journals in all areas of research.
  - Science Citation Index Expanded (1900-present)
  - Social Sciences Citation Index (1956-present)
  - Arts & Humanities Citation Index (1975-present)
  - Conference Proceedings Citation Index - Science (1990-present)
  - Conference Proceedings Citation Index - Social Science and Humanities (1990-present)
- SciFinder: provides access to a wide diversity of research from many scientific disciplines. It includes the Chemical Abstract Service database which is created and maintained by scientists, and have references from over 9,500 currently published journals and patent information from more than 50 active patent issuing authorities. The coverage is chemistry incl. patents, as well as topics like life sciences including biochemistry, biology, pharmacology, medicine, and related disciplines. In addition SciFinder contains the world's largest collection of organic and inorganic substance chemistry information.

## **2.2 International and national legislation regarding food contact materials**

The search strategy has included a search into positive lists of substances in international and national legislations on food contact materials, e.g. the EU positive list on plastic materials used for Food Contact Materials. The particular regulations are listed in chapter 3.

## **2.3 Inventory lists from industry organisations and governmental institutions**

### **Inventory lists by the European Food Safety Authority, EFSA**

The Executive Director of EFSA did in 2010 initiate an EFSA Scientific Cooperation (ESCO) working Group in order to set up inventory lists for substances used for preparation of non-plastic food contact materials. The list is compiled based on information in Member States, Switzerland and Norway. The list includes varnishes and coatings, colorants, wood and cork, paper and paperboard, printing inks, rubbers and silicones (EFSA, 2011).

### **Industry inventory lists and guidelines on food contact materials**

The European Trade Association for printing ink makers, EuPIA, has published guidance documents on packaging inks to their member companies (EuPIA, 2011). EuPIA has in the absence of specific EU legislation for food packaging inks developed a guideline for selection of raw materials for printing inks intended to be applied on the non-food contact surface of food packaging. As Part of the guideline an inventory list of packaging ink substances used for the non-food contact surface of food contact materials is given (EuPIA, 2013).

## **2.4 Databases on the use of substances in products in Denmark, in the Nordic countries and in Europe**

Danish Product Registry: the Product Registry at the Danish Working Environment Authority registers both individual substances and mixtures of substances (preparations). Danish companies have a duty to notify hazardous chemical products to the Product Registry. The notification duty applies to companies that produce, import or change the trade name of hazardous chemical products in quantities exceeding 100 kg per year.

SPIN - Substances in Preparations In the Nordic countries - contains information on chemical substances from each of the Nordic product registers. Information available in SPIN: substances in preparations on the Nordic market; total use – volume in tons; industrial use; use category – product types; exposure potential for primary recipients.

REACH registrations: Database of Industry registration dossiers according to the REACH regulation, including information on the uses of chemical substances throughout Europe. REACH registers individual substances only.

## **2.5 Informal contacts to relevant Danish companies**

The European Trade Association for printing inks, EuPIA, as well as the Danish Coatings and Adhesives Association were personally contacted for information on the potential use of 2,5-di-tert-butylhydroquinone in materials intended for food contact. Moreover some Danish producers of printing inks and adhesives for food contact materials were contacted to obtain specific information on the use of the given substance in Danish productions of these materials.

# 3. Regulatory framework

## 3.1 EU regulation of food contact materials

In EU food contact materials (FCM) are regulated by the Framework regulation no 1935/2004 (EU, 2004). The requirements in regulation no 1935/2004, covered by article 3, are crucial for ensuring food safety. These general requirements state that FCM shall, under normal and foreseeable conditions of use, not transfer their constituents into foodstuffs in quantities, which could:

- Endanger human health
- Bring about an unacceptable change in the composition of the foodstuffs
- Bring about deterioration in the organoleptic characteristics thereof

This regulation applies to all FCM, which in their finished state are:

- Intended to be brought into contact with food
- Already brought into contact with food and are intended for that purpose
- Can reasonably be expected to be brought into contact with food or to transfer their constituents to food under normal or foreseeable conditions of use

In addition to the frame work regulation, food contact materials made of plastic are moreover covered by a specific regulation given by EU no 10/2011 and amendments (EU, 2011). The scope includes plastic coatings and gaskets on metal lids and plastic layers in multi-material multilayer FCMs. The regulation covers a positive list of monomers and other starting substances. These lists include for some substances restrictions on their migration (Specific Migration Limits, SML), the concentration in the FCM (Qm), or their purity or permitted use (e.g. not permitted for plastics in contact with fatty foods). Regulation 10/2011 requires that a declaration of compliance (DoC) is supplied for plastic materials and articles at the non-retail stages. The information required to be supplied in the DoC is set out in an Annex to the Regulation.

Where a specific measure has not yet been introduced for a given FCM, the substance must comply with the general provisions of the Framework Regulation 1935/2004. Compliance with regulation 1935/2004 shall be based on risk assessments of the chemicals used in the composition of the materials, including evaluation of possible migration of the chemicals into food. In addition to the harmonised legislation in Europe, some countries have national legislation in specific areas.

## 3.2 National regulations and recommendations on food contact materials

### Swiss Regulation on printing inks

In Switzerland a regulation for printing inks was issued in 2010. On the basis of the inventory list of substances given by The European Trade Association for printing ink makers (EuPIA) and Council of Europe, the list has been regularly revised and a complete list of substances in use is provided (FDHA, 2011). According to the regulation, packaging inks may only be manufactured from substances in the regulation. The lists of substances are divided into a part A and part B. Part A contains evaluated substances subjects to the requirements set out therein, intended to be used in

the manufacture of food contact materials. Substances in part B have not been subjected to any official recognised scientific testing. The use of these substances is permitted if no transfer of the substances to food or food simulants can be detected.

The substances in Part B of the lists must not be detectable in a migration test in the lowest possible concentration at which a substance may be detected using a valid method of analysis. The detection limit depends on the composition of the substance; this limit, expressed as a concentration, must never exceed 0.01 mg/kg of food or food simulants (including the analytical tolerance). For substances that can be allocated to a group of compounds with similar toxicology or similar basic structure (e.g. isomers), this limit value applies to the sum of the concentrations of the substances.

### **German recommendations and regulations on food contact materials**

In addition to EU regulations on food contact materials the German Federal Institute for Risk Assessment, Bundesinstitut für Risikobewertung (BfR) have recommendations on materials and substances for which there is no harmonised EU regulation (BfR, 2013). In the field of plastics these substances are aids to polymerisation as catalysts and initiators, as well as polymerisation production aids like e.g. emulsifiers, which are needed in the manufacturing process. The database moreover includes recommendations for other materials than plastics as e.g. paper and board, silicones and rubber. The BfR Recommendations on Food Contact Materials are not legal norms.

Moreover, a national legislation on printing inks is under preparation in Germany (Nordic Council of Ministers, 2012). The draft regulation will include a list of substances which are approved (due to evaluations by EFSA, JECFA and BfR) for use in printing ink formulations for food contact materials. The starting point for this is the Swiss regulation on printing inks. In addition to this, chemicals which have not been risk assessed are listed but are not included in the legislation. The non-regulated substances may be used if the migration is not detectable (detection limit of 10 microgram per kg food) and the substances are not classified as either carcinogenic, mutagenic or reprotoxic. Toxicological risk assessment and an authorization procedure for chemicals used in printing ink will be a part of the proposed activity in Germany.

### **National regulations on printing inks in the Nordic countries**

None of the Nordic countries have additional national legislation on printing inks and coatings. However, in Denmark, Finland and Norway declaration of compliance, DoC, for all type of FCM including packaging inks is requested.

### **Danish regulation on materials and articles in contact with drinking water**

In Denmark drinking water is regulated by a new regulation on authorisation of materials in contact with drinking water (Ministry of Climate, Energy and Building, 2013a and b). This regulation covers materials, including coatings, in contact with drinking in the permanent installations until the tapping. According to the regulation the materials must not have health hazardous effect. Materials that are not part of the permanent installations for drinking water, i.e. after the tap, are covered by the EU regulations for food contact materials including the Framework regulation no 1935/2004 (EU, 2004) and EU regulation no 10/2011 for materials made of plastic (EU, 2011).

### **Regulation on Food contact materials by US Food and Drug Administration, FDA**

In US, food contact materials are regulated by the US Food and Drug Administration, FDA, by the regulation Code of Federal Legislation (CFR) 21 on Indirect Food Additive Substances that may come into contact with food as part of packaging or processing equipment (US FDA, 2013). The regulation includes the following lists: 21 CFR 175 Indirect food additives: Adhesives and components of coatings, 21 CFR 176 Indirect food additives: Paper and paperboard components, 21 CFR 177 Indirect food additives: Polymers.

# 4. Occurrence in food contact materials

## 4.1 Occurrence on regulations, recommendations and inventory lists

### **EU regulation on materials and articles of plastic for food contact EU 10/2011.**

The substance is not on the European Union list of authorised monomers and other starting substances for food contact materials in the regulation on plastic materials and articles intended to come into contact with food (EU, 2011). The substance is therefore not legally to be used in food contact materials of plastic on the European market.

### **Materials under the German Recommendations**

The substance was not found on the list of substances in the database of the German regulation of Food contact materials.

### **Swiss Regulation on printing inks**

1,6-hexandiol diglycidyl ether is on the list of permitted additives in printing inks in part A and on the list of solvents in part B of the regulation. In both lists it is marked as being an energy curing monomer (monomers which react chemically to form the binder of the printing ink).

As mentioned in chapter 3.2 substances on part B have not been subjected to any officially recognised scientific testing (such as that of the scientific committee of the EFSA). The use of these substances is permitted if no transfer of these substances to food or food simulants can be detected. The relevant proof can be provided by means of a "worst case" calculation or by a practical experiment.

### **US Food and Drug Administration FDA**

1,6-hexandiol diglycidyl ether is not found on FDA list (175 and 176) of indirect additives used in food contact substances. The substance is thus not permitted in adhesives and coatings or in paper and paperboard in the US.

### **EuPIA inventory list**

The substance, 1,6-hexanediol diglycidyl ether, is found on the EuPIA inventory lists of printing ink raw materials applied to the non-food contact of food packaging as "substances used as additives or ingredients of additive preparations" and "energy curing monomers" (EuPIA, 2013).

### **EFSA**

The substance was not found on the EFSA Scientific Cooperation (ESCO) inventory list of substances for food contact material of non-plastic (EFSA, 2011). The list includes substances on printing inks, coatings, paper and board, rubber and wood for food contact.

## 4.2 Industry information on the use of the substance

The European Council of Paint and Printing Inks, CEPE, confirmed that the substance is not used for lacquers and inks for metal packaging for food. A Danish company in the paint and lacquers

industry has reported that 1,6-hexanediol diglycidyl ether is used as an epoxy diluent as a part of a raw material used by them. Epoxy paints are used in chemical containers, various pipelines and drinking water tanks. The company use 1,6-hexanediol diglycidyl ether in a quantity of 800 kg/year in Denmark (personal communication to the Danish Coatings and Adhesives Association, 2013).

### 4.3 Registration in databases

The substance belongs to the European inventory of existing commercial chemical substances (EINECS) as it is recorded as being commercially available in the EU from 1 January 1971 to 18 September 1981. It was therefore registered under the REACH regulation as a phase-in substance in November 2010.

In Table 2 the reported use of the substance in various product categories is listed. The uses in consumer's products are in adhesives, sealants, coatings, fillers and plasters.

#### Chemical product category:

PC 1: Adhesives, Sealants

PC 9a: Coatings and paints, thinners, paint removers

PC 9b: Fillers, putties, plasters, modelling clay

**TABLE 2**  
CHEMICAL PRODUCT CATEGORY IN REACH REGISTERED BY COMPANIES

In the Danish product register substance is in 2013 registered to be used in 12 technical categories in 64 tonnes per year. The use areas was paint and lacquers, binders, flooring materials, construction materials, surfactants, fillers and other applications (listed in decreasing registered consumption). It is registered to be used in 84 different products; however no information was given if these applications include food contact materials.

In the database of the Nordic Product Register, SPIN, the substance is mainly registered to be used for construction materials; adhesives and binding agents; paint, lacquers and varnishes; fillers; surface treatment and others. In Denmark the registered use in 2011 was 41 tonnes. However; no information was found if the substance is used for food contact materials.

### 4.4 Information search in scientific literature and databases

In the scientific literature published information of 1,6-hexanediol diglycidyl ether is found concerning chemical structure, chemical reactions in relation to polymers and epoxy resins. In most cases the publications and other information's are directed against the use in products already mentioned as the main application areas such as adhesives, coatings, paints used in construction and building industries.

One recent scientific paper describes the synthesis of a new UV-curable prepolymer – hexanediol diglycidyl ether diacrylate – and its cured film property (Huang et al., 2011). UV-cured films have industrial applications as protective coatings, printing ink and adhesives. Generally bisphenyl A diglycidyl ether diacrylate is used as prepolymer but other prepolymers can have better producing and mechanical and properties.

A thirteen years old scientific paper discusses the different UV-curable formulations suitable for printing on plastics substrates (Lombardi et al., 2000)

No direct reference to the use in food contact materials was found.

### **Patents**

In several patents the substance 1,6-hexanediol diglycidyl ether is mentioned. In most cases 1,6-hexanediol diglycidyl ether is listed as one of many possible chemical reactants which can be a part of the chemical substances used for synthesis of the product in the patent application. The found patents cover the following application areas:

- Coatings for concrete drinking water pools (Ishida et al., 1993)
- Paper wet strength agent (product which provide strength to the paper when it is wetted (Chen, 2013; Pei and Dongping, 2010)
- Printing ink (Jego et al., 2003; Furukawa, 1998)
- Electronic packaging material (Deng, 2013)
- Coatings for medical devices (Hsu et al., 2001; Bauer and Juergen, 1993)

With the exception of coatings for drinking water tanks no direct reference to the use in food contact materials was found.

# 5. Overall findings and conclusions

## 5.1 Main findings

The substance 1,6-hexanediol diglycidyl ether is not on the positive list in the EU regulation for plastic food contact materials and articles. It may therefore not be used legally in these materials on the Danish market. Nor is the substance on the US FDA regulation lists (CFR 175 and 176) of indirect additives used in food contact materials or the ESCO inventory list for printing ink.

However; it is listed as a permitted additive and a solvent in the national regulation in Switzerland for printing inks as well as on the inventory industry list of the European Trade Association for printing ink makers, EuPIA.

From searching in scientific literature and databases it was not possible to find information on actual use of the substance within food contact materials applications. A main application is within coating and paints and a possible use is for coating of tanks for drinking water tanks and pipelines, as reported by a Danish company. Application in printing ink is reported in a scientific article and in two patents. This is in line with the listing of the substance in the Switzerland regulation and the inventory list of EuPIA.

In patent applications the substance is also mentioned in relation to drinking water tanks, paper wet strength agents, electronic packaging materials and coatings of medical devices. In the last three applications no specific description was found in relation to food contact materials.

## 5.2 Conclusions

The result of the survey indicates that the substance probably is used in coatings of drinking water tanks and pipelines. No information was found with regards to release of residual monomers of 1,6-hexanediol diglycidyl ether from cured epoxy coatings. To the extent that monomer residues of 1,6-hexanediol diglycidyl is migrating from epoxy coatings it will be released to the water phase as it is soluble in water.

Except for drinking water tanks no specific description of 1,6-hexandioldiglycidylether in relation to food contact materials was found in this survey.



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Chen, Dongping. 2013. *A paper wet strength agent and preparation method thereof*. Patent CN103362032A, filed 2013, and issued 10/23.

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### **Survey of the occurrence of 1,6-hexanediol diglycidyl ether in food contact materials**

This project is a survey of the occurrence of 1,6-hexanediol diglycidyl ether (HDDGE) specifically in food contact material on the Danish market.

The project is following up on a previous survey under the Danish EPA's LOUS-review (Environmental Project no. 1477).

This survey clarifies that HDDGE is listed on an inventory for possible use in printing inks food contact materials, but that is not used by European producers and importers. The substance is not allowed for use in plastic materials for food contact. One Danish company reported a possible use of HDDGE in coating of drinking tanks and pipelines. This is the only use of HDDGE confirmed in relation to food contact materials in Denmark.



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