

# The new QSAR models



**CONCERTREACH**  
CONCERTING EXPERIMENTAL DATA  
AND IN SILICO MODELS FOR REACH



LIFE17 GIE/IT/000461



# CONCERT REACH

- **New QSAR models** developed within two different project actions
- Models have been implemented in the **VEGA** software and they are **freely available**
- A total of **42** models have been implemented

# VEGA

- Stand-alone application with a great number of **QSAR models** that predict properties and biological activities of compounds from their chemical structure
- Output as **complete reports** (PDF) and text based summaries
- **Freely** available, from the website:  
<https://www.vegahub.eu/>
- Runs on local machine (no data sharing with external servers)
- Latest version: **112 models available**

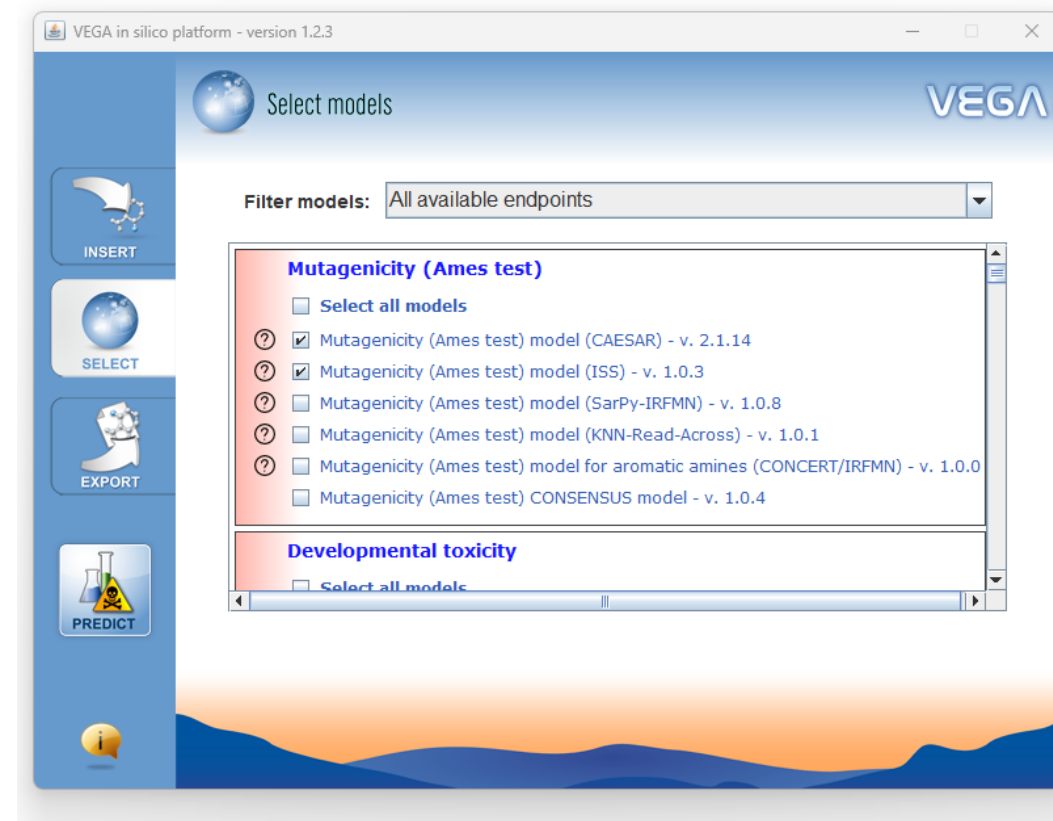


# The models

Models grouped in categories:

- **Human toxicity**
- **Ecotoxicity**
- **Fate & Distribution**
- **Physical-chemical properties**
- **Human & ecological PBPK**


For several endpoints, multiple models are available (developed with different approaches)



# The models

The **QMRF** (QSAR Model Reporting Format) document is available for each model, containing details about it – relevant for models acceptance and use for regulatory purposes – like:

- Definition of the algorithms
- Source of the data used
- Definition of the Applicability Domain
- Scientific references

|   |  |
|---|--|
|  | <i>QMRF identifier (JRC Inventory): To be entered by JRC</i> |
|   | <i>QMRF Title: Mutagenicity ISS Model - v. 1.0.2</i>         |
|   | <i>Printing Date: 30-05-2018</i>                             |
|   |  |

## 1. QSAR identifier

### 1.1. QSAR identifier (title):

Mutagenicity ISS Model (version 1.0.2)

### 1.2. Other related models:

This is the description of the VEGA model that implements the “In vitro mutagenicity (Ames test) alerts by ISS” as present in the software ToxTree v. 2.6

### 1.3. Software coding the model:

VEGA (<https://www.vegahub.eu/>)

The VEGA software provides QSAR models to predict tox, ecotox, environ, phys-chem and toxicokinetic properties of chemical substances.

[emilio.benfenati@marionegri.it](mailto:emilio.benfenati@marionegri.it)

## 2. General information

### 2.1. Date of QMRF:

30-05-2018

### 2.2. QMRF author(s) and contact details:

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## The output

- The complete PDF report contains several relevant information to understand and assess the provided prediction, to be used also as supporting material for regulatory use of the predictions.
- QSAR predictions should not be used with a “**black box**” approach, they should be analyzed and understood – also to be able to compare and use multiple models for the same property, for instance using mechanistic (rules/fragments) and statistical based models.

## The output

The reports make available information to interpret results, such as:

- **Applicability Domain** final assessment, coming from different sub-indices, so to understand possible causes for a low reliable prediction
- **Similar molecules** to the target compounds, available in the model's dataset with experimental value available (also for read-across approaches)
- **Explanation of rules/fragments** found in the target molecule



## New models – action B.1

- **30 new models** have been implemented (action B.1)
- These models were previously developed, but not available within VEGA

## New models – action B.1

| Group          | Endpoint                            | Model  |
|----------------|-------------------------------------|--|
| Human Toxicity | <b>Acute Toxicity</b>               | Acute Toxicity (LD50) model (KNN)                                  |
| Human Toxicity | <b>Androgen receptor effect</b>     | Androgen Receptor-mediated effect (IRFMN/COMPARA)                  |
| Human Toxicity | <b>Carcinogenicity</b>              | Carcinogenicity in male rat (CORAL)                                |
| Human Toxicity | <b>Carcinogenicity</b>              | Carcinogenicity in female rat (CORAL)                              |
| Human Toxicity | <b>Carcinogenicity</b>              | Carcinogenicity oral classification model (IRFMN)                  |
| Human Toxicity | <b>Carcinogenicity</b>              | Carcinogenicity oral Slope Factor model (IRFMN)                    |
| Human Toxicity | <b>Carcinogenicity</b>              | Carcinogenicity inhalation classification model (IRFMN)            |
| Human Toxicity | <b>Carcinogenicity</b>              | Carcinogenicity inhalation Slope Factor model (IRFMN)              |
| Human Toxicity | <b>Chromosomal aberration</b>       | Chromosomal aberration model (CORAL)                               |
| Human Toxicity | <b>Endocrine Disruptor activity</b> | Endocrine Disruptor activity screening (IRFMN)                     |
| Human Toxicity | <b>LOAEL</b>                        | LOAEL (CONCERT/Coral)  |
| Human Toxicity | <b>LOAEL</b>                        | Liver LOAEL (CORAL)  |
| Human Toxicity | <b>Micronucleus assay</b>           | In vitro Micronucleus activity (IRFMN/VERMEER)                     |
| Human Toxicity | <b>Micronucleus assay</b>           | In vivo Micronucleus activity (IRFMN)                              |
| Human Toxicity | <b>Mutagenicity (ames test)</b>     | Mutagenicity (Ames test) model for aromatic amines (CONCERT/IRFMN) |

## New models – action B.1

| Group               | Endpoint                        | Model   |
|---------------------|---------------------------------|---|
| Human Toxicity      | <b>NOAEL</b>                    | NOAEL (CONCERT/Coral)                               |
| Human Toxicity      | <b>NOAEL</b>                    | NOAEL (IRFMN/CORAL)                                 |
| Human Toxicity      | <b>NOAEL</b>                    | Liver NOAEL (CORAL)                                 |
| Human Toxicity      | <b>Skin sensitization</b>       | Skin Sensitization model (IRFMN/JRC)                |
| Human Toxicity      | <b>Skin sensitization</b>       | Skin Sensitization model (NCSTOX)                   |
| Human Toxicity      | <b>Skin sensitization</b>       | Skin Sensitization classification (TOXTREE)         |
| EcoToxicity         | <b>Aquatic acute toxicity</b>   | Daphnia Magna Acute (EC50) Toxicity model (IRFMN)   |
| EcoToxicity         | <b>Aquatic acute toxicity</b>   | Algae Acute (EC50) Toxicity model (IRFMN)           |
| EcoToxicity         | <b>Aquatic acute toxicity</b>   | Fish Acute (LC50) Toxicity model (IRFMN)            |
| EcoToxicity         | <b>Aquatic chronic toxicity</b> | Daphnia Magna Chronic (NOEC) Toxicity model (IRFMN) |
| EcoToxicity         | <b>Aquatic chronic toxicity</b> | Algae Chronic (NOEC) Toxicity model (IRFMN)         |
| EcoToxicity         | <b>BCF</b>                      | BCF model (Arnot-Gobas)                             |
| Fate & distribution | <b>Persistence (sediment)</b>   | Persistence (sediment) quantitative model (IRFMN)   |
| Human PBPK          | <b>Aromatase activity</b>       | Aromatase activity model (TOX21)                    |
| Human PBPK          | <b>Aromatase activity</b>       | Aromatase activity model (IRFMN)                    |

## New models – action B.2

- **12 new models** have been developed and implemented (action B.2)
- Taking advantage of the new tools and of the new data available, we developed a series of new models, for endpoints of specific interest for the REACH.
- The 12 models with best performances have been implemented in VEGA.
- Evaluation of models made also using ECHA data
- Multiple models for the same endpoint developed, adopting different approaches (statistical / fragment-based)

## New models – action B.2

| Group                | Endpoint                          | Model                                 |
|----------------------|-----------------------------------|---------------------------------------|
| Human Toxicity       | <b>Skin sensitization</b>         | Skin Sensitization (CONCERT/Kode)     |
| Human Toxicity       | <b>Skin sensitization</b>         | Skin Sensitization (CONCERT/SarPy)    |
| Human Toxicity       | <b>Skin irritation</b>            | Skin Irritation (CONCERT/Kode)        |
| Human Toxicity       | <b>Skin irritation</b>            | Skin Irritation (CONCERT/Coral)       |
| Human Toxicity       | <b>Skin irritation</b>            | Skin Irritation model (CONCERT/SarPy) |
| Human Toxicity       | <b>Eye irritation</b>             | Eye Irritation (CONCERT/Kode)         |
| Human Toxicity       | <b>Eye irritation</b>             | Eye Irritation (CONCERT/KNN)          |
| Human Toxicity       | <b>Eye irritation</b>             | Eye Irritation (CONCERT/SarPy)        |
| EcoToxicity          | <b>Terrestrial acute toxicity</b> | Earthworm Toxicity (CONCERT)          |
| Phys-Chem properties | <b>Melting point</b>              | Melting Point (CONCERT/Kode)          |
| Phys-Chem properties | <b>Melting point</b>              | Melting Point (CONCERT/KNN)           |
| Phys-Chem properties | <b>Vapour pressure</b>            | Vapour Pressure (CONCERT/Kode)        |

## VegaHub website

All models available in the latest version (1.2.3) of VEGA:

<https://www.vegahub.eu/download/vega-qsar-download/>



← → ↻ [vegahub.eu/download/vega-qsar-download/](https://www.vegahub.eu/download/vega-qsar-download/) 🔍 📄 ⚙️ ☰ 👤

# VEGA HUB

## VEGA QSAR Download

**Experience**  
The CLIENT Application  
and its features

All the VEGA models are also available in a unique stand-alone application.

With the VEGA application you can easily execute all the models on your local machine without sending any information to our server. VEGA is the ideal application for batch processing large dataset. VEGA can be installed and used on any operative system supporting JAVA technology (for any doubt please visit JAVA website).

- Introduction
- Screenshots
- Interpretation
- How to quote VEGA QSAR
- VEGA QSAR for KNIME
- Download**

THANK YOU

