PPI

Technical evaluation study of dried beef powder DAV.090

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MEAT & LIVESTOCK
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1 SCOPE OF PROJECT

Barry Lee (Connectica International) acting for MRC, approached FRI to prepare a background paper discussing the production of dried meat powder. MRC is aware that Farm Pride Eggs (VEMB) is developing a natural beef powder as a flavouring ingredient and has interest from H.J. Heinz. MRC is also aware that the FRI has recently produced sample quantities of a spray-dried meat extract for Southern Country Foods, which is currently showing these to some Japanese food manufacturers.

Barry Lee has requested FRI to undertake a preliminary study into the technologies used in Australia to produce dried meat powder and to comment on whether investment by MRC is warranted to develop or nurture any of these. Assessment of local or overseas demand is not required, and will be pursued independently by MRC.

2 BACKGROUND

The terminology for various powdered meat products and substitutes varies in the literature and throughout the local food industry, with the main types discussed below.

Meat flavoured powders are usually based on hydrolysed vegetable protein (HVP) powders, to which natural or artificial meat flavours are added. They are widely used in Australia for flavouring soups, gravies, stews, pastry products etc.

Meat extract powder is produced by concentrating a liquid meat extract (itself usually a by-product of a cooking process) in an evaporator, then drying with carriers and extenders in a spray dryer. There is a small but growing demand locally and in South East Asia for addition to premium products, usually to replace HVP flavourings and allow "no artificial flavours" labelling. Meat extract powder has the same flavour profile as the parent meat extract, but is more convenient to handle.

Meat powder is produced by cooking meat, comminuting then drying, usually in a spray dryer but also by roller drying, or freeze drying. There appears to be a small use of such products in Australia (including Heinz and Unifoods). However, there is a growing demand for meat powder in South East Asia, for use as a base in dehydrated soups.

3 LITERATURE SEARCH

Many text book and journal references exist describing the *production* of meat extract, and comminuted meat. However a search of the FOOD SCIENCE AND TECHNOLOGY ABSTRACTS 1969-1991 yielded:

- Only twelve references on the further *processing* of meat extract. Only one reference was on the production of meat extract powder (using a hot-air cabinet dryer), and is a German Patent.

- Only three references on meat powder.

The most recent edition (1991) of Masters' *Spray Drying Handbook* contains only a small entry for drying of meat purees:

> Meat purees are spray-dried for use in soups, sauces,minces, etc. Beef meat, for example, is cooked at 100 °C with 15-30% water. Acetic acid and additives are added. The feed becomes a meat soup which is spray-dried in a co-current-flow dryer with rotary atomisation and special features to handle the fat content. Inlet drying temperatures of 150-200 °C can be used. Outlet temperatures are 85-100 °C. Chicken is another spray-dried meat. Frozen dressed chickens are cooked, meat separated from the bones and ground to a puree with its broth. An anti-oxidant is added to the puree to retard rancidity of the fat. The mixture is spray-dried under conditions similar to those given above.

Recent research in New Zealand has been reported, in which enzyme hydolysis was used to enhance the flavour of meat extract powder.

No other significant references were found in text books and journals on this subject.

Relevant references are appended.

4 COMMERCIAL SEARCH

4.1 Ingredient manufacturers

Five food ingredient companies (Bush Boake Allen, Food Ingredient Specialities, Quest International, Product Makers, Universal Flavours) were contacted to ascertain the availability of meat powder in Australia. All sold a variety of hydrolysed vegetable protein powders which contained artificial meat flavours (pork, beef and chicken). The powders differed in the carriers and extenders used and in their heat stability and solubility. Some of the companies sold products containing natural meat flavours.

Bush Boake Allen have recently started manufacturing a natural dried beef product, available as powder or cubed. They are initially selling only locally, but will be interested in developing export markets. Further details were not available, as the Sales Manager, Natural Products (Elaine Conroy) was interstate.

4.2 Dryer manufacturers

Niro Australia (major manufacturer of Spray Dryers) was contacted to discuss spray drying of meat extract. Niro have a 3000 page database on product drying applications, used to support Niro Dryer owners in product development and troubleshooting. The database has been established through Niro's own research in Denmark and unfortunately is proprietary to Niro. They were not prepared to make general recommendations or comments on drying of meat extract or meat puree. However, FRI has just taken delivery of a Niro Pilot Fluidised Spray Dryer, and so will be able to request Niro assistance if there is a bona-fide product under development.

4.3 Southern Country Foods

Southern Country Foods currently prepares a beef extract by concentrating the cooking water from its corned-beef production. The extract is sold locally and overseas in 15 kg buckets. SCF has had a number of requests for supply of powdered extract, and commissioned FRI to produce some test samples.

FRI used a bench top spray-dryer for product development, varying the proportions of salt, starch and encapsulated starch to determine the best product. Microbiological or shelf-life testing was not undertaken.

The details of the formulations are confidential to the client, but all products dissolved easily giving a full beef taste and aroma.

4.4 Farm Pride Products

Farm Pride Products (VEMB) have developed several natural chicken powders. These are produced commercially using their Henningsen box-type spray dryer which is also used for powdered egg production. These products are sold locally for canned soup and premium soup mixes.

VEMB have been developing a process for producing beef powder for 18 months. One of the main problems has been the economical comminuting of the cooked meat and the separation of the fat.

VEMB performed initial drying tests at CSIRO Highett in a spray-dryer equipped with a nozzle atomiser. The particle size was large and gave a gritty feel to the product (why this is a problem for a product which is re-dissolved is unclear).

Several different batches of dried beef powder were produced recently for VEMB in the old FRI/VCAH Niro pilot spray dryer. This dryer is of an older tall-form design, using a rotary atomiser for high throughput. It is fitted with an external fluidised bed for product cooling. It is set up for powdered milk production and cannot produce agglomerated product.

4.5 Defence Science Technology Organisation

DSTO operates a food research group at Scottsdale, Tasmania, known as the Materials Research Laboratory-Tasmania. This group develops and produces military ration-packs. They have extensive experience in production of dehydrated foods, especially by freeze-drying. They do not produce meat powders and are not aware of any Australian company using freeze drying technology to do this.

4.6 Read Industries, NSW

Read Industries, Castle Hill NSW, produce several meat powders. The limited budget for this project did not allow a visit to be made, but a phone interview was conducted with the Operations Manager, Mr Rob Noack.

The company produces roller-dried chicken powder and granulated beef, chicken and bacon products in a fluid-bed dryer. The powders are supplied to local manufacturers, including Unifoods for a soup-mix ingredient. The company has had many export inquiries which it has declined because it does not have export registration for its premises. However, Read Industries is interested in starting an export business and is in the process of gaining AS3900 accreditation for its manufacturing process.

4.7 H.J. Heinz

A phone discussion was held with Mr Garth Wilkinson (Senior Development Chef) about Heinz' use of meat powders and extracts. Heinz use chicken powder (from VEMB) as an ingredient in baby foods. They prefer to use a powder because they feel the product is more consistent (in terms of protein and fat content, and flavour) than fresh meat.

Heinz have been trialing the VEMB beef powder for soup production and are generally satisfied, though Mr Wilkinson stated that the details were confidential. They had analysed a number of (unspecified) imported powders and found them to contain too much salt or other carriers to be suitable for premium soups.

5. EVALUATION OF SIMILAR PRODUCTS

Samples of dried beef extracts from Nestlé New Zealand and Taiwan were supplied to FRI by Southern Country Foods, to compare with the powdered extract produced by FRI.

A portion of each imported sample was dissolved in hot water, and compared according to solubility, taste and aroma.

The NZ sample dissolved after few seconds and fat residues were observed floating on the surface. It has a dominant salty taste, with a strong rancid beef extract aroma.

The Taiwanese powder sample dissolved quickly in hot water. The colour, flavour and aroma were very weak, which could be due to a big amount of carrier added and only a small amount of extract.

The Taiwanese granular powder sample did not dissolve completely in hot water, even after a period of time. It had a pasty-residue formed at the bottom of the cup. The taste and aroma were acceptable.

6. CONCLUSIONS

Meat powders can be produced by spray-drying, roller-drying or freeze-drying pureed meat with suitable carriers. It appears the major producers in Australia are the VEMB, Keysborough, Victoria, and Read Industries, Castle Hill, NSW.

Spray-drying is likely to be the most flexible technology since the particle size can be varied to suit market requirements. Spray dryers with integral or external fluidised beds can produce agglomerated particles. These particles are called "instantized" because they have improved wetting and solubility characteristics. There are problems drying high-fat purees, but these can be managed in the new generation of fluidised bed dryers. Spray dryers, however, are expensive to purchase and run - a dryer with an evaporative capacity of 100 kg/h would cost about $2 M.

Roller drying is likely to be a cheaper means of producing meat powder because there is a greater tolerance on liquid particle size than for spray-drying, and because the capital cost of the dryer is less. Roller dryers, however, produce flaky material which must be pulverised and so do not give the same control over the finished particle size as do spray dryers. Roller dryers are difficult to clean and roller-dried products often suffer from microbial contamination (which is largely why they were abandoned by the dairy industry). It is difficult to establish accurate costs for a roller dryer, but a unit with 100 kg/h evaporative capacity would be about $0.8 M.

Anecdotal evidence suggests there is an increasing demand for meat powders as a soup and flavouring base in SE Asia, particularly Korea, Japan and Indonesia.

The major technical problems to resolve are to devise an economical way to comminute and strain the cooked meat, and how to produce high-fat powders.

The shelf-life of the product is limited by oxidation of the fat. The incorporation of artificial anti-oxidants detracts from the otherwise 'natural' ingredients, and thus some work is required to devise acceptable anti-oxidants.

Experience at the VEMB shows that the prime beef cuts yield a better flavoured product than cheaper cuts. This is partly attributed to the different amounts of fat in these cuts.

7. RECOMMENDATIONS

7.1 Beef Extract Powder

MRC should consider investing in production of beef extract powders.

(i) Beef extract is a by-product. Its production volume cannot be easily varied and its international price fluctuates rapidly with demand. By changing the product form to a powder, the manufacturer has a better chance of being a price-setter, rather than a commodity-supplier.

(ii) Beef extract powders are a more convenient form of beef extract, and so may represent and opportunity to add further value to this by-product.

(NB. An alternative view proposed by one manufacturer, which has been examined but not accepted at the FRI, is as follows: drying of beef extract may not be warranted because it adds cost and may simply replace the manufacturer's market for liquid meat extract.)

7.2 Beef Powder

MRC should consider investing in production of beef powders.

(i) There appears to be a growing demand for natural beef powders in South East Asia, and a willingness to purchase product from Australia.

(ii) There is some opportunity for import replacement.

MRC should consider assisting existing manufacturers to start export operations.

The VEMB operation is professional and well organised. It has export-registered premises, the backing of a NATA-registered microbiological lab and a quality assurance program. If the MRC marketing intelligence indicates that it is worthwhile developing a meat powder industry, then VEMB would be worth investing funds for market development and refinement of the cooking/comminution stage. A negative aspect of the VEMB operation is that the VEMB defining Act does not allow the company to produce or deal in red meat products. The new coalition government in Victoria is likely to de-regulate or privatise the VEMB soon, so this may not be a long-term problem.

Read Industries is almost as advanced as VEMB in being ready for export production. It has the advantage of owning two different drying technologies,

which gives it more production flexibility. This represents an opportunity for MRC to invest in alternative powder-producing technologies, which may be lower cost.

7.3 Further research

MRC should determine customers' desired specifications, then invest in development of suitable powders.

Potential purchasers of beef powder may have specific requirements (fat content; particle size; degree of agglomeration; restrictions on carriers, emulsifiers, extenders or anti-oxidants).

FRI has recently taken delivery of a Niro fluidised-bed pilot spray-dryer. This new-generation dryer is capable of drying high-fat or high-carbohydrate products which are difficult or impossible to dry in conventional co-current spray-dryers.

FRI would welcome the opportunity to undertake development of agglomerated meat or meat extract powders, which could have improved solubility and keeping characteristics. The logical commercial partner for this work would be VEMB.

REFERENCES FROM THE FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

AN: 85-05-S0098
TI: [Henningsen plant for dried meat manufacture.]
AU: Anon
PY: 1984
SO: Voedingsmiddelentechnologie; 17 (16) 33
LA: Nl (Dutch); Non-English
SC: S Meat-poultry-and-game
AB: A new plant at Waalwijk, Netherlands, for manufacture of dried meat is described; it is operated by Henningsen Nederland BV, a joint venture of Henningsen Foods Inc., New York, & Van den Burg Eiprodukten BV. Products include pieces of dried chicken, beef and ham for use by manufacturers of dried soups, prepared meals, etc., and powdered meat for use in sauces, soups, etc. Fresh or frozen meat is comminuted to an appropriate particle size, heat treated in an autoclave at greater than 100 degree C, and dried in a special spray dryer. The powdered meat product has a final moisture content of approx. 4%. Throughput is at present 25 t/wk.
DE: DRIED-FOODS; meat products, installations for dried; SPRAY-DRYING-; meat pieces, spray-dryers for; MEAT-PRODUCTS; installations for dried meat products; MEAT-; spray-dryers for meat pieces
UD: 8505

AN: 89-11-G0007
TI: [Stock cubes and dehydrated soups. II. Basic components.]
AU: Lage-MA; Simal-J; Rodriguez-G
AD: Dep. de Quimica Analytica, Nutr. y Bromatologia, Fac. de Farmacia, Univ. de Santiago, 15706 Santiago, Spain
PY: 1987
SO: Alimentaria; No. 188, 34-39, 13 ref.
NU: ISSN: 0300-5755
LA: Es (Spanish); Non-English
LS: en (English)
SC: G Commodity-technologies-general
AB: The dried products described above (chicken, fish, meat, ham and meat + vegetable stock cubes, dried meat sauce and dried fish soup) [see preceding abstr.] were subjected to chemical analysis. Proximate composition (% in DM) of the 7 dried products was: fat content, 9.2-20.2%; ash, 28.1-69.8%; NaCl, 23.5-61.1%; total N, 1.5-3.3%; creatinine, 0.04-0.19%; and glutamic acid, 5.7-20.4%. DM content ranged from 87.0 to 97.4%. Composition of the liquid stock obtained from a rehydrated stock cube was: 40.1% DM; 0.2% fat; 19.8% ash; 16.5% NaCl; 7.6% total N; 0.20% creatinine and 12.5% glutamic acid. Only 4 of the products contained starch. The high NaCl content of the stock cubes is noted. Concn. of glutamic acid was considered relatively high, but in no product did it exceed the max. of 12 g/l of product ready for consumption, set by Spanish legislation.
DE: JUICES-; stock cubes, composition of; DRIED-FOODS; soups, composition of dried; meat sauces, composition of dried; SAUCES-; MEAT-PRODUCTS; SOUPS-; composition of dried soups
ID: Prepared-foods
UD: 8911

AN: 83-10-S1737
TI: Dehydrated beef products, a method of preparing them and meat products containing them.
AU: Whittle-MT
PY: 1982
SO: Australian-Patent-Application
PN: AU 66 966/81 (AU66966/81)
PA: Protein Foods (UK) Ltd.
DT: Patent
LA: En (English)
SC: S Meat-poultry-and-game
AB: The dehydrated, bacteriologically stable connective tissue product described is intended for inclusion in meat products. It has a water content less than 10% by wt., fat content less than 10% by wt., and particle size less than 5 mm.
DE: DRIED-FOODS; meat products, dehydrated connective tissue products for, Patent; CONNECTIVE-TISSUES; MEAT-PRODUCTS; dehydrated connective tissue products for meat products, Patent
UD: 8310

AN: 78-04-U0242
TI: [Legal evaluation of freeze-dried meat powder.] Bemerkungen zur lebensmittelrechtlichen Beurteilung von gefriergetrocknetem Fleischpulver.
AU: Nagel-G
PY: 1977
SO: Deutsche-Lebensmittel-Rundschau; 73 (11) 364-365, 6 ref.
LA: De (German); Non-English
SC: U Standards-laws-and-regulations
AB: Possible legal difficulties with newly developed freeze-dried powdered meat products in the Federal Republic of Germany are discussed, with special reference to paragraph 3 of the Meat Regulations of 1976, which prohibit the use of dried meat in meat product manufacture. The applicability of these regulations (which were intended to restrict use of an inferior type of dried meat) to the new product is discussed, and possible difficulties with amendment of the Regulations are considered.
DE: LEGISLATION-; meat powders, evaluation of freeze-dried, FRG; GERMANY,-FEDERAL-REPUBLIC-OF; meat powders, evaluation of freeze-dried, Legislation; DRIED-FOODS; meat powders, evaluation of freeze-dried, Legislation, FRG; MEAT-PRODUCTS; POWDERS-
UD: 7804

AN: 78-04-S0612
TI: Comminuted meat product.
AU: Catlin-BJ; Williams-TP
PY: 1977
SO: United-States-Patent
PN: 4 018 935 (4018935)

PA: Thomas J. Lipton Inc.
DT: Patent
LA: En (English)
SC: S Meat-poultry-and-game
AB: Shrinkage of comminuted meat products during heating is reduced by the incorporation of a dried potato pulp from which starch has been removed.
DE: MEAT-PRODUCTS; dried potato pulps & heat shrinkage reduction of comminuted meat products, Patent, USA; HEATING-; meat products, dried potato pulps & heat shrinkage reduction of comminuted, Patent, USA; DRIED-FOODS; PULPS-; POTATOES-
UD: 7804

AN: 72-07-G0348
TI: [Instant food concentrates.]
AU: Kundin-PV; Nemtsova-AS; Parshina-GN
PY: 1970
S O :
Trudy,-Vsesoyuznyi-Nauchno-issledovatel'skii-Institut-Konservnoi-i-Ovoshchesushil'noi-Promyshlennosti; 13: 110-117
LA: Ru (Russian); Non-English
SC: G Commodity-technologies-general
AB: Standard foods were processed into conc. foods suitable for consumption under extreme conditions of foodstuff supply e. g. geological and other expeditions, mountaineering and tourist expeditions where food preparation is time-consuming and laborious. Complete meals as well as subsidiary dishes were prepared in conc. form from vegetables (beans etc.) which are ready-to-serve. Tables and formulae for various concentrates are given, including soups and purees. The concentrates were made from potato flour, pea flour, beans, garden beans, wheat and maize, carrot flour, powdered onions, powdered vegetables, fat, salt, glutamate and meat compressed into bricks. Tables give composition of the meals and their caloric value.
DE: SOUPS-; Instant /soups/; PUREE-; Instant /purees/; BEANS-; /Beans/ in instant foods; VEGETABLES-; /vegetables/ in instant foods; POTATOES-; /potato flour in instant foods; PEAS-; /pea flour in instant foods; WHEAT-; /wheat/ in instant foods; CORN-; /maize/ in instant foods; CARROTS-; /carrot flour in instant foods; ONIONS-; /onions/ in instant foods; FATS-; /fat/ in instant foods; SODIUM-CHLORIDE; /salt/ in instant foods; GLUTAMIC-ACID; /glutamate/ in instant foods; MEAT-; /meat/ in instant foods
UD: 7207

AN: 72-04-T0204
TI: Fenaroli's handbook of flavour ingredients.
AU: Furia-TE; Bellanca-N [Editors]
PB: Cleveland,-Ohio,-USA:-Chemical-Rubber-Co.-Price-£18.75.
PY: 1971
SO: xi • 803pp., Numerous ref.

DT: A-book
LA: En (English)
SC: T Food-additives-spices-and-condiments
AB: In this well-presented and comprehensive handbook, part I (pp. 3-26) deals with general considerations, covering definitions, nomenclature, assessment and general methods of preparing flavour ingredients; parts II (pp. 33-256) and III (pp. 259-640) consist of detailed descriptions of approximate equal to200 natural and approximate equal to750 synthetic flavour ingredients including the FDA regulatory status and FEMA proposals; part IV (pp. 643-762) deals with the use of flavour ingredients in food, including the relationship of certain flavour ingredients to taste and flavour, floral and citrus flavours, fruital flavours, bitter flavours, alcoholic beverages (vermouth, bitters, sweet liqueurs, elexirs, distilled liquor imitations and their composition), non-alcoholic beverages (syrups, soft drinks and carbonated beverages, dry beverage bases, teas and tisanes, cocoa, coffee), baked goods, confections, dairy products (milk, cream, ice cream and sherbet, yoghurt, butter, margarine, cheese), sauces, dressings, condiments and powdered flavours, soups and broths, desserts, and meat, fish and vegetables. The book is well indexed (pp. 765-803).
DE: BOOKS-; Book. Flavour ingredients; FLAVOUR-(ADDITIVES); VERMOUTH-; Book. Flavour ingredients in /vermouth/; LIQUEURS-; Book. Flavour ingredients in /liqueurs/; BEVERAGES-(ALCOHOLIC); Book. Flavour ingredients in /alcoholic beverages/; SYRUP-; Book. Flavour ingredients in /syrups/; BEVERAGES-; Book. Flavour ingredients in / soft drinks/; TEA-; Book. Flavour ingredients in /tea/; COCOA-; Book. Flavour ingredients in /cocoa/; COFFEE-; Book. Flavour ingredients in /coffee/; BAKERY-PRODUCTS; Book. Flavour ingredients in /bakery products/; CONFECTIONERY-; Book. Flavour ingredients in /confectionery/; DAIRY-PRODUCTS; Book. Flavour ingredients in /dairy products/; MILK-(ADDITIVES-&-CONTAMINANTS); Book. Flavour ingredients in /milk/; ICE-CREAM; Book. Flavour ingredients in /ice cream/; CREAM-; Book. Flavour ingredients in /cream/; SHERBET-; Book. Flavour ingredients in /sherbet/; YOGHURT-; Book. Flavour ingredients in /yoghurt/; BUTTER-; Book. Flavour ingredients in /butter/; MARGARINE-; Book. Flavour ingredients in /margarine/; CHEESE-; Book. Flavour ingredients in /cheese/; SAUCES-; Book. Flavour ingredients in /sauces/; CONDIMENTS-; Book. Flavour ingredients in /condiments/; SOUPS-; Book. Flavour ingredients in /soup/; BROTH-; Book. Flavour ingredients in /broth/; DESSERTS-; Book. Flavour ingredients in /desserts/; MEAT-; Book. Flavour ingredients in /meat/; FISH-; Book. Flavour ingredients in /fish/; VEGETABLES-; Book. Flavour ingredients in /vegetables/
UD: 7204

AN: 70-08-S0678
TI: [Soluble meat powder.]
AU: Charier-Vadrot-P
PY: 1969
SO: French-Patent
PN: 1 568 051 (1568051)
DT: Patent
LA: Fr (French); Non-English

SC: S Meat-poultry-and-game
AB: Boned and chopped meat is cooked at 100 degree C in 10-30% (by wt. of meat) water. The water/meat mixture contains/kg greater than1 of the following (wt. tolerance plus/minus30%): weak acid, e.g. acetic or citric (1.5 g); antioxidant, e.g. ascorbic acid (0.2 g); surface-active agent, e.g. sucrose stearate (0.5 g); vegetable or marine colloid, e.g. gum arabic (120 g); binder, e.g. monosodium glutamate (3.0 g); potassium or sodium nitrate (0.3 g); glucose (10 g). 30-60% of the additives are added before cooking and the balance afterwards. The meat and soup-like product are then crushed finely at 50 degree C to produce a pasty liquid phase with the meat in supension. This phase is pressurized and fed into a column, where it is vaporized. The fine droplets are projected into an air current at 150-220 degree C (on input), which causes rapid evaporation of water droplets and precipitation of powdered solids and crystallized liquids. The air current carries this powder towards a separator where it is collected. Flow rates of air and aqueous solution are so adjusted that the humidified vent air from the separator is at 65-110 degree C, preferably 85 degree C.
DE: SOLUBILITY-; Soluble meat powder; MEAT-; POWDERS-; ACIDS-; /Acids/ in soluble meat powder; ANTIOXIDANTS-; /antioxidants/ in soluble meat powder; SURFACE-ACTIVE-AGENTS; /surface active agents/ in soluble meat powder; GUM-ARABIC; /gum arabic/ in soluble meat powder; GLUTAMIC-ACID; /monosodium glutamate/ in soluble meat powder; NITRITES-; /nitrite/ in soluble meat powder; GLUCOSE-; /glucose/ in soluble meat powder
UD: 7008

AN: 88-11-S0040
TI: Effects of creatine and creatinine content on the mutagenic activity of meat extracts, bouillons and gravies from different sources.
AU: Laser-Reuterswaerd-A; Skog-K; Jaegerstad-M
AD: Swedish Meat Res. Inst., POB 504, S-244 00 Kaevlinge, Sweden
PY: 1987
SO: Food-and-Chemical-Toxicology; 25 (10) 747-754, 45 ref.
NU: ISSN: 0278-6915
LA: En (English)
SC: S Meat-poultry-and-game
DE: EXTRACTS-; meat extracts, creatine-creatinine & mutagenicity of; MEAT-PRODUCTS; CARCINOGENS-; bouillons, creatine-creatinine & mutagenicity of; gravy, creatine-creatinine & mutagenicity of; SOUPS-; GRAVY-; AMINO-ACIDS
ID: Prepared-foods
UD: 8811

AN: 71-09-T0467
TI: [Method for flavouring food products.]
PY: 1970
SO: Netherlands-Patent-Application
PN: 7 004 150 (7004150)
PA: Unilever NV

DT: Patent
LA: Nl (Dutch); Non-English
SC: T Food-additives-spices-and-condiments
DE: MEAT-; Synthetic meat flavour containing 2,5-dialkyl-4-hydroxy-2,3-dihydrofuran-3-ones; FLAVOUR-; SOUPS-; Synthetic meat flavour for /soups/; MEALS-; Synthetic meat flavour for / prepared meals/; CANNING-; Synthetic meat flavour for /canned ham/; HAM-; CONDIMENTS-; Synthetic meat flavour for /seasonings/
UD: 7109

AN: 70-02-E0114
TI: [Preparation of products in a form suitable for freeze-drying.]
PY: 1969
SO: Netherlands-Patent-Application
PN: 6 717 658 (6717658)
PA: Unilever NV
DT: Patent
LA: Nl (Dutch); Non-English
SC: E Food-engineering
DE: FREEZE-DRYING-; Freeze-drying of liquids; LIQUIDS-; MILK-; Freeze-drying of /milk/; CREAM-; Freeze-drying of /cream/; FRUIT-; Freeze-drying of /fruit juices & pulps/; JUICES-; PULPS-; VEGETABLES-; Freeze-drying of /vegetable juices & pulps/; MEAT-; Freeze-drying of /meat extracts/; EXTRACTS-
UD: 7002

AN: 85-12-S0014
TI: [Effect of fluidized bed granulation on characteristics of meat extract tablets.]
AU: Remon-JP; Aerde-P-van; Severen-R-van
AD: Lab. voor Artsenijbereidkunde- en Farmakognosie, Harelbekestraat 72, B-9000 Ghent, Belgium
PY: 1985
SO: Voedingsmiddelentechnologie; 18 (3) 24-25, 4 ref.
LA: Nl (Dutch); Non-English
SC: S Meat-poultry-and-game
DE: FLUIDIZATION-; meat extract tablets, granulation fluidized-bed & characteristics of; GRANULES-; MEAT-PRODUCTS; EXTRACTS-
UD: 8512

AN: 80-06-S0967
TI: New developments in meat aroma research. (In 'Flavor of foods and beverages' [see FSTA (1980) 12 6A363].)
AU: Flament-I; Willhalm-B; Ohloff-G
AIA: United States of America, American Chemical Society, Division of Agricultural & Food Chemistry [Flavour Symposium]
AD: Firmenich SA, Res. Lab., Geneva, Switzerland
PY: 1978

SO: pp. 15-32, 61 ref.
DT: Lecture
LA: En (English)
SC: S Meat-poultry-and-game
DE: AROMA-COMPOUNDS; compounds in meat extracts, aroma; MEAT-PRODUCTS; EXTRACTS-
UD: 8006

AN: 72-12-S1638
TI: [Manufacture of a granular meat extract.] Verfahren zur Herstellung von rieselfaehigem Fleischextrakt.
AU: Geilsdorf-H; Mocka-E
PY: 1972
SO: German-Democratic-Republic-Patent
PN: 89 779 (89779)
DT: Patent
LA: De (German); Non-English
SC: S Meat-poultry-and-game
DE: GRANULATION-; Granular meat extract; MEAT-; SODIUM-CHLORIDE; /Salt in granular meat extract; WHEAT-; /wheat starch in granular meat extract; STARCH-; MIXING-; /mixing of granular meat extract; DRYING-; /drying of granular meat extract; COMMINUTION-; /grinding of/ granular meat extract
UD: 7212

AN: 70-10-S0964
TI: [Method for pickling extracted meat.] Verfahren zum Poekeln von extrahiertem Fleisch.
AU: Tschichold-P
PY: 1970
SO: Swiss-Patent
PN: 484 622 (484622)
PA: Knorr Naehrmittel AG
DT: Patent
LA: De (German); Non-English
SC: S Meat-poultry-and-game
DE: PICKLING-; Pickling of meat by-product from manufacture of extracts; MEAT-; BY-PRODUCTS-; EXTRACTS-; CANNING-; /Canning/ of pickled meat; DEHYDRATION-; /dehydration/ of pickled meat; RECONSTITUTION-; /Rehydration/ of dried pickled meat; ORGANOLEPTIC-PROPERTIES; /organoleptic properties/ of dried pickled meat
UD: 7010

AN: 69-10-M0761
TI: [Method for manufacture of free-flowing powders from fat and flour.] Verfahren zur

Herstellung rieselfaehiger Pulver aus Fett und Mehl.
AU: Kautz-K
PY: 1968
SO: West-German-Patent-Application
PN: 1 417 553 (1417553)
DT: Patent
LA: De (German); Non-English
SC: M Cereals-and-bakery-products
DE: DOUGH-; Spray dried dough for use in /bread; cakes; soup/; BREAD-; Spray dried dough for use in /bread/; CAKES-; Spray dried dough for use in /cakes/; SOUPS-; Spray dried dough for use in /soup/
UD: 6910

AN: 75-10-S1385
TI: [Production of stable, microbiologically pure liquid or soluble powder concentrates of the flavouring and proteins from animal raw materials.]
AU: Laran-GMEA
PY: 1974
SO: French-Patent-Application
PN: 2 218 060 (2218060)
DT: Patent
LA: Fr (French); Non-English
SC: S Meat-poultry-and-game
DE: FROZEN-FOODS; meat extracts, preparation of frozen, Patent, France; MEAT-PRODUCTS; EXTRACTS-
UD: 7510

OTHER REFERENCES

Jones, S.G. and Stanley (1992). The enhancement of beef flavour by enzyme hydrolysis and the Maillard reaction. 27th Meat Research Conference, Hamilton, New Zealand.