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Development Of Technology And Recipes Of Functional Canned Food Of Gerontology Nutrition.

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ABSTRACT

The article is devoted to the development of a model of four groups of canned food (drinks, kissels, creams, desserts), gerontology of destination, the process flow is developed under production conditions. The nutritional and biological value of raw materials and materials and canned food of four groups was studied on the example of ten species after manufacture and after year storage. The degree of preservation of biologically active substances in canned food after annual storage in the conditions of traditional unregulated environment is established on the example of certain types. The bacteriological reliability of canned food obtained according to the developed documentation under production conditions using the example of four types of canned food was studied, the bacterial safety of sterilization regimes was confirmed. Structures and schemes of instrumentation of the subsystems of the technological flow of production of four groups of canned gerontology destination have been developed. The schemes of technological control of production of gerontology canned food at critical points of the process flow have been developed. The regulatory documentation for four groups of canned food was developed and approved: drinks, jelly, creams, desserts.

Keywords: gerontology canned food, biological value, technological subsystem, operator model, regulatory documentation.

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INTRODUCTION

Analysis of scientific, technical and patent-licensed information on the production of canned food for gerontocontingent in our country has shown that this is a problem area, practically there is no special production in the country, but search and primary work has already begun to create a production of canned gerodietic products [1, 3 -6, 12-16]. At that time, medicine in the country has been dealing with gerontology issues for a long time and standard indicators of requirements for geropathing have been developed, there is a formula for gerontodietic nutrition [5], it differs little from the general formula with basic nutrient indicators qualitatively, there are quantitative differences.

These requirements were taken into account by the authors of the work when choosing models of canned gerontoproducts.

When developing models of products and all related research, they focused on the requirements and recommendations of scientists presented in the scientific and technical literature [1-7,15-17].

Gerontocontingent - a group of people most vulnerable. This group also needs to create such working and living conditions so that they can be long in active physical form.

The age of 59-74 years is a contingent of mainly working people who carry the basic physical and mental labor costs 75 years and above - people are mostly unemployed, but they have to serve themselves, and they also need an active form of activity.

In designing the formulations, the diseases of the elderly were taken into account: cardiovascular, diabetes, osteoporosis, diseases of the brain, nervous system, gastrointestinal diseases, including intestinal lethargy, reduced immunity, etc.

For the acquisition of recipes for canned food, well-known "healthy" products were used - raw materials, materials, with the help of which, as is well known, diseases can be prevented, they can be delayed or facilitated.

Against the background of the current situation, fundamentally new technologies for producing canned food are required for our country, enriched with essential and non-essential amino acids and other biologically active substances (BAS) necessary for feeding, as balanced as possible, providing only a positive effect on the human body.

In general, the study of this work was the development of technology for the production of canned gerontodietic multifunctional purpose such as drinks, desserts, jelly, creams, as balanced as possible by the natural nutritional formula that have only a positive effect on the body of an elderly person.

MATERIAL AND METHODS

The studies were carried out in laboratory and bench conditions of the Research and Development Institute "Biotechprocessing" and under the production conditions of the canning enterprises of the Krasnodar Territory.

The object of the research was: apples (raw materials, freshly prepared or canned puree, reconstituted and natural juice), cherry plum (raw materials, freshly prepared and preserved puree, concentrated juice), beets (puree, concentrated juice), oats (cereals, Hercules, freshly prepared puree), watermelons (juice with pulp, mashed freshly prepared), walnuts in milky-wax ripeness (crushed mass, mashed potatoes, water extract, extract), pasteurized whey, canned food - drinks, creams, kissels, desserts.

Nuts in the milky-waxy degree of ripeness, nut leaf contain biological substance - juglon (5-hydroxy-1.4 naphthoquinone), which has medicinal properties of up to 5 mg / dm³, is poisonous in large doses. Therefore, the presence of juglone in products containing green walnuts is regulated and controlled by qualitative and quantitative methods.

The main indicators characterizing the quality and value of new types of gerontoproducts are standard physical and chemical (dry substances, pH, titrated acids, mineral impurities) and organoleptic (taste, color, smell, texture, appearance), as well as indicators characterizing nutritional and biological value: vitamins: (C, β -carotene, P (polyphenols)), minerals K, Na, Ca, Mg and trace elements, free acids and microbiological indicators characterizing industrial sterility (bacteriological over urgency) in accordance with regulatory requirements.

Physico-chemical parameters, organoleptic properties, vitamins C,-carotene, etc. were determined by standard methods.

Macro elements K, Na, Ca, Mg on a flame photometer FLAVIO, the remaining trace elements were determined using an atomic adsorption spectrograph, amino acids on an amino acid analyzer.

Microbiological methods are selected standard in accordance with the requirements of GOST RF.

RESULTS AND DISCUSSION

Initially, the research determined the choice of the range of raw materials, materials and food additives to create compounding models of canned food for multifunctional gerodietic purposes.

The choice was made on natural multivitamin raw materials and semi-finished products with high biological value, which are well combined with each other, complementing and enhancing the useful properties and qualitative standard indicators.

The selected assortment of the studied raw materials and materials: watermelons, beets of dark-colored varieties, pectin-containing apples, cherry plums, as well as oats, walnut in a milky-waxy degree of ripeness, whey.

The listed raw materials, natural semi-finished products from it are in selected models of canned food the main or additional raw material, or food additive. All selected types of raw materials are rich in vitamins, antioxidants, macro-and micronutrients, amino acids, dietary fiber.

Studies have confirmed that the fruits of apples are a rich source of polyphenolic compounds with P-vitamin activity. Apples in the recipes of new types of gerontoconservatives are the main raw material.

The presence and change of the majority of polyphenols is associated with the formation of the technological properties of raw materials, color, taste and aroma against atherosclerosis, nervous system disorders, thrombophlebitis, varicose veins, blood clots, is a powerful hematopoietic.

Table 1: Vitamin composition and partial nutritional value of beet, apple, cherry plum and beet juice, mg%

| Vitamins and vitamin-like substances | Juice, concentration | | | Daily intake of vitamins |
|--------------------------------------|----------------------|-------|-------------|--------------------------|
| | beet | apple | cherry plum | |
| Ascorbic acid | 11,5-21,4 | 4,0 | 6,0 | 75,0 |
| Thiamine (B ₁) | 0,02 | - | - | 1,20 |
| Riboflavin (B ₂) | 0,13 | - | - | 1,5 |
| Pyridoxine (B ₆) | 3,7 | - | - | 1,6 |
| Niacin | 0,10 | - | - | 15,0-18,0 |
| Tocopherols (E) | 0,7 | - | - | 10,0-12,0 |
| Beta-carotene | 0,02 | - | - | 0,8 |
| Bioflavonoids including: | 992,6 | - | - | 25,0 (Ruthin) |
| anthocyanin | 721,0 | - | - | - |
| leucoanthocyanins | 213,2 | 7,0 | 6,9 | - |
| R-catechins | 58,4 | 34,8 | 10,0 | - |

| | | | | |
|------------------|-------|------|------|---|
| Soluble solids,% | 71,6 | 69,2 | 67,6 | - |
| Total sugar,% | 50,02 | 48,4 | 47,5 | - |
| Sugar invert,% | - | 28,6 | - | - |
| Organic acids, % | 3,85 | 2,24 | 3,22 | - |

Apple and cherry plum natural concentrated clarified (DM = 65-70%) have the same properties as the raw materials.

For the formation and improvement of taste, aroma, color, consistency, the recipes included natural additives in the form of nut mass, extracts of walnut leaf extracts, concentrated cherry plum, beet juice (puree), decoctions, mashed oatmeal (thickener) additives.

Formulations of new types of canned food were developed in four groups: drinks, jelly, creams, desserts.

On the basis of the performed experimental work, physicochemical, organoleptic, microbiological studies, the best limit-optimal ratios of the components in the recipe-models, which are included in the regulatory documentation for their production, were identified.

One of the most important indicators of the quality of new types of canned food is the total and active acidity, which affects the safety of food flavors and microbiological integrity in the process of production and subsequent storage of canned food, on the choice of the sterilization regime. Therefore, the indicator of active acidity for most canned food was planned at the level of 4.0-4.2. This makes it possible to sterilize canned food at a temperature of 100 ° C.

The main advantage of the recipes of new types of canned food is 100% use of natural components in the form of polybiologically valuable raw materials with dietary multifunctional healing properties.

Formulations of four groups of canned food have been developed:

- drinks (four kinds);
- kissels (13 species);
- creams (four kinds);
- desserts (ten kinds), table 2.

All types of canned food are recommended for inclusion in the regulatory documentation for their production.

Table 2: Recipes of new types of canned food for the purpose of plants

| Group and type of canned food | Component name | 1000 kg recipe | |
|-----------------------------------|--|----------------|-------|
| | | % | kg |
| Drinks: oat-apple-plum-currant | Apple puree, freshly prepared or preserved | 16,4 | 164,0 |
| | Cherry plum puree | 12,3 | 123,0 |
| | Decoction of oats | 49,0 | 490,0 |
| | Currant puree | 10,0 | 100,0 |
| | Granulated sugar | 5,55 | 55,5 |
| | | | 6,75 |
| oat-currant | Decoction of oats | 63,0 | 630,0 |
| | Currant puree | 33,5 | 335,0 |
| | Granulated sugar | 3,5 | 35,0 |
| oat-sea buckthorn | Decoction of oats | 50,0 | 500,0 |
| | Sea buckthorn puree | 12,5 | 125,0 |
| | Granulated sugar | 7,5 | 75,0 |
| | Water | 30,0 | 300,0 |

| | | | |
|---------------------------------|---|------------------------------------|---|
| oat - pumpkin | Decoction of oats Pumpkin puree Plum juice concentrate Granulated sugar | 47,0 30,0 3,0 10,0 | 470,0 300,0 30,0 100,0 |
| Kissels: oat - fruity | Decoction of oats Fruit puree (cherry or apricot, plum, cornel, peach, sea buckthorn, cherry plum, apple) Granulated sugar | 70,0 22,0 8,0 | 700,0 220,0 80,0 |
| oat - fruity - beetroot | Decoction of oats Fruit puree (apple, plum, peach) Beet Juice Concentrate Granulated sugar | 70,0 17,0 5,0 8,0 | 700,0 170,0 50,0 80,0 |
| oat - pumpkin | Decoction of oats Pumpkin puree Lemon acid Granulated sugar Water | 50,0 30,0 2,0 6,0 12,0 | 500,0 300,0 20,0 60,0 120,0 |
| oat - milky | Decoction of oats Whey Granulated sugar | 67,0 27,0 6,0 | 670,0 270,0 60,0 |
| Creams: watermelon - oat | Watermelon puree Oatmeal flour Plum juice concentrate | 91,0 7,0 2,0 | 910,0 70,0 20,0 |
| pumpkin - oat | Pumpkin puree Oatmeal flour Plum juice concentrate, DM = 65 % Granulated sugar | 89,0 7,0 1,0 3,0 | 890,0 70,0 10,0 30,0 |
| fruity - oat | Puree fruit (apple, cherry plum, plum, pear, cornel, currant) Oatmeal flour Granulated sugar | 84,0 10,0 6,0 | 840,0 100,0 60,0 |
| milky - oat | Sour whey Oatmeal flour Granulated sugar | 90,0 6,4 3,6 | 900,0 64,0 36,0 |
| Dessert: watermelon - fruity | Watermelon puree Fruit puree (apple, pear, plum, cherry plum) | 50,0 50,0 | 50,0 50,0 |
| watermelon - pumpkin | Watermelon puree Pumpkin puree Granulated sugar | 50,0 45,0 5,0 | 500,0 450,0 50,0 |
| nut - fruity | Nut crushed mass Fruit puree (apple, plum, cherry plum, pear) Granulated sugar | 40,0 45,0 15,0 | 400,0 450,0 150,0 |

A complex of chemical studies was performed to study the nutritional and biological value of canned food after production and storage for a year in an unregulated environment.

Table 3 presents the physico-chemical characteristics of canned food, new species differ in relatively low calorie content, which meets the requirements of gerontological nutrition.

Table 4 presents data on the content of vitamins and vitamin-like components, in table 5 - the amino acid composition.

According to all indicators of food and biological value, the organoleptic properties of canned food meet the requirements for canned products, including for gerontological nutrition.

Table 3: Physical and chemical indicators of new types of canned food, % per wet weight

| Sample Name | Mass fraction of dry matter | | Acidity per mass fraction of malic acid | pH | Sugars | | Starch | Cellulose | Hemicellulose | Lignin |
|---------------------------------|-----------------------------|------------------|---|------|---------|----------|--------|-----------|---------------|--------|
| | drying | by refractometer | | | general | reducing | | | | |
| Drink oat-sea buckthorn | 13,87 | 11,80 | 0,46 | 3,15 | 8,90 | 8,13 | 0,67 | - | - | |
| Drink oat-pumpkin | 10,93 | 9,20 | 0,12 | 4,40 | 7,66 | 5,73 | 1,33 | 0,18 | 0,15 | 0,06 |
| Drink oat-fruit | 14,63 | 11,30 | 0,61 | 3,30 | 11,5 | 8,40 | 2,72 | - | - | - |
| Kissel oat-pumpkin | 13,88 | 10,10 | 0,08 | 5,16 | 5,96 | 2,88 | 2,98 | - | - | - |
| Kissel oat-pumpkin (with flour) | 20,86 | 15,6 | 0,13 | 4,95 | 8,2 | 3,93 | 3,71 | - | - | - |
| Kissel oat-fruit-beet | 22,69 | 17,50 | 0,50 | 4,50 | 9,50 | 4,08 | 4,27 | 0,35 | 0,25 | 0,09 |
| Kissel milky - oat | 22,65 | 16,5 | 0,56 | 4,95 | 12,72 | 4,35 | 5,35 | - | - | - |
| Dessert watermelon- oat | 18,86 | 16,60 | 0,75 | 4,10 | 10,52 | 5,26 | - | - | - | - |
| Dessert watermelon- oat | 12,98 | 9,30 | 0,41 | 4,35 | 7,7 | 4,01 | 3,26 | - | - | - |
| Dessert watermelon - apple | 14,87 | 14,00 | 0,83 | 3,85 | 10,98 | 9,00 | - | 0,57 | 0,20 | 0,14 |
| Dessert nut - apple | 36,17 | 35,40 | 2,34 | 3,25 | 29,76 | 21,04 | - | - | - | - |
| Cream pumpkin -oat | - | - | - | - | - | - | - | 0,59 | 0,28 | 0,16 |
| Cream milky -oat | - | - | - | - | - | - | - | 0,40 | 0,38 | 0,11 |
| Cream watermelon -oat | - | - | - | - | - | - | - | 0,52 | 0,23 | 0,14 |

Table 4: Vitamin composition of new types of canned food for the purposes of wet mass

| Sample name | Vitamins | | Polyphenolic substances | | | | | Vitamins | | | | |
|---------------------------------|----------|-------------|-------------------------|------------|--------------|-------------------|-----------|----------------------------|------------------------------|------------------------------|--------|-----------------|
| | C | β- carotene | total amount | Flavonoids | Anthocyanins | Leucoanthocyanins | Catechins | Thiamine (B ₁) | Riboflavin (B ₂) | Pyridoxine (B ₆) | Niacin | Tocopherols (E) |
| Drink oat-sea buckthorn | 2,64 | 0,49 | 32,50 | 8,40 | 6,64 | - | - | - | - | - | - | - |
| Drink oat-pumpkin | 2,64 | 2,43 | 25,00 | 22,50 | 8,60 | 12,70 | 8,60 | 0,12 | 0,35 | 2,2 | 0,09 | 0,20 |
| Drink oat-fruit | 8,45 | - | 137,00 | - | 11,65 | 31,80 | 16,20 | - | - | - | - | - |
| Kissel oat-pumpkin | 1,90 | 0,650-2,42 | 21,50 | 9,00 | - | 12,60 | 8,76 | 0,04 | 0,20 | 5,85 | 0,2 | 0,75 |
| Kissel oat-pumpkin (with flour) | 6,70 | 3,60 | 33,00 | 7,50 | - | 11,30 | 12,00 | 0,04 | 0,17 | 5,71 | 0,18 | 0,71 |
| Kissel oat-fruit-beet | 7,90 | 0,02 | 143,00 | - | 10,90 | 31,80 | 14,60 | 0,02 | 0,21 | 3,4 | 0,03 | 0,40 |
| Kissel milky - oat | 11,16 | 0,02 | 40,00 | - | - | 33,40 | 24,00 | 0,01 | 0,09 | 6,2 | 0,01 | 0,2 |
| Dessert oat - fruit - beet | 14,08 | 0,02 | 195,00 | trace | 13,64 | 12,70 | 11,50 | 0,03 | 0,08 | 6,39 | 0,04 | 0,39 |
| Dessert watermelon - oat | 8,27 | 0,01 | 75,00 | 33,0 | 3,84 | 12,70 | 1,30 | 0,02 | 0,19 | 0,31 | 0,05 | 0,01 |
| Dessert watermelon - apple | 1,76 | 0,02 | 176,00 | trace | 3,5 | 31,80 | 31,30 | 0,02 | 0,15-0,14 | 0,52 | 0,01 | 0,4 |
| Dessert nut - apple | 101,73 | 2,5 | 320,0 | -«- | 10,3 | 167,4 | 58,00 | 0,12 | 0,20 | 8,70 | 0,11 | 2,70 |
| Cream milky -oat | 4,00 | 0,20 | - | - | - | 13,40 | 13,50 | 0,02 | 0,07 | 6,48 | 0,05 | 0,48 |
| Cream pumpkin -oat | 4,93 | 2,50 | - | - | - | 12,00 | 11,60 | 0,02 | 0,15 | 6,25 | 0,09 | 0,25 |
| Cream watermelon - oat | 4,18 | 0,01 | - | - | 2,5 | 28,80 | 30,30 | 0,02 | 0,19 | 0,31 | 0,05 | 0,01 |

It has been established that canned food for gerodietic purposes contains the same set of BAS as the raw materials, which are fairly well preserved in canned food during production and storage. The food properties of canned food are quite good in taste and color, aroma, texture, especially good organoleptics are canned, developed in a production environment with all the requirements of regulatory documentation.

Table 5: Composition of amino acids of canned food products for feeding in 100 g of product, mg%

| Name of amino acids | Drink oat-pumpkin | Drink oat-fruit | Cream oat - pumpkin | Kissel oat-fruit-beet | Cream milky-oat (with flour) | Dessert oat - fruit - beet | Dessert watermelon-oat | Dessert watermelon - apple | Dessert nut - apple | Walnut Leaf Tea |
|---------------------|-------------------|-----------------|---------------------|-----------------------|------------------------------|----------------------------|------------------------|----------------------------|---------------------|-----------------|
| Lysine | 27,5 | 21,1 | 45,7 | 31,1 | 51,2 | 27,0 | 29,7 | 5,4 | 40,1 | 1,8 |
| Histidine | 19,3 | 16,8 | 31,8 | 23,5 | 29,5 | 19,4 | 19,3 | 1,5 | 38,5 | 0,7 |
| Arginine | 39,4 | 24,5 | 50,8 | 40,8 | 69,0 | 33,5 | 50,8 | 6,2 | 97,4 | 1,0 |
| Aspartic acid | 52,1 | 39,5 | 60,3 | 66,2 | 88,2 | 58,1 | 83,4 | 10,8 | 81,6 | 3,5 |
| Threonine | 21,3 | 15,6 | 27,1 | 37,9 | 44,3 | 38,1 | 30,5 | 2,1 | 48,7 | 0,6 |
| Serine | 41,2 | 20,8 | 43,4 | 48,3 | 62,7 | 45,7 | 54,8 | 3,9 | 87,3 | 0,9 |
| Glutamine | 83,5 | 63,2 | 88,0 | 90,8 | 105,1 | 83,1 | 120,1 | 11,5 | 125,8 | 3,1 |
| Glycine | 36,5 | 22,4 | 40,0 | 38,3 | 37,8 | 40,5 | 29,8 | 4,0 | 75,4 | 1,2 |
| Alanine | 55,8 | 29,8 | 69,8 | 32,5 | 51,3 | 31,7 | 65,2 | 5,5 | 17,8 | 1,1 |
| Valin | 49,0 | 21,3 | 78,5 | 35,4 | 75,8 | 40,4 | 59,9 | 3,2 | 88,3 | 0,8 |
| Methionine | 11,4 | 8,0 | 16,3 | 12,6 | 19,4 | 10,3 | 16,3 | 0,9 | 27,5 | 0,1 |
| Cystine | 7,5 | 2,1 | 12,5 | 10,3 | 14,5 | 11,8 | 10,7 | 0,4 | 19,8 | 0,2 |
| Proline | 19,1 | 9,7 | 34,4 | 30,1 | 60,8 | 30,8 | 41,2 | 2,6 | 80,6 | 0,6 |
| Isoleucine | 30,8 | 21,9 | 41,3 | 26,7 | 56,0 | 20,9 | 44,8 | 2,8 | 62,5 | 0,9 |
| Leucine | 39,5 | 18,7 | 69,4 | 48,5 | 81,5 | 44,3 | 68,5 | 3,1 | 78,9 | 1,1 |
| Tyrosine | 20,8 | 11,5 | 38,2 | 25,8 | 50,8 | 27,5 | 43,4 | 1,1 | 49,3 | 0,5 |
| Phenylalanine | 45,1 | 25,4 | 52,7 | 48,3 | 63,2 | 42,9 | 52,9 | 2,6 | 67,3 | 0,7 |
| Tryptophan | not exp. | not exp. | - | - | - | - | - | - | - | - |

Canned food produced under production conditions according to sterilization regimes selected in accordance with the requirements is industrially sterile.

For all groups of canned food, sterilization regimes have been developed for an autoclave using an aqueous sterilization method. Modes were selected taking into account the pH of canned food and the required mortality. The actual mortality rate was calculated on the basis of experimental data on the degree of heating under production conditions in accordance with the requirements.

In the process of modeling gerontological canned food, the microbiological characteristics of the production processes and the establishment of standards for hygienic control indicators of canned food were studied in parallel.

Special attention was paid to the study of microbial contamination of products by mixing, packing, after sterilization, after a year of storage of canned food in traditional conditions of unregulated environment.

CONCLUSION

For the first time, four groups of canned foodstuffs for gerodietic purposes were developed, including: four kinds of drinks;

kissels, including 13 species;
creams, including four types;
desserts, including ten kinds of names of canned food.

The main advantage of models of canned food is 100% use of natural ingredients in the form of biologically valuable raw materials with dietary multifunctional therapeutic and prophylactic properties. All components are well combined with each other, complement natural, therapeutic and dietary properties.

The basis of the selection of models of gerontological canned food was the organoleptic properties of the finished product, the compatibility of the components, their therapeutic and dietary (prophylactic) properties and the focus on improving immunity, good work of the gastrointestinal tract, etc. oats in the form of broth or flour.

The nutritional and biological value of new types of canned food has been studied; all of them retain the BAS of the raw materials, including vitamins, mineral substances, including iodine, all essential and replaceable acids, are rich in dietary fiber, have good flavoring properties.

According to all indicators, canned food - drinks, jelly, creams and desserts will be useful to all groups of the population, from children (2-3 years old) to gerontological age (seniors, seniors, as well as the group of long-livers).

Requirements for an operator model of a subsystem — a technological complex for preparing raw materials (vegetables, fruit puree, cereals, flour, dairy raw materials) have been developed.

Operator models of technological schemes for the production of gerontodietic products (four main groups), technological, technical and sanitary and microbiological control schemes for the production of gerontological products have been developed.

The nutritional and biological value, microbiological purity of ten types of canned food after annual storage in traditional conditions of unregulated environment was studied.

It has been established that, after a year of storage, new types of gerontological canned foods contain the whole complex of biologically active substances (vitamins, amino acids, macro- and microelements) contained at the time of their manufacture, i.e. characteristic of the BAS of the feedstock. Some changes in the direction of the quantitative reduction of vitamin C and polyphenolic substances are noted, but this is practically not visually reflected on the color of canned food.

Starch content in canned food decreased due to hydrolytic processes. Additionally, it was revealed that all ten types of controlled canned foods contain to a greater or lesser extent vitamins B₁, B₂, B₆, niacin, β-carotene, some types contain vitamin E, all essential amino acids, vital mineral elements: potassium, calcium, magnesium, phosphorus, sodium, iodine, zinc, copper, cobalt, silicon, sulfur, iron.

The food properties of canned food are quite good both in taste, in color, aroma, and consistency.

Bacteriologically, canned food is industrially sterile, which confirms the reliability of the selected sterilization regimes. The shelf life of canned food is 2 years.

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