



Progress Report 2004 and Application for Continuation in 2005

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The Directorate for Food, Fisheries and Agro Business
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1. Research program

Research in organic farming 2000-2005 (DARCOF II)

2. Project title and number

Poultry Production Systems- Health and Welfare FØJOII-6

3. Head of project

Poul Sørensen Dr. Agro., Souschef
Afd for Husdyravl og Genetik
Danmarks JordbrugsForskning
Postboks 50
8830 Tjele
Tlf: 89 99 13 03
Fax: 89 99 13 00
E-mail: Poul.Sorensen@agrsci.dk

4. Participating institutes

Danmarks JordbrugsForskning
Postboks 50
8830 Tjele

I. Afd. for Husdyravl og Genetik
Tlf: 89 99 19 19
Fax: 89 99 13 00

II. Afd for Husdyrsundhed og Velfærd
Tlf: 89 99 19 19
Fax: 89 99 15 00

Den kgl. Veterinær og Landbohøjskole
Institut for Veterinær Patobiologi
Stigbøjlen 7
1870 Frederiksberg C

Tlf: 35 28 27 06
Fax: 35 28 27 55

5. Other project staff

Seniorforsker Birte Lindstrøm Nielsen. Afd. for Husdyrsundhed og Velfærd, Danmarks JordbrugsForskning, Postboks 50, 8830 Tjele.

Tlf. 89 99 13 73, fax: 89 99 15 00, e-mail Birte.Nielsen@agrsci.dk

Adjungerende Lektor Anders Permin, Institut for Veterinær Patobiologi, Den Kgl. Veterinær- og Landbohøjskole, Stigbøjlen 7, 1870 Frederiksberg C. E-mail pmin@lundbeck.com

Forsker Jørgen B. Kjær, Afd for Husdyrsundhed og Velfærd, Danmarks JordbrugsForskning, Postboks 50, 8830 Tjele

Tlf. 89 99 13 24, fax 89 99 15 00, e-mail J.Kjaer@agrsci.dk

Forsker Guosheng Su, Afd for Husdyravl og Genetik, Danmarks JordbrugsForskning, Postboks 50, 8830 Tjele

Tlf. 89 99 12 67, fax 89 99 13 00, e-mail Guosheng.Su@agrsci.dk

Ph.d.studerende Nicoline Maag Eigaard, Institut for Veterinær Patobiologi, Den Kgl. Veterinær- og Landbohøjskole, Dyr lægevej 2, 1870 Frederiksberg C. (Ansæt pr 1. nov. 2001), e-mail NME@kvl.dk

Lektor Jens Peter Christensen, Institut for Veterinær Patobiologi, Den Kgl. Veterinær- og Landbohøjskole, Stigbøjlen 7, 1870 Frederiksberg C. e-mail JPC@kvl.dk

6. Project period (month, year)

Start of project: December 2000
End of project: June 2005

7. Midterm description of the project, its results and progress, and application for continuation in 2005

A. Project summary

The organic table egg production in Denmark has over the past 5-6 years increased from nought to 12 % of the marked egg, while the table chicken production is at its beginning.

Farmer's that want to produce organic table eggs is faced with several problems.

1. In free-range flocks, including organic systems, it has often been observed that the flock has started to perform feather pecking that ended with an unacceptable high rate of cannibalism.
2. Mortality due to infectious diseases might be high in organic production systems as the free range does not allow a biosecurity program that is known in e.g. the cage system and lack of knowledge on management and good farm practice in this new farm system is obvious

Basic research on organic table egg production was performed in the previous research program under DARCOF, which resulted in the Darcof report No. 11 from 2001. In this report a number of advises on how to rear the chickens are given, some thought on infectious diseases and some experiences from nutrition experiment is given as well. Comparison of a non-commercial breed with the ISA Brown was performed under short term condition in experimental condition showing large differences in production level in favour of the commercial breeds, but also they showed an unacceptable high cannibalistic performance that resulted in a mortality rate of 15% within 7 month. (The wording Breed is used in this report, but often it will be a cross of 2-4 lines/breeds why breeds or breed combination is sometimes seen in the literature)

The breeding stock used for table egg production have, through many generations, been selected for high performance based on their production capacity measured in individual cages. Little attention has been paid to their genetically based ability to behave well in large flocks of hens. The result of such a breeding policy is a high yielding hen, but she appears to have lost some of her ability to have suitable social relations when kept in large flocks.

The breed combination currently used in organic table egg production systems in Denmark is the ISA Brown, which is laying eggs with brown shells, has a high laying capacity and is available on the market as day old as well as pullets ready to lay. The drawback in using this breed for organic table egg production is the increasing evidence of feather pecking in larger flocks. Thus the question is: are there breeds available that are more suitable for organic production?

The Random Sample Test (RST) is the system used to compare the various breeding materials. The benefits of the RST is that the egg producers get the comparison of available breeds and could make their choice among these. Most RST-stations were supported by public funds, and managed by research institutes. As poultry breeding became more and more commercialised this arrangement was given up and the RST stations, have been closed one by another. This has followed the other major trend in world wide poultry breeding that the numbers of breeding companies have decreased and those left has becoming world wide which means that they show little interest for supplying breeding material specifically adapted to a comparatively small market for organic table production in Northern Europe. Recently at the 11th Poultry Conference in Bremen September 2002 some of the 4 transnational breeding companies admitted that they was starting to including the free range aspect into their breeding programme.

A small scale Danish Hatchery "Hellevad" has bred a New Hampshire line ever since 1960 under floor condition and with a mild selection pressure on laying traits. The Hellevad Hatchery also

breed the female White Leghorn line from the former “Skalborg” breeding centre, which was known to perform well in floor systems. In Uppsala in Sweden the “Blommahønen” is under test for laying, and in the Czech Republic the breeding company Dominant have strains of poultry which may be suitable for organic table egg production as they until recently were bred under floor condition.

Among the behaviour traits giving rise to particular welfare problems for the hen in organic production systems are feather pecking and cannibalism. We found and reported that the heritability for tendency to feather pecking, observed in 20-30 min. on each bird in standardised condition, had a size which was promising for use in a breeding programme.

Diseases constitute an enormous problem in organic farming systems. According to the annual report from The Danish Poultry Council (Anonymous, 1999) 4.8 and 9.4% died in a production period of 1 year in traditional battery cage or deep litter production systems respectively. However, in free-range organic production systems the mortality rate has been 14.9 % and has even been reported to be as high 50% in individual flocks. To date there has been no systematic studies on the reasons for this high mortality. Reports have indicated that a range of diseases are present in these systems, i.e., *Pasteurella multocida*, egg drop syndrome (Adenovirus), *E. coli* and *Histomonas meleagridis* (black head). Furthermore, due to the outdoor conditions and the large flock size (up to 5.000 animals) parasitic diseases are very common (Permin et al. 1999). Several studies have shown that all animals are parasitized at a stage in their life and that specially *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria obsignata* and *Eimeria* spp. are common infections. Recent studies have shown that the interaction between for instance *Ascaridia galli* and *Pasteurella multocida* create *Pasteurella* carrier animals enhancing the zoonotic aspects of *Pasteurella*. *Ascaridia* eggs might also be able to transfer Salmonella to healthy animals (Chadfield et al. 1999). Many of these infections & aspects are not seen in conventional indoor systems due to the high level of management and biosecurity.

Under current Danish rules, breeds used in the organic table chicken production has to be slow-growing and the growth period must be at least 81 days. One of the major problems in organic broiler production is the high incidence of breast blisters, which in a recent Danish survey was 7% on average, with some farms having a 17% incidence. Breast blisters can become puss filled and painful to the touch, and the condition is worsened by contact with ammonia rich litter. In addition to these obvious welfare consequences, breast blisters also result in a quality downgrading of the carcass at the slaughterhouse. Perches are obligatory in organic broiler houses, but little is known about the relationships between breast blisters, perch availability and the use of perches and outdoor areas by broilers. Breed differences in the prevalence of breast blisters has also not been investigated. In order to ensure high welfare standards in organic broiler production it is also important to choose breeds which are robust and behaviourally suitable.

In this project major focus is on the laying hen in commercial, organic flocks.

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

No.	Work package title	Participants*	Budget (1.000 DKK)	Start	End	Deliverable no(s):
1	Breed performances and welfare at farm level	<u>JBK</u> , PS, GS	1270	2001	2005	D1-D4
2	Studies on disease incidence and the significance of diseases and interaction in or-	<u>APE</u> , NME, JPC	1590	2001	2004	D5-D13

	ganic free-range poultry					
3	Genetics of feather pecking, and breed performance at experimental level	<u>PSO</u> , JBK, GS	1020	2000	2003	D14-D15
4	Breed performances and welfare of table chickens	<u>BLN</u>	660	2001	2002	D16-D17
5	Farmer compensation, experimental farms and consultancy.	<u>PSO</u>	850	2000	2004	
6	Co-ordination and management of the project	<u>PSO</u>	240	2000	2005	

* Responsible participants are underlined

B. Objectives and expected achievements

The objectives of the proposal is to obtain knowledge needed to improve the welfare of organic reared poultry and give the producer at better and less variable income. That will be carried out through investigating the problems related to management, production, health and their interactions using different breeds of laying hens and table chickens held in organic free-range system.

In particular:

- To create knowledge about the suitability of the existing breeding materials regarding table egg production under organic principles on farm level.
- To conclude investigations about the genetic mechanisms in laying hens, having influence on feather pecking and cannibalism, to an extent that commercial breeding companies can use this in their breeding programmes.
- To identify elements in the management and environments which will improve the welfare of the birds
- To investigate the incidence (occurrence) of diseases in organic table egg production systems and to relate disease prevalence and management system
- To investigate the interaction between diseases
- To develop strategies to improve disease prophylaxis in organic poultry production
- To examine the relationship between availability and use of perches in table chickens of different breeds and the time budget of the birds and the incidence of breast blisters as parameters for welfare.

C. Midterm results and progress

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

WP 1) The contact and selection of three farmers that is willing to divide his facilities into two parts in order to keep two different strains of hens and record laying and feed intake separately is in a firm pattern. The situation is as follow:

FARM 1 Situated in Vendsyssel. Contract established and agreement obtained that they should compare ISA Brown and LSL. After a period with much diseases the owner decided to stop with this flock already after 9 months, and we have agreed with him that no further research is done on this farm.

FARM 2 is situated in Vest Jylland. Agreement was obtained regarding the first batch to compare the breeds Hellevad and ISA Brown, each in a number of 3.000. They were hatched medio oktober 2001 and reared at Bredahl Fjerkræ and transferred to Farm 2 at the age of 16 weeks and the hen started to lay in februar 2002 and they were stopped 9 month later due to salmonella infection. The next batch consists of Lohmann Brown and Lohmann Tradition and they started rearing in October 2002 at Asta Bredahl and they were placed ultimo februar 2003. The third and last batch will consist of Hyline White and Hyline Brown. They will be placed as dayold at The Bredahls in oktober 2003 and started at 13th Febr 2004 as laying hens.

FARM 3 is situated at the west coast of Vendsyssel. Agreement on Isa Brown and Hyline Brown in a number of 3.000 for each breed was obtained and they started rearing at Bredahl Fjerkræ primo March 2002 and were transferred to Farm 3 in June 2002 and run for a complete period. The next batch consists of Isa Brown and Lohmann Silver, they were hatched ultimo Feb 2003 and placed at Farm 3 medio june 2003. Agreement on the last batch is not yet done.

As substitute for Farm 1 we have made an agreement with a farmer in Mid-Jutland. That is termed Farm4 and he started ultimo march 2003 with Lohmann Silver and Babcock. The second and last batch were planned to be placed in March 2004, but no agreement is obtained.

Protocols for the behavioural and clinical recordings involves visit four times during a batch in which the behavioural and welfare are recorded. The health is followed by post mortem investigation of all dead birds. If special diseases shows up a closer contacts in forms of visits etc. takes place. Production data is withdrawn from the E-control run by the Danish Poultry Council in which some detail data on the individual flock can be found. In addition we got the data from the Egg Packing unit regarding detailed data on quality of the eggs. It is planned to start the data handling and analysing in the end of 2004.

WP 2) One interaction study has been carried out between *Ascaridia galli* and *Salmonella* in chickens. The study has shown that the interaction between *Ascaridia galli* and *Salmonella* create *Salmonella* carrier animals enhancing the zoonotic aspects of *Salmonella*. At the moment two papers are in the process of being written and it is expected to submit both papers in year 2004 or in the beginning of year 2005.

Post mortem examinations of dead birds from Farm 1 were finished in July as the chickens were slaughtered at that time. The mortality reached 91% at Farm 1 due to outbreaks of *Pasteurella multocida* and *Erysipelothrix rhusiopathiae*. Molecular characterization of several isolates of above mentioned agents has been done and demonstrated establishment and spread of a successful clone of *P. multocida* spp. *multocida* and *E. rhusiopathia*, respectively. In addition, it was demonstrated that these two pathogens might cause severe losses in free-range chickens with a mortality rate as high as 91%. At the moment one publication is in the process of being written and it will be submitted in near future.

Cohort studies in 14 farms with layers have been carried out. In total 10 farms with organic production and 4 farms with deep litter production are included in the study. At the moment the last data are being collected from the farms and data from post mortem examinations are in the process of being analysed. The intention is to publish one paper on the studies on causes on mortality in free-range chickens in Denmark and to elucidate the possible relationship between diseases prevalence and production systems. In three of the organic farms a high mortality was initiated shortly after the start of the production period due to an outbreak of Histomoniasis. A high number of the chickens submitted for post mortem were concurrently infected with E.coli. At

present plasma profiles of several of the isolates of *E. coli* is running (one publication is in the process of being written). In addition, high mortality was observed at the end of the production period in 1 of the 3 flocks, which had a previous outbreak of Histomoniasis. This high mortality was demonstrated to be associated with an outbreak of *Erysipelothrix rhusiopathia*. The intention is to deliver one publication about clonal stability of *E. rhusiopathia* in free-range layer as outbreak of *E. rhusiopathia* had been observed at two farms in WP2. From all 14 farms in the cohort study serum samples have been collected and serological profiles for selected diseases will be determined in the coming months. The results from this serological survey will either be included in the paper which present the other result from the cohort study or in one separate paper (depending on the outcome of the serological survey).

WP3. Feather pecking behaviour of generation 5 selection lines as well as the control line was recorded in February and March 2002. Recordings were made in mixed groups consisting of 10 high- and 10 low feather pecking line birds. The videotapes from three hours of behavioural observations were analysed during the summer and breeding values estimated in November, 2002. After selection, insemination and collection of hatching eggs, the sixth generation of pedigreed birds were hatched in January and February 2003 (three hatches). Rearing was done in mixed line groups in floor pens.

Clinical examinations of generation 5 adult hens revealed a higher body weight of the control line compared to both selection lines. Selection lines did not differ from each other with respect to body weight, but the level of feather pecking was significantly higher in the high-line, medium in the control and lowest in the low-line, as expected.

Task 15: Parents of generation 5 have produced chickens for task 15 and data on individual egg production and feed efficiency have been collected during spring, 2002. Data analysis showed that selection for feather pecking is genetically correlated to feed efficiency and in particular to the need for maintenance and the two selected lines deviated in a 4 week test period by more than 10% regarding feed intake adjusted for egg production and a possible weight gain. The control line was intermediary in between the two selected lines. This is new knowledge and indicate that either the better covered plumage in the low feather pecking line save energy for keeping warm or the birds are less active. Supplementary investigations on birds in floor pens support this last suggestion that high feather peckers are more active, see Task 16.

Task 16: Parents of generation 5 of selection lines as well as control line produced 1500 chickens for task 16. A contract with a commercial farmer was made and a complete rearing unit with 48 pens was built. Chickens were placed in the unit in July 2002. Recordings of feather pecking, general activity, pecking to inanimate stimuli (string and feather bunch) and egg production has been done. With regard to individual laying pattern an electronic system for recording of individual laying pattern in loose housed layers has been developed. All 600 hens of selection lines and control line of generation 6 have been marked with an electronic transponder using leg-rings. Single bird nests (48) have been installed in the floor pens used for rearing (see above) and each nest has been equipped with an antenna. A special electronic device made for the experiment scans all nests during a 30 sec cycle and record the number of any hen in a nest as well as the exact time of observation. Furthermore, a device monitoring egg production has been developed. An automatic recording of nest number, egg laying and date and time of egg laying are made. Finally these data will be merged to assess the individual nesting behaviour of all pedigreed birds. This electronic equipment has been used to perform a more detailed study of the activity pattern of individual birds from the three lines. Two mixed line groups of 180 birds each has been housed in pens with antennas on the floor. In this way we will be able to record the movement of single birds and thereby estimate the relative general activity. Very preliminary data from the first group

of birds support the suggestion of higher activity of high pecking birds.

With regard to the commercial breeds day-old chickens were placed in the ‘eco-cottages’ in July 2002. Eggs from 6 breeds were incubated, but due to low fertility/hatchability there was a shortage of chickens of one breed (Bovans Gold), resulting in only 5 breeds are being tested. Recordings of feather pecking, plumage condition and egg production are progressing as planned. The experimental part was finalised ultimo October 2003.

WP4) Two simultaneous experiment were carried out from 9th of April to 2nd of July 2002. In the first experiment two strains were compared: i657, which is the strain conventionally used for organic table chicken production in Denmark, and Labresse, which is a dual-purpose strain of French origin. Both strains were kept according to the rules for organic table chicken production in Denmark (e.g. they had access to perches from day-old and roughage available from 3 days of age, outdoor access from 6 weeks of age and were slaughtered at 84 days of age). In the second experiment, only i657 birds were used. They were kept in 12 groups of 50, and had access to either 0, 7.5 or 15 cm of perch space per bird throughout the rearing period. In both trials, perch use was recorded using video equipment, the use of outdoor areas was recorded by behavioural observations using a time sampling technique, and data on breast blisters, foot pad lesions, dermatitis and production parameters were obtained at slaughter. This fulfills **Tasks 18** and **19**.

Task 20: The prevalence of breast blisters was significantly higher in the Labresse strain (42%), which is currently not used for organic production in Denmark. The prevalence of breast blisters in the i657 strain, which is the most commonly used strain for organic production in Denmark, was approx. 16%, of which 7% would cause downgrading of the carcass and may be assumed to be uncomfortable for the birds. However, the latter was associated with the ability to perch, and a different perch design may alleviate the occurrence of severe breast blisters. Thus, i657 is the most suitable for organic table chicken production under Danish conditions of the two strains tested.

Task 21: The prevalence of breast blisters was significantly higher in males birds of both strains. Breast blister prevalence could thus be reduced by using only female birds in organic production, but this will have other implications for the organic concept in terms of sustainability, if no other use for male birds can be found. The possibility to perch is assumed to have a positive welfare effect on the birds, and the design of perches needs to be evaluated in relation to perch use and breast blisters.

C.2 Fulfilment of deliverables and milestones

(To be completed for each work package)

WP 1: Breed performance and welfare at farm level	Time schedule according to application	Deviations, if any*
Deliverables		
D 1. Production performances, egg quality and health of four breed	Running	
D 2. Feather pecking behaviour and integument of four breeds	Running	
D 3. Individual range behaviour of four laying breeds	Running	
D 4. Final report of WP1	June 2005	
Milestones		

Completed first egg production period on farms, All farms has completed.	Feb 2003	
Completed second egg production period on farms,	Feb 2004	
Completed third egg production period on farms,	Jun 2005	
Completed data analysis,	Jun 2005	

WP2: Studies on disease incidence and the significance of diseases and interaction in organic free-range poultry	Time schedule according to application	Deviations, if any*
Deliverables		
D 5. Cross-sectional studies on causes on mortality in free-range chickens in Denmark.	2002	Running until 2004
D 6. Longitudinal studies on the significance on diseases in free-range chickens in Denmark	2004	Running until 2004
D 7. Experimental investigations on the influence of <i>Dermanyssus gallinae</i> on sensitivity to selected diseases in free-range chickens in Denmark.	2004	Depending on the outcome of D5 and D6
D 8. Experimental investigations on the influence of <i>Dermanyssus gallinae</i> on the persistence of selected diseases in free-range chickens in Denmark.	2004	Depending on the outcome of D5 and D6
D 9. Investigations on haematological changes associated with dual infections with <i>Dermanyssus gallinae</i> and <i>Pasteurella multocida</i> / <i>E.coli</i> .	2004	Depending on the outcome of D5 and D6
D 10. Investigations on the significance of <i>Capillaria</i> spp. On production parameters and the persistence of selected disease agents in free-range poultry	2004	
D 11. Assessment of immune status of multiple disease infected poultry	2004	
D 12. Investigations on complement killing activity of in-bred lines of chickens used for free-range poultry production	2004	
D 13. Final report	2004	

WP3: Genetics of feather pecking	Time schedule according to application	Deviations, if any*
Deliverables		
D 14. Genetic parameters of traits related to feather pecking (realised heritabilities, etc.)	2004	
D 15. Phenotypic and genetic correlation between feather pecking and egg production, egg quality, feed conversion, body weight etc	2004	
Milestones		
Completed recording of feather pecking behaviour in generation 4	October 2000	

Completed selection and reproduction of gen. 4 and start of rearing of generation 5	January 2001	
Completed recording of feather pecking behaviour in generation 5	October 2001	
Completed selection and reproduction of gen. 5 and start of rearing of generation 6	January 2002	
Completed recording of feather pecking behaviour in generation 6	Aug 2003	
Plan to recording of test birds in cages and "Eco" cottage of generation 6		Dec2003
Completed calculation of genetic parameters	Aug 2004	
Completed report and papers,	June 2005	

D. Description of deviations and subsequent adjustments of plans

WP1 After considerable postponing of start due to difficulties to get the interested farmers the project were prolonged into 2005 in order to get 3 production periods. After this correction the project is running according to the new plan been approved by DARCOF in november 2002.

WP2 The project is running according to the plan and will be concluded with several publications under ways in 2004-2005. However, as *Dermanyssus gallinae* has not shown to be a major problem in the free-range flock included in WP2 (outcome of D5 and D6) the experiments will be changed to meet the overall objective of the work package, namely to further investigate the most important diseases in free-range poultry. So far therefore the intention is to study either *Pasteurella multocida*, *Erysipelotrix rhusiopathiae* or Blackhead infections

The time schedule in WP3 is now running as planned and part of it is finished in some month ahead of the plan and a number of publication is at the drawing board. A scheduled test of range behaviour in selected feather pecking lines was changed to an activity test using specially developed electronic transponder equipment, see task 16. The reason for this was the very new and interesting results emerging from task 15 indicating a change in feather pecking behaviour is related to a change in general activity. Recent studies at DJF have indicated that feather pecking is related to the neurotransmitter dopamine and feather pecking in poultry might be a possible animal model of human diseases related to this system, in example obsessive-compulsive disorder.

WP4 is finished as planned and a publication is already in the literature

E. Project publications and other products

1. Products from Organic Eprints archive

Peer-reviewed and accepted

English

Nielsen, Dr. Birte L. (2003) [The relationship between breast blisters and the availability and use of perches by organic broilers](#). Paper presented at 37th International Congress of the ISAE (International Society for Applied Ethology), Abano Terme, Italy, June 24-28 2003; Published in Ferrante, Valentina, Eds. *Proceedings of the 37th International Congress of the ISAE (International Society for Applied Ethology)*, page 122-122. Fondazione Iniziative Zooprofilattiche e Zootecniche.

Boelling, Dr. Dorothe and Groen, Dr. Ab F. and Sørensen, Prof. Poul and Madsen, Dr. Per and Jensen, Dr. Just (2003) [Genetic Improvement of Livestock for Organic Farming Systems](#). *Livestock Production Science* 80. Online at <[http://www.sciencedirect.com/doi:10.1016/S0301-6226\(02\)00323-8](http://www.sciencedirect.com/doi:10.1016/S0301-6226(02)00323-8)>**

Dahl, C. and Permin, A. and Christensen, J.P. and Bisgaard, M. and Muhairwa, A.P and Petersen, K.M. and Poulsen, J.S. and Jensen, A.L. (2002) [The effect of concurrent infections with](#)

[Pasteurella multocida and Ascaridia galli on free range chickens](#). *Veterinary Microbiology* 86(4):313-324.**

Kjaer, Dr. Jørgen B. and Sørensen, Prof. Poul and Su, Dr. Guosheng (2001) [Divergent selection on feather pecking behaviour in laying hens \(Gallus gallus domesticus\)](#). *Applied Behaviour Science* 71:229-239.*

Nielsen, Birte L. (2004) [Breast blisters in groups of slow-growing broilers in relation to strain and the availability and use of perches](#). *British Poultry Science* 45(3):306-315.

Schou, T. and Permin, A. and Roepstorff, A. and Sorensen, P. and Kjaer, J. (2003) [Comparative genetic resistance to Ascaridia galli infections of 4 different commercial layer-lines](#). *British Poultry Science* 44(2):182-185.**

Not peer-reviewed

English

Sørensen, Poul (2001) [Breeding strategies in poultry for genetic adaptation to the organic environment](#). Paper presented at Breeding and feeding for animal health and welfare in organic livestock systems, Wageningen, Netherlands, 24-27 march 2001; Published in Hovi, Malla and Baars, Tom, Eds. *Breeding and feeding for animal health and welfare in organic livestock systems, Proceedings of the Fourth NAHWOA Workshop*, page 51-62.*

Maag Eigaard, N. and Permin, A. and Christensen, J.P. and Bisgaard, M. (2003) [Mortality in organic free-range chickens and molecular characterization of the involved pathogens](#). Poster presented at XIII Congress of the World Veterinary Poultry Association, Denver, Colorado, July 19-23, 2003.

Su, Dr. Guosheng and Kjaer, Dr. Jørgen B. and Sørensen, Prof. Poul (2003) [Genetic improvement on feather pecking behaviour by selection is promising](#). Poster presented at 3rd European Poultry Genetic Symposium, Wageningen, Netherlands, 17-19 september 2003; Published in *Proceedings 3rd European Poultry Genetic Symposium*, page 1.*

Su, Dr. Guosheng and Kjaer, Dr. Jørgen B. and Sørensen, Prof. Poul (2003) [Genetic improvement on feather pecking behaviour is effective](#). Poster presented at 3rd European Poultry Genetic Symposium, Wageningen University, Netherlands, 17-19 september 2003; Published in *Proceedings 3rd European Poultry Genetic Symposium*, page 1.*

Dansk - Danish

Nielsen, Birte L. (2004) [Siddepinde og brystblærer hos slagtekyllinger](#) [Perches and breast blisters in broilers]. In *Oekologisk Jordbrug*, 28. May, No 314, page 4.

Nielsen, Birte L. (2000) [Svært at finde den bedste slagtekylling](#). In *Økologisk Jordbrug*, 25. August, page 16.

Permin, A. and Ambrosen, T. and Maag Eigaard, N. and Folden Fensburg, M. and Bojesen, M. and Christensen, J.P. and Bisgaard, M. (2002) [Sygdomme og velfærd](#) [Diseases and welfare]. In *Dansk Veterinær tidsskrift*, No 6, page 12-16.*

Other products (oral presentations, public meetings, field days, etc.)

Su, Dr. Guosheng and Kjaer, Dr. Jørgen B. and Sørensen, Prof. Poul (2004) Variance Components and Selection Response for Feather Pecking Behavior in Laying Hens. Poultry Science (accepted)

Jessen, Louise (2004) Stress, aktivitet og fjerpilning som reaktion på lysintensitet og dagslængde hos tre genetiske linier af Hvid Italiener (*Gallus gallus domesticus*). Master thesis, Syddansk Universitet.

Kjaer, J.B. (2002). Recording of feather pecking and selection against feather pecking. Archiv für Geflügelkunde, special issue september, 11th European Poultry Congress, abstracts, 6-10 September, 2002, Bremen. Ed. European Federation Worlds Poultry Science Association, 31 (invited paper).

Hegelund, L., Kjaer, J.B., Kristensen, I.S. and Soerensen, J.T. (2002). Use of the outdoor area by hens in commercial organic egg production systems. Effects of climatic factors and cover. Archiv für Geflügelkunde, special issue september, 11th European Poultry Congress, abstracts, 6-10 September, 2002, Bremen. Ed. European Federation Worlds Poultry Science

Sørensen, P., 2001. Status og perspektiver for forskning og udvikling af økologisk ægproduktion. FØJO-rapport nr 11, 7-12.*

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* 25-75% financed by DARCOF

** 5-25% financed by DARCOF

F. Scientific education

Nicoline Maag Eigaard was registered as a PhD student the 1st of December 2002. The Royal Veterinary and Agricultural University has agreed to finance the last year of the PhD study.

Ph.D.-courses:

- SOAR, Summerschool 2004: Is Organic Farming the Key to Sustainability?, 2004, 4 ECTS
- NOVA, Nordic postgraduate course in Veterinary Epidemiology Part 1, 2003, 5 ECTS
- NOVA, Nordic postgraduate course in Veterinary Epidemiology Part 2, 2004, 4 ECTS
- The Royal Veterinary and Agricultural University, Statistics for Veterinarians, 2003, 9 ECTS
- The Royal Veterinary and Agricultural University, Immunologi, 2002, 24 ECTS
- The Royal Veterinary and Agricultural University, Veterinary Immununo-diagnostic Methods, 2002, 6 ECTS

Ph.D.-courses which will be finish in 2005:

- The Royal Veterinary and Agricultural University, Poultry Diseases, (practical part and theoretical finished – a examination paper need to be handed in to pass the final part of the course, 11 ECTS

Furthermore Nicoline is teaching the veterinary students in poultry diseases as a part of the scientific education.

Louise Jessen was registered as a master student and defended her master thesis June 25th, 2004, from the University of Southern Denmark, Odense. Her tutor at the University was Ass. Professor Ole Naesbye Larsen.

G. National and international cooperation

The interacting context with other projects on organic poultry production in Denmark was the topic of a 24 h workshop held in November 2001. In total it had 15 participants of whom 8 came from DIAS, 3 from KVL, 3 from the Advisory Service organizations in Denmark and one from Danish Animal Welfare Society. Three of them had started a PhD study within the area of organic poultry production. A similar symposium is planned to take place at the end of the pro-

ject to learn what we have experienced.

Research cooperation is established with the project "Improvement of Nutrition and Health..." in relation to Task 16, as half of the replicates is supported with roughage. Influence of using roughage on health and intestine environments is investigated and also a possible interaction with genotypes is investigated.

The Project leader (PS) is **member of the Steering group** for the project "The Outdoor areas for poultry) and had participated in meetings and workshop.

In relation to the welfare in organic egg production in Denmark, the Ministry of Food, Agriculture and Fisheries, called experts to participate in **a working group to formulate a revised set of control measures, including animal welfare indicators**. These new control measures are to be included in the official control of organic egg production. Furthermore, we have held a 2-day training course on Foulum, including practical lessons on two commercial farms. All official controllants of licensed organic egg production units (approx. 12 persons) have participated. **Two persons from the project participated (A. Permin and J.B Kjær)**. The new control scheme has now been tested on most (>80%) of all commercial organic egg production farms in Denmark. Results from test are being analysed now, also under participation of project participants.

A EU-proposal entitled "A breeding programme for: Healthy and well-adapted laying hens in organic and free-range systems - for a rural and animal friendly egg production in Europe" was worked out during 2000 in a cowork with scientist from Germany, Austria, Switzerland, Denmark and Netherland, with a German co-ordinator and PS as the danish participant. The proposal failed to pass the evaluation of the EEC. In a next step it was tried to establish an expression of interest for "Organic Farm Animal Breeding" for the FP6 program as a Network of Excellence. Also this failed to be accepted by the EEC. A third initiative is started and had its first meeting in October 2003 in which discussion on the concept of what actually "organic breeding" do have of implication for the various species in order to try to get and understanding of the concept. Also it was agreed that an "Animal Breeding Network with an organic perspective" should be created consisting of 6-8 European Institutes/organisations similar to an European Network already established for organic plant breeding. The first meeting in such a Network is planned to take place at the end of 2004, and with representatives from Department of Animal Breeding and Genetics at DIAS.

Nordic Gene Bank Animal has established a working group with the purpose to describe existing breeding stock of hens within the Baltic See that is suitable for free range egg production, organic egg production is considered to belong to this group. PS is chairman of the group and they will have a report finished in October 2004.

H. Critical reflection on the project

The broiler part of the project has been successfully completed and published. The strain differences in propensity to perch should not change the current choice of strain for organic broiler production, but may have implications for perch-design. However, this part of the project was relatively small, and the results could usefully be included in future investigations, where also product quality was assessed.

In the negotiation with the farmers on choice of breeds there has been some limitation in obtaining optimal solutions, as the farmers denied to take unknown breed unless they got a higher amount of guarantee, than the project was able to give. At the time of writing the application we were aware of this situation, but at the same time we were working with formulation of the EU proposal (see item G), that also would include similarly comparisons at farm level of various breeds in a number of countries. As these proposal failed to pass the EU-evaluation, the restriction in which breeds we were able to compare at farm level became more serious.

As a reaction to this we had the chance to use Research Center Foulum's Facilities in the "Eco Cottage" fully to test of the more rare breeds that is offered from breeding companies in Europe together with the Danish Hellevad and a Dual purpose breed. This has been made possible as another project has taken over to test the bird's mentioned as full sisters of generation 5 in Task 16.

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 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Man-months	50.0	27.5	11.0	2.0	100.5
Scientific personnel	43.5	20.5	11.0	2.0	76.0
Technical personnel	16.5	8.0	0		24.5

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Salaries	1828	760	323	81	2992
Scientific personnel	1414	560	323	81	2378
Technical personnel	414	200			614
Other operational costs	494	290	73	18	875
Equipment					
Others (please specify)	385 66	389 33	53	61	888 99
Direct costs	2773	1472	449	149	4854
Indirect costs (20% of direct costs)	467	210	80	19	776
Total	3240	1682	529	179	5630

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 and department: Danmarks JordbrugsForskning

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Man-months	39.0	13.5	4.0	2.0	58.5
Scientific personnel	27.5	7.5	4.0	2.0	41.0
Technical personnel	11.5	6.0	0.0		17.5

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Salaries	1315	430	140	81	1.966
Scientific personnel	1039	280	140	81	1.540
Technical personnel	276	150			426
Other operational costs	338	182	38	18	566
Equipment					
Others (please specify)	385 66	389 33	53	61	888 99
Direct costs	2104	1034	231	160	3.529
Indirect costs (20% of direct costs)	333	122	37	19	511
Total	2437	1156	268	179	4.040

Comments:

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: Den Kgl. Veterinær og Landbohøjskole

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Man-months	21	14	7		42
Scientific personnel	16	12	7		35
Technical personnel	3	2			7

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Salaries	513	330	183		1.026
Scientific personnel	375	280	183		838
Technical personnel	138	50			188
Other operational costs	156	108	35		299
Equipment					
Others (please specify)					
Direct costs	669	438	218		1.325
Indirect costs (20% of direct costs)	134	88	43		265
Total	803	526	261		1.590

Comments:

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: : **DJF og Afd for Husdyravl og Genetik**
 Workpackage 1+3+5+6

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Man-months	9,5	2,5	1,0	1.0	14,0
Scientific personnel	9,5	2,5	1,0	1.0	14,0
Technical personnel					

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Salaries	381	100	32	41	554
Scientific personnel	381	100	32	41	554
Technical personnel					
Other operational costs	70	35	8	8	121
Equipment					
Others (please specify)	385 66	389 33	53	61	888 99
Direct costs	902	557	93	110	1.662
Indirect costs (20% of direct costs)	92	27	9	9	137
Total	994	584	102	119	1.799

Comments:

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: : DJF, Afd for Husdyrsundhed og Velfærd

Workpackage 1 + 3

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Man-months	16.5	11.0	3.0	1.0	31.5
Scientific personnel	9.0	5.0	3.0	1.0	18.0
Technical personnel	7.5	6.0			13.5

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Salaries	512	330	108	40	990
Scientific personnel	324	180	108	40	652
Technical personnel	188	150			338
Other operational costs	140	147	30	10	327
Equipment					
Others (please specify)					
Direct costs	652	477	138	50	1.317
Indirect costs (20% of direct costs)	131	95	28	10	264
Total	783	571	166	60	1.581

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: : DJF, Afd for Husdyrsundhed og Velfærd

Work package 4: Slagtekyllinger

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Man-months	13.0				13.0
Scientific personnel	9.0				9.0
Technical personnel	4.0				4.0

Year:	Consumption before 2003	Consumption 2003	Expected consumption 2004	Budget 2005	Total
Salaries	422				422
Scientific personnel	334				334
Technical personnel	88				88
Other operational costs	128				128
Equipment					
Others (please specify)					
Direct costs	550				550
Indirect costs (20% of direct costs)	110				110
Total	660				660