Focus

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Selected papers from the proceedings of the Meat Science and Technology Symposium held in Clermont-Ferrand (France), October 4-5, 2006

Meat Science and Technology

Guest editor-in-chief
Joseph Culioli
FOCUS : JSMTV

Research and development in Europe in the field of muscle science and meat technology

A. Clinquart

1 – INTRODUCTION

The aim of the “Journées des Sciences du Muscle et Technologies de la Viande” is to give a report on the most recent research works to the technical, economical and scientific actors of the meat production and transformation chain. The topics of these researches and the organisations that carry them out evolve with time, depending in particular to the needs of the actors (producers, manufacturers, distributors, consumers) and of the socio-economic context. In addition, these researches fit themselves more than ever in an international context, particularly on a European level.

The objective of this lecture – a somewhat ambitious idea – is to give an overview of the researches undertaken in Europe in muscle science and meat technology field.

The researches results largely diffused in scientific publications or congress communications constitute a potential indicator of the studied topics. On the other hand information relating to the organisations, structures or teams who carry out this research is much less accessible. When they are, it’s generally in individual or partial form, for example via the website of the research centres. Indeed, on a European scale, there is no exhaustive inventory of the research teams. This lecture was thus a good opportunity to try and draw an inventory of the research centres in the field “muscle science and meat technology”. There’s no official or normative definition for “Muscle Science” and “Meat Technology”. But to have an idea, one can refer to the definitions given by the Institute of Food Science and Technology (2005) for the terms “Food Science” and “Food Technology”:
“Food Science is scientific understanding of the composition of food under various conditions”¹;

“Food Technology is the application of food science to the processing of the food materials into safe, wholesome, nutritious, tasty and attractive food products.”².

The application of these definitions to “Muscle Science” and “Meat Technology” is complicated by the fact that the terms “Muscle” and “Meat” are not identical. Usually meat is considered to be the result of post mortem muscle transformation. In the following text we will consider “Muscle Science” relates to in vivo study (metabolism, structure, biochemistry) and that “Meat Technology” relates to treatment and processing of the muscles after animals slaughtering. The in vivo muscle studies however will be limited to those having a direct link with meat production.

2 – ORGANISATIONS

Based on the observation that no exhaustive inventory of the teams or centres which devote their activities of research to “Muscle Science” and “Meat Technology” is actually available at a European level, neither under a centralized network or database form, it has been proposed to draw up a list of persons being able to serve as contact for each for the 25 countries of the E.U. and for the 7 other non E.U. countries (alphabetically: Bulgaria, Croatia, Norway, Romania, Serbia, Switzerland and Turkey), so a total of 32 countries. These contacts have been requested to identify the organisations (centres, institutes, universities, schools), which devote their research activities to the concerned field. Thus 73 organizations have been contacted. A questionnaire was submitted in order to obtain information on the organisation itself (staff size, contact person, website), on the research topics (they had to choose among a list of species, products and disciplines; and had to mention the principal research topics, and 5 publications representative of the research activities) and on the research projects financed on a regional/national or European scale. On the date of September the 12th 2006, 40 organizations out of 19 different countries had answered the questionnaire. Even if this figure seems weak, one can however consider this sample as representative of the research organisation in Europe as it includes the majority of the main active centres in the field. As a matter of comparison, for a communication at the 54th Annual Reciprocal Meat Conference of the American Meat Science Association, Sleeth (2001) had carried out an investigation on a worldwide scale and had drawn his conclusions

¹. “This seemingly straightforward definition hides a complex multidisciplinary subject involving a combination of several sciences and a knowledge of the composition of food materials and their physical, biological and biochemical behaviour including: interaction of food components with each other and/or with other elements or materials (i.e. oxygen, packaging materials), nutrition, enzymology, microbiology, pharmacology and toxicology, and the effects on the manufacturing, processing and storage.”

². “Food technology draws upon and integrates the application of other technologies to food, such as packaging, materials science, engineering, instrumentation, agriculture and biotechnology.”
on the basis of answers obtained from 22 research institutions resulting from 19 different countries.

It’s impossible to present here in detail all the answers\(^1\). Although these answers are not easily quantifiable even objectivable, certain conclusions can be drawn from this inventory and/or the comments, which accompany them.

Research is often undertaken in a joint way in research centres and structures of higher education (universities or schools). The number of these last is sometimes high, this observation being particularly obvious in Italy and Spain, these countries producing large amounts of meat and processed meat products and having a great number of universities. Except for the United Kingdom, the large European countries and/or the big meat producing countries often have national/regional research centre(s) and/or technical centre(s) partially or fully dedicated to meat: Germany (BfEL ex-Federal Kulmbach Centre), Denmark (DMRI, DIAS), Spain (IRTA Monells), France (INRA, IFIP, ADIV, AFSSA), Ireland (Teagasc), Italy (SSICA), Norway (Matforsk), Poland (MFRI). Some centres have recently been subjected to reorganisation or financial difficulties. In several countries “meat” specificity of research centres has been noticed to slowly disappear, the consequence being that they are less obvious in the field of meat science. The approach which one can describe as “vertical” (research along the whole meat chain) more and more often seems to give place to an “horizontal” approach (research in a specific discipline and this discipline can cover different chains or even the whole food-agricultural sector). This increasing specialisation of science and the need for very heavy and expensive techniques, which is not possible with in only one chain can partially explain this observation. Therefore, some competences and the associated technical means gather in “platforms” or “competence centres”, as observed in the genomics field for example (in France, the resource centre GADIE can be presented as an example). One can note the collaboration between the research centres themselves, or even between the industry and research centres, sometimes in the form of competence pole on a regional or national scale. The “Pôle de compétitivité Innovian-des” (French competitiveness pole in the field of meat and meat products) is a recent example. These types of organisation should support more and more collaboration between the research centres, industry and the (inter)professional federations.

In conclusion of this investigation, it seems very difficult to carry out a complete and detailed inventory of research teams on a European level, which could be used to promote and support the collaboration between these teams. Such an inventory is undoubtedly only possible within a European association active in the field of Muscle Science and Meat Technology. Such an association unfortunately does not exist. Ironically, the “European Meeting of Meat Research Workers” (EMMRW) created in 1955 with an aim of giving the opportunity to European research workers to know each other better (Nininvaara, 2004), “was exceeded” by its own success and was transformed into “International Congress of Meat Science and Technology” in 1987, because largely overflowing the European scale. If there is no European association in the field of muscle science and meat technology, there is one in a wider field, the animal.

\(^{1}\) The list based on this investigation, as well summarised presentation per country, can be communicated by the author.
production field (European Association for Animal Production). This type of inventory can also be considered on a national scale but initiatives don’t seem very frequent: Spain mentions a national network and Belgium has a national association (Belgian Association of Meat Science and Technology). It would be in addition useful to study the research organisation in Europe in the light of what is done in other continents or nations which also lead research on a very large scale, for example in the USA or in Australia.

3 – RESEARCH TOPICS

Concerning the analysis of the research topics, two approaches were used: the first one is based on the results of the survey evoked in the previous point; the second one is based on the analysis of the papers published in 2006 in a scientific journal very representative of muscle science and meat technology: Meat Science. These data will be completed with a very brief outline of some recent European projects.

3.1 On the basis of inventory of the research organisations

When combining all research centres the distribution of the activities per species (cattle, pig, sheep, poultry, others), per product (from the in vivo muscle to the processed products) and per discipline is presented in the table 1.

The most often mentioned species are by decreasing order the pig (~80%), the cattle (~75%) and the poultry (~60%), which corresponds more or less to the position of these species in terms of production and consumption at the European level. It should be stressed the fact that these teams very often study several species. It was however not possible to determine the share that each one devotes to each species.

Concerning the products it can here also be observed that most of the teams have a relatively broad field of investigation since they often complete their work at the same time on the level of carcass, fresh meat, processed products and adipose tissue. This also shows their intervention at various stages of the meat chain.

At last, with regard to disciplines or parameters taken into account, it can be pointed that sensorial/organoleptical characteristics are studied by a very large majority of the teams (~80%), which shows these subjects are considered as a priority. The nutritional value (~68%) and the study of the technology/processing (~70%) come in second position. Muscle science as such (biochemistry, histology for examples), animal nutrition, welfare and genetics are less often quoted. The aspects related to the public health are less often mentioned. It can not be concluded from these observations that the researchers take no further interest in these aspects; this only indicates that those subjects are probably treated by specialised teams who have a less vertical approach of the muscle and meat study than the consulted teams. Thus for example, the study of the residues and the contaminants or the study of the genotype implies the use of
very sophisticated technical means and very pointed competences that are generally only present in specialised teams (cf point 2). Finally, the economical aspects and the consumer behaviour study were the least most often mentioned by the questioned teams, respectively ~23 and ~28% of the answers.

Table 1

Results from the survey: global distribution of the activities per species, product and discipline (based on 40 answers received to the 12/09/2006)

<table>
<thead>
<tr>
<th>Species</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>30</td>
<td>75%</td>
</tr>
<tr>
<td>Pork</td>
<td>32</td>
<td>80%</td>
</tr>
<tr>
<td>Sheep</td>
<td>15</td>
<td>38%</td>
</tr>
<tr>
<td>Poultry</td>
<td>24</td>
<td>60%</td>
</tr>
<tr>
<td>Other: wild game</td>
<td>3</td>
<td>8%</td>
</tr>
<tr>
<td>Other: rabbit</td>
<td>3</td>
<td>8%</td>
</tr>
<tr>
<td>Other: miscellaneous</td>
<td>3</td>
<td>8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Products</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle (in vivo)</td>
<td>10</td>
<td>25%</td>
</tr>
<tr>
<td>Carcass</td>
<td>29</td>
<td>73%</td>
</tr>
<tr>
<td>Fresh meat</td>
<td>35</td>
<td>88%</td>
</tr>
<tr>
<td>Meat products</td>
<td>30</td>
<td>75%</td>
</tr>
<tr>
<td>Fat/lipids</td>
<td>27</td>
<td>68%</td>
</tr>
<tr>
<td>Offals</td>
<td>7</td>
<td>18%</td>
</tr>
<tr>
<td>Other: miscellaneous</td>
<td>3</td>
<td>8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disciplines</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal nutrition</td>
<td>21</td>
<td>53%</td>
</tr>
<tr>
<td>Animal welfare</td>
<td>20</td>
<td>50%</td>
</tr>
<tr>
<td>Genetic</td>
<td>17</td>
<td>43%</td>
</tr>
<tr>
<td>Biochemistry/metabolism</td>
<td>22</td>
<td>55%</td>
</tr>
<tr>
<td>Histology</td>
<td>10</td>
<td>25%</td>
</tr>
<tr>
<td>Hygiene</td>
<td>14</td>
<td>35%</td>
</tr>
<tr>
<td>Microbiology</td>
<td>19</td>
<td>48%</td>
</tr>
<tr>
<td>Residues/contaminants</td>
<td>12</td>
<td>30%</td>
</tr>
<tr>
<td>Sensory/organoleptical</td>
<td>32</td>
<td>80%</td>
</tr>
<tr>
<td>Nutritional value</td>
<td>27</td>
<td>68%</td>
</tr>
<tr>
<td>Technology/processing</td>
<td>28</td>
<td>70%</td>
</tr>
<tr>
<td>Economical aspects</td>
<td>9</td>
<td>23%</td>
</tr>
<tr>
<td>Consumer behaviour</td>
<td>11</td>
<td>28%</td>
</tr>
<tr>
<td>Quality management</td>
<td>16</td>
<td>40%</td>
</tr>
<tr>
<td>Other: miscellaneous</td>
<td>7</td>
<td>18%</td>
</tr>
</tbody>
</table>

Frequency of the items

<table>
<thead>
<tr>
<th>≥ 50%</th>
<th>≥ 25%</th>
<th>&lt; 25%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.2 On the basis of literature: Meat Sci., 2006 (J. Culioli, personal communication)

Papers published in 2006 in Meat Science (volumes 72, 73 and 74 – including the main papers presented during the 52nd International Congress of Meat Science and Technology, Dublin, Ireland – adding up 270 publications) were classified according to the first author country, the species or the product, the field and the topic. For information and with caution related to the partial character of the approach, it must be said that the European countries (17 countries of the U.E. 25 + Switzerland + Norway) add up 173 papers, which is approximately 2/3 of the total of this journal with worldwide diffusion. The positions of the countries according to their scientific production are as follows: Spain (64), Denmark (16), Ireland (15), Italy (13), France/the United Kingdom (10), Greece (8), Portugal (7), Germany (6), Belgium (5), Sweden (4), Switzerland and Norway (3), Finland/Netherlands/Czech Republic (2), Austria/Poland/Slovakia (1). Spain alone totalises up to 1/4 of the papers of the year 2006 (1/3 of the European papers), which can largely be explained by the high number of research organisations working on meat in this country. France is in the “top 6” which totalises up the 3/4 European papers; Belgium is in the “top 10” which totalises 89% of the European publications.

In order to specify the activities and topics, the publications issued out of the countries of “top 6” were sorted by:

- Species/products: beef, pork, sheep, poultry, rabbit, processed products, others and all;
- Fields: production factors, genetic factors, (pre)slaughter factors, technological factors, analytical methods;
- Topics: sensory quality, microbiology, nutritional quality, consumer behaviour, carcass, composition/structure, biochemistry, traceability.

Table 2 shows the outstanding points of this analysis applied to each country when reassembling research centres.

Concerning the species or products, it can be noticed that pork is preponderant in the studies carried out in Denmark and that beef is preponderant in the studies undertaken in Ireland. These research priorities can be explained by the respective predominance of these species in meat production of these countries. A tendency to specialisation is observed in Spain (pork) and France (beef) but it’s less pronounced than in the 2 latest cited countries. Italy and the United Kingdom are characterized by a more uniform distribution of the species or products. One could be astonished by the nearly absence of the papers devoted to poultry. This observation is in contradiction with the results from the survey (cf 3.1.) that revealed that approximately 60% of the research teams worked – at least partially – on poultry. This can easily be explained by the fact that scientific journals that are specifically dedicated to these species preferentially distribute results of correspondent research.

Concerning the research fields, one can retain that the technological factors, the production factors or (pre)slaughter factors are the leading fields in all the countries, except for France which is characterized by a particular attention to the analytical methods. Analytical methods are also very studied in the United Kingdom (1st position ex-aequo) and in Italy (2nd position).
Table 2


<table>
<thead>
<tr>
<th>Spain</th>
<th>Denmark</th>
<th>Ireland</th>
<th>Italy</th>
<th>France</th>
<th>United Kingdom</th>
<th>Top 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original papers</td>
<td>Σ = 64</td>
<td>24%</td>
<td>Σ = 16</td>
<td>6%</td>
<td>Σ = 15</td>
<td>6%</td>
</tr>
<tr>
<td>Species/product</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pork</td>
<td>63%</td>
<td>Pork</td>
<td>69%</td>
<td>Beef</td>
<td>67%</td>
<td>Pork</td>
</tr>
<tr>
<td>Beef</td>
<td>52%</td>
<td></td>
<td>19%</td>
<td>Meat products</td>
<td>20%</td>
<td>Beef</td>
</tr>
<tr>
<td>Meat products</td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
<td>13%</td>
<td>All</td>
</tr>
<tr>
<td>Meat products</td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological factors</td>
<td>41%</td>
<td>Technological factors</td>
<td>38%</td>
<td>Technological factors</td>
<td>67%</td>
<td>Production factors</td>
</tr>
<tr>
<td>Production factors</td>
<td>25%</td>
<td></td>
<td>Production factors</td>
<td>27%</td>
<td>Analytical methods</td>
<td>31%</td>
</tr>
<tr>
<td>Genetic factors</td>
<td>19%</td>
<td>Genetic factors</td>
<td>19%</td>
<td>(Pre)slaughter factors</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>(Pre)slaughter factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analytical methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analys</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensory quality</td>
<td>34%</td>
<td>Sensory quality</td>
<td>50%</td>
<td>Sensory quality</td>
<td>73%</td>
<td>Sensory quality</td>
</tr>
<tr>
<td>Composition/structure</td>
<td>34%</td>
<td>Biochemistry</td>
<td>44%</td>
<td>Biochemistry</td>
<td>20%</td>
<td>Composition/structure</td>
</tr>
<tr>
<td>Microbiology</td>
<td>23%</td>
<td>Composition/structure</td>
<td>30%</td>
<td>Carcass</td>
<td>20%</td>
<td></td>
</tr>
</tbody>
</table>

Frequency of the items

- ≥ 50%
- ≥ 25%
- < 25%
With regard to the topics of the studies, this analysis confirms the results from the survey since sensory quality is the main subject out of all studies (more than 1/3 on average) with a maximum in Ireland (73%) and a minimum in France (10% only). The French approach seems different as it concerns mainly the biochemical and nutritional aspects. Must we see in there the sign of a research in a more fundamental matter?

3.3 On the basis of the European projects

The research projects financed by the European Union constitute a very objective indicator of the researches led on a European scale. It is however difficult to give a report on all the projects related to meat. To realize it, when doing a quick research on the basis of the key word “meat” in E.U. website “Cordis”, which records all the funded projects, it appears that the number of projects financed by the U.E. is higher than 200. In this talk, we will limit ourselves to major projects of recent 5th and 6th Framework Programmes (FP5 and FP6).

3.3.1 EUPIGCLASS

This project implying 20 partners from 15 European countries aimed the “standardization of pig carcass classification through improved statistical procedures and new technological developments”.

This project revealed the need for new studies devoted to the precision of the dissection methods used for the prediction of the lean meat content of the carcasses. Recommendations were made concerning the sampling, dissection and statistical methods during the implementation of new classifying equipment on a national level. These recommendations resumed in a statistical handbook can be considered as a complement to the current European legislation covering this field. A quality assurance program was developed; it can be considered as recommendations for the implementation of national control programmes of the classification by independent organisations (G. Daumas, personal communication).

Project title: Standardization of pig carcass classification in the EU through improved statistical procedures and new technological developments.

Coordinator: Danish Meat Research Institute, Roskilde (Contact: K.B. Madsen).
French partner of the project: IFIP/Institut Technique du Porc (Contact: G. Daumas).
For more info, see: http://www.eupigclass.net/

3.3.2 HEALTHYBEEF

This project gathering 7 partners from 5 countries aimed to “enhance the content of beneficial fatty acids (n-3 fatty acids and CLA) in beef and improve meat quality for the consumer”.

This project contributed to a better comprehension of the variation factors in the fatty acid composition (in particular factors related to the production systems) and offered the industries various options or tracks making it possible
to increase beneficial fatty acids supply while preserving conservability and sensorial quality of meat expected by the consumer, and it’s flavour in particular (N. Scollan, personal communication).

Project title: Enhancing the content of beneficial fatty acids in beef and improving meat quality for the consumer.
Coordinator: Institute of Grassland and Environmental Research, the U.K. (Contact: N. Scollan).
French partner of the project: INRA/UR Recherche des Herbivores (Contact: M. Doreau).
For more info, see: http://www.healthybeef.iger.bbsrc.ac.uk/

### 3.3.3 TRADISAUSSAGE

This project gathering 10 partners resulting from 6 countries had for objective the “assessment and improvement of traditional dry sausage, from producers to consumers”, while preserving their typical quality.

This study highlighted the importance of the small manufacturing units in the southern (FR, ES, IT, PT, GK) and eastern (SK) Europe. It made it possible to define several groups of consumers according to their purchase, storage and consuming habits. The safety evaluation was carried out on the production and consumption stages and was completed by a quantitative risk analysis, which made it possible to relativise the risk related to *Listeria monocytogenes* in this type of product. Recommendations were made to improve hygiene and safety of the products (for example the introduction of disinfection procedures and the development of starter cultures). These observations and recommendations gave place to a good hygiene practices guide adapted to small manufacturing units (R. Talon, personal communication).

Project title: Assessment and improvement of safety of traditional dry sausages from producers to consumers.
Reference: QLK1 CT-2002-02240; Duration: 01/01/2003 – 31/12/2005.
Coordinator: INRA, Unit Microbiology (Contact: R. Talon).
For more info, see: http://www2.clermont.inra.fr/tradisausage/index.htm

### 3.3.4 SUSPORKQUAL

This project gathering 9 partners from 7 European countries related to the “sustainability in the production of pork with improved nutritional and eating quality using strategic feeding in out-door production”.

A study carried out on the consumers made it possible to determine what they expected and their attitudes and revealed the crucial role of labelling, the need of a clear differentiation of such type of meat (clearly different aspect from a conventional meat) and made it possible to consider the over cost accepted

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by the consumer (< 20%). This project has allowed quantifying and better understanding the relationship between meat characteristics and growth performances and the behaviour of the pigs produced out-door or in organic production. Recommendations were made as regards strategy of production (for example, difficulty of a strategy based on the compensatory growth, importance of the breed effect on the sensory and nutritional characteristics, phytases supplementation and welfare). In addition it has to be noticed that the contaminants contents observed in the meats issued out of such a production system were within the limits required by the E.U. (Andersen and Nannerup, 2004).

Title: Sustainability in the production of pork with improved nutritional and eating quality using strategic feeding in out-door production.

Reference: QLK5-CT-2000-00162 (= FP5); Duration: 01/01/2001 – 30/06/2004.


Partners for France: INRA, Theix (Contacts: E. Dransfield, C. Terlouw); INRA, Rennes (Contacts: M. Bonneau, B. Lebret).

For more info, see http://www.agrsci.dk/anf/Susporkqual-Folder/Susporkqual/index.html

3.3.5 GEMQUAL

This project concerns “assessment of genetic variation in meat quality and the evaluation of the role of candidate genes in beef characteristics”. It reassembles 9 partners resulting from 5 countries.

The study was carried out on bulls from 15 different breeds which were produced in similar breeding conditions in order to minimize the influence of other variation factors and out of which many quality parameters were measured. These data should give the possibility to test candidate genes and confirm the particular QTL (Quantitative Trait Loci) effects on meat quality. This project aims in particular at identifying SNP (Single Nucleotide Polymorphisms) being able to influence the meat quality, which then could be used as genetic markers.

In France, this project has been completed by two national projects in response of the GENANIMAL call for proposals (funded by ANR, APIS-GENE): (i) the MUGENE project which aims at determining the genetic expression profile associated to a good meat quality according to the muscle growth potential and breeding factors, and at discovering new molecular markers or polymorphic genes which control the meat quality; (ii) the QUALVIGENE project which will evaluate on a great number of animals (approximately 3550 bulls) the interest of the genetic tests now available or resulting from the previous programmes (MUGENE, GEMQUAL).

1. Project title: Integrated approach combining genetics, genomics and muscle biology to manage beef meat quality according to animal growth and breeding factors – Coordinator: INRA/UR Herbivores (J.-F. Hocquette).
Title: Assessment of genetic variation in meat quality and the evaluation of the role of candidate genes in beef characteristics.
Reference: QLK5-CT-2000-00147 (= FP5); Duration: 01/02/2001 – 31/01/2006.
Coordinator: Roslin Institute, Edinburgh, the U.K. (Contact: J. Williams).
Partners for France: Unité de Génétique Moléculaire Animale UMR1061 INRA-Univ. Limoges (French Contact of WP: H. Leveziel); INRA/UR Herbivores (Contact: J.-F. Hocquette).
For more info, see: http://www.gemqual.org

3.3.6 TYPIC

This project reassembling 9 partners from 6 countries wasn’t exclusively related to “meat” field as it concerned as much dry ham and red wine. The first objective was to measure the consumer’s preferences regarding designation of origin. The second objective was to characterize these products by physicochemical analyses and to develop a typicity evaluation method. This project showed that, beyond their preference for products of their native area, a limited but significant group of consumers is interested in foreign designations of origin. The products of origin label often show specific traits coming from raw materials and processing. Their physicochemical analysis reveals particular sensory profiles. This physicochemical characterization can prove itself very useful to legitimate even more the European policy related to identification and labelling matters of the designations of origin (G. Giraud, personal communication).

Title: Typical food products in Europe: consumer preference and objective assessment.
Reference: QLK1-CT-2002-02225 (= FP5); Duration: 01/01/2003 – 31/12/2005.
Coordinator: ENITA Clermont-Ferrand (Contact: G. Giraud).
Partners for France: id. + INRA/ENITIA Nantes + INRA Montpellier.
For more info, see: http://www.typic.org

3.3.7 WELFARE QUALITY®

Thirty-nine institutes and universities representing 13 European countries with specialist expertise participate in this integrated research project designed to develop European standards for on-farm welfare (cattle, pig, poultry) assessment and product information systems as well as practical strategies for improving animal welfare. The standards for on-farm welfare assessment and information systems will be based upon consumer demands, the marketing requirements of retailers and stringent scientific validation. The key is to link informed animal product consumption to animal husbandry practices on the farm. The project therefore adopts a “fork to farm” rather than the traditional “farm to fork” approach. Welfare Quality® will make significant contributions to the societal sustainability of European agriculture.

Title: Welfare Quality®, science and society improving animal welfare in the food quality chain.
Reference: FOOD-CT-2004-506508 (= FP6); duration: 01/05/2004 – 30/04/2009.
Coordinator: Wageningen-UR/Animal Sciences group (Contact: H.J. Blokhuis).


For more info, see: http://www.welfarequality.net

### 3.3.8 Q-PORKCHAINS

This project, still in negotiation reassembling 51 partners, meets the need of developing innovative, integrated and sustainable production chains of high quality pork meat matching consumer demands. The strategy of the project is to develop and test sophisticated and multidisciplinary approaches for identification, characterization, prediction and control of fresh meat and meat products from pig at various stages of the chain and in various production systems. This project will take into account: the consumer’s behaviour and preferences; production systems; the development of the products; the integration and the sustainable development of the chain; the last developments in genomic and biology; the development of quality prediction models, the safety and the welfare. The valorisation of these results will depend on the active participation of SME and large industries to pilot chains, the dissemination of knowledge and technology by training and the implementation of networks (L. Andreasen, personal communication).

Title: Improving the quality of pork and pork products for the consumer: development of innovative, integrated and sustainable food production chains of high quality products matching to consumer demands.

Reference: in negotiation (= FP6); Duration envisaged: 2007-2011.

Coordinator: Danish Institute of Agricultural Sciences, Foulum, DK (Contact: A. Karlsson).

Contact for France: INRA, Unit SENAH (M. Bonneau).

### 3.3.9 PROSAFEBEFEE

This project, reassembling at the present stage of the negotiation 42 European and non-European participants, is integrated in the global context of optimisation of beef quality and safety. It will thus cover the aspects related to food safety, nutritional and sensory characteristics, as well as consumer demands. This project will use in particular various tools and methodologies for quality control: quantitative evaluation of the biological and chemical risks, strategies of safety control from the stable to the table, prediction models of sensory quality (in particular an Australian model), biochemical and molecular tools. These tools, even though they would have already been used before, must be tested and validated under the European conditions.

Title: Improving the quality and safety of beef and beef products for to consumer in production and processing.

Reference: in negotiation (= FP6); Duration envisaged: 2007-2011.

Coordinator: Teagasc, Ireland (Contact: D. Troy).

Contacts for France: INRA, several laboratories (Contacts: J. Culioli + J.-F. Hocquette); UNCEIA (Contact: A. Malafosse).
4 – CONCLUSIONS AND PERSPECTIVES

Out of this inventory, which is not exhaustive but representative of the structures and the research topics in the muscle science and meat technology field in Europe, one can draw several conclusions. The research structures evolve progressively with the evolution of these sciences: even if the approach is often still “broad”, specialisation and the means increasingly larger that the research requires, involve sometimes a reorganization of the structures around the discipline, even of a tool, allowing an extremely pointed level of research. One should however take care that this specialisation of competences does not disconnect the researchers from the reality and the preoccupations of the sector.

A very spectacular evolution of the relations between the units/research centres was observed during the last decades. They collaborate more and more on a European level, even on a world wide level. The funding mode of research mainly explains this evolution. The great European research programmes (for example Framework Programmes) privilege the reassembling of competences and means around very great projects sometimes implying several tens of partners and very important budgets (to amounts of about 15.000.000 €). The coordination of such integrated projects is very heavy and requires means not available in all research centres.

The listed topics seem to answer clearly the society and the consumer preoccupations in particular: optimisation of sensory quality, improvement of nutritional quality, safety, traceability/authenticity, sustainable development, animal welfare. They also take into account the needs for the actors of the chain: prediction methods and quality management systems, innovation and competitiveness, consumers behaviour, …

This inventory is however only partial… In spite of the very spectacular evolution in technological means of communication and diffusion of information, one can note that it is difficult to make, within relatively short times, a complete inventory of the research structures in Europe. Such an inventory would be of obvious interest: it would make it possible to support even more the collaborations between teams, while avoiding useless duplications.

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