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Studies into factors responsible for the acceptability of pork on the Singaporean market

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ABSTRACT

The thesis reports the results of a series of studies looking into the acceptability of pork on the Singapore market. Anecdotal comments have indicated that pork from some countries had a less acceptable flavour than that produced locally, so a survey was conducted to clarify the situation. This indicated that imported pork, including that from New Zealand, had an undesirable mutton-like flavour. Using pork from female pigs fed either a plant only diet (NZP) or one that included some animal products (NZA) it was shown that Singapore consumers favoured the former due to a lower mutton note. The use of garlic essential oil (GEO) to improve the acceptability of NZ pork either by adding it directly to pork or feeding it to pigs was demonstrated. With increasing GEO, garlic flavour strength increased and mutton flavour strength decreased even when diets of the pigs included animal products.

Concentrations of indolic compounds (indole and skatole) in backfat increased with increasing dietary garlic concentration ($P < 0.001$), and were higher in backfat from the NZA group ($P < 0.05$), but were unaffected by different dietary lipid sources (fish oil, tallow, and a mix of linseed oil and soya oil).

A highly acceptable low-fat ($< 10\%$) and low-salt (< 450 mg/100 g) pork ball with an n-6/n-3 ratio of < 4 was developed as a premium product, and effects on its acceptability were assessed using pork from pigs on different diets. A supplement containing selenium, vitamin E, vitamin C and CLA fed to pigs led to pork and pork balls with increased levels of these items. Inclusion of fish oil in the diet (4.4%) increased the levels of the long chain n-3 fatty acids (LCN3FA) in the pork and pork balls, but also increased measures of oxidation (TBARs), especially after a period of storage, and decreased the acceptability of the product due to increased off-flavours (rancid and aftertaste). This occurred when fish oil was removed from the diet either 28 days or 49 days (early and late feeding stage) before slaughter. Further research into ways of improving the flavour aspects of these products is required.

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TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	xii
LIST OF FIGURES	xxiv
LIST OF PUBLICATIONS AND CONFERENCE PRESENTATIONS	xxvii
CHAPTER 1	
Introduction	1
CHAPTER 2	
Literature review	5
2.1 Introduction	6
2.2 Chemistry of pork flavour	6
2.3 Factors affecting pork flavour	9
2.3.1 <i>Factors affecting pork flavour</i>	11
2.3.1.1 <i>Breeds</i>	11
2.3.1.2 <i>Individual gene effects</i>	12
2.3.2 Gender effects on pork flavour	13
2.3.3 Nutrition effects on pork flavour	18
2.3.3.1 <i>Direct transfer of diet components to meat and/or fat</i>	18
2.3.3.2 <i>Diet effects on pork flavour through effects on hind gut digestion</i>	40
2.3.3.3 <i>Diet effects on liver metabolism</i>	45

2.4	Conclusions	45
CHAPTER 3		46
A survey of the perception of pork by Singapore consumers		46
3.1	Introduction	47
3.2	Materials and methods	48
	3.2.1 <i>Survey</i>	48
3.3	Results	49
	3.3.1 <i>Description of the participants</i>	49
	3.3.2 <i>Purchasing and consuming pattern for pork</i>	49
	3.3.3 <i>Reasons for buying pork</i>	50
	3.3.4 <i>Undesirable aspects of pork</i>	52
3.4	Discussions	57
3.5	Conclusions	60
CHAPTER 4		
The effects of excluding animal products from the diet on sensory properties of pork from pigs grown in New Zealand as assessed by Singaporean panellists		61
4.1	Introduction	62
4.2	Materials and methods	63
	4.2.1 <i>Samples</i>	63
	4.2.2 <i>Sensory evaluation</i>	64
	4.2.3 <i>Statistical analysis</i>	67
4.3	Results	68

4.3.1	<i>Trained panel</i>	68
4.3.2	<i>Untrained panel</i>	72
4.4	Discussion	73
4.4.1	<i>Dietary effects on pork flavour</i>	73
4.4.2	<i>Effects of nutrient supplements on pork flavour</i>	74
4.4.3	<i>Comparison of New Zealand and Indonesian pork</i>	75
4.5	Conclusions	75

CHAPTER 5

A survey of the use of natural-flavouring plant materials by Singaporean consumers during cooking or consumption of pork

5.1	Introduction	77
5.2	Materials and methods	78
5.3	Results	78
5.4	Discussion	84
5.5	Conclusions	84

CHAPTER 6

The production of pork with garlic flavour notes using garlic essential oil (GEO)

6.1	Introduction	86
6.2	Materials and methods	87
6.2.1	<i>Materials for threshold tests</i>	87
6.2.2	<i>Animals</i>	87

6.2.3	<i>Sample preparation and sensory evaluation</i>	89
6.2.3.1	<i>Threshold test for GEO in rice bran oil</i>	89
6.2.3.2	<i>Threshold test for GEO in minced pork</i>	89
6.2.3.3	<i>Flavour of pork from pig fed GEO</i>	90
6.2.4	<i>Statistical analysis</i>	93
6.3	Results and discussion	94
6.3.1	<i>Aroma evaluation of garlic in cooking oil</i>	94
6.3.2	<i>Flavour evaluation of garlic-treated cooked pork mince</i>	97
6.3.3	<i>Evaluation of pork from pigs fed with GEO</i>	99
6.3.3.1	<i>Pig performance</i>	99
6.3.3.2	<i>Sensory evaluation of a consumer panel</i>	101
6.3.3.3	<i>Sensory evaluation of a trained panel</i>	104
6.3.4	<i>Relative costs of different forms of garlic</i>	107
6.3.5	<i>General discussion</i>	108
6.4	Conclusions	110

CHAPTER 7

	Effects of dietary components including garlic on concentrations of skatole and indole in subcutaneous fat of female pigs	111
7.1	Introduction	112
7.2	Materials and methods	113
7.2.1	<i>Threshold test for skatole and indole</i>	113
7.2.2	<i>Pig feeding experiments</i>	115
7.2.2.1	<i>Experimental designs for Experiment A</i>	115

7.2.2.2	<i>Experimental designs for Experiment B</i>	115
7.2.3	<i>Skatole and indole analysis in fat samples</i>	118
7.2.4	<i>Skatole and indole in commercial samples</i>	119
7.2.5	<i>Statistical analysis</i>	119
7.3	Results and Discussion	120
7.3.1	<i>Threshold levels of skatole and indole by a Singapore panel</i>	120
7.3.2	<i>Odour profiles of skatole and indole</i>	123
7.3.3	<i>Effects of dietary garlic on skatole and indole concentration in pork fat (Experiment A)</i>	125
7.3.4	<i>Effects of dietary tallow linseed and fish oil on skatole and indole in pork fat (Experiment B)</i>	127
7.4	Conclusions	131
CHAPTER 8		
The influence of diets supplemented with various fatty-acid sources, selenium, and vitamins E and C with and without animal protein on the quality of pork from female pigs		132
8.1	Introduction	133
8.2	Materials and methods	134
8.2.1	<i>Animals, experimental design, and sample collection.</i>	134
8.2.2	<i>Preparation of lean meat and subcutaneous backfat samples</i>	136
8.2.3	<i>Sensory Evaluation</i>	137
8.2.4	<i>Laboratory measurements</i>	140
8.2.5	<i>Statistical analysis</i>	143
8.3	Results and Discussions	144
8.3.1	<i>pH</i>	144

8.3.2	<i>Colour</i>	144
8.3.3	<i>TBARs analysis</i>	145
8.3.4	<i>Elements in pork</i>	153
8.3.5	<i>Fatty acids concentrations</i>	155
8.3.5.1	<i>Diet effects</i>	156
8.3.5.2	<i>Storage-time effects on fatty-acid concentrations</i>	168
8.3.5.3	<i>Principal component analysis</i>	168
8.3.5.4	<i>Adequate intake of EPA, DPA and DHA</i>	171
8.3.6	<i>Sensory evaluation</i>	175
8.3.6.1	<i>Diet effects</i>	175
8.4	Conclusions	189
CHAPTER 9		
	Development of a low-fat, low-salt, pork ball product for the Singapore market	190
9.1	Introduction	191
9.2	Materials and methods	193
9.2.1	<i>Experiment 1: Development of low-fat and low-salt pork balls (16 formulations)</i>	193
9.2.1.1	<i>Pork Used and Experimental Design</i>	193
9.2.1.2	<i>Processing of Pork Balls</i>	195
9.2.1.3	<i>Sensory Evaluation for Experiments 1 and 3</i>	198
9.2.1.4	<i>Physical measurements</i>	200
9.2.1.5	<i>Refining the process in pork ball making (Experiment 2)</i>	202
9.2.2	<i>Pig feeding experiment (Experiment 3)</i>	204

9.2.2.1	<i>Processing of pork balls using New Zealand pork in Experiment 3</i>	204
9.2.2.2	<i>Sensory evaluation for pork balls in Experiment 3</i>	205
9.2.3	<i>Statistical analysis</i>	205
9.2.3.1	<i>Experiments 1 and 2</i>	205
9.2.3.2	<i>Sensory evaluation of pork balls from pigs fed GEO (Experiment 3)</i>	207
9.3	Results and Discussion	208
9.3.1	<i>Pork ball formulation (Experiment 1)</i>	208
9.3.1.1	<i>Physical Characteristics for Experiment 1</i>	208
9.3.1.2	<i>Trained Sensory Panel Results for Experiment 1</i>	219
9.3.1.3	<i>Untrained Sensory Panel Results for Experiment 1</i>	220
9.3.2	<i>Experiment 2: Refining Pork Ball Processing</i>	221
9.3.3	<i>Experiment 3: Garlic pork ball evaluation</i>	225
9.3.3.1	<i>Physical characteristics of the pork balls in Experiment 3</i>	225
9.3.3.2	<i>Sensory attributes of pork balls in Experiment 3</i>	225
9.4.	Conclusions	230

CHAPTER 10

	Development of low-fat low-sodium pork balls using functional ingredients for the Singapore market	231
10.1	Introduction	232
10.2	Materials and methods	233
10.2.1	<i>Pork</i>	233
10.2.2	<i>Processing of pork balls</i>	233

10.2.3	<i>Sensory Evaluation</i>	235
10.2.4	<i>Chemical analysis</i>	236
10.2.5	<i>Microbiological Analysis</i>	236
10.2.6	<i>Statistical analysis</i>	236
10.3	Results and Discussions	239
10.3.1	<i>Microbiological analysis</i>	239
10.3.2	<i>pH</i>	241
10.3.3	<i>Colour</i>	241
10.3.4	<i>TBARs analysis</i>	242
10.3.5	<i>Fatty profile analysis</i>	245
10.3.5.1	<i>Diet effects</i>	245
10.3.6	<i>Element analysis</i>	258
10.3.7	<i>Sensory Evaluation</i>	259
10.4	Conclusions	269
CHAPTER 11		
	Summary and Conclusions	270
	Appendices	280
	Bibliography	311

LIST OF TABLES

Table		Page
2.1	Classification of volatile compounds found in uncured and cured pork (modified from Shahidi et al. 1986)	7
2.2	Examples of volatile lipid oxidation products identified in cooked pork (Ramarathnam , Rubin & Diosady, 1993; Chou & Wu, 1983; Mottram, 1985)	9
2.3	A summary of the results from the studies showing the effects of boar taint on chemical and sensory properties of fat, pork meat and pork products with emphasis on effects on flavour	16
2.4	A summary of the results from the studies that assessed the effects of including fishmeal or fish oil in the diet of pigs on the chemical and sensory characteristics of pork	20
2.5	A summary of the results of studies that have investigated the effects of dietary PUFA other than fish oil on the chemical and sensory characteristics of pork	28
2.6	A summary of the results of studies that have investigated the effects of dietary CLA on the chemical and sensory characteristics of pork and pork products	32
2.7	A summary of the results of studies that have investigated the effects of dietary CLA on the chemical and sensory characteristics of pork and pork products	37
2.8	A summary of the results of studies that have investigated the effects of dietary vitamin E for pigs on the oxidative stability of pork	42
3.1	Percentage of respondents who used different cooking methods for pork (Chinese population only)	50
3.2	Reasons for purchasing and consuming pork by Singapore consumers (Chinese population only)	50

Table	Page
3.3 The frequency (%) with which respondents agreed with various “reasons for purchasing and consuming pork”, when the pork was from China, New Zealand, Australia, Indonesia, Canada or others countries (Chinese population only).	52
3.4 Frequency scores for reasons on why Singapore consumers dislike pork from various countries of origin (Chinese population only).	54
3.5 Least squares means for degree of relevance of undesirable flavour terms associated with pork from different countries of origin (Chinese population only).	54
3.6 A comparison of results from the present study (SN – shown in bold in the first data column) against those for seven other countries ^{1, 2} from Ngapo et al. (2007)	59
4.1 Composition of NZA, NZP and NZP ⁺² diets for pigs raised in New Zealand	64
4.2 Definitions of the sensory attributes of cooked pork developed by the trained panellists during training, together with the anchor points at each end of the 150 mm scale	66
4.3 Least squares means showing the effects of treatments on sensory attributes of pork as determined by a trained sensory panel	69
4.4 The largest five coefficients for the first two discriminant functions from the discriminant analysis based on the 14 aroma and taste attributes (Table 4.2) assessed by the trained panel	71
4.5 Least squares means for treatment effects on acceptability and intensity scores as assessed by an untrained panel	72
5.1 Questions set out in the questionnaire together with a summary of the responses from the 112 respondents	79
5.2 The cooking methods and their usage frequency in cooking pork with herbs, spices and other natural-flavoured plant materials	81
5.3 The three most popular methods of cooking pork for 19 spices and their percentages of cooking event	82

Table	Page
5.4 The three most popular methods of cooking pork for 12 herbs and their percentages of cooking event	83
5.5 The three most popular methods for cooking pork with eight natural-flavoured plant materials and their percentages of cooking event	83
6.1 The eight groups of pigs showing the base diet and the level of GEO added to the diet, together with the mean total garlic intake for pigs in each group	88
6.2 Definitions of the sensory attributes of pork developed by the trained Singaporean panellists during training, together with the anchor points at the ends of each scale	92
6.3 Number of panellists detecting each garlic concentration as the threshold level, and least squares means of hedonic and intensity scores for garlic aroma for different concentrations	95
6.4 Effects of GEO concentration, country, and country x GEO concentration interaction (as a measure of differences in slope) on the sensory attributes in rice bran oil and in cooked pork mince when GEO concentration was included as a covariate in the regression model	96
6.5 Least squares means showing the effect of added GEO on sensory attributes and hedonic ratings of cooked pork mince using Singapore and New Zealand consumer panellists	98
6.6 Least squares means showing the effects of diets on growth performance and carcass characteristics of female Duroc-cross pigs. Diet group abbreviations are explained in Table 6.1	100
6.7 Least squares means showing the effects of diet (Animal-Plant vs. Plant only) and GEO concentration (Table 6.1) on the sensory profile attributes of pork evaluated by a trained Singaporean sensory panel. GEO at 4 levels from 0 to 4 where 0=zero, L=low, M=medium, H=high	105
6.8 Estimates of the relative costs of different forms of garlic including fresh garlic (FG), garlic powder (GP), garlic oleoresin (GO) and GEO based on differences in potency and costs	107

Table	Page
7.1 Ingredient composition of the diets on an as-fed basis for the grower and finisher periods for the five diets. No values are given for PFS during the finishing period because no fish oil was fed during that period	118
7.2 Detection thresholds for skatole and indole as assessed by 8 panellists over a series of 5 replicated experiments	121
7.3 Inter-replicate (Rep) correlations for skatole and indole thresholds across the eight panellists	122
7.4 Mean levels of difference detected for increasing concentrations of skatole and indole in rice bran oil, using a scale from 1 to 10 where 10 is the most different	123
7.5 Least squares means of odour profile scores for indole only, skatole only and mixture of indole and skatole based on a scoring system of intensity scores from 0 to 100 where 0 is not intense and 100 is extremely intense. Measures of the overall goodness-of-fit for the model include the coefficient of determination [$R^2(\%)$] and the residual standard deviation (RSD).	125
7.6 Means showing the effects of diet (Animal+Plant vs. Plant only) and GEO concentration (Table 7.1) on levels of GEO intake ¹ and the skatole and indole concentrations in back fat. For skatole and indole, untransformed means are given for the eight groups, but statistical analysis was carried out on natural logs so the RSD and slope values are in those units.	127
7.7 Least squares means showing the effects of diets containing animal and plant products with or without a dietary supplement (S), tallow (T) or fish oils (Fe & Fl) on skatole and indole concentrations (ng/g) in the backfat from pigs	129
7.8 Least squares means for skatole and indole concentrations (ng/g) in the subcutaneous fats in commercial pork products imported into Singapore from Australia, Brazil and Indonesia.	131
8.1 Abbreviations for the six treatment groups, together with a brief description of the diets involved. More details regarding the composition of the different grower/finisher diets is given in Appendix 8.1.	135

Table	Page	
8.2	Definitions of the sensory attributes of a mix of minced longissimus muscle and subcutaneous fat (9.1%) from the loin region developed by the trained panellists during training, together with the anchor points at each end of the scale	139
8.3	Least-squares means and the significance of 5 contrasts for pH and colour (L*, a* and b*) measurements for longissimus muscle in the loin region averaged across 3 storage periods (0, 3, and 6 months at -18°C). The pork was from pigs fed diets containing animal and plant products with or without a dietary supplement (S), tallow (T) or fish oils (Fe & Fl)). Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD. Means for the 3 storage times are given in Table 8.4	148
8.4	Least squares means and effects of treatment (Trt) group, frozen storage period (Time) and their interaction (Trt x Time) for pH and L*a*b* of longissimus muscle in the loin region made from pigs fed diets containing animal and plant products with or without a dietary supplement, tallow or fish oils. Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD. Means for treatment groups are given in Table 8.3.	149
8.5	Least squares means and the significance of 5 contrasts TBARs measurements for longissimus muscle (LM) and subcutaneous backfat (FT) in the loin region averaged across 3 storage periods (months 0, 3, and 6). The pork was from pigs fed diets containing animal and plant products with or without a dietary supplement (S), tallow (T) or fish oils (Fe & Fl)). Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD. Means for the 3 storage times are given in Table 8.6	150
8.6	Least squares means for TBARs measurement and effects of treatment (Trt) group, frozen storage period (Time) and their interaction (Trt x Time) of longissimus muscle (LM) and subcutaneous backfat (FT) made from pigs fed diets containing animal and plant products with or without a dietary supplement, tallow or fish oils. Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD. Means for treatment groups are given in Table 8.5	151

Table	Page	
8.7	Least squares means for concentrations of selected mineral elements ($\mu\text{g/g}$) in longissimus muscle in the loin region from pigs fed diets containing animal and plant products with or without a dietary supplement (S), tallow (T) or fish oils (Fe & Fl), as determined by inductively coupled plasma spectrometer. Element analysis was performed for month-0 samples only	154
8.8	Least squares means of the fatty acid profiles in longissimus muscle and subcutaneous backfat in the loin region averaged across the 3 storage times (0, 3, and 6 months at -18°C) Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD. Means for the 3 storage times are given in Table 8.9	166
8.9	Least squares means of fatty acids profiles and effects of trt, time and trt x time of 6 treatment (trt) groups (AT, PO, POS, PTS, PFSe and PFSI) at 3 storage times (0, 3, and 6 months at -18°C) of longissimus muscle and subcutaneous backfat in the loin region made from pigs fed diets containing animal and plant products with or without a dietary supplement, tallow or fish oils. Means for treatment groups are given in Table 8.8	167
8.10	Least squares means of intensity score rating of longissimus muscle in the loin region for the six treatment groups (AT, PO, POS, PTS, PFSe and PFSI) averaged across the three storage times (0, 3, & 6 months at -18°C), on a scale from 0 to 100 with higher values indicating a stronger note, as assessed by a Singapore trained panel. Means for the three storage times are given in Table 8.11	182
8.11	Least squares means of the intensity score rating and effects of treatment (trt) group, time and (trt x time) of longissimus muscle in the loin region; for the 3 storage times across the 6 treatment groups (AT, PO, POS, PTS, PFSe and PFSI) on a scale from 0 to 100 with higher values indicating a stronger note, as assessed by a Singapore trained panel. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD. Means for treatment group are given in Table 8.10	183

Table	Page
8.12 Least squares means of hedonic rating of longissimus muscle in the loin region from pigs on dietary treatment (trt) containing animal and plant products with or without a dietary supplement (S), tallow (T) or fish oils (Fe & Fl) assessed by a Singapore panel, on a scale from 1 to 9 with 1 being “Dislike Extremely” and 9 being “Like Extremely”. The six treatment groups were divided into groups of 4 (group A) and 3 (group B) for evaluation with samples of POS in each group. Means for the three storage times are given in Table 8.13,	184
8.13 Least squares means of the hedonic ratings and effects of treatment (trt) group, time and (trt x time) of a mix of longissimus muscle and subcutaneous fat in the loin region; for the 3 storage times across the 2 groups (A, B) where A consisted of 4 treatment groups (AT, PO, POS, PTS); and B consisted of 3 treatment groups (POS, PFSe and PFSI) on a scale from 1 to 9 with higher values indicating a stronger liking, as assessed by a Singapore consumer panel. Measures of the overall goodness-of-fit for the model include the coefficient of determination, R^2 (%) and the residual standard deviation, RSD. Means for treatment group are given in Table 8.12	185
8.14 Percentage detection of off-flavour attributes of a mix of longissimus muscle and subcutaneous fat in the loin region by the Singapore consumer panel following 0, 3 or 6 months of storage at -18°C	186
8.15 Least squares means of intensity scores of off-flavour attributes of a mix of longissimus muscle and subcutaneous fat in the loin region by the Singapore consumer panel based on a scale from 0 to 5 with 0, being not detected, 1 being low intensity and 5 being high intensity. Means for the 3 storage times are given in Table 8.16	187
8.16 Least squares means of the intensity score rating and effects of treatment (trt) group, time and (trt x time) on a mix of longissimus muscle and subcutaneous fat in the loin region; for the 3 storage times across the 2 groups (A, B) where A consisted of 4 treatment groups (AT, PO, POS, PTS); and B consisted of 3 treatment groups (POS, PFSe and PFSI) on a scale from 0 to 10 with higher values indicating a stronger liking, as assessed by a Singapore consumer panel. Measures of the overall goodness-of-fit for the model include the coefficient of determination, R^2 (%) and the residual standard deviation, RSD. Means for treatment group are given in Table 8.15	188

Table	Page
9.1 The experimental design showing the 16 formulations of pork balls used in Experiment 1	194
9.2 The composition of the 16 pork meatball formulations in Experiment 1 and their sodium content	197
9.3 Definitions of the sensory attributes of pork developed by the trained panellists in Experiment 1 during training, together with the anchor points at each end of the scale	199
9.4 The ingredient level and total sodium content of three pork ball formulations evaluated in Experiment 2	203
9.5 Effects of levels of fat, and sodium chloride and their interaction on physical characteristics of pork balls after the first cooking as determined by ANOVA based on a 2 x 2 factorial design. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	212
9.6 Effects of levels of carrageenan (0%, 1.0% and 1.5%) without KCl on physical characteristics of pork balls after the first cooking in Experiment 1 as determined from type I ANOVA. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	213
9.7 Effects of levels of carrageenan (carr.), potassium chloride (KCl) and their interactions on least squares means of physical characteristics of pork balls ¹ after the first cooking in Experiment 1 as determined from ANOVA based on a 2 x 6 factorial design. Linear and quadratic effects of KCl were determined by orthogonal contrast polynomial. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	214
9.8 Effects of levels of fat, sodium chloride (NaCl) and the fat x sodium chloride interaction on least squares means of sensory attributes of pork balls ¹ following the second cooking in Experiment 1 as determined by a trained panel using type I ANOVA based on a 2 x 2 factorial design. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	215

Table	Page
9.9 Effects of levels of carrageenan (carr. 0%, 1.0% and 1.5%) without KCl on sensory attributes of pork balls following the second cooking in Experiment 1 as determined by a trained panel using type I ANOVA. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	216
9.10 Effects of levels of carrageenan (carr.), potassium chloride (KCl) and their interaction on least squares means of sensory attributes of pork balls ¹ following the second cooking in Experiment 1 as determined by a trained panel using an ANOVA based on a 2 x 6 factorial design. Linear and quadratic effects of KCl were determined by orthogonal polynomial contrast. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD.	217
9.11 Rank sum of acceptability scores for sensory attributes of the 16 formulations of pork balls following the second cooking in Experiment 1 using an untrained panel	220
9.12 True mean retention of elements in cooked pork ball prepared using two mixing methods and cooked in boiling water directly in Experiment 2. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	222
9.13 Nutrient content of pork ball (based on the F2 formulation given in Table 9.4).	223
9.14 Effects of phosphate formulations (P) and cooking methods (C) and their interactions on least squares means of true mean retention of elements (%) and cooking yield for pork balls in Experiment 2 as determined from ANOVA based on a 2 x 2 factorial design. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	224
9.15 Least squares means showing the effects of diet (Animal-Plant vs. Plant only) and GEO concentration (zero, low, medium, or high) on the physical and chemical attributes of pork balls in Experiment 3. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	226

Table		Page
9.16	Least squares means showing the effects of diet (Animal-Plant (A) vs. Plant only (P)) and GEO concentration (0, L, M, or H) on the sensory profile attributes of pork balls following the second cooking evaluated by a trained Singaporean sensory panel in Experiment 3. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	227
10.1	Definitions of the sensory attributes of pork balls developed by the trained panellists during training, together with the anchor points at each end of the scale	238
10.2	The effect of 3 storage times (0, 3 and 6 weeks at 4°C) on the microbial load of vacuum-packed pork balls. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	240
10.3	Least squares means for pH, colour indices (L^* , a^* and b^*) and TBARs (mg MDA/kg) measurements averaged across storage periods (week 0, 3, 6 at 4°C) and their contrast statistics for pork balls from pigs fed diets containing animal and plant products with or without a dietary supplement (S), tallow (T) or fish oils (Fe & Fl)). Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD	243
10.4	Least squares means for pH, colour indices (L^* , a^* and b^*) and TBARs measurements (mg MDA/kg) for the 3 storage times (week 0, 3, and 6 at 4°C) average across the 6 treatment groups (AT, PO, POS, PTS, PFSe and PFSI);and effects of treatment (Trt) group, storage period (Time), and their interaction (Trt x Time) of pork balls made from pigs fed diets containing animal and plant products with or without a dietary supplement, tallow or fish oils. Measures of the overall goodness-of-fit for the model include the coefficient of determination [$R^2(\%)$] and the residual standard deviation, RSD	244
10.5	Least squares means for total fatty acids (total fatty acids as a % of fresh weight) and fatty acid contents (% of total fatty acids) in pork balls for the 6 treatment groups (AT, PO, POS, PTS, PFSe and PFSI) averaged across the 3 storage times (week 0, 3, 6 at 4°C). Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD. Means for the 3 storage times are given in Table 10.6	251

Table	Page
10.6 Least squares means for fatty-acids contents of pork balls for the 3 storage times (week 0, 3, 6 at 4°C) averaged across the 6 treatment groups(AT, PO, POS, PTS, PFSe and PFSI). Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD. Means for treatment groups are given in Table 10.5	252
10.7 Least squares means of fatty acid profiles in pork balls for the 6 treatment groups (AT, PO, POS, PTS, PFSe and PFSI) averaged across the 3 storage times (week 0, 3, 6 at 4°C). Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD. Means for the 3 storage times are given in Table 10.8	253
10.8 Least squares means of fatty acid profiles for the 3 storage times (week 0, 3, 6 at 4°C) averaged across 6 treatment (trt) groups (AT, PO, POS, PTS, PFSe and PFSI); and effects of trt, time and trt x time on fatty acid profile of pork balls made from pigs fed diets containing animal and plant products with or without a dietary supplement, tallow or fish oils. Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD. Means for treatment groups are given in Table 10.7	254
10.9 Least squares means of element concentrations (µg/g) in pork balls from pigs fed diets containing animal and plant products with or without a dietary supplement (S), tallow (T) or fish oils (Fe & Fl), as determined by an inductively coupled plasma spectrometer. Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD	264
10.10 Least squares means showing intensity score ratings of pork balls for the 6 treatment groups (AT, PO, POS, PTS, PFSe and PFSI) averaged across the 3 storage times (week 0, 3, 6 at 4°C), on a scale from 0 to 100 with higher values indicating a stronger note, as assessed by a Singapore trained panel. Measures of the overall goodness-of-fit for the model include the coefficient of determination, R ² (%) and the residual standard deviation, RSD. Means for the three storage time are given in Table 10.11	265

Table	Page
10.11 Least squares means showing the effects of treatment (trt) group, time and (trt x time) on the intensity score rating of pork balls for the 3 storage times across the 6 treatment groups (AT, PO, POS, PTS, PFSe and PFSI) on a scale from 0 to 100 with higher values indicating a stronger note, as assessed by Singapore trained panel. Measures of the overall goodness-of-fit for the model include the coefficient of determination, $R^2(\%)$ and the residual standard deviation, RSD. Means for treatment group are given in Table 10.10	266
10.12 Least squares means of hedonic rating of pork balls for the 6 treatment groups (AT, PO, POS, PTS, PFSe and PFSI) averaged across the three storage times on a scale from 1 to 9, with 1 being “Dislike Extremely” and 9 being “Like Extremely”. Means for the three storage times are given in Table 10.13	267
10.13 Effects of treatment (trt) group, time and (trt x time) and least square means of consumer acceptability scores of pork balls made from pigs fed diet AO, PO, POS, PTS, PFSe and PFSI, with measures of the overall goodness-of-fit for the model including the coefficient of determination, $R^2(\%)$] and the residual standard deviation, RSD. Means for treatment groups are given in Table 10.12	268

LIST OF FIGURES

Figure		Page
3.1	A plot of seven countries relative to the first two discriminant functions made up of relevance scores for the seven undesirable flavour attributes (Table 3.5) as assessed by Singapore consumers. Based on Wilks' Lambda test, significance values of function 1 and function 2 were less than 0.001.	56
4.1	A plot of function 1 versus function 2 from the discriminant analysis based on the 14 aroma and flavour attributes evaluated by the trained panel (Table 4.2). Points are shown for the 23 individual pigs as well as the treatment group centroids.	70
5.1	The top 20 natural-flavoured plant materials and their average usage scores used in cooking pork in Singapore in terms of frequency of usage where 0 = "Not at all", and 4 = "Always".	80
6.1	The effects of the level of GEO in the diet (low, medium or high) of pigs on the ability of consumers in Singapore ^a and New Zealand ^b to detect differences between the pork from those pigs and that from pigs receiving no GEO using triangle tests (48 and 60 tests in Singapore and New Zealand, respectively). Significance of p values; *p< 0.05; ** p<0.01; ***p<0.001.	102
6.2	Mean (\pm SE) differences in scores for the acceptability of flavour of pork ¹ , as assessed by the Singapore consumer panel between groups receiving GEO in their diet and the appropriate controls (i.e. either AP ₀ or P ₀).	103

Figure		Page
6.3	Regression lines showing changes in the intensity of garlic aroma and flavour and mutton aroma and flavour in pork (y) with increasing amounts of GEO consumed by the pigs (x).	106
7.1	Odour profiles for skatole and indole using a scale of 0 to 100 where 0 is is not intense and 100 is extremely intense.	125
8.1	Interaction plots showing the effect of treatment group and frozen-storage period (0, 3 and 6 months at -18°C) on TBARs values for longissimus muscle in the loin region (vertical bars show the standard error).	152
8.2	PUFA metabolic pathways (Mayes, 1996).	163
8.3	Interaction plots showing the effect of treatment and frozen-storage period (0, 3 and 6 months) on fatty acids (%) in subcutaneous backfat (mean±SE).	164
8.4	Interaction plots showing the effect of treatment and frozen-storage period (0, 3 and 6 months) on fatty acids (%) in subcutaneous backfat (mean±SE).	165
8.5	Projection of fatty acid profiles of the 6 diet groups for subcutaneous backfat based on the least squares means of the items in Tables 8.8 averaged across the 3 storage periods (0, 3, & 6 months at -18°C) studied in the plane defined by two principal components.	169
8.6	The intake of a pork product (g/day; mean±SEM) required to achieve an intake of 160 mg of (EPA+DPA+DHA)/day as the percentage of backfat in that pork product increases from 15% to 50%, with the remainder of the product being lean meat.	173
8.7	Patterns of change in TBARs (in subcutaneous backfat) and rancid and meaty flavour scores for a mix of minced longissimus muscle (90.9%) and subcutaneous fat (9.1%) during frozen storage for 0, 3 or 6 months at -18°C. Meaty flavour was reduced by 9 and 17 % in months 3 and 6; whilst rancid flavour was increased by 20 and 60% relative to month 0. The meaty and rancid flavours were assessed by a Singapore trained panel. Common letters above the bars indicate non-significance ($p > 0.05$) in the scores amongst bars for the same characteristic.	178
9.1	A flowchart showing the steps followed for producing pork balls using Method A (Experiments 1 and 2) and Method B (Experiments 2 and 3).	196

Figure		Page
9.2	Least-squares means (\pm SE) for overall acceptability of pork balls following the second cooking as assessed by an untrained panel with SE bars from pigs fed with three levels of garlic relative to the appropriate controls within groups receiving either animal or plant diets in Experiment 3. A scale from 0 to 100 was used by the panel where anchor points at the ends of the scale were “Least acceptable = 0” and “Most acceptable” =100”. There were 4 animals per group except for AP _h where 3 animals were used. Each panellist evaluated one pork ball produced from pork and backfat from each pig. Bars with a common letter above them do not differ significantly ($P < 0.05$) as determined by Fisher’s least significance difference (LSD) mean separation test.	229
10.1	Animal involvement in pork ball processing.	234
10.2	Interaction plots showing the effect of treatment and storage period (0, 3 and 6 weeks at 4°C) on trans-11 vaccenic acid, γ -linolenic acid and cis-11, 14 eicosadienoic acid (%) in pork balls (mean \pm SE)	250
10.3	Projection of fatty acids of the 6 diet groups (based on the least squares means over the 3 storage periods of 0, 3, & 6 weeks at 4°C) studied in the plane defined by two principal components. Values are shown for individual animals (n = 4/treatment group) as well as the group centroids.	256
10.4	The intake of a pork balls (g/day) (mean \pm SEM) for 6 dietary treatment groups that was required to achieve an intake of 160 mg of (EPA+DPA+DHA)/day when percentage of back fat in the pork balls is 10%.	257
10.5	Interaction plots showing the effect of treatment and storage period (0, 3 and 6 weeks at 4°C) on consumer acceptability scores of pork balls (mean \pm SE) on a scale from 1 to 9 with 1 being “Dislike Extremely” and 9 being “Like Extremely”.	263

LIST OF PUBLICATIONS AND CONFERENCE PRESENTATIONS

Chapter 3

1. Leong, J., Purchas, R. W., Morel, P. C. H., & Wilkinson, B. H. P. (2008). A survey of the perception of pork by Singapore consumers. Poster presented at the NZIFST Annual Food Conference at Rotorua, New Zealand, June 2008.
2. Leong, J., Purchas, R. W., Morel, P. C. H., & Wilkinson, B. H. P. (2008). The survey of perception of pork by Singapore consumers. *Singapore Institute of Food Science and Technology Annual, 2008*, 53-56.
3. Leong, J. (2007). Factors affecting pork flavour. *Singapore Institute of Food Science and Technology Annual, 2007*, 27-32.

Chapter 4

1. Leong, J., Purchas, R. W., Morel, P. C. H., & Wilkinson, B. H. P. (2010). The effects of excluding animal products from the diet on sensory properties of pork from pigs grown in New Zealand as assessed by Singaporean panellists. *Asian - Australasian Journal of Animal Sciences*, 23(1), 122-130.
2. Leong, J., Purchas, R. W., Morel, P. C. H., & Wilkinson, B. H. P. (2009). A comparison of sensory properties of pork from New Zealand and Indonesia using Singaporean panellists. Paper presented at the NZIFST Annual Food Conference at Christchurch, New Zealand, June 2009.
3. Purchas, R. W., Leong, J., Morel, P. C. H., & Wilkinson, B. H. P. (2009). Pork flavour and composition. Paper presented at Advancing Pork Production seminar, Palmerston North, New Zealand, June 2009.

Chapter 5

1. Leong, J., Purchas, R. W., Morel, P. C. H., & Wilkinson, B. H. P. (2008). Attitudes and behaviour of Singapore consumers regarding the use of natural-flavoured plant materials during cooking or consumption of pork: Empirical evidence based on a consumer survey. Poster presented at the World Food Congress in Shanghai, October 2008.

Chapter 6

1. Leong, J., Morel, P.C. H., Purchas, R. W., & Wilkinson, B. H. P. (2010). The production of pork with garlic flavour notes using garlic essential oil. *Meat Science*, 84, 699–705.

2. Leong, J., Purchas, R. W., Morel, P. C. H., & Wilkinson, B. H. P. (2009). Using garlic oleoresin to modify the flavour of pork - from the perspective of Singapore and New Zealand consumers. Poster presented at the World Congress on Fats and Oils at Sydney, Australia, September 2009.

Chapter 7

1. Leong, J., Morel, P. C. H., Purchas, R. W., & Wilkinson, B. H. P. (2010). Effects of dietary components including garlic on concentrations of skatole and indole in subcutaneous fat of female pigs. *Meat Science*, 88, 45–50.
2. Leong, J., Morel, P. C. H., Purchas, R. W., & Wilkinson, B. H. P. (2009). Detection thresholds and odour profiles of skatole and indole in a model system using a Singapore panel. Poster presented at the NZIFST Annual Food Conference at Christchurch, New Zealand, June 2009.
3. Leong, J., Morel, P. C. H., Purchas, R. W., & Wilkinson, B. H. P. (2010). Effects of dietary garlic essential oil on indole and skatole concentration in New Zealand pork. Poster presented at the NZIFST Annual Food Conference at Auckland, New Zealand, June 2010.