

# Acute aquatotoxicity screening of cellulosic products contained glyoxal, using multi-strain bacteria, daphnia, and zebrafish embryos

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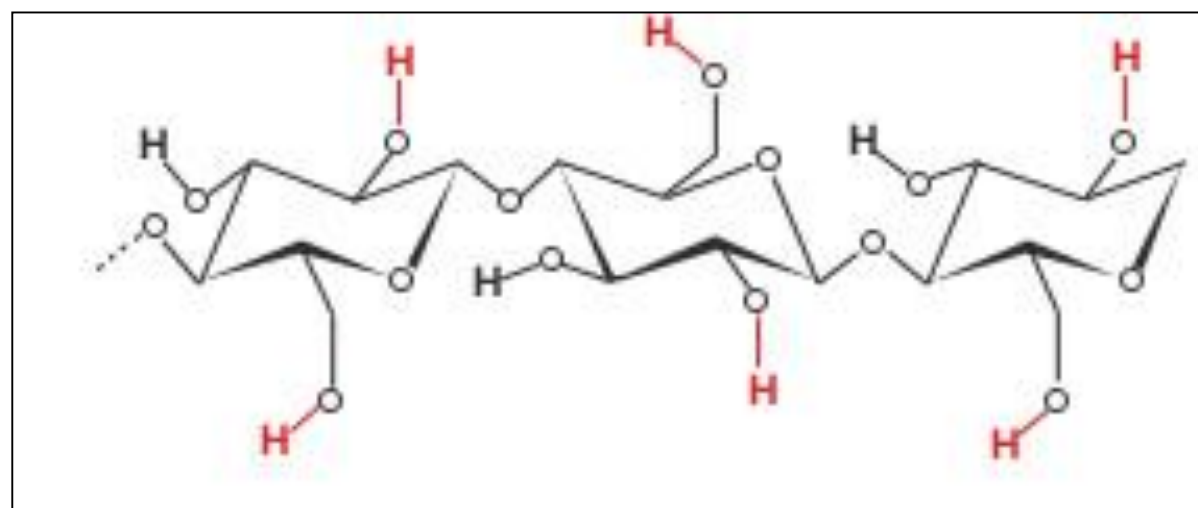
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<sup>2</sup> Samsung fine chemicals Co., Ltd, Yeocheon-ro 217 beon-gil 19, Nam-gu, Ulsan 680-090, Republic of KOREA

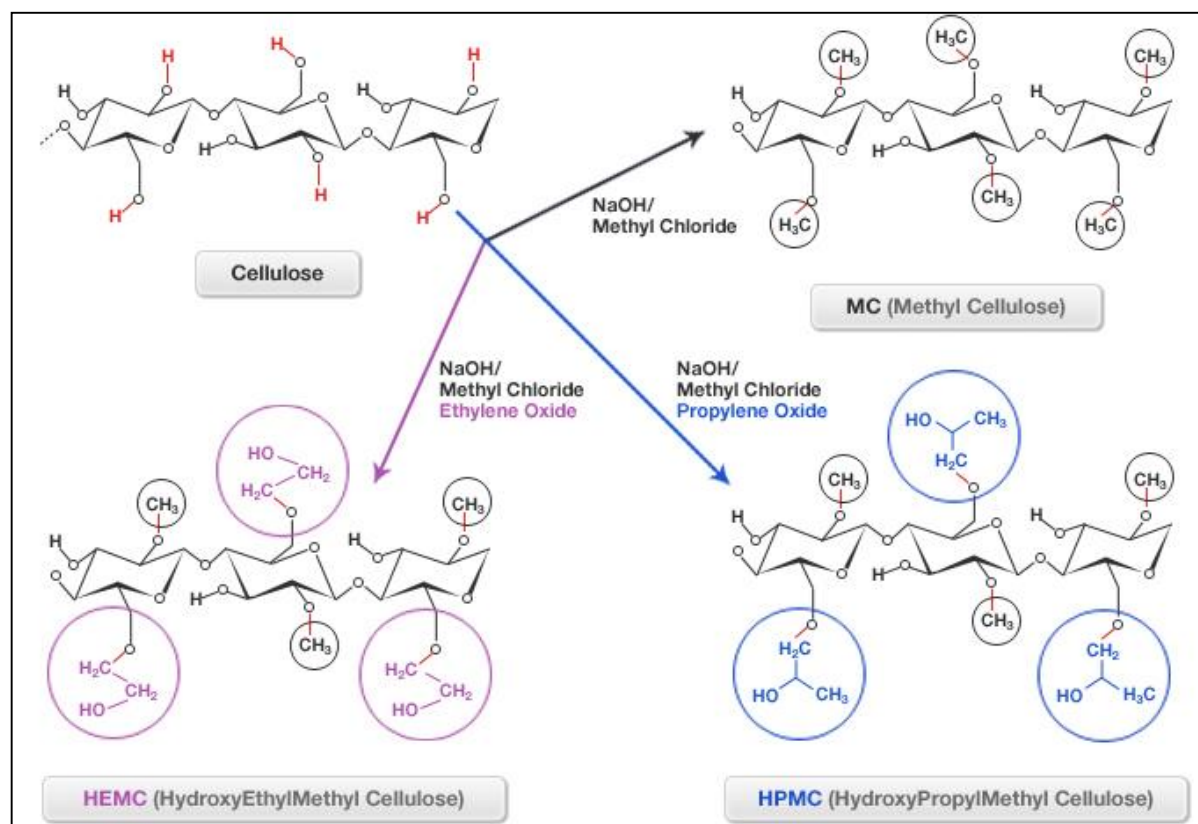
## Introduction

### Natural organic polymer

#### Cellulose



#### Modification



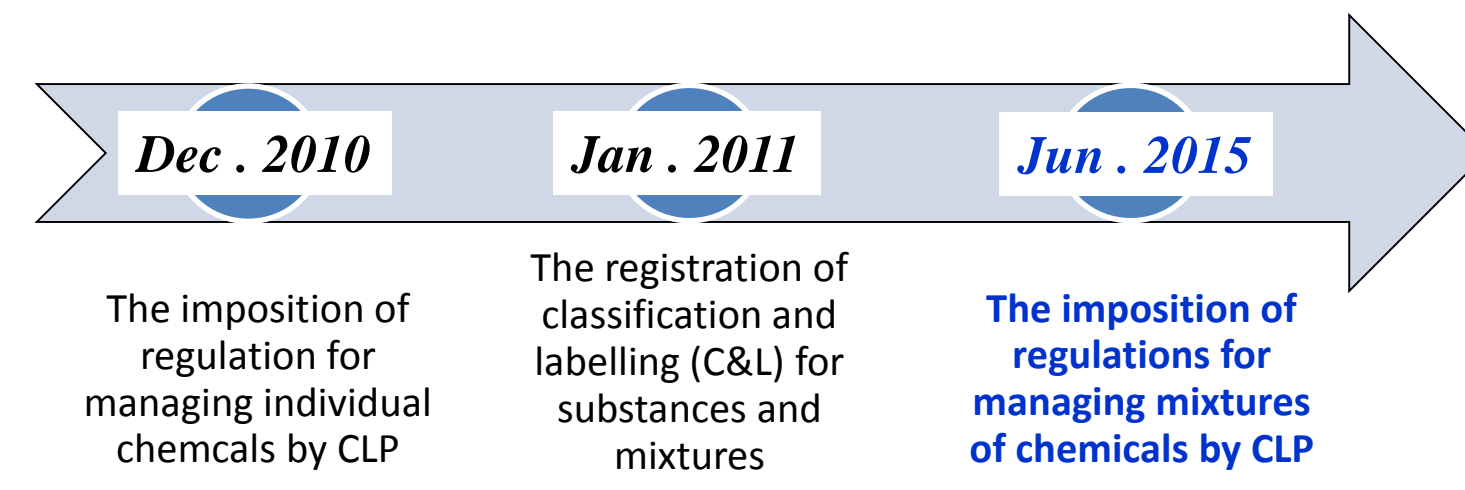
#### Application to the industry



Figure source: Samsung fine chemicals

### EU CLP legislation (EC 1272/2008)

The European parliament and the council of 16 December 2008 on classification, labelling and packaging (CLP) of substances and mixtures



### Classifying obligation for mixture involving polymer compounds

For reflecting the client demand

- Exploration of potential hazard factors
- Toxicity screening for mixtures
- Application of toxic or hazard information

**Sample of example**

SAFETY DATA SHEET  
METHYLCELLULOSE (Modified Grade) (FMC-Grade)  
According to Regulation (EC) No 453/2010

SECTION 2: HAZARD IDENTIFICATION

2.1 Classification of the substance or mixture  
Classification (EC 1272/2008):  
Hazard and Chemical Hazards: Not classified  
Human health: Not classified  
The full Technical and Safety and Health Statements are Disputed  
Hazard and Chemical Hazards: Not classified  
Physical and Chemical Hazards: Not classified  
Preparation and use: Not classified

2.2 Label elements  
Labels: Not classified  
Labels in accordance with (EC) No 1272/2008: Not classified

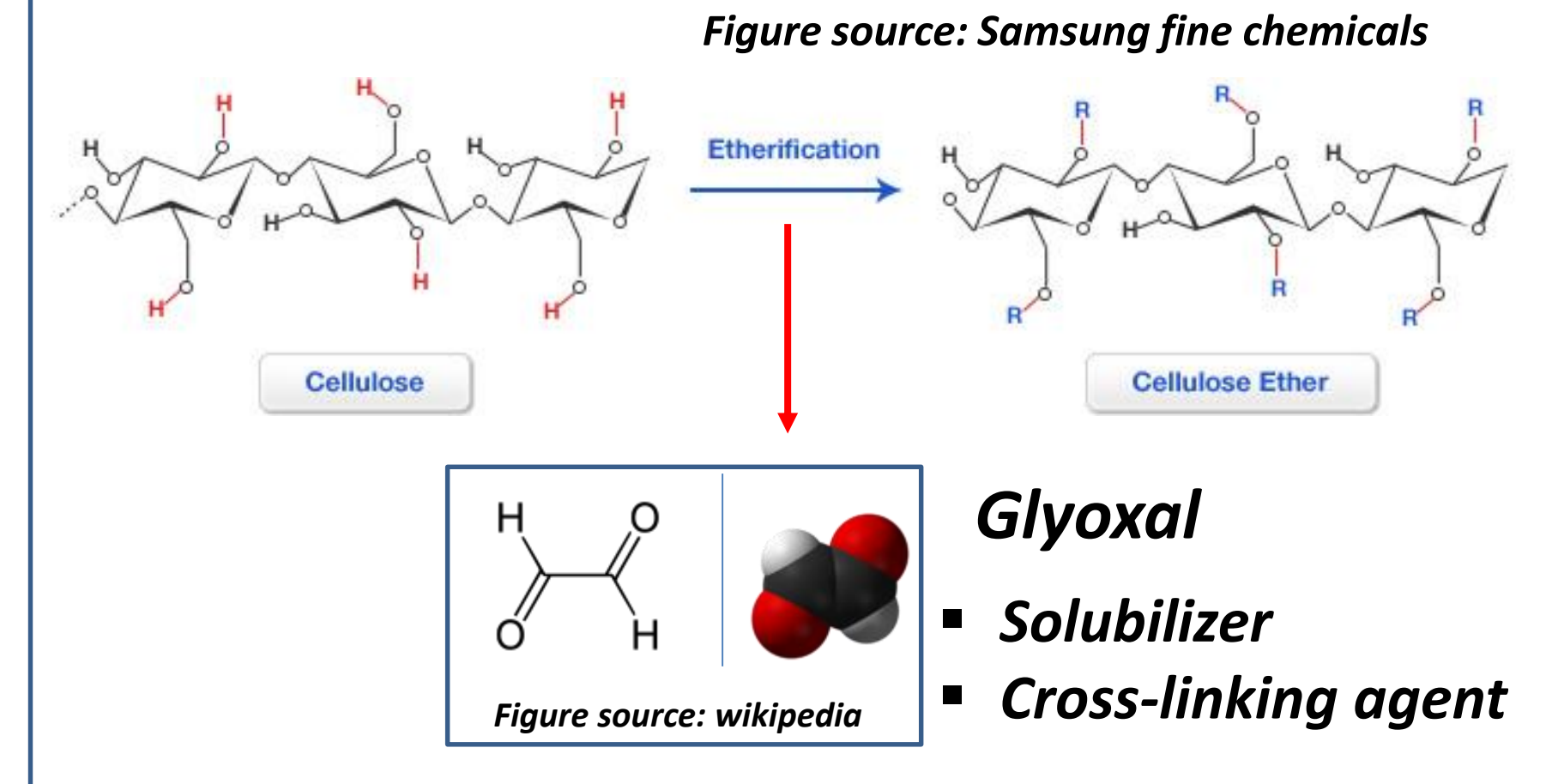
2.3 Other hazards  
No other hazards

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

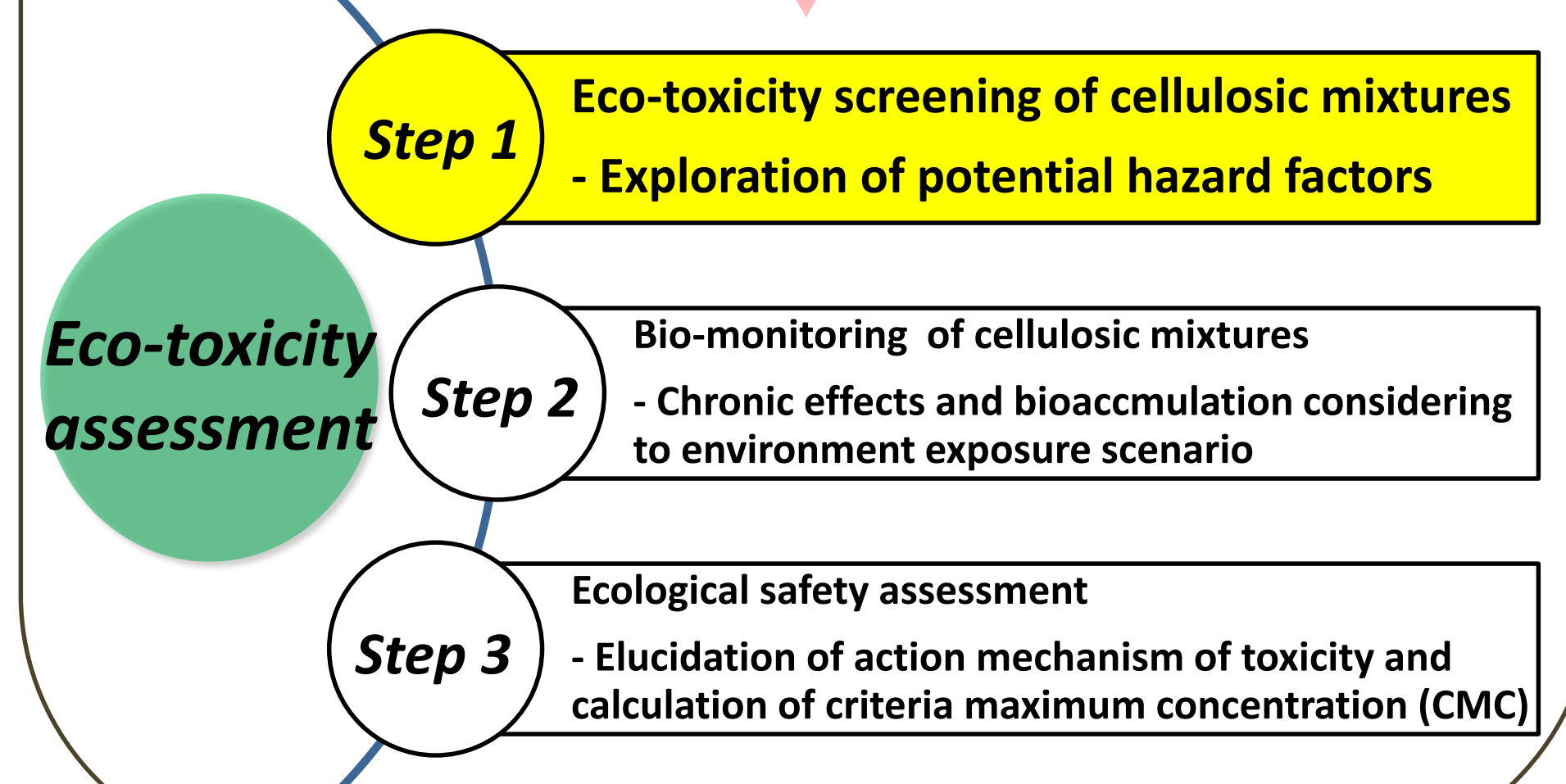
3.1 Mixtures  
Modified Cellulose derivatives  
CAS No.: EC No.:  
Classification (EC 1272/2008): Not classified  
Classification (GHS/EC): Not classified

## Objectives

### Cellulosic products



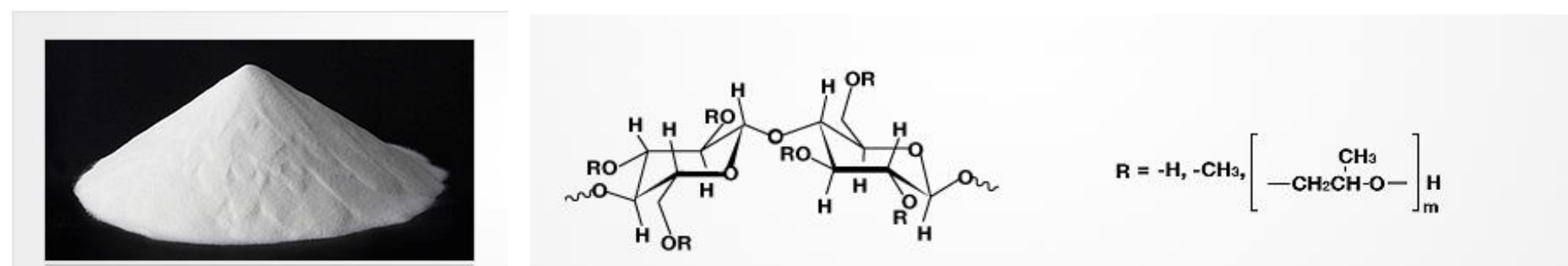
For the production of eco-friendly cellulosic products



## Materials & methods

### Target cellulosic product

2-hydroxypropyl methyl ether (cellulose, CAS-N. 9004-65-3)



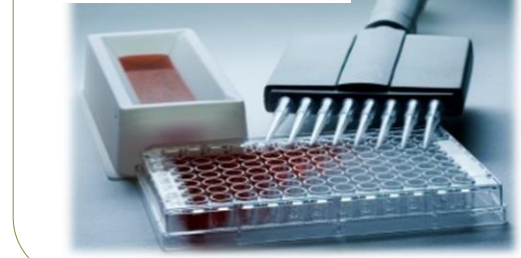
Sample	Viscosity (mPas)	pH	Moisture (%)	NaCl (%)	Methoxyl (%)	Hydropropoxyl (%)	Total-gly(%)
Ref							0
1	3.5	5.0~8.0	3	0.5	27~29	6~8	1.4
2							2.3
3							6.3

- ≤ 1.0 % of glyoxal is contained in commercial cellulosic products
- Cellulosic products contained ≥ 1.3 % of glyoxal were used as a test sample

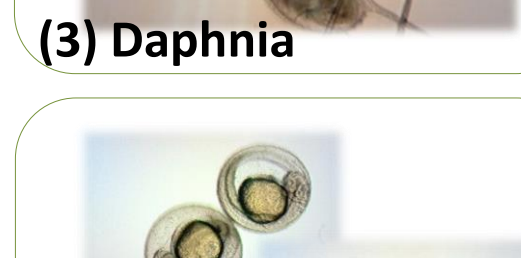
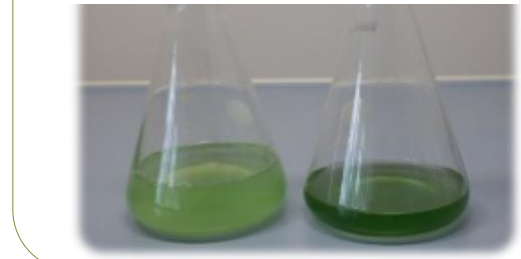


### Eco-toxicity screening

#### (1) MARA test



#### (2) Growth inhibition

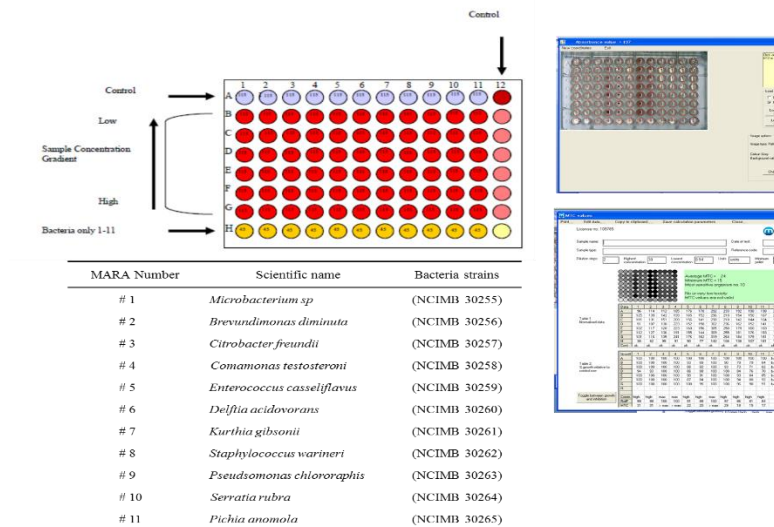


#### (3) Daphnia

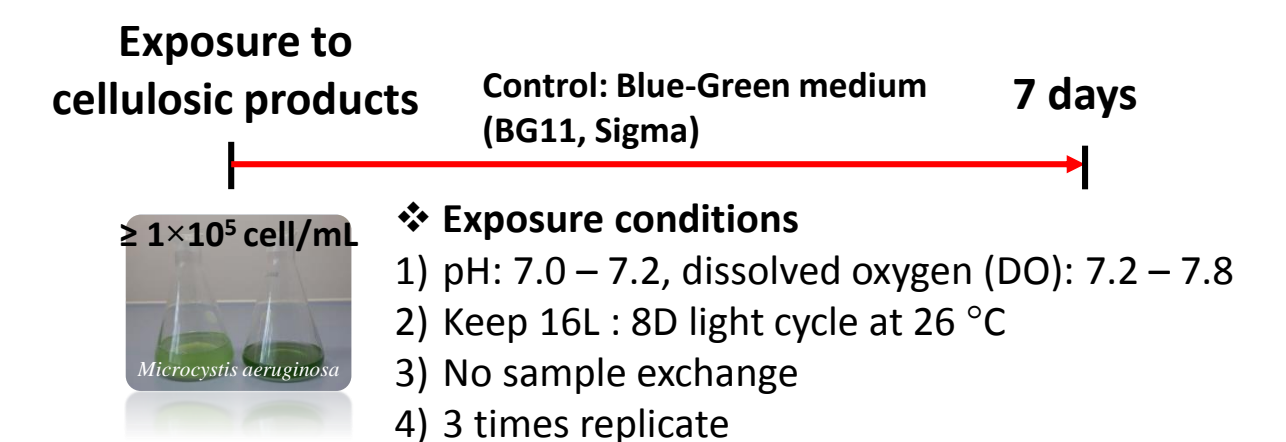


#### (4) Zebrafish

(1) Microbial Assay for toxicity Risk Assessment (MARA) test  
- 11 freeze-dried microbial strains (NCIMB Ltd, UK)



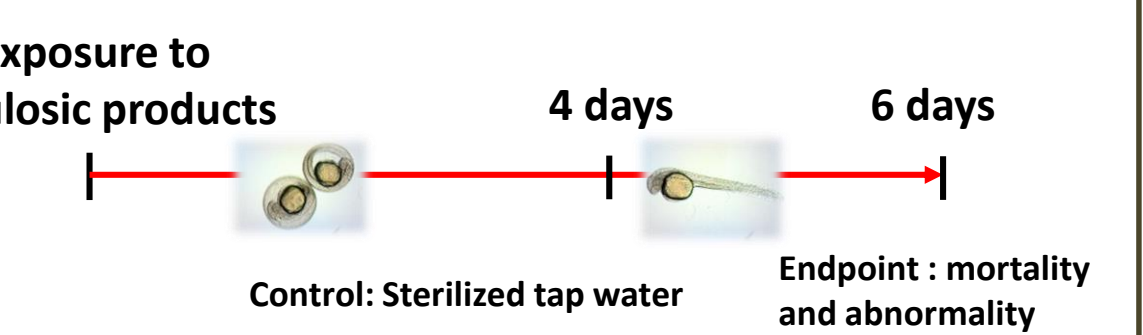
(2) Cyanobacteria growth inhibition test  
- Microcystis aeruginosa



(3) Daphnia magna acute toxicity test  
- Daphtoxkit F<sup>TM</sup> (MicroBio Test Inc., Belgium)



(4) Zebrafish embryo toxicity test  
- OECD Test guideline 236 (2012)



## Results & discussions

### (1) Microbial Assay for toxicity Risk Assessment

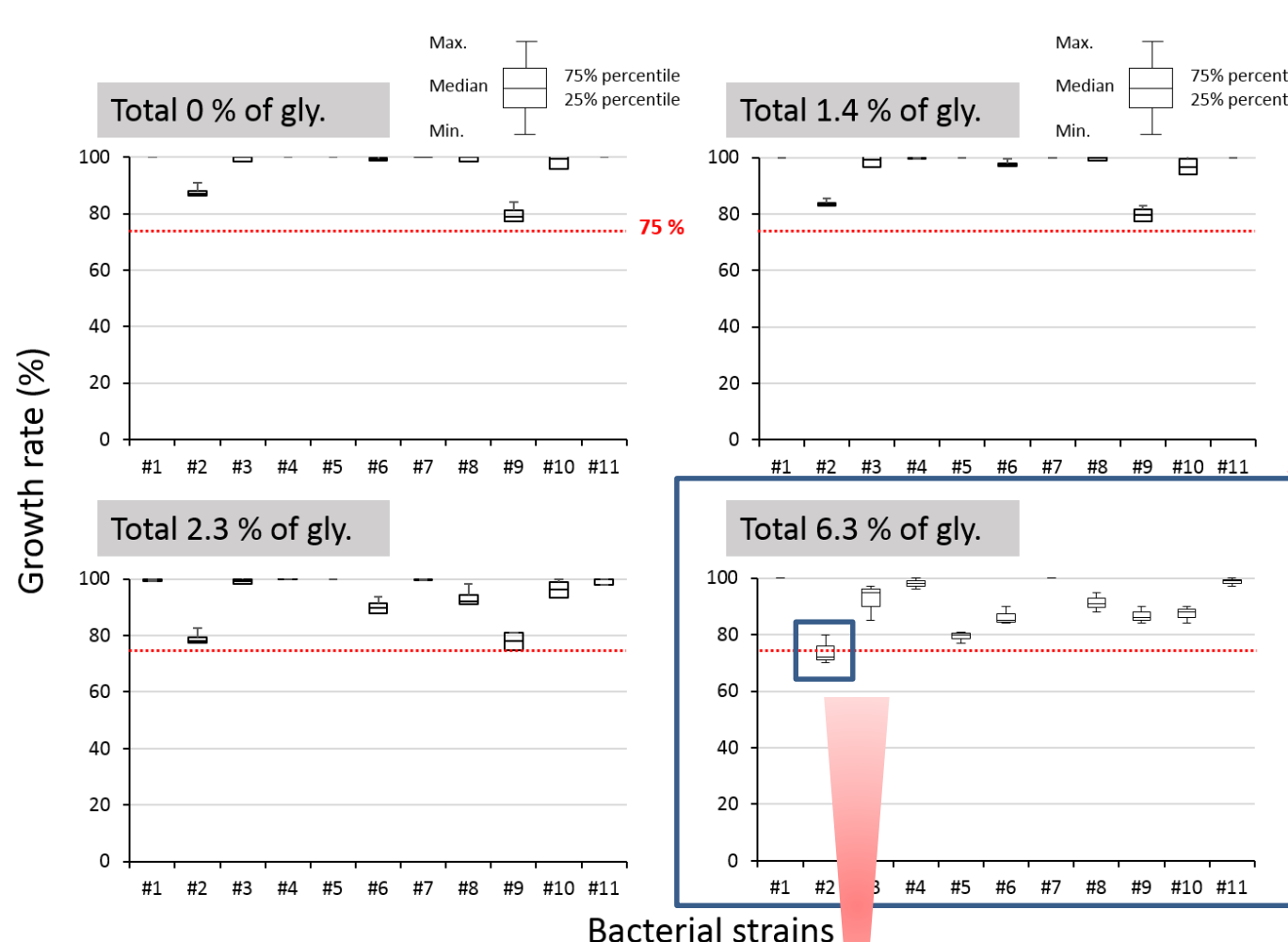


Figure 1. Effects of cellulosic products contained different glyoxal concentrations on multi-microbial strains growth

- No significant difference between all treatment groups, due to ≥ 75 % growth rate
- However, glyoxal concentration dependence was observed in the growth inhibition rate of # 2 strain exposed to cellulosic product containing 6.3 % glyoxal

### (2) Cyanobacteria growth inhibition

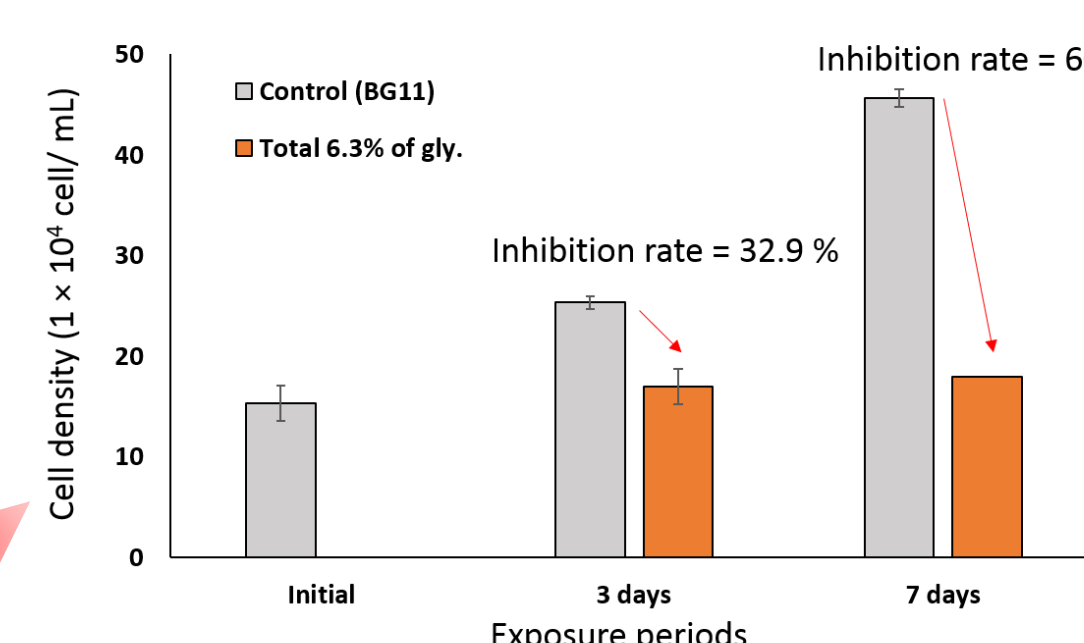


Figure 2. Effects of cellulosic products contained 6.3 % of glyoxal on cyanobacteria growth

- It seems that cellulosic products contained 6.3 % of glyoxal can induce the growth inhibition of cyanobacteria
- Unfortunately, however, we could not decide the mechanism of action on growth inhibition

### (3) Daphnia magna acute toxicity

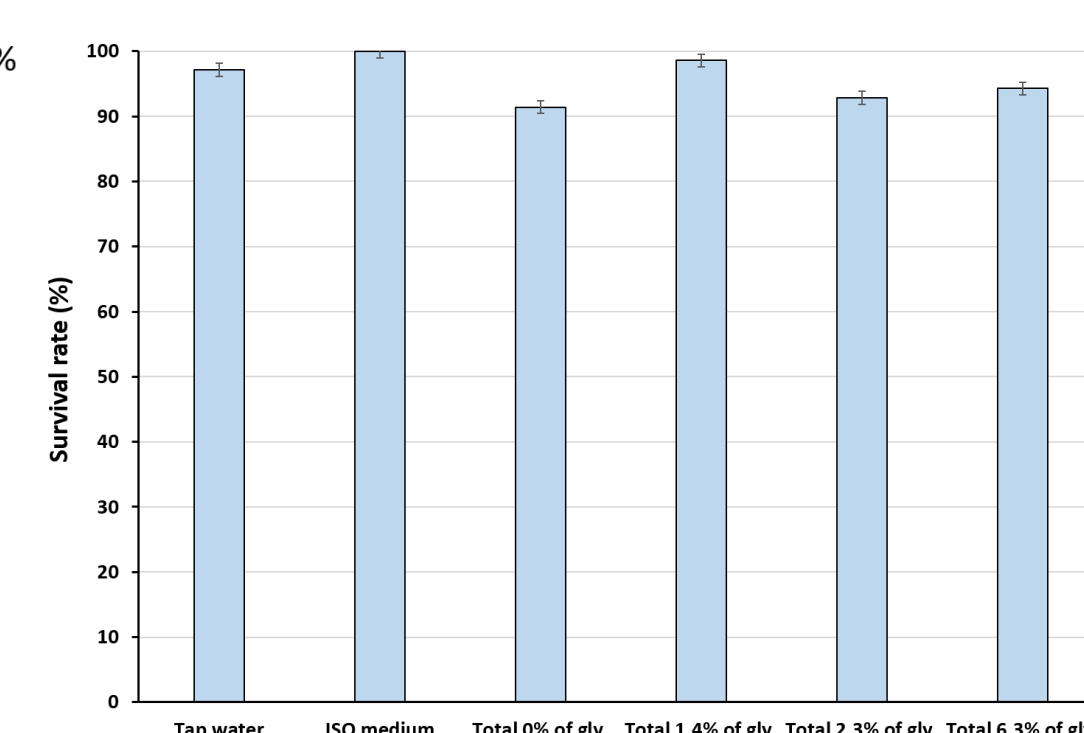


Figure 3. Effects of cellulosic products contained different glyoxal concentrations on daphnia magna acute toxicity

- No significant difference between all treatment groups, due to ≥ 90 % survival rate

### (4) Zebrafish embryo toxicity

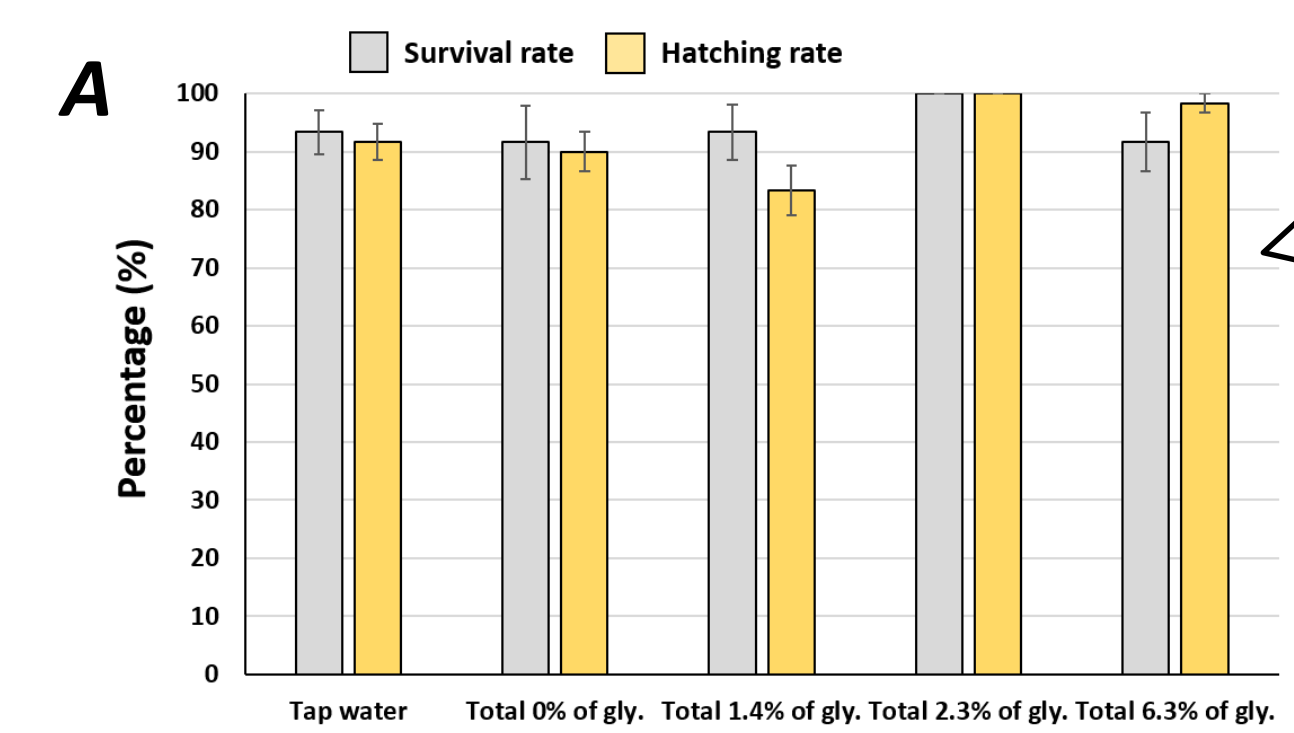


Figure 4. Effects of cellulosic products contained different glyoxal concentrations on zebrafish embryo development. A: survival and hatching rate, B: abnormality

- No significant difference between all groups, due to ≥ 90 % survival rate
- A few abnormalities, spin curvature, were observed in cellulosic products contained ≥ 1.4 % of glyoxal

## Conclusions

- Our results indicated that commercial cellulosic products which is contained ≤ 1 % of glyoxal is no toxic on 3 different aquatic organisms.
- However, high concentration of glyoxal more than 1 % may be one of potential hazard factors in a cellulosic products.
- Further research about the chronic effects by long-term exposure is need to more understand the action and its mechanism on aquatic toxicity.