A study into the composition and properties of meat-&-bone pastes and their possible use

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The increase of the mechanically dissected meat (MDM) production after bones pressing does not permit its total usage for sausage production. According to the above said, it is necessary to use widely this raw material for the production of ready-to-cook and ready-to-eat products and their further utilization at the mass catering establishments.
Several ways of meat-&-bone pastes use obtained after extra grinding (MDM), after bone pressing are developed, namely:
-to get ready-to-cook product for broth from the bone residue;
-to use MDM as a base to obtain thick sauces;
-to replace to 20 % of meat by MDM in ready-to-cook products from ground meat (cutlets, beef-steaks);
- to replace about 20 % of pig liver by MDM when producing ready-to-cook products "Paté" and "Thick sauces from meat products", produced as tinned foods and slightly freezed casings (1,5 - 2 kg);
-to use about 15 % of MDM instead of meat when producing cooked sausages.
Broth is the base for soups and sauces. Their production technology at mass catering establishments has a number of drawbacks, which can be removed by using the bone residue, resulting from bone pressing. From bone residue two kinds of ready-to-cook products for broths which can further be cooked at mass catering establishments are obtained. With this aim in view the residue is centrifuged and divided into two fractions: bone and meat. Bone fraction is fried for 10-12 min at 190-210° C and used at the mass catering establishments for cooking brown broth required for sauce production. Meat fraction is used to cook meat broth the cost price of which is much lower than that cooked from meat. The designed ready-to-cook products are under author certificate N 1097259 (USSR). The value of broths cooked from the given ready-to-cook products is essentially higher than those cooked under the traditional technology when natural bone is used. Moreover, the time of broth cooking is three times reduced. These are achieved due to the fact that after pressing the bone largely loses its initial firmness. In small bone pieces after pressing microcracks occur. These bone pieces with broken structure after frying are still more subjected to destroying and that is why water easily penetrates into the cracks formed and when cooked, such food substances as fat, protein, mineral substances excrete much quicker from this bone.
MDM, obtained after mechanical extra dissection of bone by pressing, approximates at most by its properties to the meat of the second category. MDM is offered to be used as a raw material for broth production. For this purpose MDM after pressing is fried, 20-25 % of rat excreting, then MDM is mixed with water in proportion of 1:3,5 + 4, cooked for 25-35 min and infused for 20-25 min without heat supply. The broth produced is filtered and used for thick sauce production at mass catering establishments, which are in their turn ready-to-cook product for a large group of sauces. The factor limiting the wide use of MDM as a meat substitute is bone inclusions which are organoleptically detected in these products. To exclude this drawback a device for extra MDM grinding is suggested, meat and bone paste being the result of it.
Rheological properties of MDM as well as meat-&-bone paste are studied: instant (G_1), highly elastic (G_2) modulas and viscosity (η) given in Table 1.

Table 1.

	$G_1 \cdot 10^4$, Pa	$G_2 \cdot 10^4$, Pa	$\eta \cdot 10^6$, Pa·s
1. MDM after pressing	5,67 ± 0,11	1,42 ± 0,08	0,14 ± 0,02
2. MDM after extra grinding	2,83 ± 0,10	0,54 ± 0,02	0,06 ± 0,01

Analising the results of study of MDM structural and mechanical properties, it should be noted that MDM obtained after bone pressing and extra grinding occupies an intermediate position between solid-liquid structures and solid-viscous ones as they are characterized by the viscosity to 10^6 Pa·s as well as by elastic shift module lying in the limits between 10^4 and 10^5 Pa.
Meat stuffing is known to belong to solid-liquid structures with well defined viscous properties of a solid. One can assume that MDM addition close by its structural mechanical properties to meat stuffing does not essentially alter their rheological characteristics. Grinding of meat stuffing and MDM to equal size enables us to get a general system with common, well distributed medium.
Production technology of cooked sausages with 15 % of meat-&-bone paste as an additive instead of meat and ready-to-cook products from minced meat (cutlets, beef-steaks) to replace 20-25 % of meat was developed. When producing cutlet ready-to-cook products frozen milk serum is added to meat stuffing for its enrichment while as a binding component manna-croup is used instead of bread. This technology is protected by the author certificate N 1159546 (USSR).
Cutlets prepared from the suggested ready-to-cook product possess high quality, storage of ready-to-cook products increasing twice.
Meat-and-bone paste produced from MDM is well combined with subproducts, liver including.

Ready-to-cook products from liver and spleen "Thick sauce from meat products" and "Paté" are developed, the composition of which includes about 30 % of meat-&-bone paste.
To prepare "Thick sauce from meat products" pig liver made ready, i.e. bile ducts, pellicle, vessels being removed, is cooked. When liver is cooked, slightly baked or fried vegetables: onion, carrots, parsley are put into broth and cooked till ready, then cooked vegetables and liver are ground, homogenized and meat-&-bone paste cooked in liver broth for 0,5 - 1hr is added.
Broth and meat-&-bone paste is mixed with liver, millet, pea and barley flour is added to the mixture. This mass is thoroughly mixed, casings are made of it and then cooked. Further the casings are cooled to +8 - 0° C and transported to mass catering establishments.
At mass catering establishments thick sauce from meat products may be used in several ways :
- as stuffing for the products made of pastry and vegetables (pies, kulebiaka, rasstegai, vareniki, pancakes, meat loaf, baked pudding, zrazy and others);
- as the basis for meat thick soup preparation (after liquid is added and vegetables are cooked) for dietary and child's nutrition;
- to prepare meat sauce after milk addition and cooking, for vegetable and groats dishes enrichment.
To prepare ready-to-cook product "Paté" from meat products" liver made ready,i.e. bile ducts pellicle, vessels being removed, is cooked in a little quantity of water. Liver being cooked slightly baked or fried vegetables (onion, carrots) are added and cooked till ready. Meat-and-bone paste is cooked in liver broth. The cooked liver and vegetables are ground, homogenized and cooked meat-&-bone paste, dry milk, skimmed milk or cow unskimmed milk, salt are added to the mass, mixed, made into casings which are cooked or baked till the temperature inside the casings is 72° C. Further the casings are cooked to +8°C - 0°C.
The total chemical composition of ready-to-cook products from liver and meat-&-bone paste is given in Table 2.

Table 2.

Parametres		Paté from meat products	Thick sauce from meat products
Protein, %		21,65	16,72
Fat, %		15	16
Ashes, %		5	6,49
Mineral substances, mg per 100 g of product:			
	Calcium	300	26,3
	Phosphorus	727	796
	Magnesium	79	95
	Iron	22,20	19,54
Vitamines, mg %:	A	0,68	0,83
	β-carotine	0,40	0,35
	B_1	0,240	0,138
	B_2	0,588	
	PP	4,88	
Biological value, %		222,2	286,6

Ready-to-cook products developed contain a large quantity of protein, mineral substances and are good sources of phosphorus and iron. A comparatively high calcium content in ready-to-cook products is the advantage that distinguishes them from other existing meat products As to the iron content all developed ready-to-cook products can be used for curing anaemia and other diseases.
Ready-to-cook products possess high food and biological value. To control their biological value ready-to-cook products were compared with the standard model (casein), the biological value of the latter was taken as 100 %.
Studying of structural-mechanical properties of ready-to-cook products from liver and meat-&-bone paste allowed to determine that the best quality and consistence of ready-to-cook products is acieved when the limited shift strain for the paté from meat products is 831-978,3 Pa, for thick sauces from meat products - 531,4 - 644,3 Pa.
From the above said it can be concluded that meat-&-bone paste produced from MDM is a valuable raw material for the production of ready-to-cook product and culinary product. MDM functional properties allow further development of its usage for the production of new kinds of ready-to-cook products.