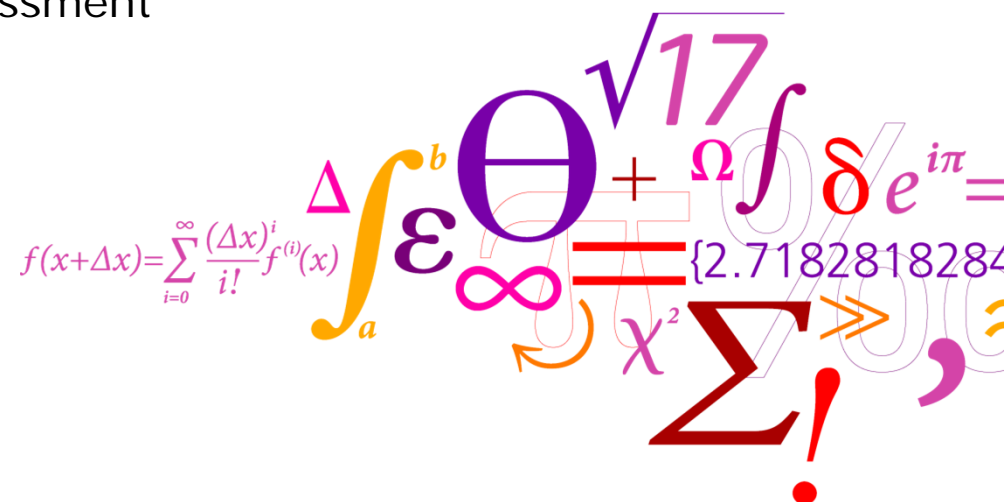


# Development of the 'Cocktail Effect Calculator'

A tool for risk assessment of cocktail effects

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Division of Toxicology and Risk Assessment







## **Challenge in risk assessment of cocktails**

- **Information on toxicity and exposure of chemicals is spread out in many databases and reports**
- **Time consuming to collect data for calculation of combination effects**

# The 'Cocktail Effect Calculator'

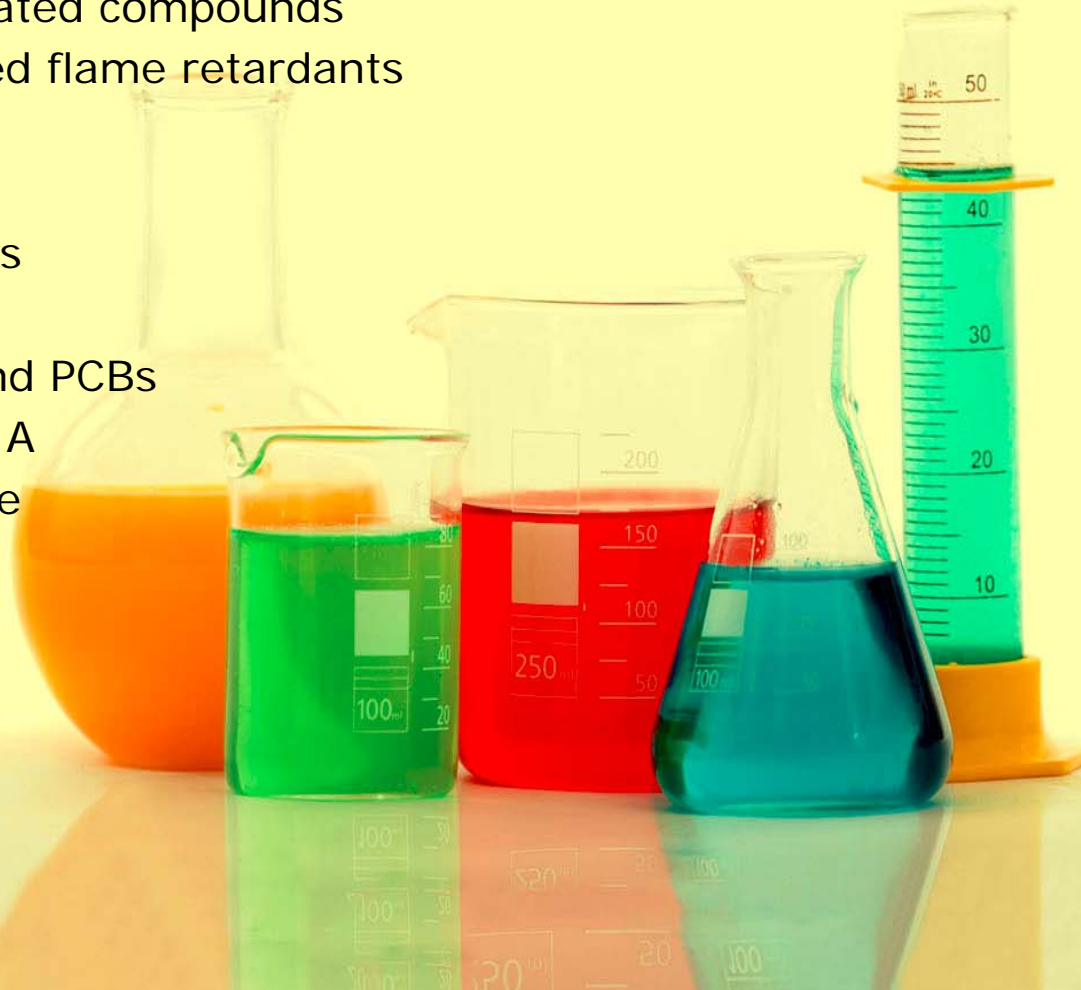
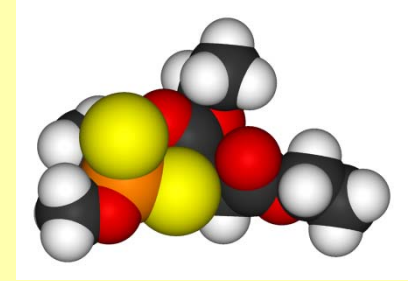
A user interface for:

- Finding information on **toxicity** and **exposure** data for chemicals
  - The toxicity information is limited to the critical toxicity on which the present EU regulation is based
- Calculating a **hazard index** for the actual cocktail



# Chemical classes

- Selected chemicals with available information:
  - Phthalates
  - Perfluorinated compounds
  - Brominated flame retardants
  - Pesticides
  - Metals
  - Mycotoxins
  - PAHs
  - Dioxins and PCBs
  - Bisphenol A
  - Acrylamide



# The collection of information

- Phthalates
- Perfluorinated compounds
- Brominated flame retardants
- Pesticides
- Metals
- Mycotoxins
- PAHs
- Dioxins and PCBs
- Bisphenol A
- Acrylamide

## Tox data

- critical adverse effect
- point of departure (e.g. NOAEL)
- reference dose (e.g. TDI/ADI)

## Exposure data

- intake values for defined consumer groups
- exposure via food; does not cover the exposure from other sources such as cosmetics products

- **Hazard quotients** for the individual chemicals are, if possible, calculated based on the collected information
- Contains **links** to reports containing the collected toxicity and exposure information

## Information sources

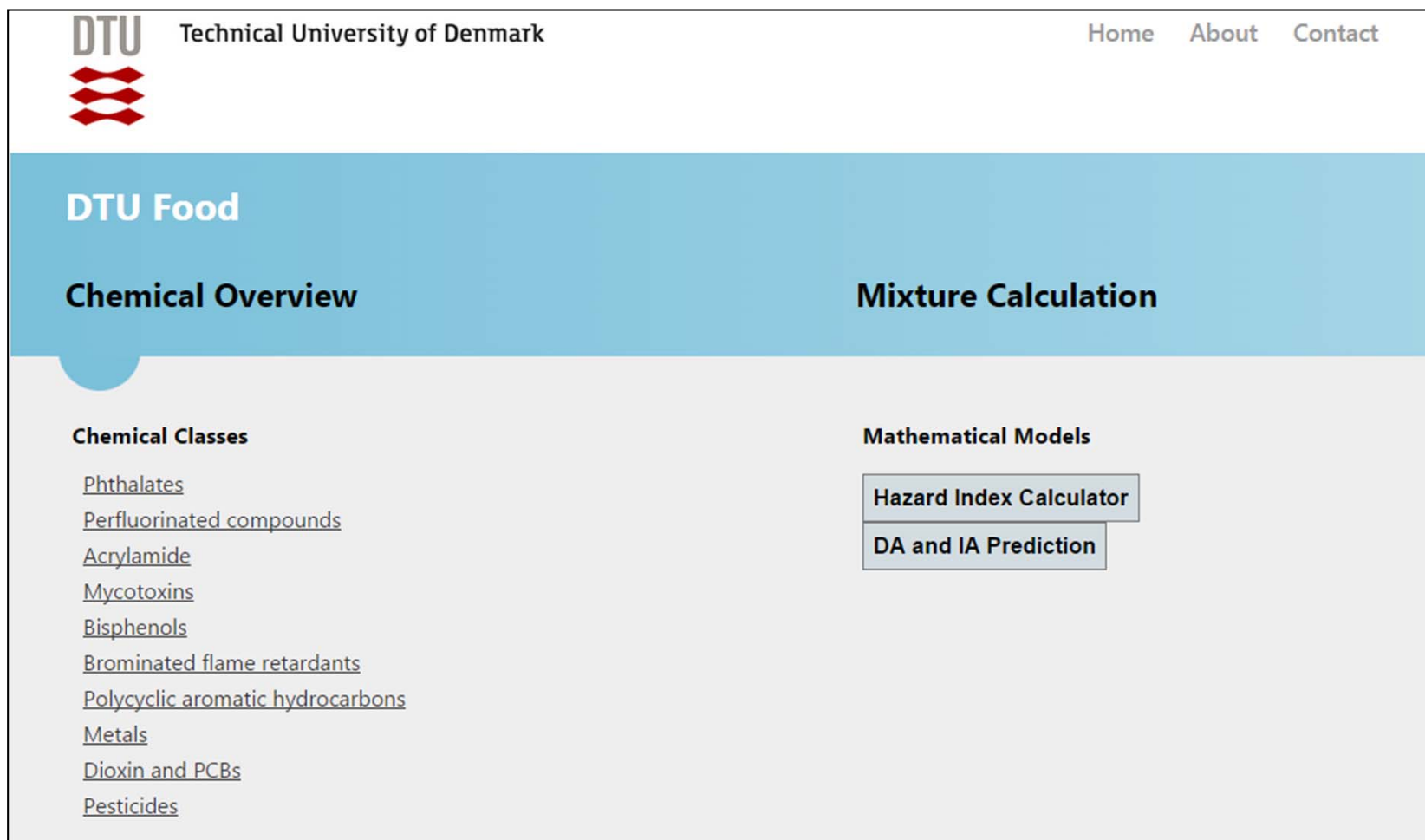
The toxicity information is limited to the critical toxicity on which the present EU regulation is based

Only chemical exposure via the food has been taken into account

If no reference value such as TDI or ADI has been established, a reference dose was calculated using the formula: *point of departure / safety factor*

Data from EFSA and Danish reports are primarily used for the calculations; in some cases JECFA or ECHA data are used

# Front page of the user interface – overview of entries



The screenshot shows the front page of the DTU Food user interface. At the top left is the DTU logo and the text 'Technical University of Denmark'. At the top right are navigation links for 'Home', 'About', and 'Contact'. Below this is a blue header bar with 'DTU Food' on the left and two main sections: 'Chemical Overview' and 'Mixture Calculation'. Under 'Chemical Overview', there is a sub-section 'Chemical Classes' with a list of links: Phthalates, Perfluorinated compounds, Acrylamide, Mycotoxins, Bisphenols, Brominated flame retardants, Polycyclic aromatic hydrocarbons, Metals, Dioxin and PCBs, and Pesticides. Under 'Mixture Calculation', there is a sub-section 'Mathematical Models' with two buttons: 'Hazard Index Calculator' and 'DA and IA Prediction'.

DTU Technical University of Denmark Home About Contact

## DTU Food

### Chemical Overview

### Mixture Calculation

#### Chemical Classes

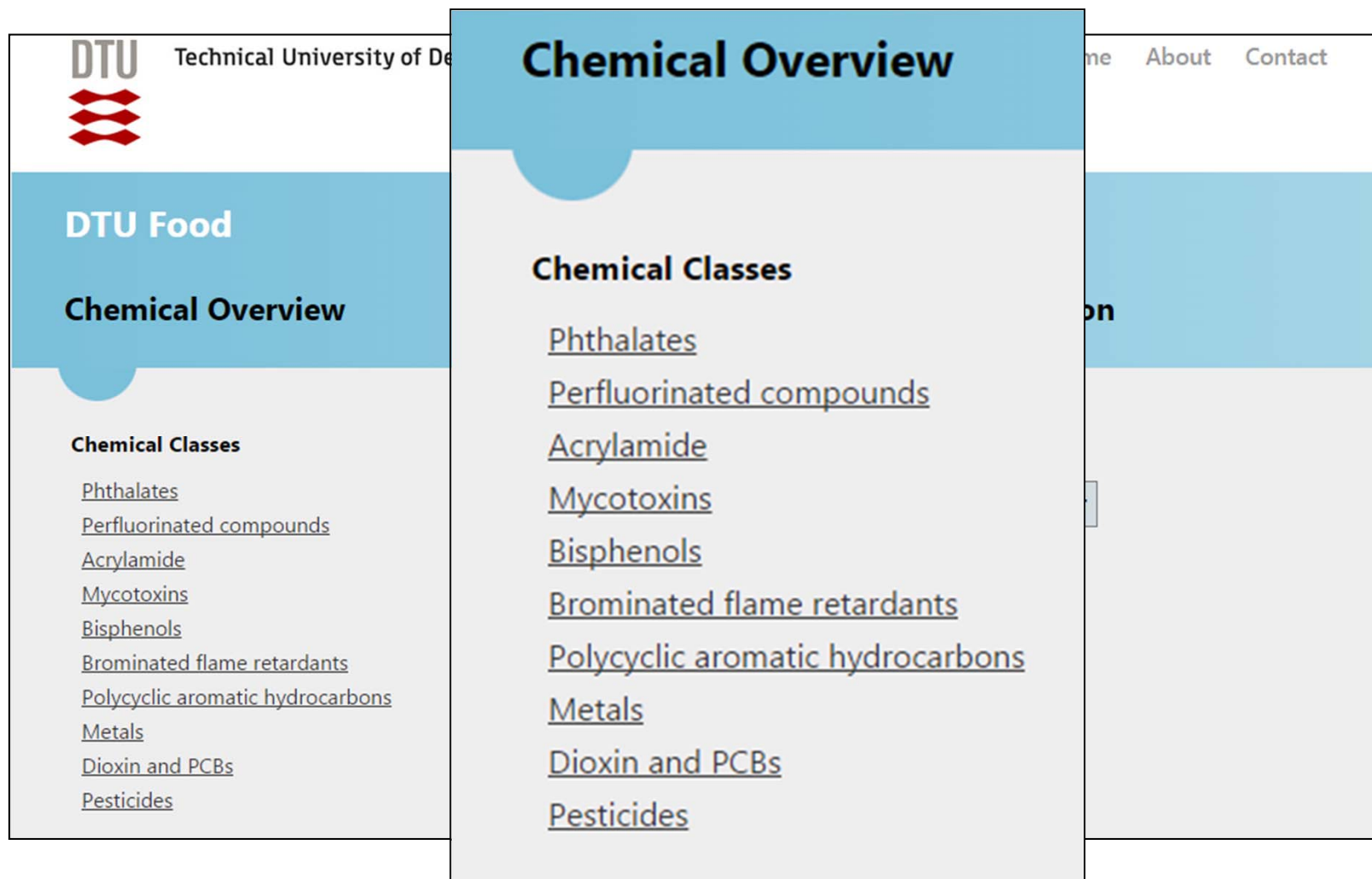
- [Phthalates](#)
- [Perfluorinated compounds](#)
- [Acrylamide](#)
- [Mycotoxins](#)
- [Bisphenols](#)
- [Brominated flame retardants](#)
- [Polycyclic aromatic hydrocarbons](#)
- [Metals](#)
- [Dioxin and PCBs](#)
- [Pesticides](#)

#### Mathematical Models

- [Hazard Index Calculator](#)
- [DA and IA Prediction](#)



# Front page – Chemical Classes



The image shows a screenshot of the DTU Food website's front page. The page features a blue header with the DTU logo and the text 'DTU Food'. Below the header, there is a section titled 'Chemical Overview' which lists various chemical classes. The list includes: Phthalates, Perfluorinated compounds, Acrylamide, Mycotoxins, Bisphenols, Brominated flame retardants, Polycyclic aromatic hydrocarbons, Metals, Dioxin and PCBs, and Pesticides. The page also includes a navigation menu with links for 'Home', 'About', and 'Contact'.

DTU Technical University of Denmark

Home About Contact

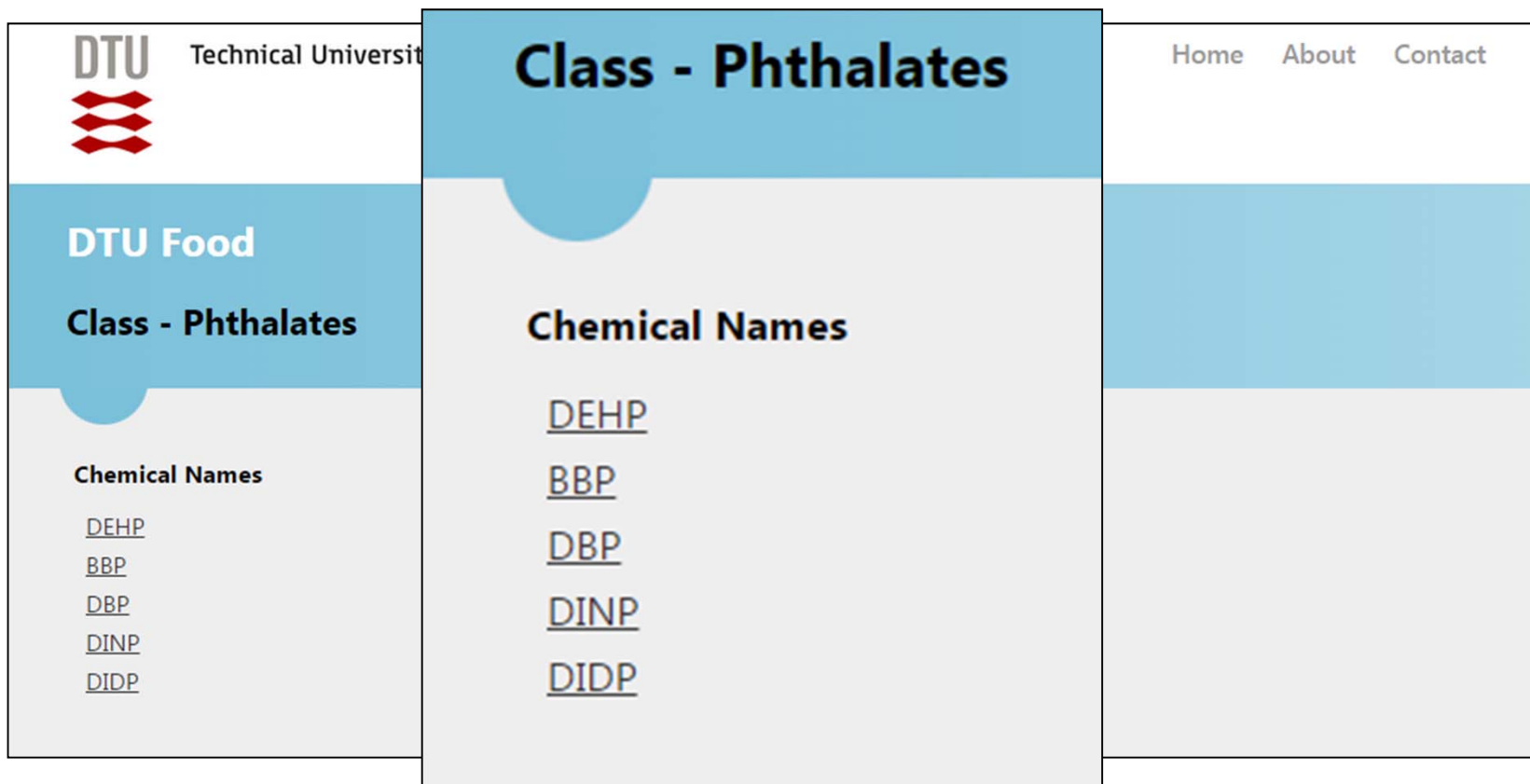
## DTU Food

### Chemical Overview

#### Chemical Classes

- [Phthalates](#)
- [Perfluorinated compounds](#)
- [Acrylamide](#)
- [Mycotoxins](#)
- [Bisphenols](#)
- [Brominated flame retardants](#)
- [Polycyclic aromatic hydrocarbons](#)
- [Metals](#)
- [Dioxin and PCBs](#)
- [Pesticides](#)

## Example of a chemical class – phthalates



The image shows a screenshot of a website page for 'Class - Phthalates'. The page is divided into three main sections: a header, a left sidebar, and a main content area. The header includes the DTU logo and 'Technical University of Denmark' on the left, and navigation links 'Home', 'About', and 'Contact' on the right. The left sidebar contains the 'DTU Food' logo and the page title 'Class - Phthalates', followed by a list of chemical names: DEHP, BBP, DBP, DINP, and DIDP. The main content area features a large blue header with the title 'Class - Phthalates' and a section titled 'Chemical Names' with a list of the same chemical names: DEHP, BBP, DBP, DINP, and DIDP.

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**DTU Food**

**Class - Phthalates**

**Chemical Names**

[DEHP](#)

[BBP](#)

[DBP](#)

[DINP](#)

[DIDP](#)

**Class - Phthalates**

**Chemical Names**

[DEHP](#)

[BBP](#)

[DBP](#)

[DINP](#)

[DIDP](#)

# Example of a phthalate – DEHP

## DEHP

CAS RN: 117-81-7

### Toxicity and Exposure Information

<b>Critical Effect</b>	Testes (rat)	<b>Intake (<math>\mu\text{g}/\text{kg}/\text{day}</math>)</b>	6.9	<b>Hazard quotient</b>	0,138
<b>Point of departure (mg/kg/day)</b>	NOAEL: 5	<b>Consumer Group</b>	Toddlers (2.5-3.5 y). UK 95% perc., LB		
<b>ADI/TDI (mg/kg/day)</b>	TDI: 0.05				

#### Comment

LB: Lower bound; all results <LOD/LOQ=0

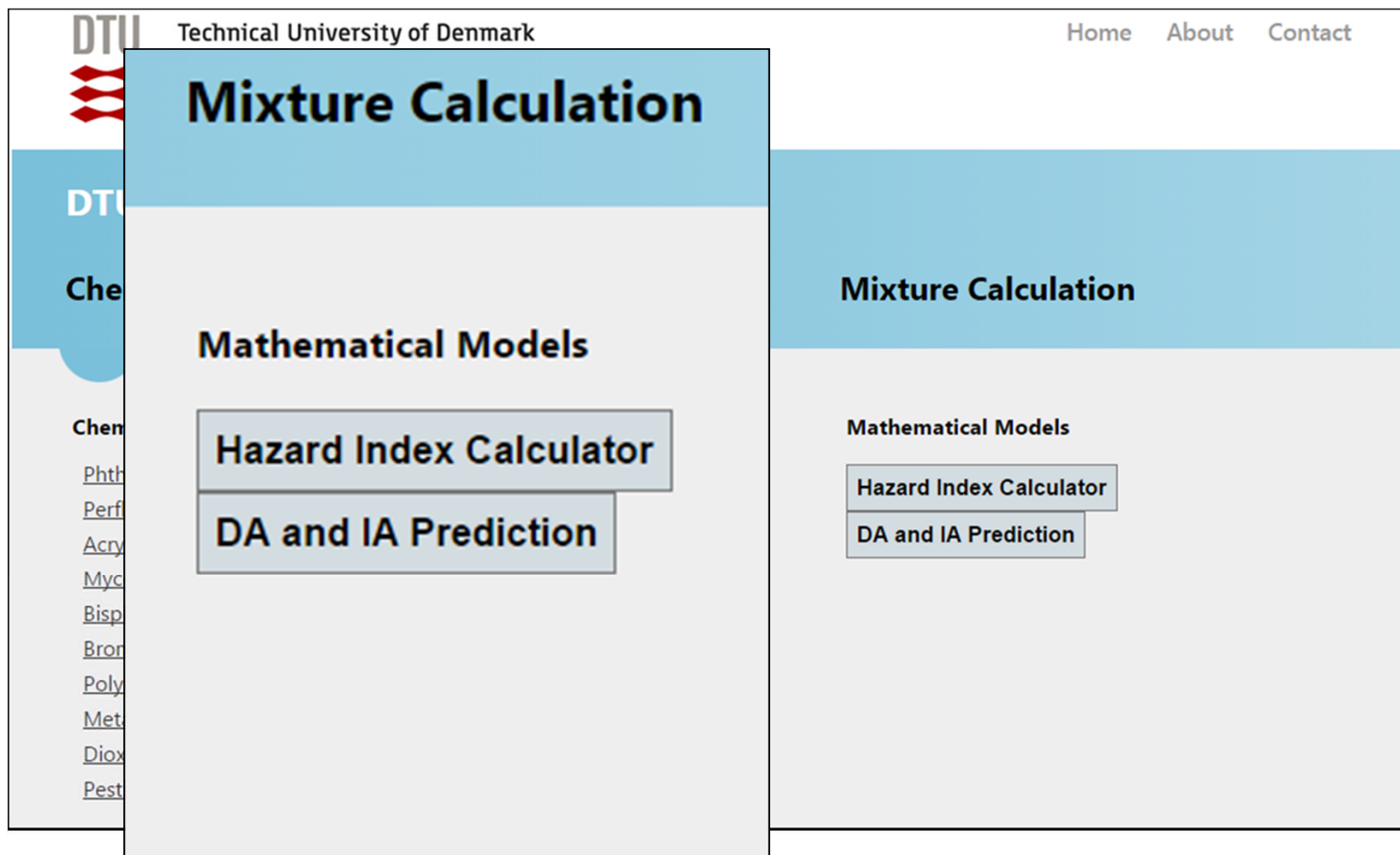
**Tox Link** <http://www.efsa.europa.eu/en/efsajournal/pub/243.htm>

**Description:** - Scientific opinion on DEHP, EFSA 2005

**Intake Link** <http://cot.food.gov.uk/cotstatements/cotstatementsyrs/cotstatements2011/cot201104>

**Description:** - Committee of toxicology 2011

# Back to front page – Mixture Calculation



The image shows a screenshot of the DTU website's 'Mixture Calculation' page. The page layout includes a header with the DTU logo and 'Technical University of Denmark', navigation links for 'Home', 'About', and 'Contact', and a main content area. A zoomed-in view of the content area is overlaid on the left, showing the following structure:

- Mixture Calculation** (Section Header)
- Mathematical Models** (Section Header)
- Hazard Index Calculator** (Tool Link)
- DA and IA Prediction** (Tool Link)

The main page content area on the right mirrors this structure, with the following elements:

- Mixture Calculation** (Section Header)
- Mathematical Models** (Section Header)
- Hazard Index Calculator** (Tool Link)
- DA and IA Prediction** (Tool Link)

On the far left, a vertical sidebar contains a list of chemical categories under the heading 'Chemical Substances':

- Phthalates
- Perfluorinated Compounds
- Acrylates
- Mycotoxins
- Bisphenols
- Brominated Compounds
- Polyaromatic Hydrocarbons
- Metals
- Dioxins and Furans
- Pesticides

# Hazard Index Calculator

## Hazard Index Calculation

**Hazard Index Value:** 0

**Print**

CAS-RN / Chemical Name	Critical Effect	POD	SF	RfD	Exposure	HQ
<input type="text" value="CAS-RN"/> <input type="text" value="Chemical Name"/>	<input type="text" value="Critical Effect"/>	<input type="text" value="Type of Value"/> <input type="text" value="POD Value"/> <input type="text" value="Unit"/>	<input type="text" value="SF"/>	<input type="text" value="POD / SF"/> <input type="text" value="Unit"/>	<input type="text" value="Type of Value"/> <input type="text" value="EXP Value"/> <input type="text" value="Unit"/>	<input type="text" value="HQ"/>
<input type="text" value="CAS-RN"/> <input type="text" value="Chemical Name"/>	<input type="text" value="Critical Effect"/>	<input type="text" value="Type of Value"/> <input type="text" value="POD Value"/> <input type="text" value="Unit"/>	<input type="text" value="SF"/>	<input type="text" value="POD / SF"/> <input type="text" value="Unit"/>	<input type="text" value="Type of Value"/> <input type="text" value="EXP Value"/> <input type="text" value="Unit"/>	<input type="text" value="HQ"/>
<input type="text" value="CAS-RN"/> <input type="text" value="Chemical Name"/>	<input type="text" value="Critical Effect"/>	<input type="text" value="Type of Value"/> <input type="text" value="POD Value"/> <input type="text" value="Unit"/>	<input type="text" value="SF"/>	<input type="text" value="POD / SF"/> <input type="text" value="Unit"/>	<input type="text" value="Type of Value"/> <input type="text" value="EXP Value"/> <input type="text" value="Unit"/>	<input type="text" value="HQ"/>

# Example with toddlers and phthalates

## Hazard Index Calculation

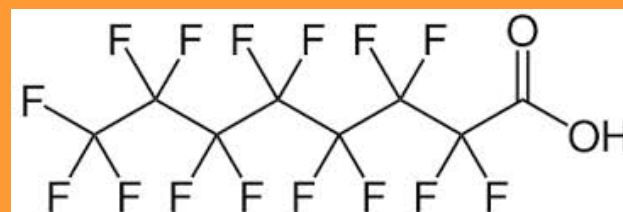
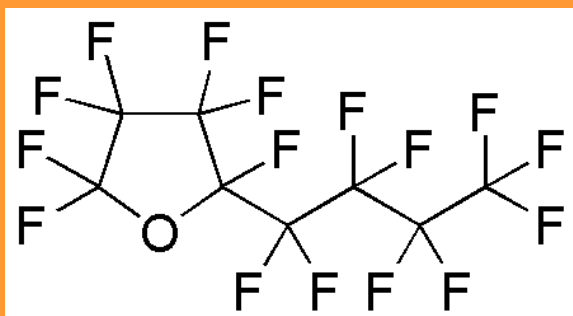
Hazard Index Value: **0.17800000000000002**

[Print](#)

CAS-RN / Chemical Name	Critical Effect	POD	SF	RfD	Exposure	HQ
117-81-7 DEHP	Testes (rat)	NOAEL 5 mg/kg/day	100	0.05 mg/kg/day	Intake 0.0069 mg/kg/day	0.138
84-74-2 DBP	Testes (rat)	LOAEL 2 mg/kg/day	200	0.01 mg/kg/day	Intake 0.0004 mg/kg/day	0.04
CAS-RN Chemical Name	Critical Effect	Type of Value POD Value Unit	SF	POD / SF Unit	Type of Value EXP Value Unit	HQ

## Limitations in hazard index calculation

- The calculations are based on available data and regulations
- For some groups of chemicals (e.g. perfluorinated chemicals) this means that the risk may be underestimated due to lack of data



# Expanding and updating the 'Cocktail Effect Calculator'

➤ Other exposure sources



➤ New exposure/tox data





# Acknowledgements

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**Thank you for listening**

