Prevalence of foodborne pathogens in rural pigs and in derived cold pork meats - preliminary report

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Introduction
The "rural" breeding of one or two pigs and their domestic slaughtering is a significant reality in the Veneto Region, as a consequence of an ancient tradition still surviving in the countryside.

In the eastern part of the Venice Province, about 2,500 rural pigs are bred and slaughtered every year in the period between November and February.

Many data are available on industrial breeding and processing, whereas very little is known about the prevalence of foodborne pathogens both in live animals and in derived food, mainly sausages, salami and cold pork meats.

The present paper shows the preliminary results of a project during which about 400 samples were collected at different steps: faeces, muscle and lymph nodes during slaughtering, fresh sausage just after sackling and fermented salami at the end of the seasoning period.

Samples are examined for several parameters, including bacteria (Enterobacteriaceae, Salmonella, Listeria monocytogenes, Campylobacter spp., β-glucuronidase-positive Escherichia coli, Lactic Acid Bacteria, Coagulase-positive Staphylococci and Sulphite-Reducing Clostrides) and parasites (Trichinellosis spp., Giardia duodenalis, Cryptosporidium spp and others).

The aim of the research is to define: 1) the pathogens prevalence during breeding, 2) the hygienic conditions during slaughtering and processing, mainly considering pathogen carry-over effects and 3) the microbiological profile of sausages and salami, the latter being conditioned by proper seasoning practices and environmental contamination.

The research will continue involving microbiology laboratories of the local hospitals since we would like to know if any case of illness due to foodborne pathogens was detected and recorded, moreover we will collect data about products (ingredients, salt percentage, use of preservatives... and processing (temperature, drying conditions, seasoning conditions...) to know the relationship between these conditions and pathogen prevalence in pork products.

Material and methods
Samples are processed in San Donà di Piave and Padua Parasitology Laboratories. Almost all deliveries are composed of the following samples: faeces and mesenteric lymph nodes taken during slaughter and a fresh sausage produced usually in the same day of slaughter, another sample of fermented salami, belonging to the same lot of the previous samples, are delivered after 60-70 days of seasoning.

In total, 70 faeces, 70 lymph nodes, 70 diaphragms, 69 fresh sausages, 12 seasoned salami samples were examined.


Diaphragms were examined for the detection of Trichinella spp. (magnetic stirrer method for pooled sample digestion, according to Regulation 2075/2005).

Lymph nodes and faeces were examined for the detection of Salmonella spp. (in 25 g), Listeria monocytogenes (in 25 g) and Campylobacter spp. (in 25 g).
pH was measured in all fresh sausages.

62 faecal samples were examined by flotation technique and modified Zhiel-Neelsen staining for gastrointestinal parasites, and Cryptosporidium oocysts. For 50 sample an Immunofluorescence (IF) kit (Merifluor, Meridian) for both Giardia cyst and Cryptosporidium oocysts was performed too.

Results

8 faeces samples (11.4 %) were positive for Campylobacter spp., (in 5 cases Campylobacter coli); 2 samples (2.8 %) were positive for Salmonella spp. (Salmonella derby and Salmonella typhimurium); Listeria spp. has never been detected.

25 faecal samples (40%) were positive for gastrointestinal parasites, in particular 15 (24.2) for coccidia, 9 (14.5%) for ascarids, 5 (8.0%) for trichurids and 4 (6.5%) for gastrointestinal strongyles. 7 animals showed mixed infection of 2 or more parasites. Giardia cysts were found in 5 animals (8.2%); 13 animals were found positives for Cryptosporidium oocysts at the stained smears, but only 8 of them (13.11%) were confirmed by IF.

5 lymph nodes samples (7.3%) were positive for Campylobacter spp. (1 Campylobacter coli and 1 Campylobacter jejuni). 2 samples (2.9 %) were positive for Salmonella spp. (1 Salmonella derby). No samples were positive for Listeria monocytogenes. 2 samples were not examined due to the small quantity.

All diaphragm samples were negative for Trichinella spp.

Fresh sausage samples (69) showed a Enterobacteriaceae count between 0 (7 samples) and 39.000.000 CFU/g; a Coagulase-positive Staphylococci count between 0 (6 samples) and 12.000 CFU/g; a β-glucuronidase-positive Escherichia coli between 0 (25 samples) and 910.000 CFU/g; a Sulphate-Reducing Clostridia count between 0 (40 samples) and 840 CFU/g. Lactic Acid Bacteria were counted between 270 and 1.300.000.000 CFU/g.

Salmonella spp. and Campylobacter spp. were not detected in any sample (in 25 g) while Listeria monocytogenes was detected in 1 sample (1,4%).

Inhibitory Substances have never been detected.

In all samples, pH values of fresh sausages ranged between 5.0 and 6.3.

Fermented salami samples (12) showed a Enterobacteriaceae count between 0 (5 samples) and 3.900 CFU/g; a Coagulase-positive Staphylococci count between 0 (8 samples) and 280 CFU/g; a β-glucuronidase-positive Escherichia coli between 0 (8 samples) and 4.000 CFU/g; a Sulphate-Reducing Clostridia count between 0 (9 samples) and 250 CFU/g. Lactic Acid Bacteria were counted between 67 and 500.000.000 CFU/g.

Salmonella spp. and Campylobacter spp. have not been detected (in 25 g) in any of the examined fermented salami; 2 samples (16.7%) were positive to Listeria monocytogenes.

In all samples, pH values of fermented salami ranged between 5.1 and 6.1.

Discussion

Even if only a few number of fermented salami has been examined (many of the others are still seasoning) preliminary results showed hygienic situation of alive rural pigs and derived meats. Some pathogens (Salmonella spp., Campylobacter spp.) were detected in faeces and lymph nodes but not in derived products.

This is probably due to good hygienic practices during slaughtering and processing. Enterobacteriaceae and β-glucuronidase-positive Escherichia coli reduction during seasoning says that this phase is, in most cases, correctly done.

In other situations this did not appear, probably as a consequence of not appropriate processing and seasoning conditions (temperature, humidity). Listeria monocytogenes presence in fermented salami is probably linked to a high water activity value, due to a low salt content or to a short seasoning period.

It will be important, by the end of the research, to correlate the presence of Listeria monocytogenes to these products and process characteristics.

Conclusions

Notwithstanding the research is not concluded, pathogens presence at different stages of production outlines the importance of continuing the exam of other samples.
According to the final results, HACCP principles will be used to establish where a CCP phase can help operators to avoid the risk of *Listeria* and other pathogens in final products. For each CCP, critical limits will be set, i.e.: salt percentage in the recipe, use of microbial starter cultures, seasoning conditions: time, temperature, humidity...

All these factors will be adequately considered since environmental conditions cannot be completely controlled since these products are usually stored in private basements and not in refrigerating rooms.

**References**