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

Instrument: STP-Specific Targeted Project

Periodic Activity Report

Second year report (D34)

Due date of deliverable: **1 April, 2008**
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Dissemination level: **PU**

Start date of project: **April, 1ˢᵗ 2006**
Duration: **3,5 years**

Organisation name of the lead contractor for this deliverable:
National Public Health Institute (Jouni Tuomisto)

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Publishable Executive Summary

> Project acronym: Beneris
>
> Project full title: Benefit-risk assessment for food: an iterative value-of-information approach
>
> Contract no: 022936
>
> Related to other Contract no: 022957/QALIBRA
>
> Project duration: 1 April 2007 - 30 September 2009
>
> Reporting period: **1 April 2007 - 31 March 2008**

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 that are relevant for the second year are listed below.

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.

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?

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.

Participants

Participant Role	Partic. no.	Participant name	Participant short name	Country
Coordinator	1	National Public Health Institute	KTL	FI
Contractor	2	Delft University of Technology	TUDelft	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 Ltd	Lendac	IE
Contractor	8	Fundación Privada para la Investigación Nutricional	FIN	ES

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Public website for the project: **http://www.beneris.eu** – See also **http://heande.pyrkilo.fi**

Work performed

The work with benefit-risk analysis methods has taken a very challenging task: to develop completely new approach to benefit-risk assessment. This work has been done in close collaboration with Intarese and some other projects about environmental health risk assessment. The new approach 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 report produced, and the mere philosophy of doing assessments.

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.
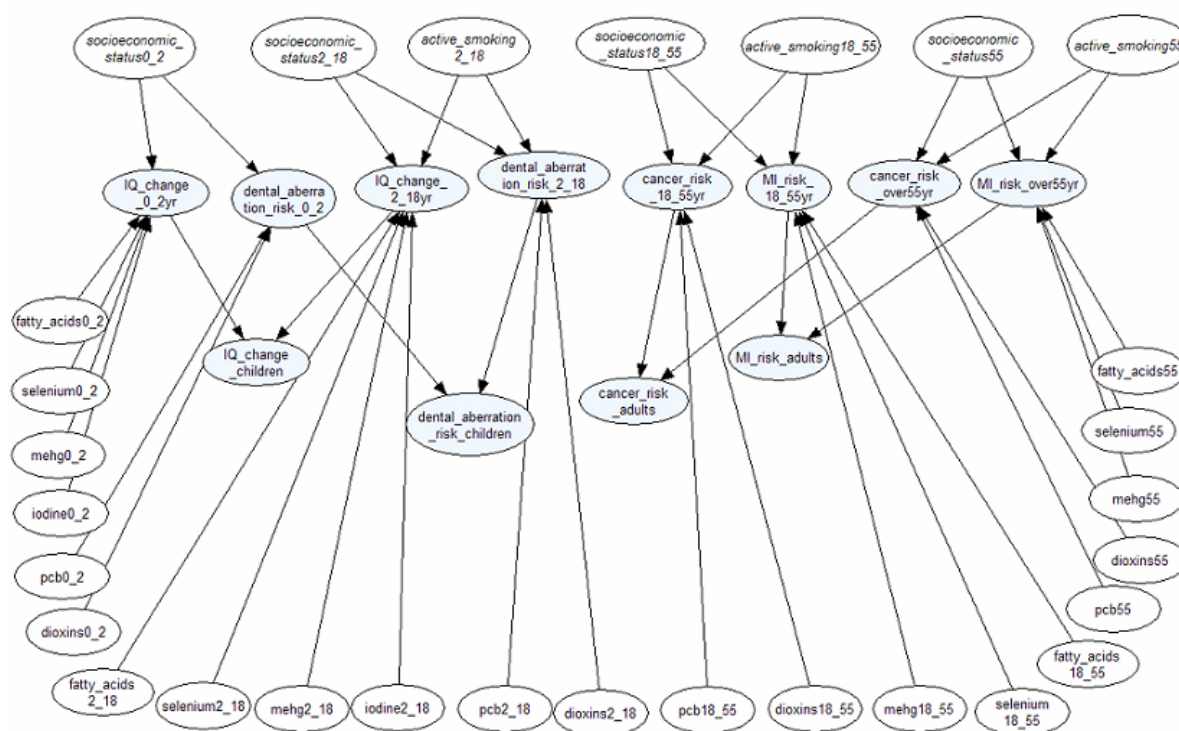
An example of a Bayesian belief network. This is a fish benefit-risk case study. The numbers refer to different age groups.

Results achieved so far and expected end results

The core of a new benefit-risk assessment method has been developed and is now being published. A website (http://heande.pyrkilo.fi) for performing benefit-risk assessments is up and running, and several assessment case studies are under way, also outside Beneris. The website is designed for assessments that are performed openly, allowing also for stakeholder participation. There is a pilot database to test the functionalities of an integrated repository for assessment information. The aim of the work is to obtain practical experience on this kind of collaborative work and to develop the benefit-risk assessment methods further.

Intentions for use and impact

The methods and tools developed in Beneris are offered to other projects, or real-life benefit-risk assessments. The website is available for this purpose. We hope that it will become a place where several assessors are able to share their information and work collaboratively, thus producing better assessments.

The main elements of the publishable results and the plan for using and disseminating the knowledge

The main products of Beneris are the improved methodology for benefit-risk assessments, the website for performing them in a collaborative way, and the integrated repository containing ready-to-use information needed in assessments. Interested assessors will be identified and recruited 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.

An example of a benefit-risk analysis performed in the project website with the Internet tools: BRA of methyl mercury and omega-3 fatty acids in fish.

Section 1 - Project objectives and major achievements during the reporting period

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.

The specific objectives of this project, and the progress related to them are described below.

Objectives in developing benefit-risk analysis methods

The exact objectives in the Description of work are:

- 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.

The progress during the reporting period is described under these three bullet points. In addition, general progress with a new benefit-risk approach is described first.

Progress during the reporting period

New approach

The work with benefit-risk analysis (BRA) methods has taken a very challenging task: to develop completely new approach to risk assessment. This work has been done in close collaboration with Intarese project, which is about environmental health risk assessment. Together, Beneris and Intarese 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 properties of a benefit-risk assessment; 2) causality; 3) collective structured learning; 4) value judgements; 5) variable structure; 6) collaborative work; and 7) dealing with disputes. These are described in more detail in WP1.

During the second year, we have further operationalised these fundamental properties into three rules of making BRA. We hypothesise that these three rules will improve the quality of BRA and make the process of doing them more efficient. The evidence for or against this hypothesis will be obtained during the latter part of the project.

First, the BRA should be performed using complete openness. This means that all details of the assessment and its estimates, results, and conclusions should be freely available for anyone interested (in practice, in the Internet) during the whole process of the assessment.

Second, all parts of the assessment should be subject to scientific scrutiny and criticism. It is therefore required that all parts of the assessment are described in a way that the statements and estimates can be verified or falsified using the scientific method and observations. Third, all disputes and criticism is handled using formal argumentation, which consists of attacking or defending arguments against or for a statement.

BBN methods

Beneris has further developed statistical methods that are useful in benefit-risk assessment. This work has been about using 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 BBN work has been lead by TUDelft in collaboration with other partners.

Beneris has developed a general Bayesian Belief Network (common for two case studies). The nodes of the general BBN have been defined and described, and the causal relations between them have been specified. Nodes of this BBN have been associated with random variables representing decision nodes, personal and nutritional effectors, and various health endpoints caused by food consumption.

The quantification of the BBN has progressed. In addition, we have developed links between the two platforms needed: the UNINET software for handling and computing BBNs, and the Mediawiki software for handling the descriptions of and discussions about the variables in the BBN model.

Improved dose-responses

One methodological aim was to develop improved methods for dose-response assessment, especially about combining epidemiological and toxicological data. Beneris and Qalibra have been informing each other about the issues and progress within dose-response work. However, as the two approaches are different, we have found it useful to first develop the ideas further, and only later consider the possibility of combining parts of the methods.

There are two streams of work within Beneris. The first relates to BBNs and how a dose-response can be defined in this context as a function of variables linked to the node of interest. Because of limited information about dose-response relations for health effects chosen for fish case study, TUDelft has developed and applied to this specific case a generalized method for modeling and quantification of these relations. This method has attractive features: is flexible, can be used to estimate health effects of various natures (expressed as probability or size of the effect) and to quantify the uncertainty around these estimates. It also guides the overall data collection effort and shows places where this effort can best be focused. This approach has been implemented in the current version of the BBN model.

The other stream has been performed in collaboration with Intarese project. A conceptual framework has been developed for combining toxicological and epidemiological data. The basic idea is to quantitatively describe all potential sources of bias related to published dose-response functions. Then, a new dose-response is derived based on the published results and the influence of the biases. We have identified the potential biases and built a draft framework where these biases are taken into account. A case study (dioxins) has been launched, and the quantification is in progress. Because the quantification of all possible

biases is a very labourous task, we have started with the first ones in the approach: biases in the measured exposure, and the measured effect. The dioxin case, which involves both animal and human data, is a very suitable for the conceptual work needed and estimation of the biases for both animal and human data.

Intergrated repository

The idea of an integrated repository of data has been under active development. The overall structure for the repositoroy has been developed. The structure has been developed in close collaboration with Intarese project, and there has been remarkable improvement since the start of Beneris. The main findings are being described in a joint manuscript (Tuomisto et al., 2008).

Since the mid-term meeting, the structure of the repository has been decided, and the database has been set up for testing and further development. The key idea in the repository is that it will not contain original data, but instead it will contains estimates about the variables or real interest, such as consumption of fish or other foods in defined populations and age groups. The strength of the approach is twofold. First, the estimates in the repository are directly usable in benefit-risk assessments as variables. Second, we avoid many problems related to intellectual property rights of the original data, which is kept in the hands of the researchers. The actual uploading of the results to the repository will occur during the third year and go on until the end of the project.

Scientific objectives in food risks and benefits

The exact objectives in the Description of work are:

- To review the existing databases and their availability for chemical contaminant data in Europe, and integrate available data.

- 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 combine existing and new data from food consumption databases with data on levels of contaminants in fish. The special emphasis is on children and the developing foetus.

- To estimate distributions of nutrient intake and food consumption relevant to benefit-risk analysis in a number of populations, and also the variability in exposure among various subgroups in the population.

- To identify food consumption patterns and food choices that determine the intake of those nutrients and contaminants that are related to benefit/risk-balance of a food item.

- To explore the usability of these patterns in another country than in which they were developed.

- 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?

Progress during the reporting period

Existing databases

As described in previous reports, the SafeFoods and other experience lead to the conclusions that 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. This has been put into action in the structure of the integrated repository (see above). We have identified the key information that is needed in the repository. This includes the list of food items and fish species the consumption of which will be collected into the repository. Also the technical form of collecting the data was decided upon. The data has been obtained from all participating Beneris countries as planned. The data processing is ongoing. The first results are likely to appear in the repository within a few months, but the finalisation of this work is estimated to take at least a year.

The use of the repository to store results from other sources than the Beneris participants is under discussion. Technically, the repository is available for other data sources as well, but so far we are collecting experience from within the project. However, contacts to Safefoods, and possibly other projects will be made during the third year to explore possibilities to utilise other existing databases.

Nutrient intake data and comparison

Irish data on food consumption data for Irish adults aged 18-64 (n= 967) has been made available to the Beneris data repository. The distributions of Finnish food consumption and nutrient intake relevant to benefit-risk analysis in pregnant women (DIPP Nutrition Study), Finnish 25-64 year old adults (Finravinto 2002 Study) and 1-, 3- and 6-year old children (DIPP Nutrition Study) have been calculated and reported (D18). Food consumption patterns and food choices have been identified for Finnish adults aged 25-64 years (D14). DTU has submitted a report about available data for consumption and concentrations in Denmark, Finland and Ireland, deliverable D7. Spanish consumption data has been derived from the Enkid Study (subjects aged 2-24) and ENCAT (2002-2003) Study (subjects aged 25 – 74).

Contamination research

The large task of chemical analysis of 130 placenta samples have been performed by DTU (mercury) and other pollutants (KTL). The statistical analyses are ongoing. We are now beginning the work to utilise these results in contaminant intake estimates on one hand, and in the studies on fetal exposure to contaminants due to mother's diet on the other hand. As described before, the fish case model contains an age group 0-2 years. The contaminant exposure estimation for them is problematic, as a large part of it comes from mother during

pregnancy or via lactation. Some effects considered, notably the teeth defects due to dioxin, occur during this period. It is therefore important to evaluate the exposure of the child using the information about the mother's diet and the pollutant concentrations in the placenta. A regression analysis can now be performed as the chemical analysis results exist. The results will be used in the case study for estimating children's exposures.

Risk-benefit analyses

A preliminary benefit-risk analysis of fish (case 1) was published (Leino et al., 2008). This work was mainly done in KTL, with collaboration with FFiles. The full Bayesian belief network (BBN) model has been developed, and the data collection for the model has started.

Objectives in dissemination

The exact objectives in the Description of work are:

- To integrate results into updated benefit-risk assessments, and evaluate the remaining uncertainties and their importance for decision-making.

- To evaluate the integration methodology by all partners and develop it further.

- 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 develop methods to collect feedback from end-users about benefit-risk analyses.

- To enhance the availability of existing databases through this interface.

- 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.

Progress during the reporting period

Overall, the dissemination activities are scheduled in the mid-term and end of the project. There has been four streams of activities here:

- The Beneris wesite and an open assessment website were utilised.

- The Gordon-type conference was organised in Valamo, Finland.

- Tools to publish models in the Internet have been developed.

- A full benefit-risk analysis (case 1: fish) has been started in the Internet.

The Beneris website

There are three websites that are used in Beneris. First, the Beneris website (www.beneris.eu) provides public access to the Beneris project. The website was set up to provide an overview to the various aspects of Beneris from project objectives to participant information. The website contains comprehensive information on all aspects of Beneris and includes project summary, project objectives, participants list, potential impact, work

package details, news, events, posters, publications and links to other relevant websites. The website includes an overall search engine to facilitate location of relevant data. Second, a closed project website has been used for benefit-risk assessment work. Model details have beed described and discussed there, and proprietary data have been uploaded and analysed there. The different model versions can be downloaded from there. This way, all partners in Beneris have access to the most up-to-date information within the project. Third, some parts of the work has already been opened to an openly available website (http://heande.pyrkilo.fi), which is a general forum for open risk assessments and which is utilised by several other projects (esp. Intarese, and a Finnish project Erac).

Gordon conference

Beneris project in collaboration with Qalibra project, and Sytyke (Graduate School of Environmental Health) organised a conference about environmental health in the Valamo monastery, Finland, on December 3-5, 2007. The theme of the conference was **Benefit-risk analysis: how to learn from previous assessments?** The conference was open to all aspects of environmental health. Risks and benefits of food were emphasized. There were about 60 participants, mainly researchers from Beneris, other EU projects, University of Kuopio, EFSA, and KTL.

Tools to publish models

The tools to publish models are directly linked to the overall method development (Workpackage 1). The main achievements are described there, and here we only focus on the dissemination aspects. We have developed an Internet interface in collaboration with Intarese project. The interface makes it possible to describe the contents and results of benefit-risk analyses, and enable stakeholders to bring up related issues and concerns. The internet site exists already, and the major properties that the interface will have are known. The basic functionalities have been installed.

Dissemination of benefit-risk analysis of fish

The fish case study has been used as an example for dissemination activities and methods. There is a published article on this (Leino et al., 2008) about the preliminary benefit-risk assessment of fish. At the same time of submission, the actual benefit-risk model of this case was published in the Internet. Further work is going on to publish also the detailed descriptions of the model contents and conclusions in a way that they can be understood without modelling experience. In addition, a possiblility to give feedback about the model and its conclusions is available already now. This feature will be developed further.

The evaluation of the methodologies developed was started during the second year. A major effort in this respect was the project workshop in Berlin in September 2007. This was used in internal training and evaluation. In addition, two participants from Qalibra were in the workshop as well. In addition, there was and other workshop in Kuopio in February 2008. The participants came from Beneris, Intarese, Envirisk, Hiwate, and Heimtsa, in other words the workshop had a wide coverage over the EU-funded research projects related to environment and health. One day out of five was dedicated to evaluation and collecting feedback about the methodologies applied in Beneris. During the third year, we will collect comments based on the so far published assessments, including the Leino et al. model and article (Leino et al., 2008). The evaluation work will be done in collaboration with other projects, including Qalibra and Intarese.

Recommendations from the Mid-term Review and actions taken by Beneris

Methodological advances in the specific area of risk-benefit are much needed. Particular attention is deserved by aspects that are unique to risk-benefit assessments.

> Disability-adjusted life years is a major method to combine risks and benefits. BENERIS will apply and develop DALYs and develop tools for practical use. The work is done in collaboration with INTARESE. There is already a draft model for calculating DALYs in a life-table setting. This model will be added to and tested with BENERIS case studies. Another area of specific risk-benefit issues is the symmetric handling of uncertainties related to risks on one hand and benefits on the other hand. A manuscript is under preparation related to uncertainties.

Technical cooperation with QALIBRA should be improved.

> BENERIS is further developing the project website where open risk assessments are being performed. The new website will have more functionalities for collaborative work beyond project boundaries. This will facilitate the cooperation with QALIBRA. We estimate that the new website will be running before summer holidays. It will also provide the technical means to perform the cross validation of case studies, when the level of cross validation has been decided (see below).

QALIBRA and BENERIS should work together and use a single repository of surveillance.

> The development work of a single repository is going on. Currently, there is a test database that will go through practical testing during May-June, 2008. This work is done in collaboration with HEIMTSA. The best option for QALIBRA-BENERIS collaboration about the repository will be decided by the end of September, 2008.

The share data base should be used for cross validation of methods.

> QALIBRA will consult with BENERIS by the end of October 2008 to assess the feasibility of undertaking these additional analyses.

Coordination of activities should be improved in order to achieve the proposed objectives. The coordinator should make sure that all partners will effectively participate in the evaluation of the integrated methodology.

> One meeting is added to the Beneris timeplan. The timing has not been decided yet, but it will most likely be in October or November. A major issue in the meeting is the evaluation of methods and practices developed so far. The new practices and plans will be written into a document and distributed to the partners and the Commission before summer. Dedicated evaluation period will start in the fall 2008. Several key manuscripts has been finalised and submitted by then. There are currently four manuscript under preparation on this topic.

The deliverables and reports should be improved (better organised, methodologies used).

> This task has been given to a dedicated person who has more time to check this than what was the case previously.

The second case study should be well defined.

This is still under way. The work is delayed due to long sick leaves of personnel (see Management).

Workpackage 3 has suffered some retard in obtaining results in the first case study.

The work has now speeded up. The preliminary case study has been published. Most of the data that was planned to be collected has now been collected.

The partners should interact more with the Science Advisory Panel (SAP). They should be informed on the progress of the work, and the outputs of the project.

When the evaluation period starts next fall, we will send some key material to the SAP and ask for specific comments (and of course give possibility to general comments as well). In addition, SAP will be given access to the updated project website so that they can follow the progress of the project at any time.

Potential users and other stakeholders (outside the consortium) are not suitably involved.

Dissemination plan will contain a detailed plan about how to involve stakeholders and potential users. The dissemination plan will be finalised in August 2008, to allow a proper time for commenting by project members.

References

Leino O, Tainio M. and Tuomisto JT. (2008) Comparative risk analysis of dioxins and fine particles. Risk Analysis Feb;28(1):127-40.

Jouni T. Tuomisto, Mikko Pohjola, Marko Tainio, Juha Pekkanen . (2008) Open participation in environmental health risk assessment. Submitted.

Tuomisto Jouko, Livar Froyland (2007) The risks and benefits of consumption of farmed fish. In a book "Improving farmed fish for the consumer" by Prof Øyvind Lie (editor).

Section 2 - Work package progress over the period

This section describes the progress of work by workpackage.

WP1: "Method (top-down approach to risk-benefit analysis)"

WP leader	KTL / Jouni Tuomisto
Partners involved	KTL, TUDelft, FFiles, FSAI, DTU, FVST, Lendac, FIN
Workpackage objectives	• To introduce all partners to the common methods to be used: integrated modelling and Bayesian belief networks. • To develop Bayesian belief networks (BBN) to handle complicated benefit-risk situations. • To develop a decision support system (DSS) based on BBN. • To develop improved methods for dose-response assessment, combining epidemiological and toxicological data. • Apply the dose-response methods in combining epidemiological and toxicological information on fish contaminants (esp. dioxins and PCBs). • To integrate results from the previous workpackages into an updated assessment. • To evaluate the remaining uncertainties and their importance for decision-making. • To evaluate the integration methodology by all partners and develop it further. • To produce risk assessments that will be used for Internet interface and Dissemination Workpackages.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- Major new developmental areas for BRA method were identified and solutions suggested

- Work done in collaboration with Intarese

- A functional BBN was developed and tested with pilot data

- A draft method for combining epidemiological and toxicological data was developed in collaboration with Intarese

The work in this workpackage was organized under three main themes: **pyrkilo method**, **Bayesian belief networks** (BBN), and **improved dose-response** (combining epidemiological and toxicological information). The three themes were described in detail in the 1st-year report.

Progress towards objectives

TU Delft:
During the second year of the project TU Delft has been working on improving the BBN model developed for the benefit-risk assessment in Beneris project. The effort has been mainly directed towards development of approaches for model calibration. In more detail, TU Delft has refined its generalized method for modelling and quantification of dose-response relations so that its output matches observable data points.

Moreover, during the reporting period TU Delft has addressed methodological questions regarding case-control study on dioxins and has been actively working on improving the

BBN software including its data mining capabilities (i.e. extracting/analyzing information from an ordinal multivariate data set and summarizing relationships identified in form of a BBN).

FoodFiles:

Foodfiles has been studying the risk-analysis methodology used in BENERIS project and participated the Beneris workshop on methodological issues 19th-21st of September 2007 in Berlin, Germany.

FSAI:

FSAI has not contributed to the objectives of WP1 other than by participation in the Berlin Training Workshop in September 2007 on benefit:risk methology and in the mid-tem meeting in November. FSAI has however provided data on contaminants intake from fish by Irish consumers in 2007 which can be used in the case studies of WP 1.

Lendac:

Lendac involvement in WP1 was primarily in the area of designing, developing Internet based tools to facilitate conversion and dissemination of benefit risk assessment models etc. Initial work in this area was developing and converting the XML output from benefit-risk models. At a later stage it was decided to replace part of this process with the conversion of benefit-risk model data to Mediawiki format. Lendac attended the Berlin workshop in September 2007 at which other methods of open risk assessment (ORA) were discussed which would result in the introduction or development of alternative Internet-based tools.

FIN:

Apart from participation via email and document reviews, FIN representatives attended the following two meetings:

Luis Alberto Henríquez Hernández at the Qalibra-Beneris midterm meeting (Helsinki, 7-9 Nov 2007) where details of the fish and vegetable case studies and framework were discussed. (see Meeting minutes)

Lluís Serra-Majem attended the Beneris Internal Training Workshop, Berlin, 19-21 Sept 2007. Among others, the Pyrkilö-method was discussed and updated, including details of how to incorporate information from other data sources, and levels of access.

Deviations from the project workprogramme, and corrective actions taken/suggested

Lendac:

As outlined above.

Deliverables

No.	Name	WP no.	Due (project month*)	Date of submission Actual	Fore-seen	Reasons for deviation and recuperative measures	Indicative person-months *) Estim.	Used	Lead contractor(s)
D15	Pyrkilo guide 2	1	14	Sept 5, 2007		The report became much larger than originally thought, and this took a few more months	7	8	KTL
D25	Decision support system	1	20	15 May, 2008		Delivered as a presentation in November 7-9, 2007 at the Helsinki meeting. However, paper submission deferred until the 2nd-yr report.	8	8	TUDelft

Milestones

Name	WP no.	Due (project month*)	Actual achiev. date	*Foreseen achiev. date*	Reasons for deviation and recuperative measures	Lead contractor(s)
A draft of the decision support system (the second project meeting)	**1**	19	7 Nov, 2007			TU Delft
Dose-response model ready for applying it on dioxins and PCB (the second project meeting)	**1**	19	7 Nov, 2007			KTL

Name	WP no.	Due (project month*)	Actual achiev. date	*Foreseen achiev. date*	Reasons for deviation and recuperative measures	Lead contractor(s)
A draft of the decision support system (the second project meeting)	**1**	19	7 Nov, 2007			TU Delft
Dose-response model ready for applying it on dioxins and PCB (the second project meeting)	**1**	19	7 Nov, 2007			KTL

WP2: "Database"

The work done in WP2 is described in detail below, under the sub-workpackage titles.

Deliverables

No.	Name	WP no.	Due (project month*)	Date of submission — Actual	Date of submission — Fore-seen	Reasons for deviation and recuperative measures	Indicative person-months *) — Estim.	Indicative person-months *) — Used	Lead contractor(s)
D9	Ethical approval	2	12	March 12, 2007			0.3	0.3	KTL
D10	Food diaries	2	12	March 30, 2007			3.7	4	KTL
D11	Food intake data	2	12	March 30, 2007			2	1	FIN
D12	Contaminant levels in fish	2	12	May 15, 2008		It was not noticed that the delivarable was not sent to the EC although the contaminant levels were delivered to partners on 15 Oct 2007	1	1	KTL
D14	Dietary patterns	2	14	July 6, 2007			3	3	KTL
D18	Subpopulation intakes	2	16	Oct 1, 2007			3	3	KTL
D19	Contaminants in placenta	2	17		May 2008	Analyses still going on. Persistent organic pollutants expected to be analyzed by May 2008	17	17	KTL
D20	Intake of contaminants in children	2	18	Dec 19, 2007			3	3	KTL
D21	Intake of contaminants: natl registries	2	18		Dec 2008	As a part of this deliverable, PCDD/F concentration data has been requested from the Commission more than 6 mo ago. The data was promised but still not delivered.	1		FVST
D26	Evaluation of patterns	2	20		Dec 31, 2008	Completion of the database has taken longer than expected, and this part of the project will only be undertaken in year 3	2	0	FSAI
D27	Intakes based on patterns and average	2	20		June 2008	Work not yet completed due to a key person's (Tero Hirvonen) part-time absence	3		KTL
D29	Intake of contaminants: gender	2	21	24 April, 2008		Work completed late due to a key person's (Tero Hirvonen) part-time absence	3	3	KTL
D30	Intake of contaminants: age groups	2	21	24 April, 2008		Work completed late due to a key person's (Tero Hirvonen) part-time absence	3	3	KTL
D32	Critical dietary patterns	2	22		June 2008	Work not yet completed due to a key person's (Tero Hirvonen) part-time absence	3	3	KTL

WP2.1: "Food intake studies"

WP leader	FSAI / Iona Pratt
Partners involved	KTL, FSAI, DTU, FVST, FIN
Workpackage objectives	• To review the existing databases and their availability for chemical contaminant data in Europe, and integrate available data. • 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 distributions of nutrient intake and food consumption relevant to benefit-risk analysis in a number of populations, and also the variability in exposure among various subgroups in the population. • To identify food consumption patterns and food choices that determine the intake of those nutrients and contaminants that are related to benefit/risk-balance of a food item. • To explore the usability of these patterns in another country than in which they were developed. • 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, we will test the hypothesis whether a recommendation to restrict fish eating would increase meat consumption.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

• Data collecting and computation completed on food consumption data for Finnish, Spanish and Irish populations, as classified by gender, age classes, various food stuffs and fish species. In addition, some nutrient intakes from Finnish and Spanish populations were classified as above.

Progress towards objectives

FSAI:
FSAI has contributed to WP2 overall in 2007-2008 by the contribution of detailed data on contaminant concentrations in fish (Persistent Organic Pollutants and Mercury) and on intakes of these pollutants by Irish consumers, based on the food consumption data for Irish adults (aged 18-64 years, n=967). These data have been uploaded into the Beneris data repository and are freely available to all users of the Beneris database. FSAI has worked with the Danish Technical University on mercury in fish to provide data for a risk:benefit analysis. Ireland has delivered mercury data for the years 2002 to 2006 for a total of 28 different species of fresh fish have been analysed, as part of deliverable D7 (see report from DTU).

Irish data on food consumption data for Irish adults aged 18-64 (n= 967) has been made available to the Beneris data repository and data for Irish children aged 5-12 (n = 594) will be made available as needed, e.g. for WP4, case study 2. Food consumption data for Irish teenagers aged 13-17 have recently been published and work is underway to make this available to Beneris in year 3 of the project.

KTL:
The distributions of food consumption and nutrient intake relevant to benefit-risk analysis in pregnant women (DIPP Nutrition Study), Finnish 25-64 year old adults (Finravinto 2002

Study) and 1-, 3- and 6-year old children (DIPP Nutrition Study) have been calculated and reported (D18). Food consumption patterns and food choices have been identified for Finnish adults aged 25-64 years (D14). These patterns can later be used in risk/benefit-calculations. Intake of contaminants in children has also been calculated and reported (D20).

DTU:

DTU has submitted a report about available data for consumption and concentrations in Denmark, Finland and Ireland, deliverable D7. The concentration data covers many different fish species, However for none of the chemicals there are single residue data for all three countries. It would be possible to find single residue data for fatty acids, vitamin D, vitamin A, selenium, mercury and other heavy metals, as well as dioxin for at least one country. In the report the concentration data from the different countries are summarised.

Extraction and preparation of Danish data on fish consumption for Monte Carlo Risk Assessment.

Literature search for preparation of knowledge leading to recommendation for use of consumption data from Denmark, Finland and Ireland for the assessment of dietary exposure to specific categories of potentially hazardous or beneficial substances.

FIN:

Country Spain-specific food consumption data and fish species-specific intake data (g/person/day). The following explains the data set for which future analysis regarding fish consumption and contaminants will be based:

After reaching consensus among distinct partners on what food variables (food groups and nutrients) would be included and data format presentation (age groups, consumers/no consumers, descriptive statistics, etc), the elaboration of the consumption data for Spain was undertaken.

Spanish consumption data has been derived from the Enkid Study (subjects aged 2-24) and ENCAT (2002-2003) Study (subjects aged 25 – 74). To date in Spain, the Enkid Study is the only nutrition study conducted at the national level based on individual food surveys. This study evaluates the nutritional status of Spanish children and youth from the age of 2 to 24 years. Apart from this, several Spanish Regions have carried out nutrition surveys in the adult population. Of these, Catalonia (the northeast region of Spain with a population of 7 million inhabitants) is the Region that has a nutrition monitoring system for which nutrition surveys are periodically administered (1996, 1992, 2002) in representative samples of the Catalan population. For the Beneris analysis, data taken from the last survey, ENCAT-2002, have been utilised.

ENKID

The Enkid study on nutritional status and food habits of Spanish children and young people, is a cross-sectional population based survey that was carried out between 1998 and 2000 on a random sample of the Spanish population aged 2–24 y, (n=3534; 1629 boys and 1905 girls), selected by multistage random sampling procedures based on a population census. The dietary questionnaire used to assess nutritional status was: one 24-h diet recall by subject; and a second 24-h diet recall in 25% of the sample. The 24-h recalls were administered throughout the year in order to avoid the influence of seasonal variations. The questionnaires were conducted in the participant's home. To avoid bias brought on by day-to-day intake variability, the questionnaires were administered homogeneously from Monday to Sunday. In order to estimate volumes and portion sizes, the household measures found in the subjects' own homes were used. The administration of two questionnaires in a subsample allowed for the adjustment of intakes for random intraindividual variation.The nutrient database software used for the study consisted of the Spanish database from Mataix et al, completed with information from the French and British food composition tables.

A 164-item food frequency questionnaire was also administered. Questions on dietary habits, consumption of supplements, physical activity on weekdays as well as leisure time, tobacco and alcohol use and basic information regarding food and nutrition were part of the study protocol as well. Anthropometrical measurements were assessed in standard conditions on

each individual (weight, height, perimeters,..). All field workers (43 dietitians) underwent a training period prior to data collection. Field work was completed between May 1998 and April 2000.

In preparing the data base for this project, data derived from the 24 hour recall, which included 496 different food codes, was utilised. Food items were regrouped according to categories previously defined for Beneris: potatoes and other tubers; vegetables ; legumes; fruits; dairy products; cereals and cereal products; meat and meat products; fish and shellfish; eggs and egg products; fat; sugar and confectionary; cakes; non alcoholic beverages; alcoholic beverages; condiments and sauces; soups, bouillon and miscellaneous.

Consumption data for each distinct food group was analysed (g/person/day) as well as energy intake (Kj/day), total fat (g/day) and vitamin D (mcg/day) (Mean, SD, 5th, 25th, 50th, 75th and 95th percentiles and percentage of users) by age group (4-5 y, 6-9 y, 10-13 y, 14-17 y and 18-24) and sex. Specific intakes of fish and other seafood by species, which included 56 food codes, were analysed in a similar manner.

ENCAT 2002-2003

The ENCAT study on nutritional status and food habits of the Catalan population, a cross-sectional population survey, was carried out between 2002 and 2003 on a random sample of the Catalan population aged 10–75 y, (n=2160; 954 men and 1106 women), selected by multistage random sampling procedures based on a population census.

A 24-hour recall was conducted to evaluate food consumption and nutrient and energy intake and 62% of the sample answered a second 24-hour recall 8 to 30 days later, conducted on a day that differed from the first interview. Household measures found in the subjects own homes were used to estimate the volumes and portion sizes. Interviews were conducted on all days of the week throughout the entire year In coding the 24-hour recalls 635 codes were utilised. The CESNID Spanish food composition table was chosen to convert food to energy and nutrients and results were adjusted for intraindividual variability.

A quantitative 80-item food frequency questionnaire was used to evaluate food habits.
A general questionnaire compiled information about socio-economic variables (profession, level of education, etc.) as well as food habits, chronic disease control, smoking, physical activity, opinion and knowledge about nutrition, attitudes, nutrition education and food safety. The questionnaire ended with questions on anthropometry and measurements were taken in standard conditions for the following parameters: weight, height, waist, hip and arm circumference, and elbow breadth.

The surveys were carried out in the home of the subject being interviewed by 22 dietitians, which had previously undergone an intensive training programme. Field work took place from March 2002 to June 2003.

For the Beneris analysis, data derived from the average of the two 24-hour recalls were utilised, and the protocol for analysis is similar to that used to evaluate the Enkid study database. This applies to both the consumption of foods and nutrients as well as the specific intakes of fish. The following age groups were applied: 25-74y (25-24y, 35-44y 45-54y 55-64y 65-74y) (n=1530, 706 men and 824 women)

Deviations from the project workprogramme, and corrective actions taken/suggested

FSAI:
While FSAI was nominally leader for WP2.1, Food intake studies, in practice the main responsibility for this has transferred to KTL, with a focus on detailed consumption data for Finnish and Spanish adults and children. This is considered appropriate since KTL have the necessary expertise and overall vision of the Beneris strategy and are in a position to coordinate the work on food intake studies in the most effective manner.

KTL:
D18 and D20 were done 2 weeks to one month later compared to the original due date, because the dietary patterns (D14) were done 1,5 months in advance. D27 (Intakes based on patterns and average) and D32 (Critical dietary patterns) have not yet been completed due to a key-person's (Dr. Tero Hirvonen) part-time absence. The work will be completed within 3 months.

Milestones

Name	WP no.	Due (project month*)	Actual achiev. date	*Foreseen achiev. date*	Reasons for deviation and recuperative measures	Lead contractor(s)
Distributions of nutrient intakes and food consumption relevant to risk-benefit analysis among 25-64 year old adult population	**2.1**	not determined	10 April, 2008			DTU, FIN, KTL
Distributions of nutrient intakes and food consumption relevant to risk-benefit analysis among pregnant women	**2.1**	not determined	28 Sept, 2007			DTU, FIN, KTL
Distributions of nutrient intakes and food consumption relevant to risk-benefit analysis among 1-, 3- and 6-year old children	**2.1**	not determined	13 Dec, 2007			DTU, FIN, KTL

		Due (project month*)	Actual achiev. date	*Foreseen achiev. date*	Reasons for deviation and recuperative measures	Lead contractor(s)
Distributions of nutrient intakes and food consumption relevant to risk-benefit analysis among 25-64 year old adult population	**2.1**	not determined	10 April, 2008			DTU, FIN, KTL
	2.1	not determined	28 Sept, 2007			DTU, FIN, KTL

WP2.2: "Contaminant concentration"

WP leader	KTL / Terttu Vartainen
Partners involved	KTL, DTU
Workpackage objectives	• The general objective is to find out association between external dose (intake) and internal dose (concentrations in the body). The immediate objectives are • To analyse contaminants (PCDD/Fs, PCBs, PBDEs, organotin compounds, PCNs and Hg/methyl-Hg) from 50-200 placentas.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- The preparation and chemical analysis of 130 placenta samples for methyl mercury (DTU) and other pollutants including PCDD/Fs, PCBs, PBDEs, organotin compounds, and PCNs (KTL) has started.

Progress towards objectives

KTL:

D19 Contaminants in placenta (month 17); analyses of 130 placenta samples performed for seven groups of persistent organic pollutants (PCDD/F, PCB, PBDE, PBB, PCN, DDE, OT) by partner 1. Studies of association between intake and internal dose start on spring 2008.

Same placentas have been analysed for Hg, Se, As, Cd, Pb concentrations by partner 5.

DTU:

Analysis of 130 placenta for methyl mercury has been finalised.

Deviations from the project workprogramme, and corrective actions taken/suggested

None.

Milestones

None.

WP2.3: "Contaminant intake studies"

WP leader	KTL /Tero Hirvonen
Partners involved	KTL, FSAI, DTU, FIN
Workpackage objectives	• To combine existing and new data of food diary data with data of contaminants. The special emphasis is on children and the developing foetus.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- A probabilistic intake estimation method (Monte Carlo simulation) has been developed and tested, using data from WP2.1 and WP2.2.

Progress towards objectives

KTL:

The food intake of subpopulation was calculated and reported (D18) as well as the intake of contaminants in children (D20). The food intake of pregnant women has been calculated and reported (D18 and 29-30) and the calculations of contaminants during pregnancy will also be calculated before the end of 2008. The contaminants from the food diaries compared to the values from placentas are under work at the moment and will be finished before the end of year 2008.

FSAI:

FSAI has contributed to WP2 in 2007-2008 by the contribution of detailed data on contaminant concentrations in fish (Persistent Organic Pollutants and Mercury) and on intakes of these pollutants by Irish adults. Intake data for Irish children aged 5-12 (n = 594) can be made available as needed by KTL. FSAI has worked with the Danish Technical University on mercury in fish to provide data for a risk:benefit analysis. Again, intake data for mercury in fish can be provided for both Irish adults and children as needed for this risk-benefit analysis.

DTU:

During EU mid-term evaluation of the project, Beneris was asked to find possibilities to corporate with Eurofir and Qalibra. We have contacted both projects; so far we have not started a formal corporation but we are going to deliver a review on toxicity data of methyl mercury.

We have received data on methyl mercury in fish from Ireland, the data has been harmonised with the Danish data. Unfortunately, the difference between the databases was too large to get a single harmonised database. In the future we will try to calculate the total methyl mercury in from fish in Ireland and compare them to the Danish total intake.

DTU has prepared tables with single data for fatty acids, vitamin D, vitamin A, selenium, mercury and other heavy metals. These tables are not yet submitted.

FIN:

Country-specific intake of critical contaminants and trace elements:
Data on the intake of contaminants via fish consumption in the Spanish population has been obtained from fish consumption data derived from the ENKID and ENCAT 2002 studies.

The data base for contaminants was derived from published data on contaminant concentration (PCDD/F and PCB and Mercury) in fish that were analysed by the Research teams of Prof Josep Lluis Domingo, Laboratory of Toxicology and Environmental Health of the Rovira Virgili University and Dr. Juan M. Llobet, Toxicology Unit of the University of Barcelona, in which different samples of the most commonly consumed fish in Catalonia were obtained for analysis.

The methodology for analysing contaminants has been described by the various authors (Bocio A, Domingo JL, Falcó G, Llobet JM. *Concentrations of PCDD/PCDFs and PCBs in fish and seafood from the Catalan (Spain) market: estimated human intake*. Environ Int. 2007;33(2):170-5; and Domingo JL, Bocio A, Falcó G, Llobet JM. *Benefits and risks of fish consumption Part I. A quantitative analysis of the intake of omega-3 fatty acids and chemical contaminants*. Toxicology. 2007;230(2-3):219-26):

During the months of March and April 2005, fish and seafood species were acquired in local fish markets, big supermarkets and grocery stores from six main cities of Catalonia, Spain. The following species were represented: sardine, tuna, anchovy, mackerel, swordfish and salmon corresponding to blue fish; hake, red mullet and sole as white fish; cuttlefish and squid as cephalopods; and clam, mussel and shrimp corresponding to shellfish. Fish and seafood species were not necessarily caught from the Catalonian coastal waters. They were randomly purchased independently on their geographical origins. According to recent studies, all these species are included into the most consumed by the population of Catalonia. The levels of PCDD/Fs and PCBs were determined in a total of 42 composite samples (3 samples for each species). Each composite sample was made up of 20 samples of the respective species. For small species (i.e., sardine, anchovy, clam, etc.), the entire edible part of each individual was included to prepare the composite sample. However, for bigger species (i.e., hake, swordfish, or tuna) only fillets of edible parts of each individual were collected and included in the respective composite samples. For all species, only edible parts were included in the composites.

Analytical procedures: The 17 most toxic congeners of PCDD/Fs were analyzed. The seven PCB markers (IUPAC No. 28, 52, 101, 118, 138, 153 and 180), the coplanar PCB congeners No. 77, 126 and 169, and the mono-ortho PCB congener No. 105 were also determined. The choice of these PCB congeners was based on a previous PCB survey (Llobet et al., 2003). Among them, PCB 126 and 169, which possess the highest toxic equivalency factors (TEFs) for PCBs, were included. PCDD/Fs and PCBs were determined by HRGC/HRMS according to the US EPA 1613 and 8290 methods, and the US EPA method 1625, respectively. Toxic equivalents (TEQ) of the analyzed PCDD/Fs and dioxin-like PCBs (DL-PCBs) were calculated using the WHOTEF values.

For each of the more than 50 food codes obtained in each survey (ENKID and ENCAT-2002) that corresponded to "fish or seafood" and to foods whose primary ingredient was fish, a value of contaminant concentration was assigned, based on the similarity of fatty acid composition. The tables on intakes of contaminants were elaborated.

Deviations from the project workprogramme, and corrective actions taken/suggested

None.

Milestones

Name	WP no.	Due (project month*)	Actual achiev. date	*Foreseen achiev. date*	Reasons for deviation and recuperative measures	Lead contractor(s)
Intake of different contaminants in different subpopulations is compared with the TDI values of EC and WHO.	2.3	not determined				KTL
Food consumption advice is given for relevant subpopulations.	2.3	not determined				KTL

WP2.4: "Database work"

WP leader	DTU / Ole Ladefoged
Partners involved	KTL, DTU, Lendac
Workpackage objectives	• To develop an integrated repository of surveillance, nutrient and food consumption data, • To develop a robust system capable of receiving datasets from multiple sources on an ongoing basis, • To develop a rapid analytical tool for deriving intake estimates for key contaminants and essential nutrients to address the overall aims of the project. • To develop tools for making the accumulated data readily available to key stakeholders involved in risk analysis including the European Food Safety Authority and national authorities.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- Based on the evaluation of existing work on food databases, it was concluded that the collection of data for benefit-risk analyses should be designed so that there is a special emphasis on the applicability and simplicity of the data.

Progress towards objectives

DTU:

DTU has submitted a report about available data for consumption and concentrations in Denmark, Finland and Ireland, deliverable D7. The concentration data covers many different fish species. (See details in WP2.1). The data in this report can be used in the work to develop and test the integrated repository (see below).

KTL:

The idea of an integrated repository of data has been under active development. The overall structure for the repositoroy has been developed. The structure has been developed in close collaboration with Intarese project, and there has been remarkable improvement since the start of Beneris. The main findings are being described in a joint manuscript (Tuomisto et al., 2008).

Since the mid-term meeting, the structure of the repository has been decided, and the database has been set up for testing and further development. The key idea in the repository is that it will not contain original data, but instead it will contains estimates about the variables or real interest, such as consumption of fish or other foods in defined populations and age groups. The strength of the approach is twofold. First, the estimates in the repository are directly usable in benefit-risk assessments as variables. Second, we avoid many problems related to intellectual property rights of the original data, which is kept in the hands of the researchers. The actual uploading of the results to the repository will occur during the third year and go on until the end of the project.

Deviations from the project workprogramme, and corrective actions taken/suggested

An explicit decision about certain parts of data going to the repository will not be made in that form (as suggested in the milestone). Instead, the work to develop the repository contents has started from the information directly used by the case study models. As the

experience grows, more data already collected by the Beneris partners will be synthesized into the form required by the repository. This work will go on until the end of the project.

Milestones

Name	WP no.	Due (project month*)	Actual subm. date	*Foreseen subm. date*	Reasons for deviation and recuperative measures	Lead contractor(s)
A decision will be made on which parts of the national data will be integrated and on what level	**2.4**	9	18		The repository was deemed to require continuous development and needed to be discussed in the Berlin workshop.	DTU

WP3: "Case 1: Fish"

WP leader	FFiles / Henna Karvonen
Partners involved	KTL, TUDelft, FFiles, DTU, FIN
Workpackage objectives	The general objective is to perform risk-benefit analysis on fish based on the methods developed in WP1; nutrition and contaminant information collected in WP2; and benefit dose-responses derived in this WP. We will estimate the dose-response slopes for different health benefits of fish including uncertainty around these estimates. A key task is to quantify the cardiovascular benefits of fish on different population subgroups, like cardiovascular patients vs. healthy adults, using the large body of published literature. Other potential benefits of fish include beneficial effects during pregnancy and early childhood on childhood development, allergies, and osteoporosis. All of these effects will be reviewed, prioritized and the most important effects and their uncertainties will also be quantified.

In general, WP3 aims at performing benefit-risk analysis on fish consumption based on methods developed in WP1 and data on consumption and contaminants collected in WP2. TU Delft has had the main responsibility of developing the Bayesian belief network, while KTL, together with FFiles, has prepared the preliminary case study.

The different threads of work were described in more detail in the 1st-year report.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- A BBN developed for the full BRA of fish.

- Literature review on health effects of fish was completed. Evaluation of the most relevant health effect indicators of fish is under way.

- The preliminary BRA on fish was finalised and published.

Progress towards objectives

FoodFiles:
Foodfiles has completed a review on quantifiable cardiovascular health benefits of fish and omega-3 fatty acids (D16) for the further development of the benefit-risk analysis. The report was completed on 15th of October, 2007.

Furthermore, Foodfiles has compiled a review on the other health benefits of fish (D28). The report was completed on 31st of March, 2008.

TU Delft:
Successive meetings and discussions among project participants during the reporting period resulted in improved, more sophisticated version of the BBN model for the fish case study. TU Delft has participated in re-defining variables of this new network and also describing causal relations among these variables according to the new method for the risk assessment developed in the project (as known as the pyrkilo method). Moreover, TU Delft has been working on adjusting its methods developed during the first year of the project to the current situation. There are no quantitative results yet, but the collection of data required for the new BBN model has started.

FSAI:

While not a participant in this WP, FSAI has provided detailed data on contaminant concentrations in fish (Persistent Organic Pollutants and Mercury) to WP2 that can be used in Case 1: Fish

FIN:

FIN has participated in the development of this case study by providing data on consumption of various fish species by age group and gender. Integration of database information has been addressed and is being finalised.

Deviations from the project workprogramme, and corrective actions taken/suggested

FoodFiles:

Since several meta-analyses on the cardiovascular health benefits of fish consumption or intake of fish oils have been published during the recent years, we felt that another perspective was needed for the meta-analysis of cardiovascular benefits. Consequently we include the effect of age on the cardiovascular benefit assessment. Due to the change in the perspective, the deliverable D16 was delayed from the original schedule until 15th of October, 2007. Respectively, the deliverable D28 was delayed from the original schedule (month 20) until March 31st, 2008 due to prolonged medical leave of the person responsible for the project.

Deliverables

| No. | Name | WP no. | Due (project month*) | Date of submission | | Reasons for deviation and recuperative measures | Indicative person-months *) | | Lead contractor(s) |
				Actual	Fore-seen		Estim.	Used	
D16	Cardiovasc. dis. benefit meta-analysis	3	14	Oct 15, 2007		Submitted to Beneris web-site. Delivery date postponed as requested by the responsible partner	3	3	FFiles
D22	Preliminary benefit-risk analysis of fish	3	18		May 15, 2008	Work done, deliverable delayed due to parallel activities	1	1	KTL
D28	Other fish benefit review	3	20	15 May, 2008		The author of the review was on extended medical leave. Therefore the due date was extended to 31 Mar, 2008.	2	1	FFiles

Milestones

Name	WP no.	Due (project month*)	Actual achiev. date	Foreseen achiev. date	Reasons for deviation and recuperative measures	Lead contractor(s)
Review of the initial prioritization of the most important health benefits. Possible changes in work plan	3	6	6			FFiles
Quantification of the effect of fish on cardiovascular disease and mortality. Identification of the need for further expert elicitation and other work. Feedback from of benefit-risk analysis.	3	18		month 26	The expert needs have been identified. The information will be collected using in-house experts during spring 2008.	KTL/TUDeflt

WP4: "Case 2: Vegetables"

WP leader	FIN Lluis Serra-Majem
Partners involved	KTL, FSAI, DTU, FIN
Workpackage objectives	• To perform a preliminary benefit-risk analysis for vegetables in diet. A special focus will be on alternative sources of nutrients, such as supplements and food fortification. • To perform an updated benefit-risk analysis based on the preliminary analysis, the new intake data from several countries, and the redefined scope based on discussions among Beneris researchers.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- None (needed further development and application of methods in WP3).

Progress towards objectives

FIN:

FIN conducted an exhaustive review to generate summary tables on the risk-benefit relationship of vegetable consumption. This review addressing vegetable intake focused on children and adolescents. Four different reviews were performed, the last incorporating adults for a general overview of the subject. The aim of the first review was to look for the associated health risk of vegetable intake due to contaminant contents. The second search focused on the health effect (positive or negative) of vegetable consumption. The third one dealt with health benefits of consumption of supplements and fortified foods containing key vegetable nutrients. And the last focussed on general health effects (positive or negative) of vegetable consumption in adults. As stated in the WP4 description, the reviews mainly focused on the vegetables most consumed by children and adolescents. Data about vegetable consumption in children and adolescents came from the enKid study, a cross-sectional study conducted in Spain to evaluate food habits and nutrient intake in individuals from 2 to 24 years. This analysis included the collaboration of two Dutch Erasmus students (Joni Roelse and Annouk Engelen) during their practical rotation with FIN.

KTL:

One approach to perform this case study is to develop plausible diet scenarios with either high or low vegetable consumption. These scenarios would then be compared according to their health impacts by a nutrition scientist. This approach would need an in-house nutrition scientist to assess the health impacts. The feasibility of this approach has been discussed within KTL between the risk research groups (Jouni Tuomisto and Olli Leino) and nutrition group (Suvi Virtanen, Tero Hirvonen, among others). The discussions are still ongoing but are likely to be finalised within the next few months.

FSAI:

Case study 2 was scoped at the mid-term meeting in Helsinki in November. In 2008 FSAI will contribute vegetable consumption data for 6 year old children consuming an "unhealthy" low vegetable diet, compared with "balanced diet" children, and an attempt will be made to compare nutritional intake in these groups with health outcomes.

Deviations from the project workprogramme, and corrective actions taken/suggested

FIN:
This activity was implemented at a later time than scheduled due to the delay in the methodological definition and framework of the first case study on fish.

KTL:
The plan to proceed with this case from the nutritional point of view will be made during 2008.

FSAI:
Case study 2 has been delayed pending agreement among the Beneris partners about the objectives and scope of the work, so work will only commence in year 3.

Deliverables

None in this reporting period.

Milestones

Name	WP no.	Due (project month*)	Actual achiev. date	Foreseen achiev. date	Reasons for deviation and recuperative measures	Lead contractor(s)
A summary table of the most important risks and benefits of vegetables vs. supplements and food fortification	4	18	15 April, 2008		Postponed due to the overall timetable of the vegetable case study.	FIN

WP5: "Dissemination"

WP leader	FSAI / Iona Pratt
Partners involved	KTL, TUDelft, FSAI, DTU, FVST, Lendac, FIN
Workpackage objectives	• To develop an internet interface for publishing risk assessment results. Specifically, • to develop a method to publish entire benefit-risk models over the Internet using XML; • to develop methods to collect feedback from end-users about benefit-risk analyses; • to enhance the availability of existing databases through this interface. • 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.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- Beneris website was opened.

- A tool for transforming BRA models into web pages was developed.

- The planning of a Gordon conference was started.

The streams of dissemination activities and future plans of dissemination were discussed in detail in the 1st-year report.

Progress towards objectives

FSAI:

As outlined in the year 1 report, overall the dissemination activities are scheduled in the mid-term and end of the project, and the 2 years of the Beneris project have been focussed on methods development and tools for dissemination. The ongoing development of the Pyrkilo method for risk:benefit analysis and the increasing focus of the Beneris project on Open Risk Assessment (ORA) has constrained FSAI's input to WP5 to a major extent, although FSAI was nominally the workpackage leader for WP5

FSAI will support KTL as required in fulfilling one of the objectives of the project: evaluation of the relevance and usefulness of the work done in the project from the perspective of an end-user/food safety (deliverables 31 and 46, scheduled for months 21 and 40). This work will be undertaken in year 3 of the project, when the BBN and ORA methodology is more fully developed. FSAI will also provide toxicological input and oversight into the model as required.

A further scheduled deliverable is testing of consumer reactions (month 38). While FSAI was scheduled to play a role in this, using a test population of Irish consumers, and has undertaken a preliminary scoping exercise on methodology in 2007, a similar exercise has been carried out within Qalibra in 2007. In order not to duplicate activities, any further work will be undertaken as part of the Qalibra:Beneris cluster activities under the leadership of the lead contractors for both projects**.**

Lendac:

This partly overlaps with WP1 with regard to the benefit risk models and risk assesment tools etc to facilitate dissemination of information. The initial aspect of dissemination strategy was the development and hosting of the overall public access Beneris website and the consequent development of tools and technologies to facilitate dissemination of information via this website. This involved the development of a website to outline project objectives, partner information, progress reports, news events etc combined with a general search interface. The second aspect was a multi level authoring capability to facilitate publishing of information by various partners in the project under control of an overall editorial group. The third aspect was to ensure that the platform could handle yet to be developed public response activities such as feedback reports, polls etc on particular aspects of benefit risk analysis. The above aspects of the project are essentially completed.

The final aspect of Lendac's involvement in the dissemination area was in the development of Internet based tools to facilitate conversion and dissemination of results of benefit risk models. As outlined in WP1 this aspect of the project has been subject to some major changes in the interim period but development has been carried out on the various methods proposed including the model proposed in the initial proposal. Initial work in this area was developing and converting the XML output from benefit-risk models. At a later stage it was decided to replace part of this process with the conversion of benefit-risk model data to Mediawiki format which was completed. The Pyrkilo method is now the focus of the open risk assessment approach within Beneris. Lendac attended the Berlin workshop in September 2007 at which Pyrkilo and related methods of open risk assessment (ORA) were discussed which would result in the introduction or development of alternative Internet-based tools for information dissemination.

KTL:

There are three websites that are used in Beneris. First, the Beneris website (www.beneris.eu) managed by Lendac (see above). Second, a closed project website (managed by KTL) has been used for benefit-risk assessment work. Third, some parts of the work has already been opened to an openly available website (http://heande.pyrkilo.fi, managed by KTL), which is a general forum for open risk assessments and which is utilised by several other projects (esp. Intarese, and a Finnish project Erac). This website is an effective platform to disseminate project results towards other research projects, and also to other interested parties.

KTL, in collaboration with Qalibra project, and Sytyke (Graduate School of Environmental Health) organised a conference about environmental health in the Valamo monastery, Finland, on December 3-5, 2007. The theme of the conference was **Benefit-risk analysis: how to learn from previous assessments?** The conference was open to all aspects of environmental health. Risks and benefits of food were emphasized. There were about 60 participants, mainly researchers from Beneris, other EU projects, University of Kuopio, EFSA, and KTL.

KTL has developed an Internet interface in collaboration with Intarese project. The interface makes it possible to describe the contents and results of benefit-risk analyses, and enable stakeholders to bring up related issues and concerns. The internet site exists already, and the major properties that the interface will have are known. The basic functionalities have been installed.

The fish case study has been used as an example for dissemination activities and methods. There is a published article on this (Leino et al., 2008) about the preliminary benefit-risk assessment of fish. At the same time of submission, the actual benefit-risk model of this case was published in the Internet. Further work is going on to publish also the detailed

descriptions of the model contents and conclusions in a way that they can be understood without modelling experience. In addition, a possiblility to give feedback about the model and its conclusions is available already now.

The evaluation of the methodologies developed was started during the second year. A major effort in this respect was the project workshop, organised by KTL in Berlin in September 2007. This was used in internal training and evaluation. In addition, two participants from Qalibra were in the workshop as well. In addition, there was and other workshop in Kuopio in February 2008. The participants came from Beneris, Intarese, Envirisk, Hiwate, and Heimtsa, in other words the workshop had a wide coverage over the EU-funded research projects related to environment and health. One day out of five was dedicated to evaluation and collecting feedback about the methodologies applied in Beneris.

DTU, TUDeflt, FIN:

These partners have participated in the Beneris workshop in Berlin in autumn 2007, the midterm evaluation in Helsinki and the Valamo conference.

Deviations from the project workprogramme, and corrective actions taken/suggested

FSAI:

Dissemination deliverables and milestones have been somewhat delayed. While FSAI was nominally leader for WP5 and will still play a role in dissemination as required, in practice the main responsibility for this has transferred to KTL. This is considered appropriate since KTL have the knowledge and understanding of the methodology required for effective dissemination

Lendac:

As outlined above.

Deliverables

No.	Name	WP no.	Due (project month*)	Date of submission Actual	Date of submission Fore-seen	Reasons for deviation and recuperative measures	Indicative person-months *) Estim.	Indicative person-months *) Used	Lead contractor(s)
D17	Internet interface	5	14	July 6, 2007			10	7	Lendac
D31	Enduser evaluation	5	21		Dec 31, 2008	Evaluation has been delayed pending refinement of the risk-benefit methodology. Project coordinator will work closely with FSAI to ensure understanding of the method in order to enable this evaluation by the end of 2008	2	0	FSAI

Milestones

Name	WP no.	Due (project month*)	Actual achiev. date	Foreseen achiev. date	Reasons for deviation and recuperative measures	Lead contractor(s)
Initial application of model to simple benefit: risk scenarios other than those developed during the project (the second project meeting).	5	ca. 19	Dropped.		The methods developed are used in collaboration with project INTARESE.	
Initial development of material for dissemination of outcome of the benefit-risk assessment of contaminants in fish (second project meeting).	5	ca. 19	Nov 2007			KTL

WP6: "Cluster activities"

WP leader	KTL / Anna Karjalainen
Partners involved	KTL, TUDelft, FSAI
Workpackage objectives	The objective is to establish a platform for cluster activities between Qalibra and Beneris projects and report about them to the Commission.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- Beneris kick-off meeting on May 2006.

- The first Cluster meeting and a report containing the output from the Cluster meeting (deliverable D3)

- Joint web page opened.

- Collaboration with TU Delft and CSL about modeling.

- Cluster coordination.

- Joint project meetings planned/organized.

- Gordon conference in preparation.

- Scientific advisory panel appointed.

Progress towards objectives

TU Delft:
Cluster activities taken by TU Delft during the reporting period are listed below:

- 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.

- Patrycja Gradowska participated in a conference in Valamo Monastery on environmental health risk assessment (organized by KTL in collaboration with Beneris, Qalibra projects, with ERAC and Sytyke) where she presented the Bayesian Belief Network approach to be applied in the benefit-risk assessment of fish in the Beneris project.

FSAI:
One of the objectives of the cluster activities between Qalibra and Beneris is development of an integrated dissemination strategy (D5, month 4 of the project). FSAI and Wageninen University had joint responsibility for this, while overall responsibility for cluster co-ordination lies with the project coordinator of Qalibra. At this stage in the projects, an integrated dissemination strategy has not been progressed. It is recognised that more work has to be done in collaboration between QALIBRA and BENERIS, while the dissemination strategy for Beneris has been delayed pending refinement of the risk:benefit methodology. The integrated dissemination strategy will be developed in year 3 by and following discussions between the 2 project coordinators on strengthened collaboration.

KTL:

The major cluster activities by KTL relate to dissemination and they are described under WP5. These are the open website for BRA (http://heande.pyrkilo.fi); the project workshop in September 2007; the Valamo Gordon conference in December 2007; and the Open risk assessment workshop in February 2008.

Deviations from the project work programme, and corrective actions taken/suggested

None.

Deliverables

No.	Name	WP no.	Due (project month*)	Date of submission Actual	*Fore-seen*	Reasons for deviation and recuperative measures	Indicative person-months *) Estim.	Used	Lead contractor(s)
D23	Second project meeting	6	19	Nov 8, 2007			1	1	KTL

Milestones

Name	WP no.	Due (project month*)	Actual achiev. date	*Foreseen achiev. date*	Reasons for deviation and recuperative measures	Lead contractor(s)
Scientific Advisory Panel Meetings	6	19 and 39	8 Nov, 2007			
Sharing data on concentrations (exposure assessment) for different fish species (Salmon & herring from BENERIS and other oily fish from QALIBRA)	6	12		*April 2008*	Postponed due to changes in the development of data repository.	KTL
Planned cluster meetings of the partners, month 19 (midterm) where results from riskbenefit analysis of salmon & herring (BENERIS) and other oily fish (QALIBRA) will be compared, integrated and discussed and month 39 (final cluster meeting) where final results of salmon & herring (BENERIS) and other oily fish (QALIBRA) will be integrated	6	19 and 39	7-9 Nov, 2007			KTL

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The work in WP7 is described below under Section 3 (Consortium management).

Section 3 - Consortium management

WP leader	KTL /Jouni Tuomisto
Partners involved	KTL, TUDelft, FFiles, FSAI, DTU, FVST, Lendac, FIN
Workpackage objectives	The objective of this activity is to guarantee a smooth and effective collaboration between partners, and an organised processing of different activities so that all partners are working in concert, and at the end of each year and at the end to take lead in reporting activities.

Starting point at beginning of reporting period

Main achievements of the 1st reporting year:

- Kick-off meeting organised.

- Steering committee elected.

- Framework development agreed upon.

- Project deliverables prepared.

- Upcoming Gordon conference and 2nd project meeting prepared.

- Partners informed via email on relevant issues.

Progress towards objectives

KTL:
The coordinator is undergoing a reorganisation of tasks in aim to improve the project coordination and management. Some tasks have been redistributed already, but the process will still go on for a few months. The process was unfortunately delayed due to long sick leaves of two full-time researchers from the coordination team. The situation has now come back to normal, but it will take some time before all tasks due are up-to-date again.

KTL (food studies unit):
Contact has been kept to other members of Beneris within KTL regarding overall timetable of deliverables and how to proceed with WP2.3.

FSAI:
FSAI has participated in the collaborative activities between partners, most recently in the Berlin Training Workshop in September 2007 on benefit:risk methology and in the mid-tem meeting in November 2007, and has contributed to the first year report and to this 2nd-year report.

Lendac:
Lendac has been involved in various group discussions and meetings (eg Berlin September 2007 workshop) regarding project development. The initial website development provides a a platform for collaborative information sharing and dissemination.

Changes in personnel. Consortium management problems and corrective actions.

Dr. Erkki Kuusisto was given the responsibility of reporting and managerial issues of BENERIS. These tasks previously belonged to Dr. Anna Karjalainen.

Dr. Anna Karjalainen was given the responsibility to collect, organise, and synthesise the methodology description. This work is done in collaboration with INTARESE.
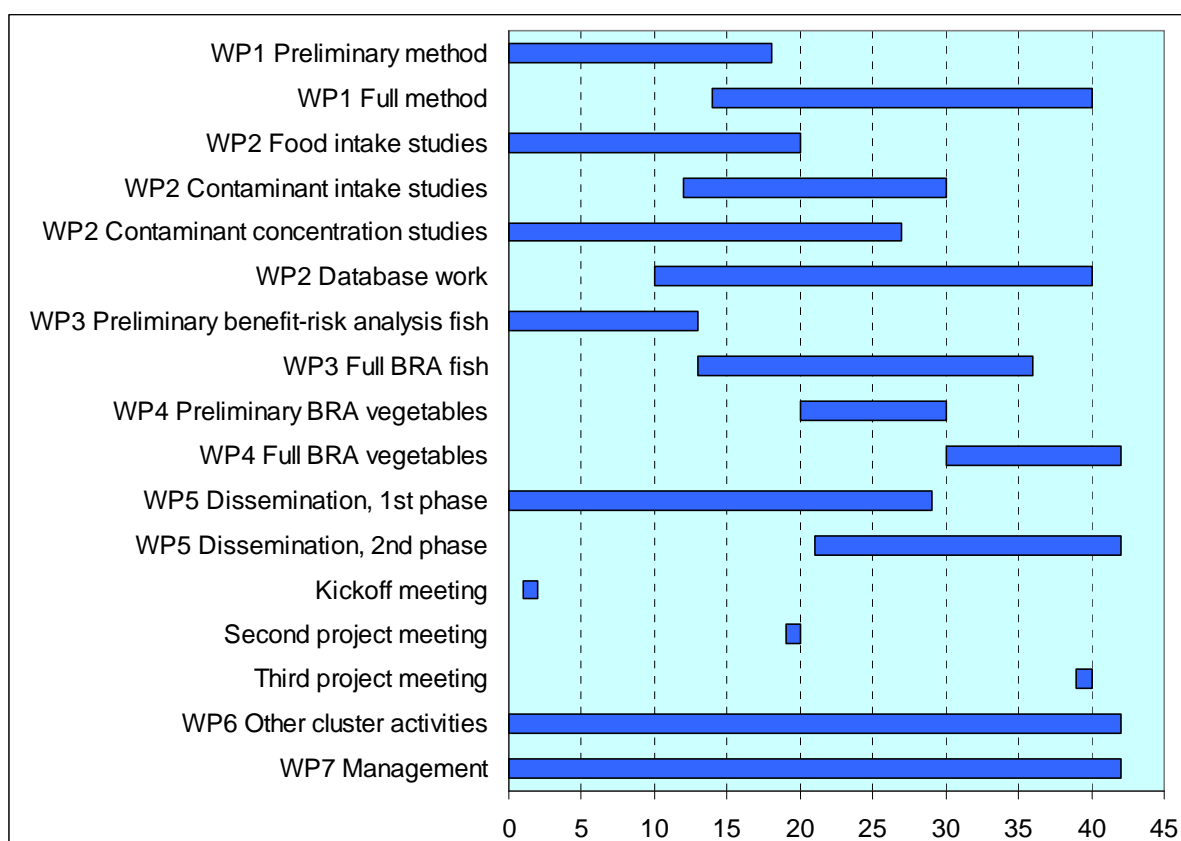
The task distribution between the coordinator Jouni Tuomisto and Mr. Olli Leino was clarfied. Olli Leino is now more clearly responsible for the management of the case studes.

There is a need for one more person in the management and cooordination of BENERIS. The recruitment of this person is still ongoing. If possible, this will be done using in-house distribution of tasks.

Project timetable and status

There are no major changes in the project timetable. The start of Case 2 (Vegetables) and the database work has been postponed slightly. On the other hand, the preliminary benefit-risk analysis of fish has been finalised slightly sooner than anticipated.

The current timetable is shown below.

Deliverables

No.	Name	WP no.	Due (project month*)	Date of submission Actual	Date of submission Fore-seen	Reasons for deviation and recuperative measures	Indicative person-months *) Estim.	Indicative person-months *) Used	Lead contractor(s)
D13	First year report	7	12	May 14, 2007			0.5	1	KTL
D24	Midterm review report	7	20	Jan 16, 2008			0.5	0.5	KTL

Milestones

Name	WP no.	Due (project month*)	Actual achiev. date	Foreseen achiev. date	Reasons for deviation and recuperative measures	Lead contractor(s)
The second project meeting (ca. month 19), reporting and further planning, decision of one or two other cases for benefit-risk analysis	7	ca. 19	Nov 2007			KTL
End of iterative phase 1 (month 19), preliminary draft of benefit-risk analysis on fish consumption distributed to partners	7	19	Nov 2007			KTL

Section 4 - Other issues

None.

Appendix I - Plan for using and disseminating the knowledge

Section 1 - Exploitable knowledge and its use

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. 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 has been opened (http://heande.pyrkilo.fi), and the first benefit-risk analysis on fish (Case 1) has recently been launched.

Table 1/I. Exploitable Knowledge and its Use.

Exploitable Knowledge (Description)	Exploitable Product(s) or Measure(s)	Sector(s) of Application	Timetable for Commercial Use	Patents or Other IPR Protection	Owner & Other Partner(s) Involved
Benefit-risk analyses (BRA) of food issues. The content is open and freely available to all.	A website to collect, organise, and distribute BRA information. http://heande.pyrkilo.fi	Food safety. Environmental health.	-	Based on General Public Lincense.	Owner: KTL. All partners involved in developing the website and/or producing information.

Section 2 – Dissemination of Knowledge

Table 1. Dissemination of Knowledge - Overview.

Planned/Actual Dates	Type +	Type of Audience ++	Countries Addressed	Size of Audience	Partner Responsible
October 22-23, 2007	Scientific workshop on advanced methods in dose-response estimation. A speech about the Beneris work by Jouni Tuomisto.	Risk assessors mainly from the USA, especially from the U.S.EPA	USA	ca. 50	2. TUDelft, Roger Cooke; Jouni Tuomisto (KTL) and Patrycja Gradowska (TUDelft) participated
December 3-5, 2007	Gordon-type conference in the Valamo monastry, Finland	Researchers from Finland and Europe	Several EU countries	ca. 60	1 KTL, Jouni Tuomisto
February 11-12, 2008	BRAFO kickoff meeting: presentation about Beneris by Jouni Tuomisto	Researchers in BRAFO	Several EU countries, EFSA-	ca. 40-	1. KTL, Jouni Tuomisto (participant)
February 18-22, 2008	Open risk assessment workshop	Researchers from several EU-funded projects	Several EU countries	25	1. KTL, Jouni Tuomisto

+ Includes press releases (press/radio/TV), media briefings, conferences, exhibitions, publications, project website, posters, flyers, direct e-mailing, film and video

++ General public, higher education, research, industry (sector x)

Section 3 - Publishable results

Table 2. Publishable Results.

Result Description	Possible Market Applications	Stage of Development	Collaboration Sought or Offered	Collaborator Details	IPR Granted or Published	Contact Details
A website to collect, organise, and distribute information on issues relevant for benefit-risk analyses (BRA) of food. http://heande.pyrkilo.fi	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 General Public License.	Main developer: KTL	Based on General Public License.	Jouni Tuomisto, KTL, P.O.Box 95, FI-70701 Kuopio, Finland. email: jouni.tuomisto[at]ktl.fi