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(54) **PROCESS FOR PRODUCING MEAT PRODUCTS**

VERFAHREN ZUR HERSTELLUNG VON FLEISCHPRODUKTEN

PROCEDE DE PRODUCTION DE PRODUITS CARNES

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- **DATABASE WPI Section Ch, Week 9318 Derwent Publications Ltd., London, GB; Class D12, AN 91-224181 XP002068913 -& DK 166 250 B (SLAGTERIERNES FORSKNINGSINST)**
- **CHEMICAL ABSTRACTS, vol. 105, no. 19, 10 November 1986 (1986-11-10) Columbus, Ohio, US; abstract no. 170834d, I.I. TIMOSHCHUK ET AL.: "Novel high-protein products from beef" page 609; column 2; XP002068912 & PISHCH. PROM-ST. (KIEV, 1977-), no. 2, 1986, pages 31-33,**

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Description

[0001] The present invention relates to processes for producing meat products at high yield, to cured meat products produced without phosphate supplements and to meat products (e.g. cooked meat products) produced by such processes.

[0002] The water holding capacity (WHC) of meat is defined as its ability to retain the endogenous tissue water present in its structure. The water binding capacity (WBC) is defined as the ability of meat to bind added water. Both play a crucial role in meat manufacture.

[0003] Many different factors determine the WHC of meat. These include intrinsic factors, such as the age, gender, species, breed, muscle type, fat levels, prevalence of large blood vessels, size of the source animal, post-mortem physiological state and pH. Extrinsic factors include antemortem procedures (such as feeding patterns and physical activity prior to slaughter), method of slaughter, preservation techniques and adjuncts (such as added electrolytes).

[0004] Preferably the defined starter culture comprises a mixture of two or more species of microorganism.

[0005] The defined starter cultures comprise one or more Staphylococcus spp. and one or more Lactobacillus spp.

[0006] Chem. Abst., vol. 105, no.19 (1986-11-10), Columbus, ohio, US , page 609; col.2, abstr. № 170 83401 discloses the use a curing solution containing mixed bacteria including Streptococcus diacetilactis and lactobacillus acidophilus for producing high-protein products from beef having good flavor, water binding capacity, amino acid score and absence of pathogenic microflora.

[0007] Phosphates (usually polyphosphates) have been used in the meat industry for decades to increase the water retention properties of meat products. Although their effect is not fully understood, several possible mechanisms for phosphate activity have been proposed. These include the influence of changes in pH value, solubilization of proteins, effects of ionic strength and specific interactions of phosphate anions with divalent cations and myofibrillar proteins.

[0008] While phosphates have been approved for use in many different meats (for example, 5g/kg is accepted in certain types of hams in Europe), their use in certain types of meats is not permitted. For example, the meat industry in France, Germany, Italy and Poland does not use phosphates in certain cooked ham products (such as Jambon Superieur).

[0009] There is therefore a need for meat products which can be produced at high yield but which do not contain phosphate supplements. However, attempts to replace phosphates with supplements exhibiting similar yield-improving properties without adding to costs have been unsuccessful.

[0010] It has now surprisingly been discovered that starter cultures may increase the yield of a cooked whole muscle meat product, and that starter cultures have hitherto unrecognized utility in the production of Jambon Superieur.

[0011] Thus, according to a first aspect, the present invention there is provided a process for producing a cooked whole muscle meat product at a yield of at least 90% comprising the step of incubating the meat with a defined starter culture as defined in the claims.

[0012] In a second aspect, the invention relates to a process for producing a Jambon Superieur meat product comprising the step of incubating the meat with a defined starter culture as defined in the claims.

[0013] Preferably, the meat is produced at a yield of at least 90%, and the processes of the invention may increase the water binding capacity of the meat product (thereby increasing yield). In particularly preferred embodiments, the meat product is produced at a yield of at least 95%, at least 100%, greater than 100%, at least 110%, at least 120% or to en extent which is substantially equivalent to that obtainable through the use of phosphate supplements.

[0014] The process is conducted in the absence of supplementary phosphates. The term supplementary phosphates is intended to define phosphates (especially polyphosphates) added as a supplement during procesing to increase the phosphate content of the meat (and so increase yield). Thus, endogenous phosphates lost during processing may be "added back" in processes which are conducted in the absence of supplementary phosphates.

[0015] Any meat may be used in the process of the invention, but particularly preferred is a ham. In the second aspect of the invention, a Jambon Superieur is produced. The term "Jambon Superieur" is a term of art which defines a particular class of high quality cooked hams which are produced without the addition of supplemental phosphates.

[0016] Preferably, the Lactobacillus spp. used in the invention are selected from homofermentative Lactobacillus spp. (as defined in Bergey's Manual of Determinative Bacteriology, 8th Edition).

[0017] The optimum amount of each component of the starter culture may be readily determined by routine trial and error, and varies inter alia according to the type of meat, the desired flavour characteristics, the conditions under which the meat is to be cured and the identity of the bacterial species selected.

[0018] The starter culture is preferably injected into the meat prior to incubation. This ensures that the culture becomes evenly distributed throughout the body of the meat. However, it may also be introduced by any other suitable means, such as by diffusion, massaging and tumbling.

[0019] In preferred embodiments, the starter culture is introduced into the meat in a brine carrier (optionally wherein the brine comprises salt and sugar, e.g. NaCl and glucose). The carrier is preferably injected to about 10% by weight (with respect to the meat), for example to produce a final salt concentration in the meat of about

2% w/w.

[0020] Preferably, the meat is tenderized after injection with the starter culture.

[0021] The meat may be tumbled (e.g. for about 20 hours) after injection, optionally at a temperature of at least 5°C. The tumbling is optionally followed by resting (e.g. for about 4 hours).

[0022] The meat may be cooked after incubation with the starter culture, preferably to a core temperature of between 60 and 70°C (e.g. about 67°C). Following cooking, the meat may be cooled for example by showering under water (e.g. at a temperature of 5-15°C) immediately after cooking, optionally followed by chilling or freezing. However, curing processes (such as salting, drying, smoking etc.) may also be employed.

[0023] The meat is preferably cured at a salt level of 1.5-2.5% (e.g. about 2.4% w.r.t. the final weight of the product), a pH of about 5-8 and tumbled at between 4-15°C.

[0024] Genetic effects play a very important role in carcass composition, and meat quality attributes like colour, tenderness and processing yield can be affected by genotype. Thus, in particularly preferred embodiments where the meat product is a ham, the meat is derived from a halothane negative and/or RN negative and/or RN negative/positive (Redement Napole or acid meat gene) pig.

[0025] The invention also contemplates a cooked whole muscle meat product as defined in claim 18 obtainable by the process of the invention.

[0026] Also contemplated is a meat product characterized in that the product is a cooked whole muscle meat incubated with the defined starter culture and produced at a yield of at least 90% and the cooked whole muscle meat product does not contain supplementary phosphates as defined in claim 19.

[0027] Where the meat product is a cured ham, the meat may be processed by the steps of: (a) cutting and trimming; (b) injecting with the starter culture in a salt solution carrier; (c) tenderizing; (d) tumbling; (e) resting; (f) moulding; (g) cooking and cooling.

[0028] In addition to increasing the yield of the meat product, the starter cultures for use in the invention may also contribute to the organoleptic properties of the meat product (e.g. colour, flavour and texture), while also reducing cooking loss (purge).

[0029] The invention will now be described with reference to an example.

Example: Preparation of a Jambon Superieur

Cutting and trimming

[0030] Five portions (each of 2.5 kg) of fresh pork leg having a pH of between 5.6 and 5.8 were deboned and deskinned. All fat, gristle, blood spots etc. were removed and the meat trimmed to produce five 2 kg portions of meat suitable for curing. The portions were then chilled.

Injection

[0031] A 15 kg brine solution containing the starter culture was injected at 1 psi to achieve a 10% increase in meat weight using a Gunther PI13 injector. The portion of meat was then tenderized using a Jaccard (TM) meat tenderizer.

Brine formulation:	%
Water	66.7
Brine	6.0
Salt	24.2
Nitrite	0.6
Flavour	1.0
Starter culture	1.5

[0032] The starter culture contained 11.11 g of each of Staphylococcus carnosus, Staphylococcus xylosus and Lactobacillus curvatus (total 33.3 g) in 333.33 g water. It was stored at -18°C prior to use, and then suspended in water (25°C or higher), equilibrated for about 30 min, mixed with cold brine (at 5°C or higher) and then immediately injected into the meat.

Tumbling

[0033] The meat was placed in a 20 kg baffled vacuum tumbler (Inject Star MC10/20) and placed under vacuum. The tumbler was then placed in a chilled unit at 5°C (or higher: colder temperatures inactivate or kill the strater culture) and the meat tumbled for 3.5 hours at 7 revolutions per minute, followed by ten minutes resting and ten minutes rotating alternately clockwise and counter-clockwise for 16.5 hours. The meat was then rested under chilled conditions for about three hours.

Moulding

[0034] The vacuum in the tumbler was released and the meat removed. It was then moulded into five equal portions and wrapped into polythene sheets covered in small holes, tied in mesh stocking and placed into a Cryovac (TM) bag. A Mainca Vector MV5 single chamber vacuum sealer was then used to vacuum the meat portions for 2 minutes on 100% vacuum with the bag unsealed and then vacuumed for a further 30 seconds to seal the bag. Moulding may also be achieved through use of a thermoshrinkable pouch.

Cooking

[0035] The meat was placed on the middle shelf of a Rapidaire (TM) Humidity Oven and cooked at 64 degrees centigrade until an internal temperature of 55 degrees centigrade was reached (about 3 hours) and then at 74 degrees centigrade until an internal temperature of 68

degrees centigrade was reached (about 3 hours). The meat was then removed and cooled to 4-10°C in cold running water by plunging, before being refrigerated overnight.

[0036] The Jambon Superieur product exhibited significantly higher WHC (i.e. a higher yield) and low purge on cooking relative to a control ham which was prepared without treatment with the starter culture mixture.

Claims

1. A process for producing a cooked whole muscle meat product at a yield of at least 90% comprising the steps of:

   a) introducing a defined starter culture into the uncooked product, the starter culture comprising one or more Staphylococcus spp. and one or more Lactobacillus spp. capable of increasing the water binding capacity of the whole muscle meat product;
   b) incubating the meat product of step a); and
   c) cooking the meat product of step b)

   characterised in that the process is conducted in the absence of supplementary phosphates.

2. The process according to claim 1 wherein the meat product is a Jambon Superieur product.

3. The process according to any one of claims lor 2 which increases the water binding capacity of the meat product and so increases yield.

4. The process according to any one of the preceding claims **characterised in that** the meat product is produced at a yield:

   (a) of at least 95%;
   (b) of at least 100%;
   (c) of greater than 100%;
   (d) of at least 110%;
   (e) of at least 120%.

5. The process according to any one of claims 1, 3 and claims dependent thereon **characterised in that** the defined starter culture comprises a mixture of two or more species of microorganism.

6. The process according to any one of the preceding claims **characterised in that** the starter culture is injected into the meat.

7. The process according to claim 6 **characterised in that** the starter culture is introduced into the meat by injection, for example with a multi needle injector, and/or tumbling and/or massaging.

8. The process according to any one of the preceding claims **characterised in that** the starter culture is introduced into the meat in a brine carrier, the brine optionally comprising salt and sugar, e.g. NaCl and glucose.

9. The process according to any one of the preceding claims **characterised in that** the meat is tenderized after injection with the starter culture.

10. The process according to any one of the preceding claims **characterised in that** the meat is tumbled, e.g. for about 20 hours after injection, optionally at a temperature of at least 5°C.

11. The process according to any one of the preceding claims **characterised in that** the meat is rested after tumbling, e.g. for about 4 hours.

12. The process according to any one of the preceding claims **characterised in that** the meat is cooked after incubation with the starter culture.

13. The process according to claim 12 **characterised in that** the meat is cooked to a core temperature of between 60 and 70°C, e.g. about 67°C.

14. The process according to claim 13 **characterised in that** the meat is cooled by showering under water (e.g. at a temperature of 5-15°C) immediately after cooking.

15. The process according to claim 14 **characterised in that** the meat is chilled or frozen after showering.

16. The process according to any one of the preceding claims **characterised in that** the meat is cured at a salt level of 1.5-2.5%, e.g. about 2.4% with respect to the weight of the final product, a pH of about 5-8 and tumbled at between 4-15°C.

17. The process according to any one of the preceding claims **characterised in that** the meat is derived from a halothane negative and/or RN negative pig and/or RN negative/positive pig.

18. A cooked whole muscle meat product containing the starter culture comprising one or more staphylococcus spp. and one or more lactobacillus spp. capable of increasing the water binding capacity of the whole muscle meat product and which cooked meat product does not contain supplementary phosphates obtainable by the process of any one of the preceding claims.

19. A cooked whole muscle meat product containing a defined starter culture, the defined starter culture comprising at least one or more Staphylococcus spp.

and one or more Lactobacillus spp. capable of increasing the water binding capacity of the whole muscle meat product, the product, when cooked, having a yield of at least 90% of the uncooked meat product and which cooked whole muscle meat product does not contain supplementary phosphates

Patentansprüche

1. Verfahren zur Herstellung eines gekochten Vollmuskelfleischprodukts mit einem Ertrag von wenigstens 90 %, umfassend die folgenden Schritte:

   a) Einleiten einer definierten Starterkultur in das nicht gekochte Produkt, wobei die Starterkultur eine oder mehrere Staphylococcus spp. und eine oder mehrere Lactobacillus spp. umfasst, die die Wasserbindekapazität des Vollmuskelfleischprodukts erhöhen können;
   b) Inkubieren des Fleischprodukts aus Schritt a), und
   c) Kochen des Fleischprodukts aus Schritt b),

   dadurch gekennzeichnet, dass das Verfahren ohne zusätzliche Phosphate durchgeführt wird.

2. Verfahren nach Anspruch 1, wobei das Fleischprodukt ein Jambon Superieur Produkt ist.

3. Verfahren nach einem der Ansprüche 1 oder 2, das die Wasserbindekapazität des Fleischproduktes erhöht und somit den Ertrag erhöht.

4. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das Fleischprodukt mit dem folgenden Ertrag produziert wird:

   (a) wenigstens 95 %;
   (b) wenigstens 100 %;
   (c) mehr als 100 %;
   (d) wenigstens 110 %;
   (e) wenigstens 120 %.

5. Verfahren nach einem der Ansprüche 1, 3 und davon abhängigen Ansprüchen, **dadurch gekennzeichnet, dass** die definierte Starterkultur ein Gemisch aus zwei oder mehr Spezies von Mikroorganismen umfasst.

6. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** die Starterkultur in das Fleisch injiziert wird.

7. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** die Starterkultur in das Fleisch durch Injektion, zum Beispiel mit einem Mehrfachnadelinjektor und/oder durch Taumeln und/oder durch Massieren eingeleitet wird.

8. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** die Starterkultur in das Fleisch in einem Laketräger eingeleitet wird, wobei die Lake optional Salz und Zucker umfasst, z.B. NaCl und Glucose.

9. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das Fleisch nach der Injektion mit der Starterkultur zart gemacht wird.

10. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das Fleisch nach dem Injizieren z.B. etwa 20 Stunden lang getaumelt wird, optional bei einer Temperatur von wenigstens 5°C.

11. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das Fleisch nach dem Taumeln z.B. etwa 4 Stunden lang ruhen gelassen wird.

12. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das Fleisch nach der Inkubation mit der Starterkultur gekocht wird.

13. Verfahren nach Anspruch 12, **dadurch gekennzeichnet, dass** das Fleisch auf eine Kerntemperatur zwischen 60 und 70°C, z.B. etwa 67°C, gekocht wird.

14. Verfahren nach Anspruch 13, **dadurch gekennzeichnet, dass** das Fleisch durch Besprühen mit Wasser (z.B. bei einer Temperatur von 5-15°C) unmittelbar nach dem Kochen gekühlt wird.

15. Verfahren nach Anspruch 14, **dadurch gekennzeichnet, dass** das Fleisch nach dem Besprühen gekühlt oder eingefroren wird.

16. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das Fleisch mit einem Salzgehalt von 1,5-2,5 %, z.B. etwa 2,4 %, in Bezug auf das Gewicht des Endprodukts, einem pH-Wert von etwa 5-8 gepökelt und bei 4 bis 15°C getaumelt wird.

17. Verfahren nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das Fleisch von einem Halothan-negativen und/oder RN-negativen Schwein und/oder RN-negativen/positiven Schwein stammt.

18. Gekochtes Vollmuskelfleischprodukt, das die Starterkultur mit einer oder mehreren Staphylococcus spp. und einer oder mehreren Lactobacillus spp. enthält, die die Wasserbindekapazität des Vollmuskel-

fleischprodukts erhöhen können, wobei das gekochte Fleischprodukt keine zusätzlichen Phosphate enthält, erhältlich mit dem Verfahren nach einem der vorherigen Ansprüche.

19. Gekochtes Vollmuskelfleischprodukt, das eine definierte Starterkultur enthält, wobei die definierte Starterkultur eine oder mehrere Staphylococcus spp. und eine oder mehrere Lactobacillus spp. umfasst, die die Wasserbindekapazität des Vollmuskelfleischprodukts erhöhen können, wobei das Produkt im gekochten Zustand einen Ertrag von wenigstens 90 % des nicht gekochten Fleischprodukts aufweist und wobei das gekochte Vollmuskelfleischprodukt keine zusätzlichen Phosphate enthält.

Revendications

1. Procédé pour la production d'un produit carné muscle entier cuit ayant un rendement d'au moins 90 % comprenant les étapes suivantes:

a) introduction d'une culture starter définie dans le produit non cuit, cette culture starter comprenant une ou plusieurs espèces de Staphylococcus et une ou plusieurs espèces de Lactobacillus capables d'augmenter la capacité de fixation d'eau du produit carné muscle entier ;
b) incubation du produit carné de l'étape a) ; et
c) cuisson du produit carné de l'étape b)

caractérisé en ce que le procédé est réalisé en l'absence de phosphates supplémentaires.

2. Procédé selon la revendication 1 dans lequel le procédé carné est un produit jambon supérieur.

3. Procédé selon l'une quelconque des revendications 1 ou 2 qui augmente la capacité de fixation de l'eau du produit carné et ainsi augmente le rendement.

4. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** le produit carné est produit avec un rendement :

(a) d'au moins 95 % ;
(b) d'au moins 100 % ;
(c) supérieur à 100 % ;
(d) d'au moins 110 % ;
(e) d'au moins 120 %.

5. Procédé selon l'une quelconque des revendications 1 et 3 et des revendications en dépendant **caractérisé en ce que** la culture starter définie comprend un mélange de deux espèces de microorganismes ou plus.

6. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** la culture starter est injectée dans la viande.

7. Procédé selon la revendication 6 **caractérisé en ce que** la culture starter est introduite dans la viande par injection, par exemple avec un injecteur à aiguilles multiples, et/ou par passage au tambour et/ou par massage.

8. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** la culture starter est introduite dans la viande dans un véhicule saumure, la saumure comprenant en option un sel et un sucre, p.ex. NaCl et glucose.

9. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** la viande est attendrie après l'injection avec la culture starter.

10. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** la viande est passée au tambour, p.ex. pendant environ 20 heures après l'injection, optionnellement à une température d'au moins 5°C.

11. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** la viande est laissée au repos après le passage au tambour, p.ex. pendant environ 4 heures.

12. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** la viande est cuite après incubation avec la culture starter.

13. Procédé selon la revendication 12 **caractérisé en ce que** la viande est cuite à une température au centre entre 60 et 70°C, p.ex. environ 67°C.

14. Procédé selon la revendication 13 **caractérisé en ce que** la viande est refroidie par douchage à l'eau (p.ex. à une température de 5 à 15°C) juste après la cuisson.

15. Procédé selon la revendication 14 **caractérisé en ce que** la viande est refroidie ou congelée après douchage.

16. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** la viande est soumise à une salaison à un taux de sel de 1,5 à 2,5 %, p.ex. d'environ 2,4 % par rapport au poids de produit final, un pH d'environ 5 à 8, et passée au tambour à entre 4-15°C.

17. Procédé selon l'une quelconque des revendications précédentes **caractérisé en ce que** la viande provient d'un porc négatif au test halothane et/ou négatif

au gène RN et/ou négatif/positif au gène RN.

18. Produit carné muscle entier cuit contenant la culture starter comprenant une ou plusieurs espèces de Staphylococcus et une ou plusieurs espèces de Lactobacillus capables d'augmenter la capacité de fixation d'eau du produit carné muscle entier, et ledit produit carné cuit ne contient pas de phosphates supplémentaires et peut être obtenu par le procédé selon l'une quelconque des revendications précédentes.

19. Produit carné muscle entier cuit contenant une culture starter définie, cette culture starter définie comprenant au moins une ou plusieurs espèces de Staphylococcus et une ou plusieurs espèces de Lactobacillus capables d'augmenter la capacité de fixation d'eau du produit carné muscle entier, ce produit, une fois cuit, ayant un rendement d'au moins 90 % par rapport au produit carné non cuit, ledit produit carné muscle entier cuit ne contenant pas de phosphates supplémentaires.