Increasing Canadian pork consumption, market share and competitiveness through enhanced nutritional values and overall quality with a functional molecule in pork meat

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Project Status: Completed in 2018

The functional molecule studied in this project is carnosine, a naturally-occurring molecule found in meat, poultry and in certain fish but not in foods of plant origin. Carnosine possesses many interesting qualities such as antioxidant and anti-aging properties.

Some outcomes of this study include:

- **A method to identify swine with high levels of muscle carnosine has been developed.**
- **A genetic marker (the SLC15A4 c.658A>G SNP) has been associated with an increase in carnosine content and improved pork meat quality.**
- **Only a few (8.5%) of surveyed pork consumers had previously heard of carnosine but they showed a willingness to pay more for carnosine-enhanced pork.**

Why was this study done?

In this project, purebred pigs in Canada were measured for their levels of carnosine. The effects of this molecule on meat quality traits were studied and researchers also verified if levels of carnosine can be enhanced through pig nutrition.

In addition, work has been done to better understand public perception and interest in this new product (for example, carnosine-enhanced pork). The information gathered will be used to create strategies to motivate the consumption of enhanced pork.

What was done and what was the outcome?

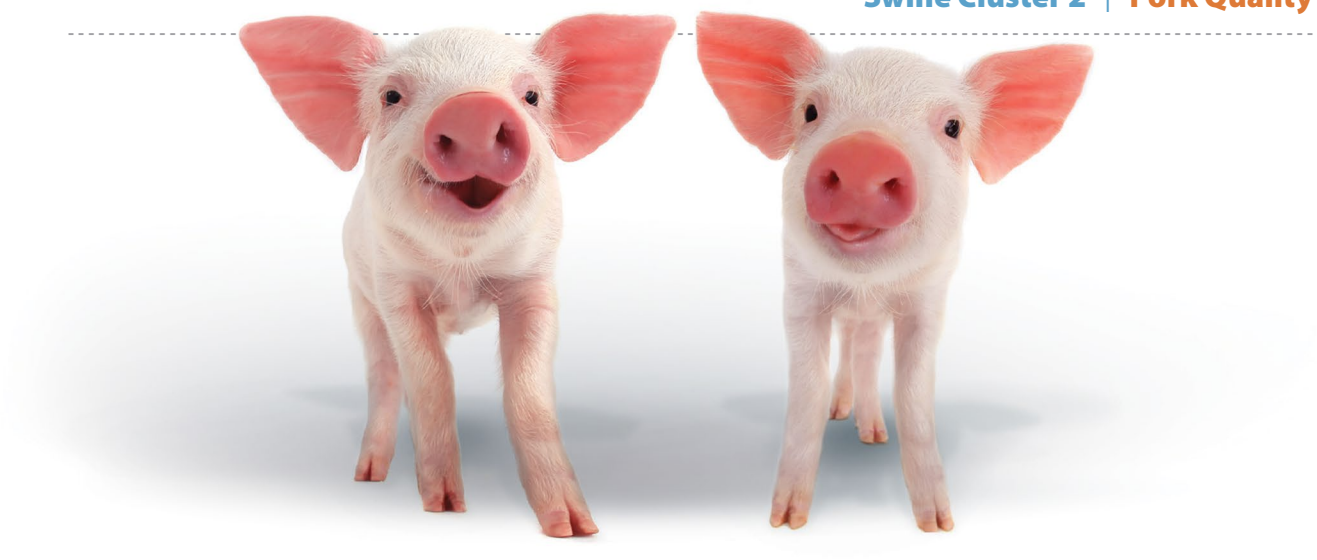
Identification of genetic markers

Twenty-seven genetic markers (SNPs) were identified in different carnosine-related genes with the most promising associations observed for SNP SLC15A4 c.658A>G. For this SNP, when compared with pigs having the AG genotype, animals with the AA genotype had the following benefits:

- Higher muscle carnosine content
- Higher pH 24 h values
- Lower color b* and color L*
- Lower drip and cooking loss
- Lower glycolytic potential values

Therefore, the SLC15A4 c.658A>G SNP could potentially be used in selection programs to increase carnosine content and improve pork meat quality. However, many Duroc and Landrace pigs already had the genotype AA, limiting the potential meat quality improvements for these two breeds. Results also showed that the sex of animals did not influence the level of carnosine present in the muscle.

Researchers also developed a molecular method to identify this SNP in swine.



Feeding trial with pigs

To see if carnosine levels could be enhanced in pork meat through feeding, a nutritional test was conducted. Pigs received a supplement of beta-alanine in varying amounts in their diets over an eight-week period. The meat from these pigs was analyzed and showed that the supplement did not increase carnosine content, but had other benefits, such as decreased lipid and protein oxidative damage. These results will be useful in identifying alternative dietary strategies to increase carnosine in pork.

Surveys to gage public perception

Given recent publicity on the possible links between red meat consumption and health risks, it was unclear whether the idea of increasing the healthiness of pork through higher carnosine levels would be well received by the public. Therefore, two consumer surveys were conducted in Canada. Results of the first survey suggested that consumers who were more health conscious and had more knowledge in general about nutrition were more interested in consuming carnosine-enhanced pork. Results of the second survey showed that only 8.5% of the surveyed pork eaters had heard of carnosine. Interestingly, these same respondents all showed a willingness to pay more for carnosine enhanced pork. Thus, communicating the benefits of carnosine to consumers will certainly be an important aspect of implementing a marketing strategy for carnosine-enhanced pork.

Collaborators

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Ellen Goddard	University of Alberta
Marie-France Palin **Candido Pomar**	Sherbrooke Research and Development Centre, AAFC
Michael Young	Canada Pork International

Additional project information

Click on the links below for further information on this project

Links were last updated in 2022

R&D Featured Articles—by Geoff Geddes for Swine Innovation Porc

Articles may be found at: http://www.swineinnovationporc.ca/resources-e-newsletters.php

- Move over Multi-Vitamins and Supplements: Here comes Carnosine
  - October 2019 (Vol. 4, No. 15.)

Peer-reviewed articles/abstracts:

- D'Astous-Pagé, J., Gariépy, C., Blouin, R., Cliche, S., Methot, S., Sullivan, B., Fortin, F., Palin, M.F. (2017) Identification of single nucleotide polymorphisms in carnosine-related genes and effects of genotypes and diplotypes on pork meat quality attributes. Abstract. *Meat Science, 134: pp. 54-60*
  DOI: https://doi.org/10.1016/j.meatsci.2017.07.019
- D'Astous-Pagé, J., Gariépy, C., Blouin, R., Cliche, S., Sullivan, B., Fortin, F., Palin, M.F. (2017) Carnosine content in the porcine longissimus thoracis muscle and its association with meat quality attributes and carnosine-related gene expression. Abstract. *Meat Science, 124: pp. 84-94*
  DOI: https://doi.org/10.1016/j.meatsci.2016.11.004

Additional Resources:

2017

- Goddard, E., Muringai, V., Robinson, A. (2017) Consumer Interest in a Natural Designation in Food Choice. Project Report. *University of Alberta Department of Resource Economics and Environmental Sociology.*
  Retrieved from: https://cloudfront.ualberta.ca/-/media/ales/departments/resource-economics-environmental-sociology/research/project-reports/documents/pr-17-01.pdf
- Arenna, Goddard, E. (2017) Consumer purchase intentions for carnosine-enhanced pork – a functional food. Abstract. *2017 Advances in Pork Production, Banff Pork Seminar Proceedings, Vol. 28: Abstract 26.*

  Retrieved from: https://www.banffpork.ca/proceedings/search
- Gariépy, C., Palin, M.F., Pomar, C. Goddard, E., Fortin, F., Sullivan, B., Binnie, M.A. Young, M., Lahaie, L. (2017) Higher concentrations of the anti-aging carnosine in pork increase its nutritional value and quality. Abstract. *2017 Advances in Pork Production, Banff Pork Seminar Proceedings, Vol. 28: Abstract 28.*
  Retrieved from: https://www.banffpork.ca/proceedings/search

2017

- Muringai, V., Goddard, E. (2017) Public trust and acceptance of technologies in pig production. Abstract. *2017 Advances in Pork Production, Banff Pork Seminar Proceedings, Vol. 28: Abstract 29*.
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- Gariépy, C., Palin, M.F., Pomar, C., Goddard, E., Fortin, F., Sullivan, B., Binnie, M.A., Young, M.(2017) Higher carnosine level in pork increases its health nutritional value and quality. Abstract and Poster Presentation. *Annual Canadian Meat Council Conference.*
  Retrieved from: https://www5.agr.gc.ca/eng/science-and-innovation/agricultural-research-results/agricultural-science-reports-and-presentations-2017/?id=1518102238051
- *Gariépy, C., Palin, M.F., Pomar, C., Goddard, E., Sullivan, B., Fortin, F., Binnie, M.A., Young, M., Lahaye, L. (2017)* Higher concentrations of the anti-aging carnosine in pork increase its nutritional value and quality. Poster Presentation. *Doors Open. AAC-Sherbrooke and AAC-St-Hyacinthe*
  Retrieved from: https://www5.agr.gc.ca/eng/science-and-innovation/agricultural-research-results/agricultural-science-reports-and-presentations-2017/?id=1518102238051

2016

- Palin, M.F., D'Astous-Pagé, J., Blouin, R., Cliché, S., Fortin, F., Sullivan, B., Gariépy, C. (2016) Muscle anserine content is associated with pork meat quality and carnosine synthase gene expression. In Energy and protein metabolism and nutrition. In: *J. Skomial and H. Lapierre (eds.) Energy and protein metabolism and nutrition, EAAP Scientific Series, Volume 137. ISBN: 978-90-8686-832-2*
  Available for purchase at: https://doi.org/10.3920/978-90-8686-832-2

2015

- D'Astous-Pagé, J., Gariépy, C., Blouin, R., Cliche, S., Sullivan, B., Palin, M.F. (2015) Carnosine levels in the porcine longissimus muscle and its association with meat quality traits and carnosine-related genes expression. Abstract. *Canadian Journal Society of Animal Science, 96(2): pp. 266-288.*
  DOI: https://doi.org/10.1139/cjas-2016-0071

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