



Midterm Status Report 2002 and Application for Continuation in 2003

For research projects financed by grants from
The Directorate for Food, Fisheries and Agro Business
under the Danish Ministry of Food, Agriculture and Fisheries

1. Research program

Research in organic farming 2000-2005 (DARCOF II)

2. Project title and number

Production of organic milk of high quality considering the future demands for use of organically produced feed and natural vitamins (II-2)

3. Head of project

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6. Project period (month, year)

Start of project: 01/2002
End of project: 12/2004

7. Midterm description of the project, its results and progress, and application for continuation in 2003

A. Project summary

Future regulations for organic production of milk stipulate that all feed must be organically produced, and that the cow can only be fed natural vitamins and antioxidants. This leads to feeding changes of such importance that it must be presumed to influence the antioxidative capacity and thus the shelf-life of the milk. The project aims at elucidating the nature of the consequences that these new regulations for organic feeding and use of natural vitamins and antioxidants for cows in organic milk production will have on the antioxidative capacity of the milk. New studies show that uric acid in milk is an important antioxidant of significance for the oxidative stability of milk. During the project, it is the aim to increase the supply of selenium and the development of endogenous antioxidants (uric acid and glutathione peroxidase) in order to produce oxidatively stable milk and dairy products.

Table A.1: Work package list (from application)

No.	Work package title	Participants*	Budget (1.000 DKK)	Start	End	Deliverable no(s):
1	Antioxidative capacity of raw milk	<u>Jacob Holm Nielsen</u>	1668	0102	1204	D1-D11
	Cheese production and oxidative stability of cheeses with high level of uric acid and selenium	<u>Leif H. Skibsted</u>	330	0104	1204	D5, D8 &D12

* Responsible participants are underlined

B. Objectives and expected achievements

To elucidate the effect of introducing new rules for organic feeding and use of natural vitamins and antioxidants on the antioxidative capacity of the milk from cows producing milk under organic conditions. Furthermore to increase the selenium supply and the formation of endogenous antioxidants (uric acid and glutathione peroxidase) of the cow in order to produce oxidatively stable milk and dairy products.

The aim consists of the below intermediate aims:

- to study the variation in content of pro- and antioxidants in organic milk from a number of herds in relation to regional variation, feeding and season
- to study whether the natural isomer of vitamin E is a more effective antioxidant than the synthetic isomer of vitamin E
- to study whether the natural carotenoid content in milk has an antioxidative effect

- to study whether cheese exposed to light shows improved antioxidative characteristics if it is based on milk with a high uric acid content
- to make guidelines on how to improve the oxidative stability of the organic milk through feeding

Achievements

The project aims at investigating the possibility to create processed dairy products (cheese) with an oxidative stability up to the same standards as conventionally produced dairy products. The project will introduce the possibility of using endogenously formed antioxidants (uric acid and glutathione peroxidase) and natural vitamin E to improve shelf-life of organic dairy products. The project is holistic and comprises the chain from stable to table. It involves inter-institutional cooperation and is based on expertise at both KVL and at DJF.

C. Midterm results and progress

C.1 Description (summary) of main results and conclusions

A method for analysis of glutathione peroxidase (GPX) in milk has been developed. The results indicate that GPX content in milk is related to the content of red blood cells in milk. Further investigation is needed. For the first time has glutathione S-transferase been isolated and identified (by MALDI-TOF MS) in milk. This enzyme is a potential candidate as antioxidant in milk. A publication is going to be published in the near future.

C.2 Fulfilment of deliverables and milestones

(To be completed for each work package)

WP1 Antioxidative capacity of raw milk, DIAS	Time schedule according to application	Deviations, if any*
Deliverables		
1 Report for the Danish Dairy Board	10/2002	
2 Report for the Danish Dairy Board	04/2003	
3 Report for the Danish Dairy Board	10/2003	
4 Report for the Danish Dairy Board	04/2004	
5 Report for the Danish Dairy Board	10/2004	
6 Final report for FØJO and the Danish Dairy Board	12/2004	1 year
7 Paper for Mælkeritidende	05/2002	6 months
8 Paper for Mælkeritidende	10/2004	1 year
9 The shelf life of organic milk in relation to feeding (paper)	8/2002	1 year
10 The antioxidative capacity of natural vitamin E in milk (paper)	6/2004	1 year
11 Mechanistic study of vitamin E i MFGM (paper)	8/2004	1 year

Milestones		
1 Characterization of milk from organic herds finished	5/2004	1 year
2 Variation in the oxidative stability of milk	5/2004	1 year
3 Feeding experiment with natural vitamin E finished	3/2005	1 year
4 Model experiments with vitamin E incorporated in the fat globule membrane og milk	3/2005	1 year
Light induced processes in cheese is described in relation to the level of natural antioxidants	12/2004	

WP2 Cheese production and oxidative stability of cheeses with high level of uric acid and selenium	Time schedule according to application	Deviations, if any*
Deliverables		
5 Report for the Danish Dairy Board	10/2004	
8 Paper for Mælkeritidende	10/2004	1 year
12 Influence of urate and selenium on light induced oxidative changes in cheese	12/2004	
Milestones		
5 Light induced processes in cheese is described in relation to the level of natural antioxidants	12/2004	

* *Deviations are to be further discussed in D*

D. Description of deviations and subsequent adjustments of plans

The project start was delayed with 4 month, because of delay of the grant from FØJO . Furthermore have we applied SOAR for support of a ph.d-student (1 year salary). The ph.d-student is expected to start on the project 01/2003. Because of these changes has the duration of the project increased with one year to the end of 2005. If we get the applied support from SOAR will the contribution to the project increase in order to understand the potential of natural antioxidants in milk.

The deviations in the projects means that we in the future will include three new deliverables in WP1:

D13 Report for the Danish Dairy Board 04/2005

D14 Report for the Danish Dairy Board 10/2005

D15 Defence of ph.d-thesis 12/2005

E. Project publications and other products

1. Articles in international, scientific journals with review procedures
2. Papers presented at congresses, symposiums, etc.
3. Reports, articles in agricultural journals, etc.
4. Oral presentations, public meetings, field days, etc.

F. Scientific education

In relation to this project is educated a ph.d.-student

G. National and international cooperation**H. Critical reflection on the project**

8. Budget

A. Account for any change in budgets

B. Budget for the whole project (1.000 DKK)

Total consumption of funds from DARCOF and expected consumption this year and coming years

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months						
Scientific personnel		2.9	7.2	12.8	5.3	28.2
Technical personnel		0.9	5.9	6.0	4.2	17.0

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries						
Scientific personnel		100	260	450	200	1010
Technical personnel		20	130	140	100	390
Other operational costs		20	65	160	20	265
Equipment						
Others (please specify)						
Direct costs		140	455	750	320	1665
Indirect costs (20% of direct costs)		28	91	150	64	333
Total		168	546	900	384	1998

The project is furthermore supported by 1.6524 mill kr by the Danish Dairy Board.

Comments:

9. Signatures and stamps

Name	Institute	Date	Signature
Head of project			

Appendix I. Detailed budget

A. Budget for each participating institute (1.000 DKr)

Name of Institute: Dept. Of Animal product Quality, DIAS

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months						
Scientific personnel		2.9	7.2	6.0	5.3	21.4
Technical personnel		0.9	5.9	6.0	4.2	17

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries						
Scientific personnel		100	260	225	200	785
Technical personnel		20	130	140	100	390
Other operational costs		20	65	110	20	215
Equipment						
Others (please specify)						
Direct costs		140	455	475	320	1390
Indirect costs (20% of direct costs)		28	91	95	64	278
Total		168	546	570	384	1668

Comments:

B. Budget for each participating department (1.000 DKK)

Name of Institute and department:

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months						
Scientific personnel				6.8		6.8
Technical personnel						

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries						
Scientific personnel				225		225
Technical personnel						
Other operational costs				50		50
Equipment						
Others (please specify)						
Direct costs				275		275
Indirect costs (20% of direct costs)				55		55
Total				330		330

Comments: