INVESTIGATION OF BIOGENIC AMINES IN FISH AND FISH PRODUCTS

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July 1995

Commissioned by Food Safety Unit

State Government Victoria Department of Human Services

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Published by:

Public Health Division

Victorian Government Department of Human Services.

Edition 1

29102002

This publication is available at the Internet address:

www.foodsafety.vic.gov.au

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INTRODUCTION

Biogenic amines are organic compounds which are derived from the corresponding amino acids when the carboxylic acid group on the amino acid is removed by enzymic reactions. They are termed biogenic amines because they are formed in raw food by bacterial action. Biogenic amines may be present in various foods, particularly fish and fish products, cheese, meat and fermented foods (Eerola et al. 1993). If foods are mishandled during storage and processing, proteins within the foods may break down to free amino acids, which may also be naturally present within the food. If the food is contaminated with bacteria containing decarboxylase enzymes, these free amino acids undergo decarboxylation to produce biogenic amines. For example, histidine is decarboxylated to produce histamine, lysine is decarboxylated to produce cadaverine and putrescine can be produced from three free amino acids, glutamine, arginine and agmatine (Halasz et al. 1994).

The amount of biogenic amines formed is influenced by factors such as microbial growth, availability of free amino acids, the presence of decarboxylase enzymes and elevated temperature conditions (Halasz et al. 1994). The enzyme involved in the production of histamine, histidine decarboxylase, requires temperatures greater than 15°C with an optimum temperature of 30°C for production of histamine. In tropical areas of the world, fish are often caught in temperatures exceeding 20°C. If these fish are not refrigerated immediately, conditions are favourable for biogenic amine production providing bacteria containing decarboxylase enzymes are present. Bacterial growth will cease once the temperature conditions are 0-5°C, however enzymic activity will still continue resulting in further amine production (Ahmed, 1991). Many biogenic amines have been studied in scientific literature, however histamine, putrescine and cadaverine are often documented in clinical studies with histamine being linked to food poisoning and putrescine and cadaverine potentiating the toxicity of histamine (Eitenmiller et al. 1980).

Histamine has an important role in human metabolism, such as the release of stomach acid. In small doses it has little effect, but in larger doses it has toxic effects (Taylor, 1986).

The intestinal tract of humans contain the enzymes diamine oxidase (DAO) and histamine-N-methyl transferase (HMT) which convert histamine to harmless degradation products. Putrescine and cadaverine can inhibit these enzymic reactions and are therefore potentiators of histamine toxicity. The presence of low levels of histamine in the diet normally has no toxic effect as humans do not absorb histamine efficiently from the gastrointestinal tract. If a high level of histamine is present in the diet, then the capacity of DAO and HMT to detoxify histamine will be limited and histamine will enter into the bloodstream resulting in histamine poisoning (Taylor, 1986).

Histamine acts by dilating blood cells and can result in hypotension. The incubation period of histamine poisoning is short. Following ingestion of a meal containing high levels of histamine, poisoning effects can occur within several minutes to a few hours (Taylor, 1986). The duration of illness is usually short and, in most cases, symptoms such as flushing, oral burning or a blistering sensation and perspiration pass within a few hours. Less frequent symptoms include vomiting, diarrhoea, stomach pain, headaches, swelling of the tongue, facial swelling and dizziness (Taylor and Bush, 1988).

Because of the toxicity effects of histamine, the National Food Authority (NFA) has recently produced a standard in the Australian Food Standards Code (1995) for histamine levels in fish and fish products.

The standard states that "the level of histamine in a composite sample of fish or fish products, other than crustaceans or molluscs, when examined according to the method in Section 977.13 of A.O.A.C, 15th Edition (1990), must not exceed 100mg/kg. Levels above 100mg/kg indicate that fish have been mishandled during storage or processing.

Reviews in scientific literature have indicated that scombroid (fish from the mackerel family) fish species such as mackerel and tuna have contained high levels of histamine within their flesh (Taylor and Bush, 1988). Scombroid fish have frequently been involved in histamine poisoning (Taylor, 1986).

The Melbourne Diagnostic Unit have received several fish samples suspected of causing histamine poisoning. However, the presence of high levels of histamine in these samples was not confirmed by chemical analysis as no laboratory had the necessary expertise for the determination of biogenic amines.

The objectives of this project were:

a: to develop a method for the analysis of biogenic amines in scombroid fish.

b: to undertake an investigation of the levels of histamine, putrescine and cadaverine in canned fish and fish products from supermarket outlets and Asian food stores.

EXPERIMENTAL

Samples Collected

Canned fish and fish products were purchased from shops located in the inner Melbourne metropolitan areas, including products from Asian countries (see Appendix 1).

Sampling and Sample presentation

Samples were minced and representative samples were taken for the analysis of the three biogenic amines, putrescine, cadaverine and histamine which were extracted according to the AOAC method (1990). The amines were derivatised with dansyl chloride and purified using a liquid - liquid extraction. Biogenic amines were determined in all samples by High Performance Liquid Chromatography (HPLC) using a C18 reversed phase column and a UV detector.

RESULTS AND DISCUSSION

The development of a method to determine biogenic amines was complicated because of their different chemical structure and solubility in various solvents. A large number of procedures using different extractants for a variety of matrices are described in scientific literature. Many analyses were undertaken to validate the method that was developed, to ensure accuracy and precision.

Precision studies were undertaken on a canned fish sample using 100% methanol as the extractant and also on a dried fish meal using 75% methanol. The reduction in methanol concentration used for extracting dried fish took into account the amount of water in canned fish tissue. Six replicates of each sample type were analysed for putrescine, cadaverine and histamine (Table 1). Co-efficients of variation for putrescine, cadaverine and histamine were less than 10% for both samples. Higher co-efficients of variation were evident for the sample of canned fish which contained lower levels of biogenic amines. Duplicate results of samples analysed for biogenic amines in some of the samples investigated are shown in Table 2. Variation of results were high in some cases, involving the samples with low levels of biogenic amines, but overall, duplicate results were satisfactory.

Recoveries of putrescine, cadaverine and histamine added to fish samples varied depending upon the sample. The recovery of histamine in all samples was satisfactory ranging from 75% to 100%, however, the recoveries of putrescine and cadaverine varied markedly from 30% to 100%. The recoveries of these amines in dried fish tissue was consistently close to 100%.

The variation in recoveries of cadaverine and putrescine in the "as received" fish tissue (wet tissue) indicate that methanol did not extract these amines fully. The spectrophotometric AOAC (1990) method which uses methanol as the extractant was initially developed to determine only histamine. Scientific literature indicated that extractants such as methanol, perchloric acid, trichloroacetic acid and hydrochloric acid have been commonly used to analyse samples of fish, meat and meat products, cheese and fermented products for biogenic amines. Low to high

METHODS

percentage recoveries of putrescine, cadaverine and histamine have been obtained depending upon the sample matrix and extractant (Gou Chin Yen and Chiu-Luan Hsien, 1991, Gill and Thompson, 1984, Hui and Taylor, 1983, Joosten and Olieman, 1986, Van Boekel and Arensten-Stasse, 1987).

Methanol was used for the extraction of all samples in the survey. However, a preliminary experiment was conducted to compare methanol and 0.1N HCL as extractants for a sample of Bismark Herring (69/95). The results obtained (Table 3) show that higher levels of putrescine and cadaverine were obtained after extracting with methanol but 0.1N HCL extracted higher levels of histamine than methanol in this sample. Further work is required to investigate various extractants in fish and fish products, particularly for putrescine and cadaverine.

The levels obtained showed that methanol was not the ideal extractant for putrescine and cadaverine in the fish matrices investigated. Therefore results for these biogenic amines are only semi quantitative. Histamine, however, was extracted well from most matrices using methanol. Methanol was the extractant used in this investigation because the NFA standards specifies this extractant (Australian Food Standards Code, 1995) and histamine is the only biogenic aminewhich has a maximun limit in fish products

The levels of putrescine, cadaverine and histamine in the fish and fish product samples are shown in Table 4. Histamine was not detected in 9% of the samples investigated (LOD 1mg/kg). Fifteen percent of samples (8 out of 55) including fish sauces and exotic species of fish contained greater amounts of histamine than the maximum permitted level of 100mg/kg for fish and fish products in the Australian Food Standards Code.

Results of twenty-three samples (1525-1543/94 and 2616-2620/94 except 1534/94) that were purchased from Bi-Lo supermarket in Balwyn East, Coles supermarket in Richmond and two Asian stores in Richmond had low levels of all three biogenic amines (Table 3). Mackerel fish have frequently been associated with scombroid poisoning (Taylor, 1986). The nine mackerel fillets analysed in this investigation all had low amounts of the three biogenic amines. These low results would indicate that when the fish were caught they were handled and processed in an appropriate manner.

One sample, Eskall Bismark Herrings (1534/94) had a high level ,of histamine (5OOmg/kg) and very low levels of putrescine and cadaverine (Table 4). This sample brand was purchased again in 1995 and re-analysed, (69/95). The levels of putrescine, cadaverine and histamine for this sample were found to be low.

Seven of the eight samples with levels of histamine above 100mg/kg were purchased from Asian retail outlets and included four pickled fish samples, a preserved salted fish, a crab sauce and a fish paste. According to the Australian Food Standards Code, these samples are unfit for human consumption and may have serious effects on health. Generally for high levels of histamine in samples, high levels of putrescine and cadaverine were also obtained (Table 4).

In Asia and in particular those areas with an extensive coastline and high ambient temperatures such as Thailand, Kampuchea, Malaysia, Philippines and Indonesia, the use of fermentation as a preservation method for fish has been practised from the

earliest of times (Beddows, 1985). When fish and dry salt are packed in layers and left for a long period (6-18 months), cellular liquid will be extracted as a pickle. If this is left in contact with fish and the proteolytic enzymes of the fish are active, then a fish sauce will develop (Beddows, 1985). The proteolytic enzymes break down the protein tissue of the fish to soluble peptides and free amino acids. If the liquid is drawn off at intervals or the period of contact is kept short, then it is possible to produce a fish paste (Beddows, 1985). If the period is much shorter and the amount of salt used is limited, then salted fish which have undergone some softening will result (Beddows, 1985).

Fish sauce is often used to give rice flavour and aroma and up to 5Oml may be consumed over two meals (Beddows, 1985). Fish pastes are widely used as a condiment (Beddows, 1985).

Fermentation of fish sauces may occur over 6-18 months (Beddows, 1985) and micro-organisms containing decarboxylating enzymes may be present (Blood, 1976). During fermentation, complex bacterial activity occurs and therefore it could be expected that high levels of biogenic amines would be found in these products.

We analysed fish sauce, fish paste, dried fish and canned fish imported from Asian countries and confirmed high levels of biogenic amines (Table 4). Wootten et al (1989) also found high levels of biogenic amines in salted, dried and canned seafood products from various Asian countries from retail outlets in Sydney. Dried fish products contained putrescine and cadaverine at levels up to approximately 2,200mg/kg and 3,300mg/kg respectively and in one instance 803mg/kg of histamine (Wootten et al. 1989).

The histamine levels in the samples 43/95, 51/95, 57/95 and 60/95 were below the maximum permitted level of 100mg/kg, however, high levels of putrescine and cadaverine were obtained (Table 4). As putrescine and cadaverine are potentiators of histamine activity, the high levels obtained for putrescine and cadaverine in these samples could result in toxic effects from low levels of histamine. There is evidence which lists putrescine and cadaverine as potentiators for histamine poisoning (Eitenmiller et al 1980) but no levels at which poisoning activity occurs.

Fifty percent of samples (17 out of 34) collected from Asian retail outlets contained high levels of biogenic amines (Table 4) although only 21 % were above the maximum permitted histamine level (100mg/kg). These results indicate that the quality of fish products available from Asian food stores may be a serious problem for public health. Further monitoring of biogenic amine levels in Asian food products together with discussion with importers to encourage higher quality products is warranted to safeguard the food supply.

Salt has been used for preservation in these products to prevent microbiological spoilage. In some marinated or pickle products, acetic acid has been used to lower the pH and encourage formation of lactic acid bacteria which are safe microbes. If lactic acid bacteria are in sufficient supply, they will overwhelm any undesirable microbes. Bacterial spoilage in these products depends upon pH, salt content and the temperature of storage. Further study is needed to identify the critical stages in handling and processing of Asian seafood products which lead to elevated levels of biogenic amines, to prevent biogenic amine poisoning and introduce improved practices (Wootton et al. 1989).

CONCLUSION

Fifty five canned fish and fish products were analysed for the three biogenic amines, putrescine, cadaverine and histamine. Analysis of the samples showed that 15% of canned fish and fish products, obtained from retail outlets in Melbourne, did not comply with the allowed maximum permitted level of 100mg/kg histamine as stated in the Australian Food Standards Code, (Standard D1). The majority of these samples were imported from Asian countries. The biogenic amine levels present a food poisoning hazard especially when coupled with additional risk factors such as ingestion of amine oxidase inhibiting drugs, alcohol, other food amines and gastrointestinal disease. Approximately 20% of the European population regularly take diamine oxidase inhibiting drugs and if similar levels of consumption occur in Australia, these people will have a high risk of developing histamine toxicity. (Maijala and Eerola, 1993).

Some samples did not have "use by" dates, however, those that did were analysed prior to that date. Samples without "use by" dates particularly those from Asian stores, were usually dusty and had faded labels, giving the appearance they had been sitting on the shelf for some time. Results from this study indicate that further monitoring of biogenic amines in fish products from Asian food outlets should be undertaken.

Results from this investigation showed that using methanol to extract putrescine, cadaverine and histamine gave reproducible results, however, complete extraction of putrescine and cadaverine in some samples was not achieved. These results indicate that different extraction solvents may be required to accurately measure cadaverine and putrescine content in fish. Further work is required to address the problem of incomplete extraction for these biogenic amines.

Although the presence of biogenic amines in meat and meat products, cheese and fermented foods have been widely documented, no limits have been set in the Australian Food Standards Code (1995). Further work is required to investigate levels contained in these products available in Victoria to determine safe limits.

Putrescine and cadaverine have been associated with potentiating the toxicity of histamine in humans. These compounds may also have independent toxicity effects on humans, although further research work is required in this area. Other biogenic amines tyramine and B-phenylethyl amine have been linked with food induced migraine headaches (Izquierdo-Pulido et al. 1994) and should also be included in the Food Standards Code. Since biogenic amines other than histamine have been shown to have toxic effects in poultry further research is required to set safe levels of all biogenic amines in food for human consumption.

Table 1

LEVELS OF BIOGENIC AMINES (mg/kg) IN CANNED FISH AND DRIED FISH MEAL

	Putrescine	Cadaverine	Histamine
Canned Fish [A]	7(9)[B]	6(6)	5(3)
Dried Fish meal [A]	546(4)	992(2)	273(4)

[A]= mean result of six determinations

[B]= percentage coefficient of variation

Table 2

DUPLICATE BIOGENIC AMINE LEVELS (mg/kg) OF SELECTED FISH PRODUCTS

Sample No.	Putrescine	Cadaverine	Histamine
1530/94	3,4	1,2	4,3
1540/94	9,3	9,3	4,4
39/95	131,109	215,171	12,17
45/95	22,20	45,42	7,10
52/95	68,67	29,19	1,3
67/95	2,7	2,3	1,2

Table 3

BIOGENIC AMINE LEVELS (mg/kg) OF SAMPLE 69/95 USING METHANOL AND 0.1N HCL EXTRACTANTS

Extractant	Putrescine	Cadaverine	Histamine
Methanol	14	29	13
0.1N in HCl	10	10	23

Table 4

BIOGEMC AMINE CONTENT OF FISH AND FISH PRODUCTS (mg/kg)

Sample No.	Putrescine	Cadaverine	Histamine
1525/94	6	7	6
1526/94	12	8	11
1527/94	6	3	6
1528/94	2	2	2
1529/94	3	2	3
1530/94	4	2	4
1531/94	4	ND	ND
1532/94	7	2	16
1533/94	7	ND	ND
1534/94	7	8	500
1535/94	9	14	4
1536/94	5	1	3
1537/94	8	ND	ND
1538/94*	4	1	5
1539/94*	5	3	3
1540/94*	7	6	4
1541/94*	6	2	15
1542/94*	1	1	8
1543/94	6	3	25
2616/94	15	18	8
2617/94	6	2	2
2618/94	7	8	7
2619/94	18	10	10
2620/94	4	5	ND
39/95*	120	190	17
40/95*	22	13	10
41/95*	2170	5000	273
42/95*	15	14	79
43/95*	550	890	18
44/95*	8	19	16
45/95 *	21	44	9
46/95*	44	30	1
47/95*	43	26	32
48/95 *	34	27	180
49/95 *	5	8	1
50/95*	24	65	35
51/95 *	540	540	30
52/95*	68	24	2
53/95*	35	24	5
54/95*	32	80	28
55/95*	11	18	3
56/95 *	160	420	220
57/95*	970	510	87
58/95*	150	250	260
59/95*	100	86	180
60/95 *	80	120	87
61/95 *	320	200	320
62/95*	58	96	190
63/9S*	1I	8	8
64/95	11	5	3
65/95	4	1	1
66/95	2	1	ND
67/95	5	2	2
69/95	14	20	13

ND = Not detected (<1mg/kg)

* = Samples collected from Asian retail outlets

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APPENDIX I

SAMPLE IDENTIFICATION AND LOCATION OF RETAIL OUTLETS

Sample Number	Description	Place of Purchase
1525/94:	John West smoked peppered Mackerel fillets in vegetable oil. Net 110g. Produced in Denmark.	Coles Supermarket, Richmond, Victoria.
1526/94:	Della Maris brand. Mackerel salad picnic Net 125g. Best before 1996. Produced by Delamaris, Izola, Slovenia.	Coles Supermarket, Richmond, Victoria.
1527/94:	Flokos fillets of mackerel, Net 170g	Coles supermarket. Richmond, Victoria.
1528/94:	Admiral mackerel fillets in oil. Net 125g.	Coles supermarket, Richmond, Victoria.
1529/94:	John West mackerel fillets in brine. Net 125g. Produced in Denmark.	Coles supermarket, Richmond, Victoria.
1530/94:	Weight Watchers tuna in springwater. Net 180g. Manufactured in Australia.	Coles supermarket, Richmond, Victoria.
1531/94:	Admiral seafood mix. Net 290g. Product of Thailand.	Coles supermarket, Richmond, Victoria.
1532/94:	Fried dace with salted black beans. Net 227g.	Coles supermarket, Richmond, Victoria.
1533/94:	Farmland chunk tuna in brine. Net 185g.	Coles supermarket, Richmond, Victoria.
1534/94:	Eskal Bismark Herrings. Product of Holland. Net 375g.	Coles supermarket, Richmond, Victoria.
1535/94:	John West scottish sardines in springwater. Net 110g. Product of Scotland.	Coles supermarket, Richmond, Victoria.
1536/94:	Admiral crab meat. Net 200g. Product of Thailand.	Coles supermarket, Richmond, Victoria.
1537/94:	Farmland smoke flavoured Red Salmon. Net 105g.	Coles supermarket, Richmond, Victoria.
1538/94:	Fried mackerells in chilli sauce. Net 155g. Product of Thailand	TAN-PHAT, Asian Grocery 272 Victoria St. Richmond

Sample Number	Description	Place of Purchase
1539/94:	Tour Eiffel brand. Net 142g. Sardines in tomato sauce.	TAN-PHAT, Asian Grocery 272 Victoria St, Richmond
1540/94:	Ligo brand sardines in tomato sauce, Net 155g.	TAN-PHAT, Asian Grocery 272 Victoria St, Richmond
1541/94:	Ocean brand salmon style mackerel in natural sauce. Product of Fiji	Tasting Food Stores 252 Victoria St. Richmond
1542/94:	Aroy-D Mackerel in natural oil, Net 425g. Product of Thailand	Tasting Food Stores 252 Victoria St, Richmond
1543/94:	Fried mackerels with salted beans. Product of Thailand	Tasting Food Stores 252 Victoria St, Richmond
2616/94:	Admiral mackerel fillets in brine. Net 125g. Batch No. PA 1902 920608	Bi-Lo Supermarket Balwyn East
2617/94:	Adria brand vegetable salad with mackerel for picnic. Net 125g. Batch No. 20194 Product of Croatia	Bi-Lo Supermarket Balwyn East
2618/94:	John West selected light smoked tuna slices in vegetable oil. Net 125g. Batch No. CTMAC J 30 HW	Bi-Lo Supermarket Balwyn East
2619/94:	John West pilchards in tomato sauce, Net 155g. Batch No. SAT 930618 KIC	Bi-Lo Supermarket Balwyn East
2620/94:	Brand name Columba, Fillets of anchovies in soya oil Net 80g. Product of Italy	Bi-Lo Supermarket Balwyn East
39/95:	Dried cuttle fish. Brand-Roller Use by 31st Dec 1995. 40g	Hiep Thanh. International Grocery. 136 Hopkins St, Footscray.
40/95:	Mackerel in natural oil, salt added Brand-555 Export quality. 425g Batch No: 5 C.C.C. 4210	Tap Hoa A Chau Phu Tan, Asian Grocery 29 Paisley St, Footscray.
41/95:	Crab sauce 114g Batch No: pg14 10 Product of Thailand	Tap Hoa A Chau Phu Tan, Asian Grocery 29 Paisley St, Footscray.

Sample Number	Description	Place of Purchase
42/95:	Fried fish paste 162g Batch No: ACCB. K.T.H 80.07.08	Tap Hoa A Chau Phu Tan, Asian Grocery 29 Paisley St, Footscray.
43/95:	Mergui salt fish 150g Product of Malaysia. Use by 3/96	Footscray Grocery Centre 42 Leeds St. Footscray
44/95:	Canton Fung Mei fish Batch No: DG23 940109 451	Footscray Grocery Centre 42 Leeds St, Footscray
45/95:	Sardines in tomato sauce 125g Sumaco brand. Batch No: 150894 Product of Thailand	Footscray Grocery Centre 42 Leeds St. Footscray
46/95:	Yeo's minced dried prawns with seasoning. 75g. Batch No:MOSA3503	Tatsing Food Store Footscray
47/95:	Braised eel in dressing sauce Batch No. 940402 (packed date) expiry period-3 years. 102g	Tatsing Food Store Footscray
48/95:	Fried fish paste. 162g Batch No: ACCB K.T.H. 81.10.05	Tatsing Food Store Footscray
49/95:	Cha Ca Vien. Fried fish ball Use by 20 Jan 95. 200g net	Tatsing Food Store Footscray
50/95:	Dried Mackerel, 175g Product of Philippines	Hopkins Asian Groceries 118A Hopkins St, Footscray
51/95:	Dried squid. net wt 200g Processed and packed in Hong Kong Brand: Crown	Hopkins Asian Groceries 118A Hopkins St, Footscray
52/95:	Dried shrimp, Imported by Lay Brothers Product of Thailand	Hopkins Asian Groceries 118A Hopkins St, Footscray
53/95:	Shrimp paste with soya bean oil 100g. Product of Thailand Batch No: B6 4 0	Tien Hung Asian Groceries 21 Paisley St, Footscray
54/95:	Silver Anchovy with pepper sauce Net wt: 227g. Batch No: 84<>12	Tien Hung Asian Groceries 21 Paisley St, Footscray
55/95:	Roasted eel. Batch No:TAES 01CV Brand: Bright Product of Thailand	Phuoc Thanh 144 Hopkins St, Footscray

Sample Number	Description	Place of Purchase
56/95:	Pickled gouramy fish Product of Thailand, Ner wt: 200ml Batch No: TG 71 20	Phuoc Thanh 144 Hopkins St, Footscray
57/95:	Lkk fine shrimp sauce Batch No: MG383 5, Net 200ml	Phuoc Thanh 144 Hopkins St, Footscray
58/95:	Pickled cat fish, Net 200ml Batch No: T671 10 Product of Thailand	Phuoc Thanh 144 Hopkins St, Footscray
59/95:	Pickled shoe snake fish Product of Vietnam	Phuoc Thanh 144 Hopkins St, Footscray
60/95:	Fish sauce Product of Cambodia Batch No: LABPLASREGDESIGN03	Phuoc Thanh 144 Hopkins St, Footscray
61/95:	Preserve salted Tench fish Brand: MAM SAC Product of Vietnam	Phuoc Thanh 144 Hopkins St, Footscray
62/95:	Pickle snack head fish Brand: Moon	Phuoc Thanh 144 Hopkins St, Footscray
63/95:	Chinese sausages, net 375g	Asian Groceries 181 Russel St, Melbourne
64/95:	CHATKA fancy pink salmon, 250g Batch No: P94, 1990, 06072	Asian Groceries 181 Russel St, Melbourne
65/95:	Whole boiled baby clams Brand: Tania, Net wt 290g Batch No: PSBC 0410	Asian Groceries 181 Russel St, Melbourne
66/95:	Crab meat 170g net Brand: AYAM Batch No: CMCP Indonesia 174T	Asian Groceries 181 Russel St, Melbourne
67/95:	Fried fish balls, 220g net Use by 12/4/95	Sun Moon Supermarket Heffernane Ln, Melbourne
68/95:	Chinese Pork sausage, 185g Use by 05/06/95	Sun Moon Supermarket Heffernane Ln, Melbourne
69/95:	Eskal Bismark Herring Batch No: L 385 01.02.95 25/10/94	Richmond Coles