Development of a methodological document for the comparison of alternatives to hazardous substances

2nd International Symposium on Alternatives Assessment

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Purpose of the request

5 French Ministries
(Environment, Labour, Health, Agriculture, Consumer affairs)

Formal request
Opinion on the possibility of formaldehyde substitution in various sectors of activity

- Embalming processes
- Animal feed
- Pathological anatomy and cytology
- Food for human consumption
Answering of the request

Working Group (WG)
“Formaldehyde and substitutes”

Expert Committee
(multidisciplinary, independent and collective appraisals)

The Working Group:
1. Development of a method to compare alternatives
2. Implementation in the various sectors of activity
General description of the method

| Identification of alternatives through a search in the scientific literature |
| Consultation of stakeholders in the sector of activity |

<table>
<thead>
<tr>
<th>1st sequential step</th>
</tr>
</thead>
<tbody>
<tr>
<td>« Technical performance » module</td>
</tr>
<tr>
<td>« Regulation » module</td>
</tr>
<tr>
<td>« Hazard » module - Rapid hazard assessment using QCAT tool</td>
</tr>
</tbody>
</table>

List of 6 to 10 alternatives graded A, B, C or « not assigned » and fulfilling the technical performance criteria retained as essential

- Exclusion of non-performing alternatives regarding technical performance criteria retained as essential
- Exclusion of alternatives prohibited via regulations
- Exclusion of substitutes graded F by the QCAT tool
General description of the method

List of 6 to 10 alternatives graded A, B, C or « not assigned » and fulfilling the technical performance criteria retained as essential

2\textsuperscript{nd} simultaneous step

- **« Hazard » module**
  In-depth assessment of the hazards using GreenScreen tool

- **« Estimation of substitution cost » module**
  Study of the direct and indirect costs of substitution

- **« Exposure conditions » module**
  Evaluation of the exposure conditions

- **« Other impacts » module**
  Module to be defined for each sector of activity

Comparative study of alternatives on the basis of available data
# General description of the method

## Technical Performance
- **Class 1**: Insufficient technical performance
- **Class 2**: Inferior technical performance
- **Class 3**: Equivalent technical performance
- **Class 4**: Superior technical performance
- **Not assigned**: Not assigned due to insufficient data

## Hazard
- **Class 1**: Extremely hazardous chemical substance
- **Class 2**: Very hazardous chemical substance
- **Class 2\textsubscript{DG}**: Very hazardous chemical substance due to missing data
- **Class 3**: Hazardous chemical substance
- **Class 3\textsubscript{DG}**: Hazardous chemical substance due to missing data
- **Class 4**: Low hazard chemical substance
- **Not assigned**: Not assigned due to insufficient data

## Exposure conditions
- **Class 1**: High exposure conditions
- **Class 2**: Moderate exposure conditions
- **Class 3**: Low exposure conditions
- **Class 4**: Exposure conditions considered negligible
- **Not assigned**: Not assigned due to insufficient data

## Substitution cost
- **Class 1**: Highest related costs
- **Class 2**: Moderate related costs
- **Class 3**: Low related costs
- **Class 4**: Lowest related costs
- **Not assigned**: Not assigned due to insufficient data
Formaldehyde is used as a processing aid for protection against ruminal degradation.

Untreated soya bean meal proteins: 100g -> 68g

Treated soya bean meal proteins: 100g -> 82g

Formaldehyde treatment decreases ruminal degradation.

Maillard reaction: Stable in the rumen.
### Implementation in animal feed

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<th>Regulation module</th>
<th>Hazard module QCAT tool</th>
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<tr>
<td>Formaldehyde</td>
<td>Class 3</td>
<td>Substitution mandatory (OSH regulation)</td>
<td>F (extremely hazardous)</td>
</tr>
<tr>
<td>Isopropanol; Ethanol; n-Propanol; Glutaraldehyde; Glyoxal; Tannins; Essential oils; Zinc sulfate; Propionic Acid; Steaming</td>
<td>Not assigned (lack of data)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium hydroxyde</td>
<td>Class 2 (inferior)</td>
<td>No exclusion by regulation</td>
<td>B (hazardous)</td>
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<tr>
<td>Extrusion cooking</td>
<td>Class 2 (inferior)</td>
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<td>A (low hazard)</td>
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<td>Heat treatment with calcium lignosulfonate</td>
<td>Class 3 (equivalent)</td>
<td></td>
<td>Not assigned</td>
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# Implementation in animal feed

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<th>Exposure conditions module</th>
<th>Other impacts module</th>
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<tr>
<td>Formaldehyde</td>
<td>Class 1 (extremely hazardous)</td>
<td>Class 4 (lowest related costs)</td>
<td>Class 3 (low)</td>
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<tr>
<td>Sodium hydroxyde</td>
<td>Class 2 (very hazardous)</td>
<td>Not assigned (lack of data)</td>
<td>Class 4 (negligible)</td>
<td>Availability; Chemical burns</td>
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<tr>
<td>Extrusion cooking</td>
<td>Class 4 (low hazard)</td>
<td>Class 1 (highest related costs)</td>
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<td>Thermal burns; Dust emission</td>
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<td>Heat treatment with calcium lignosulfonate</td>
<td>Class 3 (hazardous)</td>
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## Results in animal feed

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<th>Alternatives</th>
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<td>Class 4</td>
</tr>
<tr>
<td>« Estimation of substitution cost » module</td>
<td>Class 4</td>
<td>Class 1</td>
</tr>
</tbody>
</table>

### Identification of « other impacts »
- Thermal burns; Dust emission
- Availability; Chemical burns
- Thermal burns; Dust emission
Conclusions and recommendations

Final presentation of the results
Final tables showing the various alternatives with their advantages and disadvantages to enable the decision-makers to retain the best option in view of the criteria they consider high-priority and acceptable

As existing alternatives process are available

The WG recommends:
- to the public authorities: to prohibit the use of formaldehyde in animal feed;
- to the animal feed manufacturers: to substitute formaldehyde by using an existing alternative process (in particular “extrusion cooking” or “heat treatment with calcium lignosulfonate”).
Useful information about the reports

Link to the method

Embalmung processes

Animal feed

Pathological anatomy and cytology

Food for human consumption

Public consultation : August to September 2018 - Final report to be published mid-2019

Public consultation Dec. 2018

Public consultation mid-2019
Thank you to

“Formaldehyde and substitutes” WG
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All the participants for their attention