



Project no: **022936**  
Project acronym: **Beneris**  
Project title: **Benefit-risk assessment for food:  
an iterative value-of-information approach**

Instrument: STP – Specific Targeted Project

***Publishable final activity report***

**Final report (D48b revised)**

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Duration: **3,5 years**

Organisation name of the lead contractor for this deliverable:  
**National Institute for Health and Welfare – THL (Jouni Tuomisto)**

Project acronym: Beneris

Project full title: Benefit-risk assessment for food: an iterative value-of-information approach

Contract no: 022936

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Project duration: 1 April 2006 - 30 September 2009

Reporting period: **1 April 2006 - 30 September 2009**

Project websites: <http://en.opasnet.org/w/Beneris> (in Finnish: <http://fi.opasnet.org> )

## 1. Project execution

### Summary of the project objectives

The general objective of this project is to **create a framework for handling complicated benefit-risk situations**, and apply it for analysis of the benefits and risks of certain foods. The first food commodity to be used in the development of the methodology is fish. Some of the detailed objectives are listed below.

#### 1.1 Objectives in developing benefit-risk analysis methods

- To develop Bayesian belief networks (BBN) to handle complicated benefit-risk situations, and to develop a decision support system (DSS) based on BBN.
- To develop improved methods for dose-response assessment, combining epidemiological and toxicological data, and apply them in combining epidemiological and toxicological information on fish contaminants (esp. dioxins and PCBs).
- To develop an integrated repository of surveillance, nutrient and food consumption data that is capable of receiving, analyzing, and disseminating the accumulated data for benefit-risk analysis and to key stakeholders.

#### 1.2 Scientific objectives in food risks and benefits

- To estimate average nutrient intakes and food consumption in various subgroups based on national registries in three countries and to explore the use of the data in benefit-risk analysis.
- To estimate the health benefits of fish, and understand the effect of fish on different population subgroups (age, health, pregnancy etc.)
- To establish the association between external dose (intake) and internal dose (concentrations in the body) by analysing contaminants (PCDD/Fs, PCBs, PBDEs, organotin compounds, PCNs and Hg/methyl-Hg) from 100-200 placentas.
- To find out the effects of certain policy options on dietary habits and on intake of important nutrients and contaminants (e.g. vitamin D, n-3 fatty acids, dioxins, PCBs).

As an example, does a restrictive recommendation on fish eating increase meat consumption?

### 1.3 Objectives in dissemination

- To integrate results into updated benefit-risk assessments, and evaluate the remaining uncertainties and their importance for decision-making.
- To develop an internet interface for publishing risk assessment results.
- To develop a method to publish entire benefit-risk models over the Internet using XML.
- To disseminate the results and to evaluate the relevance and usefulness of the work done in the project from the perspective of an end-user / authority.

### Contractors involved

Role	No.	Name	Short name	Country
Coordinator	1	National Institute for Health and Welfare (formerly: National Public Health Institute)	THL (formerly: KTL)	FI
Contractor	2	Delft University of Technology	TU Delft	NL
Contractor	3	Oy Foodfiles Ltd	FFiles	FI
Contractor	4	Food Safety Authority of Ireland	FSAI	IE
Contractor	5	National Food Institute / Technical University of Denmark	DTU	DK
Contractor	6	Food Safety Authority of Denmark	FVST	DK
Contractor	7	Lendac Data Systems Ltd	Lendac	IE
Contractor	8	Fundación Privada para la Investigación Nutricional	FIN	ES

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Public website for the project: <http://en.opasnet.org/w/Beneris>

## Work performed

### Methodologies and approaches used

The new approach for benefit-risk assessments for food, developed in Beneris, is based on three principles: openness during all phases of the assessment work; strict application of scientific criticism in all parts of the assessment; and an information structure enabling reusability of information directly in other assessments. These principles affect the work performed, the structure and content of the assessment report produced, and the mere philosophy of doing assessments. This has resulted in a benefit-risk assessment method that is now called *open assessment*.

Together, Beneris and Intarese (see a description about the collaboration below) have identified several new areas that should be developed on top of the traditional risk assessment, to make it better tackle with the new challenges of benefit-risk assessment of food. These areas deal with fundamental properties of benefit-risk assessment, and its basic content. The areas are 1) purpose and performance of a benefit-risk assessment; 2) causality in structuring an assessment; 3) collective structured learning; 4) value judgements within assessments; 5) variable and information structure; 6) collaborative work; and 7) dealing with disputes. All of these challenges have been solved in at least a tentative way such that the solution is both consistent with other parts of the method and possible to implement in practice. Detailed descriptions can be read from Opasnet (<http://en.opasnet.org>) from the following pages: 1) [Performance](#), 2) [Causality](#), 3) [Trialogue](#), 4) [Value judgement](#), 5) [Variable structure](#), 6) [Mass collaboration](#), and 7) [Discussion](#), respectively.

Beneris has developed and applied Bayesian belief networks (BBNs) in describing the benefits and risks. There are also issues about proper tools of calculating and presenting the results of a BBN. Beneris has also actively worked on developing BBN software that assists decision-making, handles any continuous variables and allows for functional relations between BBN nodes.

The work related to combining existing databases into an integrated repository has led to several important conclusions that have affected the plans of further work. First, it is very difficult and time consuming to integrate food consumption data between the countries. Therefore, the collection of data for benefit-risk analyses should be designed so that there is special emphasis on the applicability and simplicity of the data structure. This applies both to existing databases, and the data produced within Beneris. Second, the new benefit-risk assessment method imposes new requirements for the database to be developed. These considerations were taken into account when the Beneris data repository was designed. This work resulted in Opasnet Base, which is described below.

### Method development in dose-responses

TU Delft performed a work on the missing covariates problem in the Cox regression. Cox proportional hazard model is the most widely used regression model for analyzing censored survival data in epidemiology including data coming from the case-control studies. It allows to identify significant variables affecting disease, death or survival, estimate the regression coefficients

of these variables and also to infer about the relative risk. It is commonly known that the conclusions drawn from the Cox model are wrong if some of the pertinent covariates are omitted. The most commonly reasons for neglecting covariates are: 1) simplification of the problem studied, 2) lack of awareness of the importance of covariates, and 3) inability to measure covariates.

The properties of the bias in coefficient estimates resulting from omitting covariates in the Cox model have been studied since early 1980s. However, all formulas for the bias derived until now are of little use in practice since they depend on the coefficients of the omitted covariates which are usually unknown. With regard to this problem TU Delft developed a new method for estimating the Cox model that leads to an explicit expression for the bias which depends only on the observed quantities and does not depend on the coefficients of excluded covariates under prevailing assumptions.

### **Food intake studies**

FIN has contributed to consumption data on food groups, nutrients, and specific data on vegetables in Spain. This was done with the objective of conducting a descriptive analysis of consumption patterns in children. Data analysed were drawn from the EnKid Study that was conducted in a representative sample of Spanish children and youth.

Low and high scores of food consumption patterns in Finland were studied and the nutrients that are crucial in benefit/risk-analysis of fish were found out (Findiet 2002 –study) (D27). The critical dietary patterns i.e. associations of foods, nutrients and contaminants crucial for benefit/risk assessment of fish were studied and reported (Findiet 2002 –study) (D32).

### **Measuring pollutant concentrations in placenta**

An extensive study was performed by THL and DTU on concentrations of several groups of persistent organic pollutants (PCDD/F, PCB, PBDE, PBB, PCN, p,p'-DDE, OT) and metals Hg, Se, As, Cd, Pb, and methylHg in 130 placenta samples from Finland (D19 Contaminants in placenta). The study produced important information on the exposure of the fetus to these pollutants.

Measurements were produced for both fresh-weight-based and lipid-based concentrations. Based on the measurements, the associations between calculated/estimated intake and internal dose measured as placental concentrations were estimated.

### **Contaminant intakes in different countries**

FIN produced an analysis of the intake of fish contaminants in the adult (aged 25-74 years n=1530, 706 men and 824 women from the ENCAT study) and children and young (aged 4-24 years n=3337, 1527 men and 1810 women from the EnKid Study) populations in Spain. Contaminant data was obtained from a large variety of informations from different toxicological studies conducted in different Spanish regions.

Contaminant intakes among Finnish adults aged 25-64 years by sex and age groups were studied and reported by THL (D29 and D30). THL also produced a study of fetus contaminants from mother's diets (D36).

FSAI contributed updated data on mercury levels and fatty acid profiles in Irish fish species

### **Fish benefit-risk case study**

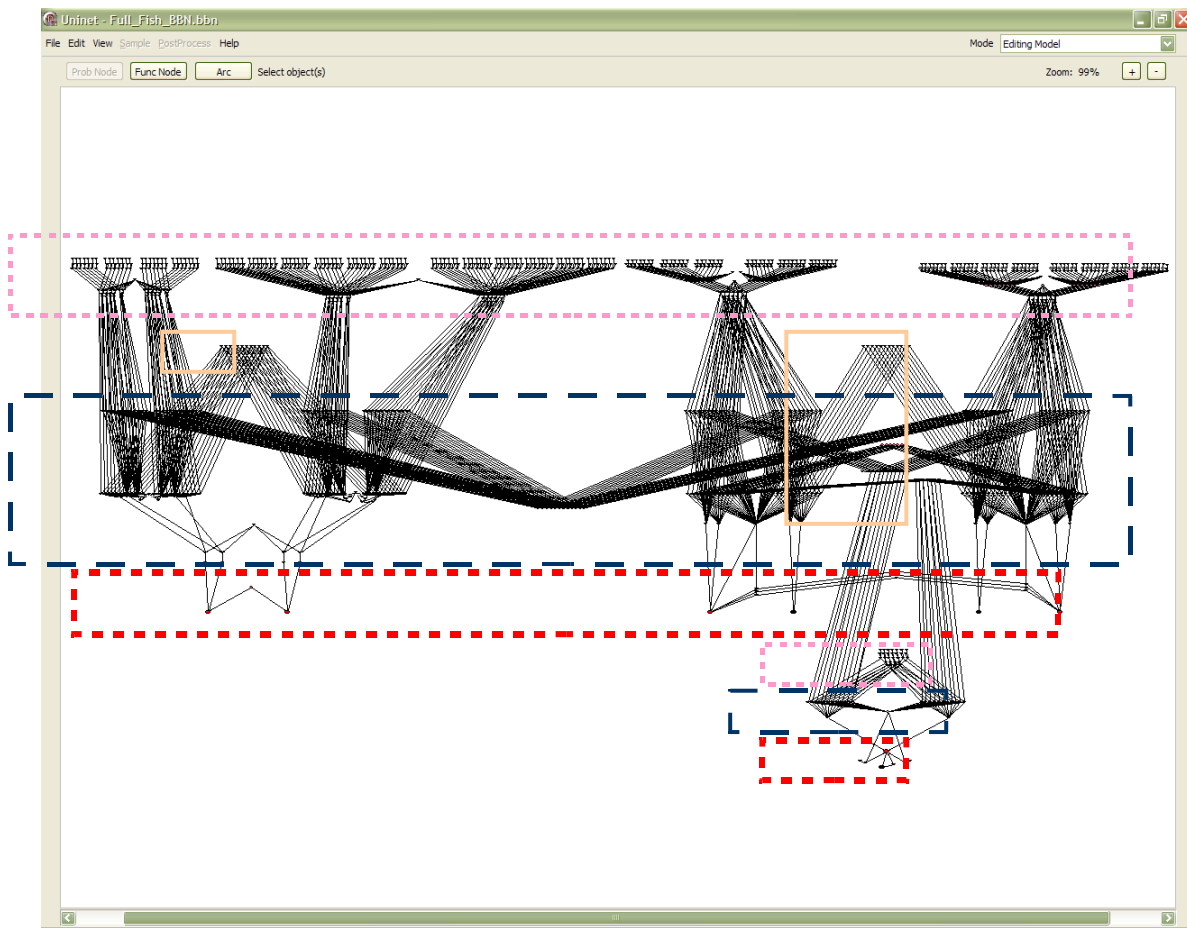
The fish case study was clearly the major effort in applying the developed open assessment and Bayes belief network (BBN) methods in practice. TU Delft built and quantified a BBN model for the benefit-risk analysis of fish. The details of this model are described below. The results were scrutinized at the THL. The full model contains all sub-models for dealing with various health endpoints (cardiovascular, cancer, teeth development, central nervous system). THL analysed

variables of interests by conditioning their values (i.e. studying the potential policy options using what-if analyses), and these results are presented in deliverable D38 (Full benefit-risk analysis of fish). To facilitate the communication among project participants regarding the contents of the model and the results TU Delft described all model variables in the Opasnet website [http://en.opasnet.org/w/Benefit-risk\\_assessment\\_of\\_fish\\_consumption\\_for\\_Beneris](http://en.opasnet.org/w/Benefit-risk_assessment_of_fish_consumption_for_Beneris).

The final scope of the fish case study is summarized below:

1. The assessment focuses on the Finnish population.
2. There are five specific population subgroups of interest in this study: infants (0-2 years old), children and adolescents (2-18 years), adults (18-55 years), elderly (55+) and pregnant women (exposure to pregnant women is used as a proxy for foetal exposure).
3. Nutrients and environmental pollutants selected for the assessment include dioxins (PCDD/Fs), polychlorinated biphenyls (PCBs), mercury as methyl mercury (MeHg) and omega-3 fatty acids (EPA and DHA).
4. Health effects of fish encompass neurological effects during early development, developmental dental defects, cardiovascular disease and cancer.
5. Fish species covered in the study are domestic species only caught in Finland's inland waters and the Baltic sea. These species are: Baltic herring (sea), vendace (sea/inland), whitefish (sea/inland), pike (sea/inland), perch (sea/inland), Atlantic salmon (sea), pike-perch (sea/inland).

The full BBN describes a) the effect of prenatal exposure to methyl mercury and omega-3 fatty acids (DHA only) on the development of intelligence quotient (IQ) in children, b) the impact of dioxins and PCBs on developmental dental defects in children, and c) coronary heart disease mortality and cancer risk in adults exposed to all four fish compounds selected. In this way every benefit-risk situation, focusing either on adults or children, could be analyzed at a very detailed level. The complete BBN for the fish case study developed in BENERIS is presented in Figure 1. It consists of 524 probabilistic nodes, 637 functional nodes and 1812 arcs.



**Figure 1:** The BBN for the case study on fish in BENERIS; the pink dotted squares cover fish consumption variables and demographic variables; the peach solid lined squares include variables representing concentrations of fish compounds; the blue dashed squares surround exposure variables and also personal/demographic variables; the red dotted squares contain exposure-response functions, baseline responses and health impacts.

One submodel of the full case study, namely methylmercury and omega-3 fatty acids in children, was analysed and published separately in Opasnet: <http://en.opasnet.org/w/MeHg-Omega3>. In addition, consumer reactions were collected based on this sub-assessment (D43).

A value-of-information (VOI) analysis was performed as a part of the fish case study (D42 Value-of-information analysis for fish). The screening analysis identified a small number of variables that seem to require further scrutiny, if the decision is to be improved with better knowledge. THL developed a new screening VOI method that can be applied directly on BBNs.

Foodfiles reviewed the existing data from clinical trials and epidemiological studies on the various health effects of fish in children and wrote a review on the health effects of fish among children in developed countries for the further development of the benefit-risk analysis.

### Vegetable case study

FIN, THL, and FSAI conducted a benefit-risk analysis of Spanish, Irish, and Finnish data (with some variation between countries) in children aged 3 to 6 regarding vegetable consumption and the possible need to fortify non-vegetable foods so as to avoid inadequate intakes of folate, vitamin A and vitamin C (D40 Full benefit-risk analysis: vegetables). Given that the available data on vegetable intake in this age group shows that the intake is quite low, and that the percentage of intakes of these nutrients below the Estimated Average Requirements (EAR) in the lowest consumers is high, further analysis on fortification was conducted.

The food fortification analysis was conducted in the three non-vegetable food groups that were specified for the “vegetable case”, which include:

I) Fruit juices, margarines, milks and yoghurt

II) All foods in option "I" and breads

III) All foods in option "II" and curl milks, milk puddings, breakfast cereals, jams, sweets, chocolates, soft drinks, biscuits, snacks, dressings, ice creams, cheeses and mineral waters.

The same procedure was conducted for each vitamin and for each food group as follows: With folate and vitamin A, we carried out fortification by adding step by step 1 µg nutrient per 100 kcal. With vitamin C, 1 mg was added per 100 kcal. Then we estimated the intake distribution for all age groups from 3 to 6 years, adjusting for intraindividual variability.

## **Opasnet and Opasnet Base**

The main products of Beneris are the improved methodology (open assessment) for benefit-risk assessments, the web workspace Opasnet for performing them in a collaborative way, and the Opasnet Base database containing ready-to-use information needed in assessments. Interested assessors have been identified and contacted for working with their own assessments using the website. These practical real-life examples will be a major method for disseminating the results of Beneris.

The new benefit-risk assessment method (open assessment) is described on the web workspace Opasnet (<http://en.opasnet.org>). This work is also continuing after Beneris. The Beneris fish case study is described in Opasnet in two parts: a separate sub-assessment was performed about methylmercury and omega-3 fatty acids in children ([http://en.opasnet.org/w/Benefit-risk\\_assessment\\_of\\_methyl\\_mercury\\_and\\_omega-3\\_fatty\\_acids\\_in\\_fish](http://en.opasnet.org/w/Benefit-risk_assessment_of_methyl_mercury_and_omega-3_fatty_acids_in_fish)), and the full assessment ([http://en.opasnet.org/w/Benefit-risk\\_assessment\\_of\\_fish\\_consumption\\_for\\_Beneris](http://en.opasnet.org/w/Benefit-risk_assessment_of_fish_consumption_for_Beneris)) contains also other pollutants and endpoints. However, some details of the full assessment are being published in scientific journals, and they will only appear on Opasnet after publishing.

Several assessment case studies are under way outside Beneris. The website is designed for assessments that are performed openly, allowing also for stakeholder participation. A database called Opasnet Base ([http://en.opasnet.org/w/Opasnet\\_Base](http://en.opasnet.org/w/Opasnet_Base)) was used to upload model results and nutrition studies performed in Beneris. The work has produced practical experience on this kind of collaborative work, and this experience has been used to develop the benefit-risk assessment methods further.

Opasnet

Jouni my talk my preferences my watchlist my contributions log out

Page | Discussion | Edit | History | Delete | Move | Protect | Watch

## Benefit-risk assessment of methyl mercury and omega-3 fatty acids in fish

**Navigation**

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**Metadata for this assessment** (please use these attributes in Analytica and Opasnet base)

Identifier	Op_en2187
Moderator:Olli (see all)	

**Main message:**

**Question:**  
What are the effects of methyl mercury and omega-3 fatty acids on development of intelligence quotient (IQ) in children? The source of exposure is Finnish fish consumption.

**Answer:**

- The consumption of oily fish can be increased without a fear of detrimental effects of methyl mercury in the children. In contrast, the consumption of predator fish, especially pike, should be avoided during pregnancy.
- The case seems to be fairly well established, as the total value of additional information is fairly low.

The Analytica model file contains the actual calculations for this assessment.

An example of a benefit-risk analysis performed in the project website with the Internet tools: Benefit-risk assessment of methyl mercury and omega-3 fatty acids in fish. This sub-assessment graph is shown as an example only, because the full fish case graph has more than a thousand nodes and would not fit on the page.

**Opasnet** is a website to collect, organise, and distribute information on issues relevant for benefit-risk analyses (BRA) of food (<http://en.opasnet.org>). It also contains material about many other topics than food, e.g. climate change policies and health, health risks of air pollution, and emissions of metal industry. The content is open and freely available to all.

The website has been intensively utilised. Several assessments are being worked on at the website. Interested parties are welcome to contribute to the case studies with their own information, as long as it is offered under a proper copyright. Opasnet uses *attribute – share alike* copyright of Creative Commons. It means that information in Opasnet can be freely used for any purpose on two conditions. First, the original source must be acknowledged. Second, the derivative works must also have similar open copyright, i.e. they must also be freely usable.

Opasnet also has a feedback and discussion functionality to facilitate contribution. Although most people who are contributing to the website are probably researchers, it is also important to have functionalities for asking questions, make value judgements about the topics covered, and give feedback about the content. An example of feedback collection is [http://en.opasnet.org/w/End\\_user\\_evaluation](http://en.opasnet.org/w/End_user_evaluation).

**Opasnet Base** is a database to collect, organise, and distribute quantitative model results and input data ([http://en.opasnet.org/w/Opasnet\\_Base](http://en.opasnet.org/w/Opasnet_Base)). Its current size is 66 data tables, and 2 million rows.

The content is open and freely available to all. The website was recently opened after structural improvements. Data from several assessments are being uploaded to the database.

The screenshot shows the Opasnet website interface. At the top left is the Opasnet logo. The main content area is titled 'Opasnet Base' and 'Special page'. On the left side, there is a navigation menu with sections for 'Navigation', 'Tools', 'Create a book', 'Search', and 'Toolbox'. The main content area is divided into sections: 'Variable information', 'Definitions', 'Available dimensions', 'Samples', and 'Results'. The 'Variable information' section contains a table with the following data:

Name	Omega-3 intake due to salmon in the population of the Western Europe
Samples	1000
Mean	0.276667
Unit	g/d
Wikilink	Opasnet

The 'Available dimensions' section contains links: 'Pollutant concentration limits for fish feed | Recommendation for consumption of farmed salmon | Salmon type | Year3'. The 'Samples' section has a text input field with the value '10'. The 'Results' section shows 'The result contains 60 rows' and buttons for 'Refresh results', 'Download CSV', and 'Sort'. Below this is a table with the following data:

#	Obs	Pollutant concentration limits for fish feed	Recommendation for consumption of farmed salmon	Salmon type	Year3	Result
849373	1	BAU	Restrict farmed salmon use	Farmed salmon	2000	0.271291
849374	2	BAU	Restrict farmed salmon use	Farmed salmon	2000	0.193452
849375	3	BAU	Restrict farmed salmon use	Farmed salmon	2000	0.124627
849376	4	BAU	Restrict farmed salmon use	Farmed salmon	2000	0.248322
849377	5	BAU	Restrict farmed salmon use	Farmed salmon	2000	0.13495
849378	6	BAU	Restrict farmed salmon use	Farmed salmon	2000	0.210519
849379	7	BAU	Restrict farmed salmon use	Farmed salmon	2000	0.109302

Figure. An example variable from Opasnet Base. The basic information about the variable is shown in the box on the top of the page. In the middle section, it is possible to select the details and sample size to be shown. Finally, the bottom part shows the result values and indices.

## Some of the major deliverables from Beneris

**D33 Consumer info about benefits and risks of fish** is a dissemination material about the main results of Beneris. [http://en.opasnet.org/w/file:Beneris\\_dissemination\\_material.pdf](http://en.opasnet.org/w/file:Beneris_dissemination_material.pdf). It was published in November 2009.

**D46 End-user evaluation** of Opasnet, open assessment, and the fish case study was performed in September-November 2009. [http://en.opasnet.org/w/End\\_user\\_evaluation](http://en.opasnet.org/w/End_user_evaluation).

**D38 Final fish benefit-risk assessment** was published in September 2009. [http://en.opasnet.org/w/Benefit-risk\\_assessment\\_of\\_fish\\_consumption\\_for\\_Beneris](http://en.opasnet.org/w/Benefit-risk_assessment_of_fish_consumption_for_Beneris)

## Collaboration with QALIBRA

Beneris has established a collaboration effort through clustering with QALIBRA, and these two consortia have been collaborating from the start of both projects. QALIBRA and Beneris have also collaborated with the BRAFO project, which is developing tiered framework for risk-benefit assessment.

Below we shortly highlight the events and activities resulting from the work related to these cluster activities between Beneris and QALIBRA.

#### Progress during the first year:

- The first Cluster meeting of the Qalibra and the Beneris projects was organized and planned by IFL/Matis in cooperation with KTL/THL, RIVM and CSL/FERA. The meeting was held at RIVM, Netherlands May 23rd-24th 2006 at the same time as both projects conducted their separate kick-off meetings. A report containing the output from the Cluster meeting was submitted to the Commission in July, 2006.
- The cluster website ([www.qalibra-beneris.eu](http://www.qalibra-beneris.eu)) was developed by CSL/FERA (QALIBRA) in collaboration with Beneris in July, 2006.
- The membership of the Scientific Advisory Panel (SAP) for QALIBRA and Beneris was finalized.
- QALIBRA liaised with Beneris about methods for quantifying uncertainty. To progress this, a CSL scientist visited TU Delft to learn about the methods for dealing with uncertainty in expert opinion in Beneris.

#### Progress during the second year:

- The second Cluster meeting (i.e. the midterm meeting) of the sister projects QALIBRA and Beneris was organised and planned in cooperation between Matis, KTL/THL and CSL/FERA. The meeting was held in Helsinki, Finland, 7–9 November 2007. This meeting focused on the review of activities and sharing information between the two projects as well as the consultation of the Scientific Advisory Panel (SAP). A report containing the output from the Cluster meeting was written and submitted to the European Commission by QALIBRA.
- Roger Cooke visited Central Science Laboratory (CSL) on 26, 27 Nov. 2007, where he conferred with researchers in the Qalibra project and gave a presentation. This was followed by a visit of CSL scientist Alistair Murray to Delft (4 Dec. 2007) during which further collaboration was discussed. This collaboration has spun of into further expert elicitation activities with Dr. W. Aspinall.
- A Gordon conference was organised and planned by the KTL/Beneris in co-operation with QALIBRA, ERAC and Sytyke. The conference theme was Environment and health - approaches to benefit-risk analysis and it was held in Valamo in Finland December 3-5, 2007, partners from both Beneris and QALIBRA attended this meeting.
- KTL/THL launched an open website for BRA (<http://heande.pyrkilo.fi>). QALIBRA was granted access to data and discussion pages at the open websites

#### Progress during the third year:

- Beneris developed a joint glossary with Intarese and gave QALIBRA partners access to this glossary (<http://en.opasnet.org/w/Glossary>). The glossary will be maintained by THL also after the end of the Beneris project.
- Beneris developed the first draft of a cluster dissemination plan

#### Progress during the fourth year

- The final Beneris and Qalibra cluster meeting was organised and planned in cooperation between Matis, THL, Altagra and FERA. The meeting was held in Budapest 10-11 June 2009. The objective of the final meeting was dissemination of activities and sharing of information between the two projects as well as the consultation with the Scientific Advisory Panel (SAP).

- At the final Beneris and QALIBRA cluster meeting the draft cluster dissemination plan was discussed and a revised final version accepted.
- The final report on the cluster activities was written and submitted to the European Commission by QALIBRA in September 2009
- In order to promote post-project activities of the two consortia Beneris and QALIBRA aim to publish several scientific articles together in a special issue. The tentative journal for this joint dissemination is Food and Chemical Toxicology.
- Beneris participated in a final end-user workshop held by QALIBRA 9-10th September 2009 in Budapest. This end-user workshop included practical hands-on training with the risk-benefit software produced by QALIBRA, using case studies developed in the project.

### **Collaboration with other projects in Opasnet and open assessment development**

The work with benefit-risk assessment methods took a very challenging task: to develop completely new approach to benefit-risk assessment. This work was done in close collaboration with Intarese and some other projects about environmental health risk assessment.

Intarese has actively participated in discussions about assessment methods and about the structure that should be used in Opasnet. Intarese develops methods for integrated environmental health impact assessment (IEHIA). IEHIA has many similarities but is not the same as open assessment developed in Beneris. IEHIA and open assessment have both learned a lot from each other. Both Intarese and Beneris have put several person-months worth of work on developing e.g. good information structures for assessments. This collaboration and synergism has produced results that are useful for the making of future assessments. The most important outcome is the Opasnet website, which was launched during the Beneris project and is continuing to grow into an open web workspace for policy-relevant scientific collaboration. It is unlikely that Beneris would have been as successful without the close collaboration with Intarese.

Heimtsa has been collecting data for "background incidence database". The Heimtsa database is technically the same as Opasnet Base. However, the data collected by Beneris (nutrient and pollutant intakes) and the data collected by Heimtsa (amounts of different diseases and causes of death in different countries in Europe) are completely different. In addition, Heimtsa participated in the planning of the database structure in 2008 and in the developing of the first version of the user interface.

Hiwate, Plantlibra, Claih, Bioher, and Hitea have not been developing the website but they have been using it to perform their own research. Of course, they have provided useful user feedback about the functionalities of the website and in that way helped in developing it further.

### **Intentions for use and impact**

The methods and tools developed in Beneris were and are being offered to other projects, or real-life benefit-risk assessments. All projects and other users are using Opasnet for free. Some of the projects have taken tasks to develop new functionalities to the website, and thus they put resources in this work. No money is transferred between the projects, however.

Opasnet workspace is available for this purpose. Several projects have already started to use the website for their own work: Intarese, Heimtsa, Hiwate, Plantlibra, and Urgenche (funded or to-be-funded by EU); Claih, Bioher, and Hitea (funded by the Academy of Finland); and Bepraribeian (European project on risks and benefits of food). We hope that it will become a place where several assessors are able to share their information and work collaboratively, thus producing better assessments than alone.

Openness, scientific criticism, and an efficient information structure are the three guiding principles

of open assessment. We believe that the improved methods are able to serve policy-making in a better way than the previous methods. It is easier to produce credible assessments. They are more likely to tackle questions that are of real interest to stakeholders or decision-makers. They are likely to produce decisions that better informed.

Of course, this does not happen by itself. There must be a real need to apply the new methods, and authorities must do their homework in learning to use them. Open assessment has high potential, but it has not yet shown in a real-life decision-making that it is able to outperform traditional assessments. If it succeeds in this critical test, it may lead to a quantum leap in reducing the gap between science and policy.

## 2. Dissemination and use

### (A part of Plan for using and disseminating the knowledge)

The **dissemination plan for benefit-risk assessment of food** aims to spread information about methods and tools for making better assessments about benefits and risks that relate to food consumption. Typically, these assessments are performed by or for food authorities or companies in the food sector. However, some assessments may be directed to general consumers to promote a healthy diet. The dissemination should be targeted to both those who make these assessments, and those who read the assessments.

A special focus in this plan is on web-based tools and methods that are applicable in Europe.

**The key objective of dissemination is to ensure that the methods and tools developed in research projects will become widely known and used, and that they will be further developed by new research after the original projects have ended.**

Beneris, with others, has produced a website for working on and disseminating benefit-risk analyses of food. The website is a collaborative effort between several research projects, especially Beneris, Intarese, Heimtsa, Erac, and Hiwate. New projects that will start using the website include Tapas, Bepraribbean, and Plantlibra. The results of the analyses have potentially high economic interest and hopefully will result also in commercial use. However, the website itself and its contents are open and distributed freely on a non-profit basis. The website is open (<http://en.opasnet.org; previously heande.pyrkilo.fi>), and it already contains several benefit-risk and other analyses on food and other topics.

## Section 3 – Publishable results

### Table 3. Publishable Results.

Result Description	Possible Market Applications	Stage of Development	Collaboration Sought or Offered	Collaborator Details	IPR Granted or Published	Contact Details
<p><b>Open assessment method.</b> A method for performing benefit-risk or other assessments openly on a web workspace. The ultimate purpose of the method is to improve societal decision-making by organising scientific information and societal values into a useful form for real-life decision situations. It is based on the principles of openness and free use of all information; scientific criticism and argumentation; and a systematic information structure.</p> <p><a href="http://en.opasnet.org/w/Open_assessment">http://en.opasnet.org/w/Open_assessment</a></p>	<p>The content is open and freely available to all.</p>	<p>The open assessment method is being increasingly used by several research projects, at least some parts of it. Large-scale applications are still missing.</p>	<p>Interested parties are welcome to contribute.</p>	<p>Researchers, policy-makers, stakeholders, citizens. Basically anyone</p>	<p>Based on Creative Commons Attribute – Share alike copyright license</p> <p><a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: <a href="mailto:jouni.tuomisto@thl.fi">jouni.tuomisto[at]thl.fi</a></p>

Result Description	Possible Market Applications	Stage of Development	Collaboration Sought or Offered	Collaborator Details	IPR Granted or Published	Contact Details
<p><b>Opasnet:</b> A website to collect, organise, and distribute information on issues relevant for benefit-risk analyses of food or other topics. Opasnet acts as a web workspace for self-organised groups that work on specific policy questions.  <a href="http://en.opasnet.org">http://en.opasnet.org</a></p> <p>Current size: 1434 web pages, 503 files, 216 users, 306227 page views.</p>	<p>The content is open and freely available to all. Even without any new funding, the functionalities of <a href="#">Opasnet</a> can be maintained until the end of 2012.</p>	<p>The website has been intensively utilised. Several assessments are being worked on at the website.</p>	<p>Interested parties are welcome to contribute to the case studies with their own information, as long as it is offered under IPR rules.</p>	<p>Anyone</p>	<p>Based on Creative Commons Attribute – Share alike copyright license  <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: <a href="mailto:jouni.tuomisto[at]thl.fi">jouni.tuomisto[at]thl.fi</a></p>
<p><b>Opasnet Base:</b> A database to collect, organise, and distribute quantitative model results and input data  <a href="http://en.opasnet.org/w/Opasnet_Base">http://en.opasnet.org/w/Opasnet_Base</a></p> <p>Current size: 66 data tables, 2 million rows.</p>	<p>The content is open and freely available to all.</p>	<p>The website was opened in 2009. Data from several assessments are being uploaded to the database.</p>	<p>Interested parties are welcome to contribute to the case studies with their own information, as long as it is offered under IPR rules.</p>	<p>Anyone</p>	<p>Based on Creative Commons Attribute – Share alike copyright license  <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: <a href="mailto:jouni.tuomisto[at]thl.fi">jouni.tuomisto[at]thl.fi</a></p>

Result Description	Possible Market Applications	Stage of Development	Collaboration Sought or Offered	Collaborator Details	IPR Granted or Published	Contact Details
<p><b>D33 Consumer info about benefits and risks of fish.</b> The product has a feedback and discussion functionality to facilitate contribution. <a href="http://en.opasnet.org/w/file:Beneris_dissemination_material.pdf">http://en.opasnet.org/w/file:Beneris_dissemination_material.pdf</a></p>	<p>The content is open and freely available to all.</p>	<p>Published in November 2009.</p>			<p>Based on Creative Commons Attribute – Share alike copyright license <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: <a href="mailto:jouni.tuomisto@thl.fi">jouni.tuomisto[at]thl.fi</a></p>
<p><b>D46 End-user evaluation.</b> <a href="http://en.opasnet.org/w/End_user_evaluation">http://en.opasnet.org/w/End_user_evaluation</a></p>	<p>The content is open and freely available to all.</p>	<p>Published in November 2009.</p>			<p>Based on Creative Commons Attribute – Share alike copyright license <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: <a href="mailto:jouni.tuomisto@thl.fi">jouni.tuomisto[at]thl.fi</a></p>
<p><b>D38 Final fish benefit-risk assessment.</b> <a href="http://en.opasnet.org/w/Benefit-risk_assessment_of_fish_consumption_for_Beneris">http://en.opasnet.org/w/Benefit-risk_assessment_of_fish_consumption_for_Beneris</a></p>	<p>The content is open and freely available to all.</p>	<p>Published in November 2009.</p>			<p>Based on Creative Commons Attribute – Share alike copyright license <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: <a href="mailto:jouni.tuomisto@thl.fi">jouni.tuomisto[at]thl.fi</a></p>

<b>Result Description</b>	<b>Possible Market Applications</b>	<b>Stage of Development</b>	<b>Collaboration Sought or Offered</b>	<b>Collaborator Details</b>	<b>IPR Granted or Published</b>	<b>Contact Details</b>
<p><b>Project management functionality</b> in Opasnet: eg. possibility to distribute and manage tasks within Opasnet  <a href="http://en.opasnet.org/w/ToDo">http://en.opasnet.org/w/ToDo</a></p>	<p>The content is open and freely available to all.</p>	<p>Several research projects utilise the functionality.</p>	<p>Projects interested in applying the project management functionality are sought.</p>	<p>Any research project.</p>	<p>Based on Creative Commons Attribute – Share alike copyright license  <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: jouni.tuomisto[at]thl.fi</p>
<p>Opasnet is available for <b>performing original research online</b>  <a href="http://en.opasnet.org/w/Open_assessment_in_research">http://en.opasnet.org/w/Open_assessment_in_research</a></p>	<p>The content is open and freely available to all.</p>	<p>Several research projects utilise the functionality.</p>	<p>Researchers interested in performing original research on a collaborative workspace are sought.</p>	<p>Any researcher or research group.</p>	<p>Based on Creative Commons Attribute – Share alike copyright license  <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: jouni.tuomisto[at]thl.fi</p>
<p><b>Policy evaluation functionality.</b> Opasnet offers a workspace for comparing policy options based on quantitative modelling. See e.g.  <a href="http://en.opasnet.org/w/Using_Opasnet_in_an_assessment_project">http://en.opasnet.org/w/Using_Opasnet_in_an_assessment_project</a></p>	<p>The content is open and freely available to all.</p>	<p>Several research projects utilise the functionality.</p>	<p>Researchers or policy-makers interested in performing policy evaluations on a collaborative workspace are sought.</p>	<p>Any policy issue.</p>	<p>Based on Creative Commons Attribute – Share alike copyright license  <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: jouni.tuomisto[at]thl.fi</p>

Result Description	Possible Market Applications	Stage of Development	Collaboration Sought or Offered	Collaborator Details	IPR Granted or Published	Contact Details
<p><b>Discussion functionality.</b> Opasnet offers a website for having organised discussion, or formal argumentation, about a particular topic. New topics can be opened by anyone. There is also guidance for organising existing discussions into a more condensed and clear format. <a href="http://en.opasnet.org/w/Discussion">http://en.opasnet.org/w/Discussion</a></p>	<p>The content is open and freely available to all.</p>	<p>Several research projects utilise the functionality.</p>	<p>Researchers, policy-makers, stakeholders, or citizens interested in clarifying a particular topic by promoting or organising discussions on a collaborative workspace are sought.</p>	<p>Any discussion topic that has policy relevance.</p>	<p>Based on Creative Commons Attribute – Share alike copyright license <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: <a href="mailto:jouni.tuomisto@thl.fi">jouni.tuomisto[at]thl.fi</a></p>
<p><b>Publishing functionality.</b> Opasnet offers a possibility to publish original research. This is done with a similar principle (publish first, review later) as in e.g. the physics website <a href="http://www.arxiv.org">www.arxiv.org</a>. The manuscripts will be reviewed and also evaluated for their scientific quality and usefulness for the evaluator. <a href="http://en.opasnet.org/w/Opasnet_Journal">http://en.opasnet.org/w/Opasnet_Journal</a></p>	<p>The content is open and freely available to all.</p>	<p>Technical functionalities exist, but the social practices are on an exploratory phase. There is no guarantee how research community at large will accept these contributions.</p>	<p>Researchers interested in quickly publishing their novel ideas are welcome to test the system.</p>	<p>Any research topic.</p>	<p>Based on Creative Commons Attribute – Share alike copyright license <a href="http://creativecommons.org/licenses/by-sa/3.0/">http://creativecommons.org/licenses/by-sa/3.0/</a></p>	<p>Jouni Tuomisto, THL, P.O.Box 95, FI-70701 Kuopio, Finland. email: <a href="mailto:jouni.tuomisto@thl.fi">jouni.tuomisto[at]thl.fi</a></p>