

## Q-PorkChains newsletter eighth edition

The Q-PorkChains Newsletter is published biannually on the public project homepage [www.q-porkchains.org](http://www.q-porkchains.org). The objective of the newsletter is to disseminate news and new knowledge in the field of pig and pork production obtained from the Q-PorkChains project to stakeholders at all levels. The newsletter is divided into different sections specifically directed towards different target groups, i.e. Pig production, Industry, Consumer, Teaching & training and Science. Subscribe the notification at the homepage and receive the newsletter in your mailbox.

### In this newsletter you can read about

- Q-PorkChains stakeholder conference.
- Scientific key activities.
- Case studies in logistics modelling of pork supply chains.
- Majorcan Black Pig: An extensive production system
- Online total fat prediction in green hams.
- Use of phytosterols in meat and meat products: An approach.
- Training and demonstration events within Q-PorkChains projects.
- Development of open educational resources in the topic of animal welfare.
- Behaviour and performance of growing-finishing pigs as welfare indicators.

### Q-PorkChains stakeholder conference

In December 2011 the 5-year integrated EU project (Q-PorkChains) ends. This will be marked by a two day conference (27-28/10-2011) at University of Illes Balears at Palma de Mallorca, Spain. The conference is public and stakeholders will be invited.

The program will have lectures, poster sessions and workshops on the most important results from Q-PorkChains, e.g. diversified production systems, sustainability evaluation, pork chain management, product quality and product development.

A workshop entitled "Molecular quality control" will take place. Biotech companies, technology developers and users will be invited, to learn more about this issue and to discuss the final project results and future potentials with several experts from Q-PorkChains. Further information will be published in the final program.

A technical tour will be arranged to a specialised production system for production of Majorcan black pigs. Read more on page 5.

### Upcoming events:

**May 9-13 2011:**

Delegation trip to Greece.

**May 29 - 30 2011:**

European saddle pig network meeting. Schwaebisch Hall, Germany.

**October 27-28 2011:**

The final Q-PorkChain conference at University of Illes Balears, Palma de Mallorca.

**More info at [www.q-porkchains.org](http://www.q-porkchains.org)**

Registration from middle of April 2011 at [www.q-porkchains.org](http://www.q-porkchains.org). The final conference programme will be announced on the homepage.



# Scientific key activities

Research on consumer and citizen roles focuses on developing new tools for marketing and development of pork-based products.

Under primary production, the diversity, flexibility and sustainability (environment, economy, societal demand) of farm level production systems are explored.

Quality control focuses on development and application of new and appropriate molecular control tools in pork production.

Chain management focuses on integrated quality management and logistic and sustainable network optimization.

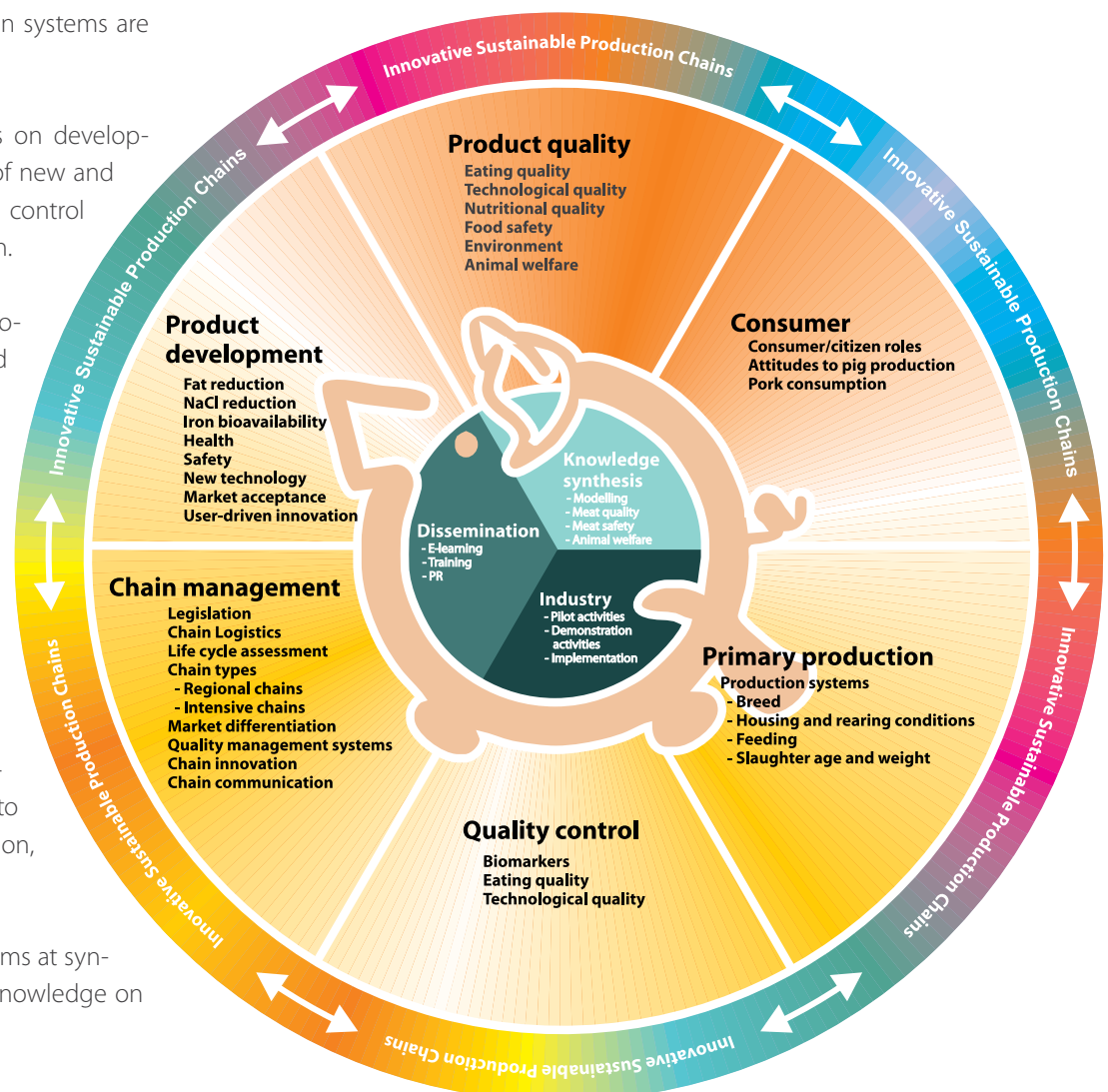
Product development focuses on innovative technologies for improved pork products, which match consumer demands with regard to quality, safety, nutrition, and convenience.

Knowledge synthesis aims at synthesising the existing knowledge on

pork quality, pork safety and animal welfare into prediction models.

The topic "Industry" aims at facilitating cooperation with Small and Medium Enterprises (SMEs) on pilot research and demonstration activities.

Dissemination of Q-PorkChains activities is undertaken via training activities, general PR and an Open Learning Platform (OLP) containing a wiki on pig and pork production, e-learning resources and a virtual community for teachers and trainers.





## Case studies in logistics modelling of pork supply chains



By Willem Rijpkema

European pork supply chains are characterised by a variety of farmer production systems and processing systems.

Furthermore, market segments have their own specific preferences for product specifications and logistics services.

The complexity of logistics planning in the pork supply chain is further increased by its specific characteristics like: animal welfare, a variety of relevant product quality features (e.g. weight, lean meat ratio), changing quality features over time, and a divergent production process (one pig ends up in a multitude of end products). In recent years, market consolidation and internationalisation have taken place. Furthermore, the means to gather and communicate quality information for logistics decision making have improved by developments in sensory technology and ICT (Information and Communication Technologies).

Despite these recent developments logistics processes are still subject to a number of inefficiencies, like poor material usage, operational inefficiencies or low perceived product quality at final customers. This results in subopti-

mal market performance and an increase of environmental impact.

We try to address these inefficiencies effectively throughout the pork supply chain in a number of case studies. This research, carried out at Wageningen University, is titled 'logistics modelling of pork supply chains'. Within these case studies innovative logistics management concepts and decision support models are developed and

assessed. These models involve multiple actors in the pork supply chain, as well as multiple tasks (supply, demand, distribution, processing).

Use of quality information is a key element in effective logistics planning and decision making in pork supply chains. Therefore we develop logistics concepts that exploit (new) product quality information to improve the match between supplied and demand- ▶

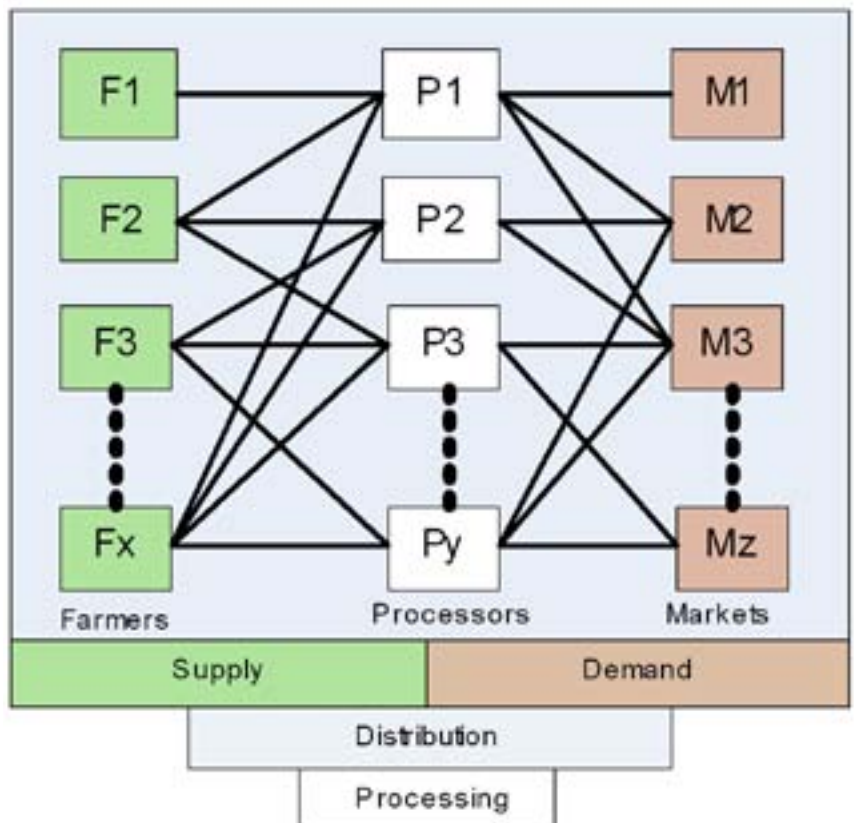


Fig. 1: Schematic overview of pork supply chain actors, their interactions and tasks



- ded products. This implies that meat with specific quality features is directed to designated processes and to specific market segments that value these quality features most. As a result the product-market combination as well as the processing performance (less waste, higher efficiencies, etc.) is improved.

## Slaughterhouse supply planning

In a first case study the use of quality information in slaughterhouse supply planning was analysed. A meat processing company may own multiple slaughterhouses or individual slaughterhouses with different demand for quality features (e.g. weight or lean meat ratio). This is caused by differences in end products which each of the slaughterhouses can produce and end markets they can deliver to. A stochastic programming model was developed to exploit historical delivery data of farmers to estimate the quality of a farmer's future delivery. This model finds slaughterhouse allocation plans that fulfil demand for multiple quality features at separate slaughterhouses at a demanded success probability or service level, while minimizing transport costs.

Our findings suggest that quality-based allocation of slaughterhouses using historical delivery data is a viable technique, and that it provides insight in the trade-off between higher transport costs of livestock and demand for quality features or service level.

## Water holding capacity

Another Q-PorkChains pilot study in which innovative logistics concepts are developed is work package IV.4. In this study Near-InfraRed (NIR) sensor technology is developed for estimation of the water holding capacity (WHC) of meat products. WHC is an important meat quality feature that affects both processing yield and sensory appearance of meat products, as indicated in several Q-PorkChains newsletters. In this pilot study we develop, in co-operation with the VION Food Group (<http://www.vionfoodgroup.com/>), logistics concepts for product sorting for WHC at processing level using NIR sensor information, and assess these concepts using simulation technologies.

We develop logistics scenarios for NIR as a sorting tool in ham production and gather relevant process data (e.g. supply and demand data, processing characteristics and volumes). This data is used to model logistics scenarios using simulation techniques to assess advanced quality driven logistics con-

cepts exploiting NIR sensor technology. This will provide advanced insight in the use of NIR technology for sorting of meat products for WHC. Furthermore the study will evaluate the possible gains resulting from its use.

In a final case study a decision support model will be developed that assesses the sustainability of international pork supply chain networks. This decision support model will incorporate regional production and consumption data, and can be used to assess the impact of future supply chain scenarios (e.g. higher energy prices, CO<sub>2</sub> taxes, legislation, reduced meat consumption) on relevant performance indicators (e.g. cost, energy consumption, product quality, environmental sustainability).

By means of our case based studies we aim at deriving generic principles for use of quality information to improve (logistics) control in pork supply chains. In addition, we aim to identify critical success factors for use of advanced quality information in logistics planning.

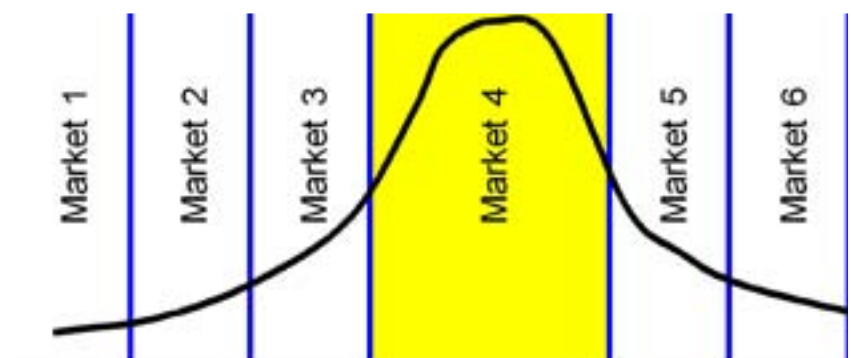


Fig 2: Sorting for WHC involves identifying separate markets for different levels of WHC



## Majorcan Black Pig: An extensive production system

By Joel Gonzales



The Majorcan Black Pig is an autochthonous breed of Mallorca, characterized by its high rusticity and adaptation to

the Mediterranean climatic conditions. It is the only autochthonous pig breed in state of conservation in the Balearic Islands. Since 1997 it has been catalogued by the Ministry of Environment, Rural and Sea Environment of Spain as a breed of special protection in danger of extinction.

The origin of this breed is uncertain as the existence of pig livestock in Mallorca soars to the period of the first settlers, placing it about the century XIV BC. Black skin and fatness are common traits of the Majorcan Black Pig with some strains of Iberian pigs distributed along Spanish and Portuguese extensive areas.

Nowadays the breed is the additive result of the incorporation of the pig effectives from each civilization established in the island, excluding the Muslim, together with the adaptation of the breed in the territory, and always under the pressure of the natural and human selection. The absence of Asian haplotypes and the halothane gene is an indicator of the geographical and genetic isolation along its history.



Majorcan Black Pig had a great importance for the household economy in Mallorca until mid 20th century. On several occasions, and due to different reasons, the census of this breed has lived complicated moments, reducing the number of effectives and passing through bottlenecks. The Arabian domination, the appearance of diseases (African swine fever...) and the introduction of leaner pig breeds and intensive production systems were the main factors that promoted the decline of the breed. Even so, none of the mentioned cases led to the extinction of the breed.

From the second half of the 20th century the decrease of the census speeded up. Some of the reasons for the

reduction of Majorcan Black Pig census were that the majority of producers changed to intensive production of pork, more cost-effective and more efficient in the production of lean meat, the increasing demand for carcasses with minor fat levels and the revolution of the touristic sector of the island, resulting in migration of people dedicated to agriculture and livestock towards the cities.

The recovery of the breed in 1980's happened thanks to the great interest of a group of stockbreeders and meat processors. They promoted the production of Majorcan Black Pig maintaining the characteristics of the pure breed. Their effort was rewarded in 1994 with the obtaining of the Pro- ▶



- ▶ tected Geographical Indication brand for the Sobrassada, the main meat product elaborated with the meat and the fat coming from animals of this breed. It is a dried and fermented sausage, highly seasoned with paprika, pepper and salt.

Due to the efforts of the Producers Association of Majorcan Black Pig (ARPNMS) in 1997 the herd book of the breed with some 400 reproductive mothers were initiated. IBABSA, a service of the Balearic Government, gives technical support to preserve, improve and promote the breed. In 2009 the census was around 1100 sows and 100 reproductive males.

## Extensive Production System

The Majorcan Black Pig is managed in extensive conditions as a complementary agricultural activity in family farms. Because of the extensive production system, males and females remain together and mating is difficult to be controlled. In some cases the paternity of young piglets is uncertain and free piglet adoptions is not uncommon between sows.

Feeding regime is based on pasture, cereals (barley and rye), legume seeds, figs, almonds, acorns, and several Mediterranean shrubs. Aside of natural feeding resources, sows are fed with commercial diets during lactation and pregnancy and growing pigs are supplemented with barley and green peas.

The Majorcan Black Pigs are rustic and resistant animals and sows present high maternal aptitudes. Reproductive parameters are similar to other rustic breeds, presenting an average of 2.1 litters and 12.0 weaned piglets per sows per year. Lactation period is usually over 4 weeks and in some cases young piglets (close to 8 kg live weight) are removed and consumed as “porcelles” (roasted piglet).

Its productive efficiency is lower than other genetic lines from conventional systems, but these animals have developed an adaptive process to the environment along their history to take profit from the poor resources of the exploitations.

Fattening period is normally longer than 12 months and the mean live weight at slaughter is 150 kg. The minimum live weight to produce “sobrassada” is 120 kg. Regarding the productive parameters the estimated average daily gain is around 470 g/day and the conversion rates from 5.0 to 8.0 during the fattening period.

The main characteristics of this breed are similar to other western Mediterranean pig breeds, presenting black or grey skin colour and high percentage of fat tissue, and some particularities as tassels in the neck, pendulous ears and a concave nose profile.

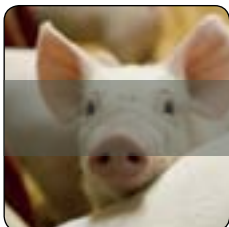
During years, the reproductive males were selected in the auctions, fairs and other popular events to avoid inbreeding, and only the morphological

traits were used to evaluate their quality. Nowadays there is a specific conservation program to reduce inbreeding based on continuous exchange of genetic material across herds, with a replacement rate around 33%.

Regarding the exploitations of Majorcan Black Pig more than 60% are located in the South-East of the island, corresponding with the zone of major production of cereals, and most of them have complementary farming and agricultural activities.

The types of exploitation according to their functioning are the following: farrowing units, only reproducers and dedicated to produce piglets; fattening units, only fatteners; and mixed units, following the farrow-to-finish system. ▶





## ► **Future perspectives of this production system**

For future use of this production system there are some improvement opportunities that should be taken into account by the sector. In order to enhance the industry development related to Majorcan Black Pig meat processing, it is needed to create new meat products and to improve the existing ones from this type of animals. This will allow facing the changes in consumer demands and to maintain the high added value of meat products, being sustainable from an economic point of view. To achieve this objective more studies regarding technological, sensory and nutritional meat quality are needed. Also, to study new ways of presentation of roasted piglets should be interesting as an alternative for stock-breeders, as well as to improve traceability and animal welfare.

## **Technical tour at the open conference**

A scientific field trip to see the Majorcan Black Pig production will be orga-

nised for the participants of the final Q-PorkChains conference. At this trip you will see a typical farrow-to-finish exploitation, with gestating and lactating sows, piglets and fattening pigs. Also, the visitor will observe the particular feeding system in this production system, based on rotational crops

and the management of natural resources in extensive conditions. The chosen exploitation is called Son Fortesa and it is owned by Camper, the local manufacturer of shoes and boots, as an example of the interest from some enterprises and institutions to preserve this production system.





# Online total fat prediction in green hams

By Xavier Serra



The total fat content of meat cuts is a key issue for the meat industry. From a technological point of view, knowing

the total fat content allows industry to classify meat cuts in different groups and assign them to the most appropriate process. In dry-cured ham processing, the fat content of green ham affects the amount of absorbed salt, the diffusion mechanisms and the processing weight losses. Similarly, in cooked ham elaboration, an excess of subcutaneous fat is not desirable. Therefore, the availability of online non-invasive technologies to predict the fat content in green hams is of special interest to the meat industry.

Within the Pilot and Demonstration activities of the Q-PorkChains project (Pilot 6: Development of non-invasive technologies for the assessment of the fat content in order to select good quality meat) a ham-grading system prototype (Fig. 1) for online non-invasive total fat prediction was evaluated in green hams. The ham-grading-system technology is based on electromagnetic induction measurements. The ham-grading system was used to predict the total fat content of raw hams from four pig



Fig.1: Ham-grading system (JMP Ingenieros, S.L., Sotés, La Rioja, Spain).

breeds (n = 25 per breed): Iberian, Mangalica, Duroc and Large White. The total fat, which included the dissected fat plus the intramuscular fat, ranged from 15 % to 40 % (w/w). The

results (Fig. 2) showed that the ham-grading system is able to predict the overall fat content of raw hams (RMSE = 1.545% w/w; R2 = 0.913) and can therefore be used to classify hams

online at an industrial level.

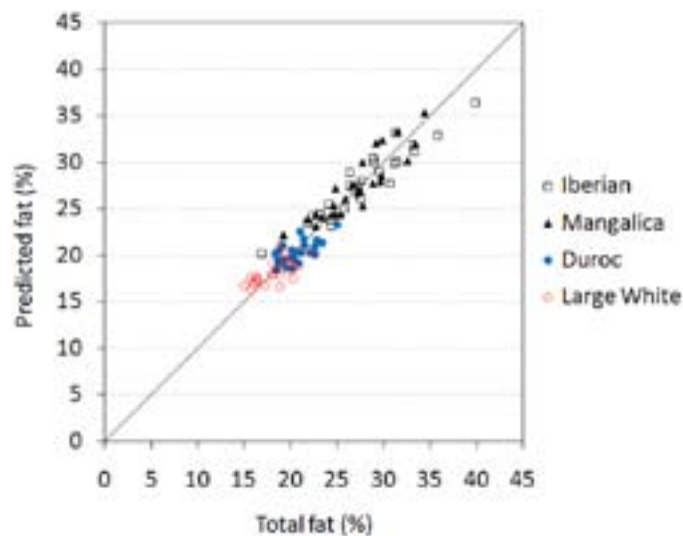


Fig. 2. Relationship between total fat percentage (dissection fat + intramuscular fat) and total fat predicted by the ham-grading system.

Co-author:  
Elena Fulladosa



# Use of phytosterols in meat and meat products: An approach

By José A. García Regueiro



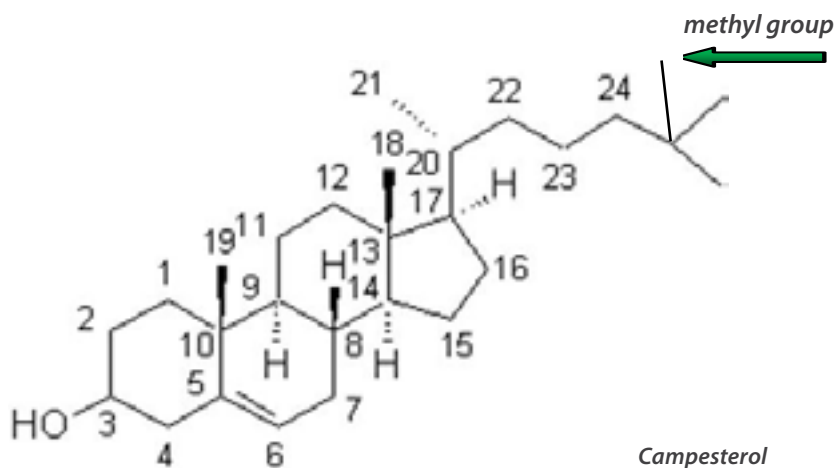
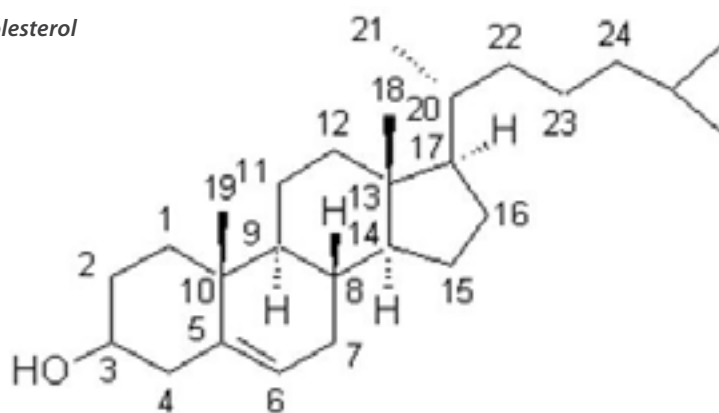
The decrease of the cholesterol levels in the blood is very important because high concentrations of total cholesterol and

LDL-cholesterol have been related to the development of cardiovascular diseases and other degenerative diseases like Alzheimer. Meat products are considered non convenient food products for persons having high cholesterol in blood, because of the cholesterol content of meat products and the relative saturation of the fat (about 35-40%)

Phytosterols are used in some food products (e.g.: dairy products) with claims approved to reduce cholesterol in blood plasma (range: 2-4 g/day). During the intestinal absorption of cholesterol, phytosterols have been recognized as cholesterol competitors. Thus, addition of phytosterols to foods has been shown to result in a decrease of about 5-10 % of the cholesterol in blood.

The use of phytosterols in fermented sausages was examined to investigate if sausages containing these bioactive compounds could be produced without diminishing the sensorial and technological quality. The tech-

Cholesterol



Campesterol

nological feasibility and the stability were evaluated, and an analytical method to quantify the sterols in fermented sausages was developed.

A GC-FID and GC/MS (GC, gas chromatography; FID, flame ionization detector; MS, mass spectrometry) method was applied to evaluate the stability of phytosterols (campesterol,

stigmasterol and  $\beta$ -sitosterol) from commercial extracts and food by products added to dry fermented sausages.

## Experimental design

Five different batches of fermented sausages were produced: a control without addition of phytosterols or



- ▶ olive peel extract, phytosterols from three commercial products (VG: Vegapure<sup>®</sup> 95E, VE: Vitasterol<sup>®</sup> S-80, VN: VE not sterified) and olive peel extracts (BA, olive oil pulp). VG and VE were esters of sterols, and VN free sterols. VG contained:  $\beta$ -sitosterol,  $\beta$ -sitostanol, campesterol, campestanol, stigmasterol, brassicasterol and other minor sterols (<3%). VE contained:  $\beta$ -sitosterol, campesterol, stigmasterol and other minor sterols (<3%). VN contained:  $\beta$ -sitosterol, campesterol, stigmasterol and other minor sterols (<3%).

### **Addition of phytosterols to fermented sausages result in less uptake of cholesterol by the gut**

The ratio of cholesterol/phytosterols was modified arising 1/8 in the case of VN extract. VG extract was less effective in obtaining high concentrations of phytosterols. Although olive peel increased slightly the phytosterol content its contribution was considered too low. The concentrations of the phytosterols, coming from VE, VG and VN extracts at the doses added, were in the range of 1.4 – 0.4 g/100g of fresh sausage. These concentrations are between 75% and 30% of the recommended daily intake to reduce the content of cholesterol in blood.

We found that the concentration of cholesterol remained unchanged but the quantity of phytosterols was from five to ten fold higher than the cholesterol concentration in the fortified sausages. This result means that the simultaneous intake of meat products with phytosterols could avoid the uptake of cholesterol by the gut. Due to the high energy density of the fermented sausages; they should not be eaten daily. However, consumption of these sausages could help to diversify the source of phytosterols in the diet by combining different foods containing phytosterols. Moreover, the reduction of fat and salt content could improve the nutri-

tional profile. Also, this approach could be applied to other kind of meat products.

### **Future potentials**

Despite our promising results, they should be the object of a specific experiment with animal models or human intervention studies. The most important challenge is the reject from EFSA to use phytosterols in meat products. However, there are unclear aspects about the bioavailability of these compounds and the overdoses associated to the consumption of other foods containing phytosterols.

Phytosterols (or also sterols) are high-melting alcohols with a molecular structure based on the cholestane skeleton.

Sterols are classified in three main groups: absence of methyl in 4-position (4-de-methyl sterols/stanols) presence of methyl in 4-position (4-mono-methyl sterols/stanols) and the presence of two methyl groups in 4-position (4-4'-di-methyl sterols). Also the hydroxilic group could be sterified by a fatty acid or other compounds. Stanols are sterols without the double bond in the cholestane skeleton.

Phytosterols are lowering cholesterol compounds with recognized health claims.



## Training and demonstration events within the Q-PorkChains project

By Christina Gawron



During the second half of 2010 training and demonstration events were carried out in order to disseminate the current research results of the Q-PorkChains project. From September until December 2010, two trade fair presentations, one workshop and one lecture session were held in France, Bulgaria and Germany. Therefore, since the beginning of the first training round, all in all, 20 trainings have been conducted in nine different countries. Figure 1 shows the geographical distribution of the training spots.

**Event no. 17** took place during the trade fair "Space" in Rennes, France. From the 14th to the 17th of September Q-PorkChains partners presented the Sanibase database. The challenge is to implement a centralised information system in the holding Group Glon for improving the exchange and use of quality, animal health and business relevant information in the pork production chain. The objectives of the Sanibase demonstration were to

develop and to increase farmer's knowledge of this new e-service. Therefore, Sanibase was presented as an efficient service and a basis for innovation in pig production and the pork chain. 107,327 visitors were present at the trade fair, 9,336 of them were international.

**Event no. 18** was a workshop in November 2010 in Sofia, Bulgaria. The workshop took place in addition to the trade fair "MeatMania". AMB (As-

sociation of Meat Processors in Bulgaria) coordinated the event on the spot. It dealt with product development, especially with regard to consumer expectations and its potential for the industry. Research results from Module I "Consumers, citizens and the market", the current situation in Bulgaria and the Q-PorkChains learning resource "Strategic New Product Development" ([www.porktraining.org](http://www.porktraining.org)) were presented. A visit to the trade fair on the 12th of November 2010 ►



Figure 1: Geographical distribution of training and demonstration events (December 2010)



- ▶ was also included in the programme. In (South-) Eastern Europe it is important to focus on new ways to meet the challenges of a global market. Therefore a workshop dealing with results focusing on consumer demands and strategic new product development was highly appropriate.

**Event no. 19** took place during the trade fair EuroTier in Hannover, Germany. Within the four days event different Q-PorkChains representatives (Chainfood; PigChamp; BESH; Verdict System) presented their work and recent results. Our regional partner ZDS provided exhibition area with the possibility to exchange ideas as well as to meet other industry representatives and to present videos, leaflets, posters etc. Additionally, the eLearning material was available for use and PigChamp demonstrated the Acute Phase Protein (APP) rapid test to a broad audience. The selection of topics was based on the main focus of the trade fair and, therefore, on the interest of the visitors.

**Event no. 20** took place on the 14th of December 2010 in the facilities of the BESH in Germany. Within the lecture session a Spanish representative from Module II- "Pork production"/Pilot 5 presented the latest results of the current work. His presentation dealt with the arcon quality meat program, the Majorcan black pig and the corresponding free-ranged pig production system. The main target group consisted of farmers from Germany. The purpose was to have an

intensive experience exchange between Spain and Germany to show several possibilities for a diversified production.

### Upcoming events:

**Event no. 21:** Delegation trip to Greece from the 9th-13th of May 2011 organised in collaboration with Pilot Chain 7 (<http://www.q-porkchains-industry.org/Pilot-7-Implementation-of-regional-pork-chain-concepts-and.266+M5c467769971.0.html>) and Module IV- "Chain management". An internal workshop for the Pilot and Module members will be held. After this meeting the circle will be extended for external participants on the second day. Furthermore, it is planned to organise plant and company visits. Within this trip the work of the project, especially in Pilot Chain 7 and Module IV will be presented in more detail to external people. The aim is to have experience exchange between different countries for such purpose as to show especially the participants how to improve their situation with the view on alternative, sustainable production systems, as well as on diversifying strategies to produce and process pig and pork products.

**Event no. 22:** This event is planned as a workshop at the final public Q-PorkChains conference on October the 27th/28th 2011 in Mallorca, Spain. The input for this workshop will be mainly from Demonstration Chain 2 and researchers from Module V – "Molecular quality control". Biotech companies and technology developers and users will be invited, to show the project results especially to the target group industry. Therefore, an interactive workshop will help to spread the information about the latest results of the Q-PorkChains project.

Additional information on training events as well as upcoming events can be found on the industry platform <http://www.q-porkchains-industry.org/> and on the QPC public homepage <http://www.q-porkchains.org/>.



# Development of open educational resources in the topic of animal welfare

By Anne Algers



A legal change in the Treaty of Lisbon states that, since animals are "sentient beings" the Union and the Member States shall pay full regard to their welfare requirements. Furthermore, several studies have shown that animal welfare is of increasing concern in the society. These two facts have changed the conditions for teaching animal welfare and pointed at the need of improved knowledge in animal welfare for a broad target group including consumers and citizens in an international context.

It has also been concluded that researchers play an important role in the development and distribution of scientific knowledge to students, citizens and consumers on the welfare of animals, how animal welfare should be measured and how it should be improved.

Formal teaching in animal welfare is delivered in traditional on-campus formats or in the form of off-campus programs and courses where knowledge is "transmitted" to the learners according to a "push" approach. The consequence is that the knowledge

on animal welfare is "locked in" in a traditional course context not accessible for general public or individual learners that are not enrolled in a formal program. A complement to traditional methods of operation is to take more of a "pull" approach, where education is demand driven, and look at a broad range of methods to make knowledge available to the society. This is the case within Q-PorkChains. The Directorate General for Health and Consumers (DC Sanco) of the European commission has started to launch a new European strategy for Animal Welfare and arranged a conference October last year "The International conference on animal Welfare Education: Everybody is responsible".

At this conference I spoke about using open educational resources for broad and fast dissemination to new target groups. The point was that developing learning resources in animal welfare based on new media and making them accessible on the Internet can be of benefit not only to teachers and learners but may also have a rapid and global impact on the development of animal welfare practices and standards.

Everyone is responsible



1st International Conference  
on Animal Welfare Education

The learning resources developed in Q-PorkChains are in this way in tune with the needs in society and the resources within the topic (that are free of use on [www.porktraining.org](http://www.porktraining.org)) are:

- Animal Welfare-friendly Pig Housing Systems
- Entire Male Pigs
- Driving Pigs to Stunning

It is our hope that the learning resources will be used in teaching and training activities in different parts of the world and during 2011 a survey will be conducted on this subject. ▶



# Teaching & training



www.porktraining.org is an initiative to facilitate access to learning resources about pig production and pork quality. The learning resources on the platform are free of charge to any user anywhere in the world, and users of the platform are invited to contribute by sharing their own material.

Seven learning resources developed within Q-PorkChains are available for use in your teaching.

Learning resources on Animal Welfare and Pig Production:

- Animal Welfare-friendly Pig housing Systems
- Entire Male Pigs
- Driving Pigs to Stunning

Learning resources on Chain Management and Product Quality:

- Pork Supply chains in the EU
- Strategic New Product Development
- Low Salt Pig-meat products and New Formulations
- Acute Phase Protein as a measurement of Animal Health

The platform can also be used for:

- Sharing your learning resources with others by posting new material to the platform
- Using wiki in teaching and training by letting your students contribute new items
- Joining the interest-based virtual community for discussions on education

You are also very welcome to promote the platform by sending our site link to people in your network.

**Q-PorkChains archive for free and open learning resources**

The Q-PorkChains platform has been developed for people all over the world working in the pork sector. The idea behind its creation has been to offer to the community a space where members can openly share existing learning resources in addition to the new learning resources (OER) that will be developed according to the plans for the EU-project. The present repository gives the possibility to submit own learning and learning resources, to find and use resources developed by others and to evaluate those already submitted.

The arguments for Open Educational Resources (OER) are many including aspects such as democracy and preservation of public education. Furthermore, it gives teachers alternatives and increases competition between providers of teaching and training, from a more individual point of view, open sharing increases publicity, reputation and the pleasure of sharing with peers. It also means broader and faster dissemination. In addition, OER enhance the motivation of students since they take part in problem solving and the intellectual development of learning resources. The more learning more rewarding and the amount of learning resources will increase over time.

**Interactive**

- Submit new training
- Update existing training(x)
- Manage subscriptions
- Manage bookmarks

**Stats**

- 30 Learning resources
- 15 Categories
- 133 Portal members
- Last updated: 2014-01-24

This portal is a customized version of the Open Training Platform (OTP)

It is an collaborative hub for free and open learning for development powered by UNESCO



# Behaviour and performance of growing-finishing pigs as welfare indicators: A meta-analytical approach

By Xavier Averos



One of the ambitions of Q-PorkChains is the integration of the existing scientific knowledge into different models that take into account the welfare of pigs, and the quality and safety of pork products.

INRA (France), the Animal Sciences Group of Wageningen UR (The Netherlands), and the University of Newcastle (UK) have established a close collaborative work to develop a predictive model of the pig welfare that integrates the simultaneous animal welfare perspectives of the animal, the producer, the consumer, and the citizen.

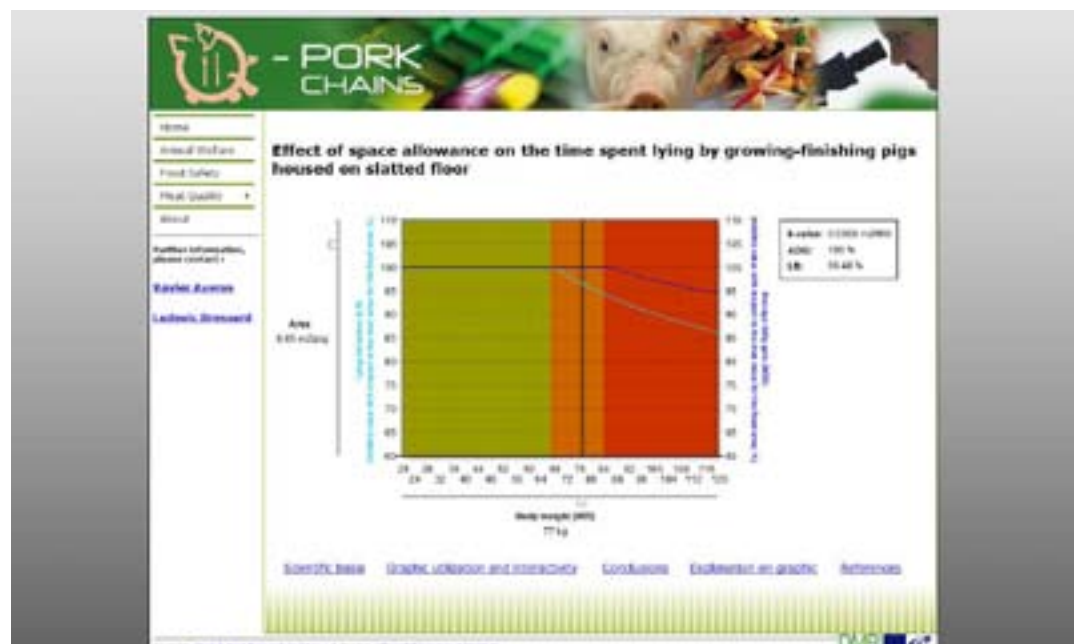
With respect to the animal perspective, work which has been led by INRA, a meta-analytical approach has been chosen to integrate the most relevant scientific information on the main factors that precisely describe any pig

production system, and that affect the welfare of growing-finishing pigs. This is a novel and promising approach.

As a first step it was decided to focus on quantifying those factors affecting the behaviour and the performance. Promising results have already been obtained up to present. With respect to the resting activity of growing-finishing pigs housed under eminently intensive conditions, an interaction was observed between the space allowance per animal and the floor

characteristics (presence/absence of slats). Results suggest that under slatted floor conditions, and taking into account the information published in other studies, a negative effect of reducing space availability would be observed on the resting activity of pigs before their performance is affected.

This work allows quantification of the best fit parameter across many studies for a threshold level in the relation between space allowance and the consequences for the pigs. With re- ▶





- ▶ spect to the physical activity, the investigative and social behaviours, and the performance of pigs of pigs housed under enriched conditions, different interactions between the factors defining the housing system were found.

Therefore, increasing space allowance/pig appears to potentiate the investigative behaviour of pigs, but this effect would be conditioned to the presence of bedding or point-source objects. Similarly, the presence of bedding was found to mitigate the negative behaviours arising when increasing the group size.

A third meta-analytical study, focused on the effect of housing and feeding

conditions on the feeding behaviour and the performance of pigs, is currently being finished. Different meta-models, to be uploaded at the internet, are currently being developed together with the Danish Meat Research Institute, in order to show the results obtained in a friendly, interactive manner that can be useful both for the scientific community and for the grand public. It is expected that

this information can be useful for the conception of new productive strategies that take into account new dimensions, such as the welfare of pigs.

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## Q-PorkChains in short

Q-PorkChains includes 62 partners, from 20 different countries including Europe, Brazil, China, South Africa and USA. The total budget is 20.7 million €. The EU grant is 14.5 million €. Q-PorkChains is an integrated project under the EU's sixth framework programme. The full title of the project is "Improving quality of pork and pork products for the consumer: Development of innovative, integrated, and sustainable food production chains of high quality pork products matching consumer demands". Q-PorkChains is composed of nine modules. The six research modules include consumer and market analysis (Module I), on-farm sustainable production systems (Module II),

product development (Module III), integration and sustainable management of the production chain (Module IV), molecular biology in pork quality control (Module V) and synthesis of existing knowledge on pork quality, safety and welfare (Module VI). Two horizontal modules (A and B) aims at incorporating new knowledge into pilot and demonstration chains and disseminate Q-PorkChains results to stakeholders at all levels.



1. University of Copenhagen (KU), Denmark
2. University of Aarhus (AU), Denmark
3. Wageningen University (WU), Netherlands
4. University of Bonn (UB), Germany
5. Swedish University of Agricultural Sciences (SLU), Sweden
6. Agricultural University of Athens (AUA), Greece
7. University Gent (UGent), Belgium
8. University of Newcastle (UNEW), United Kingdom
9. Technical University of Lodz (TUL), Poland
10. Politechnic University of Madrid (UPM), Spain
11. LaSalle Beauvais Polytechnic Institute (LB), France
12. University of Helsinki (UH), Finland
13. Royal Veterinary College (RVC), United Kingdom
14. Scottish Agricultural College (SAC), United Kingdom
15. University College Dublin (UCD), Ireland
16. University of Naples (UNINA), Italy
17. Università di Bologna (Uni Bo), Italy
18. Nanjing Agricultural University (NAU), China
19. University of Pretoria (UP), South Africa
20. FUNDACE, University of São Paulo (FD), Brazil
21. Chinese Academy of Ag. Science (CAAS), China
22. Kansas State University (KSU), United States of America
23. Polish Academy of Science (PAS), Poland
24. Norwegian Food Research Institute (Matforsk), Norway
25. Danish Meat Research Institute (DMRI), Denmark
26. Teagasc, Ashtown Food Research Centre (AFRC), Ireland
27. Institut de la Filière Porcine (IFIP), France
28. Centro Ricerche Produzioni Animali SPA (CRPA SPA), Italy
29. ASG Veehouderij BV (ASGV), Netherlands
30. Institute of Food Safety (RIKILT), Netherlands
31. Central Food Research Institute (CFRI), Hungary
32. Nutreco, Swine Research Centre (SRC), Netherlands
33. Agrotechnology & Food Sciences group (AFSG), Netherlands
34. Association of Meat Processors in Bulgaria (AMB), Bulgaria
35. Grenzüberschreitende Integrierte Qualitätssicherung (GIQS), Germany
36. Zentralverband der Deutschen Schweineproduktion (ZDS), Germany
37. Gesellschaft für Lebensmittelsicherheit (GLS), Germany
38. Inst. for Food and Agricultural Research and Technology (IRTA), Spain
39. French National Institute for Agricultural Research (INRA), France
40. Chambre Régionale d'Agriculture de Bretagne (CRAB), France
41. The Danish Meat Trade College (DMTC), Denmark
42. Danish Crown (DC), Denmark
43. Vion Food Group (VFG), Netherlands
44. Pigchamp Pro (PP), Spain
45. Pig Improvement Company UK Limited (PIC), United Kingdom
46. Casademont (CS), Spain
47. Esteban Espuña (EE), Spain
48. Glon Group (GG), France
49. Erzeugergemeinschaft Osnabrueck (EGO), Germany
50. France Hybrides (FH), France
51. Chainfood (CHF), Netherlands
52. Qualitype (QT), Germany
53. Italcarni Società Cooperativa Agricola (ITAL), Italy
54. Verdict Systems BV (VS), Netherlands
55. Jamones Segovia S.A. (Jamsa), Spain
56. Stazione Sperimentale per l'industria delle conserve alimentari (SSICA), Italy
57. Zentralverband der Deutschen Schweineproduktion (ZDS), Germany
58. Landwirtschaftlicher Beratungsdienst Schwäbisch Hall e.V. (BDSC), Germany
59. D. Didangelos Bros, El. Ar. Papisika (CHIR), Greece
60. D. Didangelos Bros, N. Exarchos SA (IASON), Greece
61. Didangelos Iason - Giannakos Andreas General Partnership (GEF), Greece
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