ISSN: 0974-8369

Biology and Medicine

International, Open Access

Available online at: www.biolmedonline.com

Biology and Medicine

Tekutyeva *et al.*, Biol Med (Aligarh) 2015, 7:3
http://www.biolmedonline.com

Research Article Open Access

Biotechnology of Uncooked Smoked Meat Products with Biocorrective Property

Lyudmila Aleksandrovna Tekutyeva*, Oksana Mikhailovna Son, Natalya Viktorovna Situn

Merchandizing and Goods Examination Department, Far Eastern Federal University, 8 Suhanova St., Vladivostok 690950, Russia

Abstract

In this work biotechnology of new types of natural uncooked smoked meat products is described: sausage products and restructured hams, manufactured using hydrolysates of commercial, Far Eastern balms, hydrobionts, mix of essential amino acids, starter bacterial cultures, polysaccharide zosterin obtained from sea grass and water and alcohol extracts of biologically active substances of plant origin, basically from wild growing plants of Ussuri Taiga.

Keywords

Uncooked smoked meat products; Mix of amino acids; Hydrolysates of hydrobionts; Bacterial preparations; Far Eastern balms; Biotechnology

Introduction

The use of phytopreparations, water and alcohol infusions, wild growing herbs [1,2] and Far Eastern balms together with starter cultures [3–5] in the production of uncooked smoked sausages and whole muscle meat products allowed significantly modifying traditional principals of manufacturing these types of products, reducing technological cycle and improving organoleptic characteristics. Moreover, prerequisites to the transition of the process to a totally new level appeared – to developing therapeutic and functional uncooked smoked and uncooked cured meat products [6–10] – particularly, taking into account high social demand for corrective food for patients with chronic obstructive pulmonary disease (COPD) [11,12]. For this kind of patients, the aforesaid group of uncooked smoked products has been developed for eliminating protein–energy malnutrition and improving oxidative and immune status.

The results of chemical development studies of new types of uncooked smoked meat products using amino acids mix, hydrolysate of mussel, bacterial preparations and Far Eastern balms showed increase in the level of finished products' bioavailability [13,14]. Adding the aforesaid contents influences the quantitative content of free amino acids in finished uncooked smoked products, and the use of uncooked smoked meat products with biocorrective property in the complex treatment regimen for COPD patients gives positive effect: positive dynamics in changing clinical laboratory and anthropometric measures is observed.

Methods

As basic objects (control samples), uncooked smoked sausages and uncooked smoked hams were chosen for manufacturing using both beef and pork as well as broiler chicken breast fillet, adding bacterial preparations for activation of fermentation during the technological process [15–17].

Mixes of L-amino acids and hydrolysates of mussel and zosterin preparation were additionally added into test batches of meat products taking into account the medico-biological requirements for COPD patients [18–22].

Mixes of amino acids were obtained [23] by enzymic hydrolysis of mussel using crab collagenase. The composition of mussel hydrolysate is given in Table 1.

Zosterin is low methoxyl pectin extracted from the sea grass of *Zosteraceae* kind. It has high adsorptive, antidotic, antimutagenic, immunomodulating, antiallergenic and antibiotic properties [24–26]; it is produced by Biopreparat (Primorskiy region). It is recommended by Institute of Nutrition RAMS as nutritional supplement in therapeutic and special products [27–29].

Medico-biological tests of new types of uncooked smoked products enriched in mussel hydrolysates and zosterin were conducted involving groups of patient volunteers at the City Clinical Hospital in Vladivostok.

Results and Discussion

The results of chemical development studies of uncooked smoked sausages 'Sidimi' (a complex mix of mussel hydrolysate, zosterin and bacterial agent PBK-BR was added into the formulation) and uncooked smoked ham 'Yubileynaya' (with an addition of mussel hydrolysate and bacterial agent PB-MP) showed that the use of amino acids mix provides significant increase in the level of finished products' bioavailability. This is showed by the data (Table 2) characterizing quantitative content of essential amino acids in the composition of protein as well as by values of estimated and analytic indexes (Table 3) of degree of protein equivalence to human needs.

Taking into account special medico-biological significance of free amino acids in functional products, researchers estimated the degree of impact of L-amino acids mix (leucine, isoleucine, valine, arginine, lysine, threonine, tryptophane, histidine, alanine, proline, serine, glycine) together with bacterial agent PBK-BR on uncooked smoked sausages, as well as impact of hydrolysates of hydrobionts and starter culture PB-MP on the quantitative content of free amino acids in restructured ham products.

The data given in Table 4 show that content of free essential amino acids in test batches of products has increased by 215% at the average in comparison with the control, and that of nonessential amino acids

***Corresponding author:** Tekutyeva LA, Merchandizing and Goods Examination Department, Far Eastern Federal University, 8 Suhanova St., Vladivostok 690950, Russia

Received: May 17, 2015; **Accepted:** June 26, 2015; **Published:** Aug 9, 2015

Citation: Tekutyeva LA, Son OM, Situn NV (2015) Biotechnology of Uncooked Smoked Meat Products with Biocorrective Property. Biol Med (Aligarh) 7(3): BM-108-15, 3 pages.

Assay	%	Amino acids composition	mg/%
Water	80-85	Glutamic acid	38.1
Sodium chloride	2-5	Aspartic acid	27.6
Peptides, amino acids	10-15	Lysine	16.6
Carbohydrates	3-5	Arginine	13.9
Lipids	0.04-0.07	Glycine	13.4
Micro-, macroelements	0.06	Leucine	11.1
		Proline	10.9
		Alanine	10.2
		Threonine	9.6
		Serine	9.5
Micro-, macroelements composition	**mg/%**	Valine	9.2
		Isoleucine	8.7
Phosphorous	145	Phenylalanine	8.5
Calcium	45	Tyrosine	6.5
Iron	18	Methionine	5.0
Silicon	15	Histidine	4.5
Zinc	4.5	Cystine	2.1
Strontium	1.5	OH-Lysine	0.6
Manganese	1.5	Ornithine	0.3
Copper	0.7	Tryptophane	3.2
Titanium	0.3	Taurine	7.4
Iodine	0.15		
Nickel	0.1		
Barium	0.07		
Cobalt	0.03		
Argentum	0.003		

Table 1: Chemical composition of mussel hydrolysate

Amino acids, g/100 g of protein	Uncooked smoked products		Standard FAO/WHO
	Sausage 'Sidimi'	Ham 'Yubileynaya'	
Isoleucine	4.77	4.72	4.0
Leucine	7.81	7.69	7.0
Lysine	8.86	8.28	5.5
Methionine + cystine	3.4	4.16	3.5
Phenylalanine + tyrosine	7.18	7.02	6.0
Threonine	4.52	4.38	4.0
Tryptophane	1.24	1.0	1.0
Valine	5.79	5.62	5.0
Amount of essential amino acids	43.57	42.87	36.0

Table 2: Amino acids composition of produced uncooked smoked products

Indexes of protein bioavailability	Uncooked smoked products	
	Sausage 'Sidimi'	Ham 'Yubileynaya'
Minimum score, C_{min}, %	97.0	100.0
Utility index, U	0.812	0.846
Comparable excess index, G	9.00	6.81

Table 3: Bioavailability of protein

Amino acids	Amino acids content, mg/100 g of product			
	Uncooked smoked products			
	Sausage 'Sidimi'		Ham 'Yubileynaya'	
	Control	Experiment	Control	Experiment
Essential amino acids:				
Valine	1,282	6,543	1,346	6,155
Isoleucine	1,593	4,330	1,486	4,072
Leucine	3,493	8,719	4,139	8,250
Lysine	1,824	9,830	1,942	7,171
Methionine + cystine	1,194	2,543	1,087	2,547
Threonine	1,148	5,400	1,167	5,012
Tryptophane	54.5	398	61.2	387
Phenylalanine + tyrosine	1,422	3,613	1,536	3,595
Amount of essential amino acids	12,010.5	41,376	12,764.2	37,189
Nonessential amino acids:				
Alanine	5,647	12,286	5,869	14,706
Arginine	328	469	295	218
Aspartic acid	395	4,065	468	3,433
Histidine	511	2,932	498	2,540
Glycine	1,449	6,858	1,657	6,270
Glutamic acid	10,415	10,707	10,764	12,801
Proline	769	6,079	783	5,078
Serine	1,560	6,035	1,679	5,781
Amount of nonessential amino acids	21,074	49,431	22,013	50,827
Total amount of amino acids	33,084.5	90,807	34,777.2	88,016

Note: Control samples didn't contain amino acids mix.

Table 4: Content of free amino acids in uncooked smoked meat products

by 120%. As individual amino acids are easily absorbed directly into blood flow, it can be supposed that the level of bioavailability *in vivo* of experimental types of products will be significantly higher than that of control samples [30–33].

Medico-biological tests of new types of uncooked smoked products enriched in mussel hydrolysates and zosterin conducted at the City Clinical Hospital in Vladivostok involving COPD patients at YY and YYY stages showed that the produced uncooked smoked products can

be recommended to COPD patients for correction of protein–energy and oxidative status [34,35]. On the basis of integrated studies, new types of uncooked smoked meat products have been developed, and standard documentation has been approved: TC 9213-169-02067936-07 'Uncooked smoked sausage products,' TC 9213-170-0206793-07 'Uncooked smoked hams.'

Acknowledgment

This work was supported by the Far Eastern Federal University, Project No. 14-08-01-11_и.

References

1. Zharinov I, Gorlov IF, Nelepov YN, Sokolova NA (2007) Food Biotechnology: Research and Practice Solutions in AIC. Moscow: Vestnik of Russian Academy of Agricultural Sciences.
2. Tekutyeva LA (2006) Meat Products Manufacturing with the Use of Starter Cultures and Far Eastern Balms: Scientific Publication. Vladivostok: Publishing Office of PSEU.
3. Tekutyeva LA, Kostenko YG, Alyekhina LV, Sokolova NA, Zharinov AI (2000) Plant extracts impact on meat products quality. Meat Industry 3: 33-34.
4. Hammes WP (1990) Bacterial starter cultures in food production. Food Biotechnology 1(4): 383-397.
5. Honikel KO (2004) Von Fleisch zur Produkt: Reifen – Erhitzen – Zerkleinerung – Salzen. Fleschwirtschaft 5: 228-234.
6. Lisitsin B, Lipatov NN, Kudryashov LS, Aleksakhina VA (2005) Meat Products Manufacturing based on Biotechnology. Moscow: VNIIMP.
7. Lisitsin B, Lipatov NN, Kudryashov LS, Aleksakhina VA, Tchernukha IM (2008) Theory and Practice of Meat Processing (2nd edition). Moscow: Editorial Service.
8. Lutz W, Stolle A (1994) Rohwurstherstellung hohere Produktqualitat durch Verwendung von Laktose. Fleischwirtschaft 8: 849-854.
9. Berry BW, Bigner-George ME, Eastridge JS (1999) Hot. Processing and grind size affect properties of cooked beef patties. Meat Science 53(3): 37-43.
10. Erl M, Erl R, Anderson A (2004) Food Products Development. Saint-Petersburg: Professiya.
11. Pozniyakovskiy VM (2007) Hygienic Bases of Food, Quality and Safety of Food Products (5th edition, revised and enlarged). Novosibirsk: Publishing Office of Sibirskiy University.
12. Nevzorova VA, Kalenik (Motkina) EV, Mokshina MV, Shestakova NV (2004) Cytokine profile of blood serum of patients with COPD and bronchial asthma of severe acute. Abstracts of 14-th National Congress on respiratory organs diseases. Moscow.
13. Motkina EV. Vascular endothelium function state of patients with chronic obstructive pulmonary disease and bronchial asthma of severe acute: thesis of Ph. D. (14.00.43)/Motkina Elena Viktorovna; [Vladivostok State Medical University].
14. Skhurikhin IM, Tutelyan VA (2002) Chemical Composition of Russian Food Products: Reference Book. Moscow: DeLi print.
15. Turkina MY, Petcherina TV (2007) Zosterin – a new sorbent for efferent therapy. Efferent Therapy 13(4): 39-44.
16. Fatjanov YV, Aleinikov AK, Ostrovski YB (1991) Modeling the process of sausage drying. In 37th International Congress of Meat Science and Technology, September 1-6, 1991, Kulmbach, Germany, p. 109.
17. Nefedova NV, Artamonova MP, Pomikov AN (2003) Studying functional properties of sausages with starter cultures. Meat Industry 11: 48-49.
18. Nefedova NV, Seregin IG (2003) Biological methods of reducing bacterial contamination of minced meat for sausage products. Meat Industry10: 48-51.
19. Rogov AIZ, Voyakina MP (2008) Chemistry of Food. Principals of Meat Products Quality Formation. Saint-Petersburg: Publishing Office of RDSA.
20. Lisitsin NNL, Kudryashov LS, Aleksakhina VA (2005) Meat Products Manufacturing on the Basis of Biotechnology. Moscow: VNIIMP.
21. Loyenko YN, *et al*. (1991) All Union conference "Biologically active substances of hydrobionts – new medical, medical and preventive, and technical preparations", September 23-27, 1991/Pacific Research Institute of Fishing Industry and Oceanography (TINRO). Владивосток. 1991.
22. Kalenik TK, Nevzorova VA, Tekutyeva LA, Son OM, Motkina EV (2009) Substantiation and use of complex of biologically active ingredients of marine genesis in uncooked smoked meat products biotechnology. News of Higher Educational Institutions. Food Technology 5-6: 34-36.
23. TC 9283-061-02698170-04 "Hydrolysates of commercial species hydrobionts".
24. Shestopalov E, Butrov AV. Amino acids solutions in parenteral nutririon. http://www.medlinks.ru/
25. Yelyakov GB, Kozlovskaya EP, Rasskazov VA, Stonik VA. Nutritional supplements and medical preparations based on natural compounds from oceanic, plant and mariculture raw material. http://www.niiits.ulsu.ru/portal/data/1701.htm
26. Philips GO, Williams PA (2006) Reference Book on Hydrocolloids. Translated under the editorship of Kotchetkova AA, Sarafanova LA. Saint-Petersburg: GIORD.
27. Loyenko YN, Artyukhov AA, Kozlovskaya EP, Miroshnitchenko VA, Yelyakov GB (1997) Zosterin. Vladivostok: Dalnauka.
28. MacKenna BM (2008) Structure and Texture of Food Products. Products of Emulsion Nature. Translated under the Scientific Editorship of Ph. D., associate professor Bazarnova YG. Saint-Petersburg: Professiya.
29. Loyenko YN, Ovodova RG, Artyukhov AA, Kovalyev VV (1987) Polysaccharide zosterin impact on immunobiological responsiveness of intact organism. In Scientific Conference on Topical Issues of Immunology: Thesis Vladivostok, 1987.
30. Lisitsin AB, Lipatov NN, Kudryashov LS, Aleksakhina VA, Tchernukha IM (2008) Theory and Practice of Meat Processing. Under the General Edition of Lisitsin AB (2nd edition). Moscow: Editorial Service.
31. Kalenik TK, Motavkina NS (2000) Molecular Bases of Food Biostimulators Technology. Monograph. Publishing Office of FESAEM.
32. Kudriyashova AA (2000) Secrets of Good Health and Active Ageing. Moscow: Pischepromizdat.
33. Son OM, Kalenik TK, Tekutyeva LA (2009) Development of Enriched Uncooked Smoked Meat Products Biotechnology. Innovative Technologies in Food Industry: Collection of Thesis of All-Russian Conference with International Participation. Samara, 2009, pp. 78-79.
34. Wang J, Sun N, Zhou C, Zhou X, Lu J, *et al*. (2013) Food Proteins from Different Allergen Families Sensitize Balb/c Mice to Family-Specific Immune Responses. Journal of Immuntoxicology 11(2): 172-179.
35. Sun N, Zhou C, Pu Q, Wang J, Huang K, *et al*. (2013) Allergic reactions compared between BN and wistar rats after oral exposure to ovalbumin. Journal of Immunotoxicology 10(1): 67-74.

Citation: Tekutyeva LA, Son OM, Situn NV (2015) Biotechnology of Uncooked Smoked Meat Products with Biocorrective Property. Biol Med (Aligarh) 7(3): BM-108-15, 3 pages.