

## GENDUROC – Authentication of Duroc pork products using genetic markers

### Summary

An increasing number of consumers associate Duroc pork products with quality. Up to now, however, there have been no regulations for identifying products with the name Duroc, nor a system to check the designation, as there is for Iberian pork products. Given this lack, several producers have long expressed the need to implement a self-monitoring labelling programme that is at least capable of rejecting batches of products labelled 100% Duroc or 50% Duroc that does not come from Duroc parents (both for 100% Duroc and at least one of them for 50% Duroc) registered in an official breed herd book.

DNA analysis makes it possible to identify species, breeds and individuals on the basis of the number of genetic variants unique or specific to each. This project aims to find DNA variants unique and/or specific to the Duroc breed that would allow the exclusion of product batches misidentified as 100% or 50% Duroc.

### Objectives

The overall objective of the project is to initiate a process to validate an authentication system for Duroc meat products.

- Objective 1: validate the ability of the *MC1R/KIT1* polymorphic system to exclude products labelled as 100% or 50% Duroc when they are not.
- Objective 2: identify a battery of unique and specific markers to identify Duroc products from a reference population.
- Objective 3: develop and validate an efficient genotyping protocol for markers suggestive of Duroc in meat products in potential tracing systems.

### Description of the actions carried out in the project

The project consists of three experiments, one per objective.

- Experiment I: validation test for *MC1R/KIT1* markers from samples where the percentage of Duroc genes is known.
- Experiment II: assay to identify new markers unique or specific to the reference Duroc population.
- Experiment III: field study to develop the genotyping protocol for commercial products.

### Final results and practical recommendations

The *MC1R/KIT1* marker system may almost be sufficient to rule out a product labelled 100% Duroc that is not such, but insufficient for 50% Duroc. To find more markers unique and/or specific to Duroc, the whole genome sequence of Duroc and non-Duroc specimens was compared. No variant entirely unique to Duroc was found, but a stock of 4,074 Duroc-specific single nucleotide polymorphisms (SNPs) was identified, all of which are suitable for genotyping with a DNA chip unlike *KIT1*. With the 24 initially most informative SNPs (more independent and specific in all Duroc origins), a first panel of markers was proposed for the authentication of

products mentioning Duroc. This panel was shown to be sufficient to discriminate between homogeneous batches of products or between a 100% individual Duroc product (>90%) or a 50% Duroc product from others with a lower percentage of Duroc genes, but was insufficient to discriminate between a 50% Duroc offspring of a Duroc parent and a 50% Duroc where neither parent was Duroc. Products from the latter genetic type are rare, so the proposed panel may be sufficient for initial monitoring of the degree of concordance between Duroc genotype and labelling, especially for batches, as in this case the percentage success with the panel was very high. However, it should be noted that the procedure is still limited. Firstly, the individual probability of assignment, in particular for 50% Duroc products, is insufficient (~70%), as is the representativeness of the training sample, which is highly conditional on the two reference Duroc lines of the project. Thus one way of avoiding these two limitations would be to validate the panel with more samples from more Duroc origins and, if necessary, extend it with more markers. Therefore, should expanding the panel or replacing one of the proposed SNPs with another prove worthwhile, a list of 200 additional SNPs is provided as a reserve. The result of the commercial sampling suggests that most products labelled Duroc might actually be 50% Duroc, while a not insignificant part of those labelled 50% Duroc might not be the offspring of a Duroc parent, which would confirm the need to clarify the market for Duroc products. It has been established that marker authentication can be performed on fresh, cured and cooked products.

### Conclusions

The result of the commercial sampling suggests that most products labelled Duroc might actually be 50% Duroc, while a not insignificant part of those labelled 50% Duroc might not be the offspring of a Duroc parent, which would confirm the need to clarify the market for Duroc products. It has been established that marker authentication can be performed on fresh, cured and cooked products.

### Leader of the Operational Group

ORGANISATION: Selecció Batallé, SA

### Coordinator of the Operational Group

ORGANISATION: CATALAN MEAT AND ALTERNATIVE PROTEIN CLUSTER (INNOVACC)

### Other members of the Operational Group (grant recipients)

ORGANISATION: GRUP GEPORK, SA

### Other members of the Operational Group (not recipients of the grant)

ORGANISATION: -

### Geographical area(s) of application

PROVINCE(S)	REGION(S)
BARCELONA	OSONA
GIRONA	GIRONA

### Dissemination of the project (publications, conferences, multimedia, etc.)

News on the INNOVACC website in November 2019, where a news item on the project grant application was published:

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<https://www.innovacc.cat/2019/11/21/projectes-presentats-en-la-linia-de-grups-operatius-2019-del-darp/>

- INNOVACC November 2019 Newsletter, where a news item on the grant application was published.
- Presentation of the Ordinary General Assembly of INNOVACC, on 15 June 2020.
- News item on the INNOVACC website in June 2020 where a news item on the decision on the project grant was published:  
<https://www.innovacc.cat/2020/06/29/6-projectes-presentats-en-la-linia-de-grups-operatius-2019-del-darp-obtenen-resolucio-favorable/>
- INNOVACC June 2020 Newsletter, where a news item on approval of the project was published.
- News item on the INNOVACC website published on 30 September 2020, explaining how the project grant had been obtained and providing a brief general description, including the participants, funding and expected completion date.  
<https://www.innovacc.cat/2020/09/30/grups-operatius-2019-projecte-genduroc-autenticacio-de-productes-porcins-de-raca-duroc-mitjancant-lus-de-marcadors-genetics/>
- INNOVACC newsletter of September 2020, where a news item about the approval of the project was published.
- Presentation of the Extraordinary General Assembly of INNOVACC, on 21 December 2020.
- Publication on the website of the beneficiary company S. Batallé, published on 17 February 2021, explaining how the subsidy to carry out the project was obtained.  
<https://www.batalle.com/cat/noticies/seleccion-batalle-lidera-el-projecte-autenticacio-de-productes-porcins-de-raca-duroc-mitjancant-lus-de-marcadors-genetics-genduroc.html>
- News item on the Grup Gepork website, published on 24 February 2021, explaining how the subsidy for the project was obtained.  
<https://www.gepork.es/2021/02/24/projecte-genduroc-autenticacio-de-productes-porcins-de-raca-duroc-mitjancant-lus-de-marcadors-genetics/>
- INNOVACC 2021 annual magazine, which included the project. See page 26 of the following link:  
[https://www.innovacc.cat/wp-content/uploads/2021/06/disseny-revista-innovacc-2021\\_ok.pdf](https://www.innovacc.cat/wp-content/uploads/2021/06/disseny-revista-innovacc-2021_ok.pdf)
- Presentation of the Extraordinary General Assembly of INNOVACC, on 21 June 2021.
- News item on the INNOVACC website published on 31 August 2021 explaining this and other projects. See the news item at the following links:  
<https://www.innovacc.cat/2020/09/30/grups-operatius-2019-projecte-genduroc-autenticacio-de-productes-porcins-de-raca-duroc-mitjancant-lus-de-marcadors-genetics/>
- INNOVACC August 2021 newsletter, where the news item “Us mostrem els casos d’èxit publicats a la revista anual d’INNOVACC publicada el juny-2021” (Success stories published in the June-2021 INNOVACC annual magazine) about this and other projects was published.

- INNOVACC 2022 annual magazine, which included the project. Action planned in the Project Dissemination Plan. See page 16 of the following link: [https://www.innovacc.cat/wp-content/uploads/2022/07/disseny-revista-innovacc-2022\\_BR.pdf](https://www.innovacc.cat/wp-content/uploads/2022/07/disseny-revista-innovacc-2022_BR.pdf)
- Presentation of the project to the Extraordinary General Assembly of INNOVACC, on 20 June 2022.

### Project website

<https://www.innovacc.cat/2020/09/30/grups-operatius-2019-projecte-genduroc-autenticacio-de-productes-porcins-de-raca-duroc-mitjancant-lus-de-marcadors-genetics/>

### More information on the project

PROJECT DATES	TOTAL BUDGET
Start date (month-year): July 2020	Total budget: €106,000.00
Completion date (month-year): September 2022	DACC funding: €43,320.00
Current status: Completed	EU funding: €32,680.00
	Own funding: €30,000.00

### With funding from:

Project funded through Operation 16.01.01 (Cooperation for Innovation) through the Catalan Rural Development Programme 2014-2022.

*Order ARP/133/2017 of 21 June, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ARP/1531/2019, of 28 May, announcing the call for the grant.*

