قسم : الصحة ومراقبة الأغذية ـ كلية الطب البيطرى ـ جامعة القاهرة.
رئيس القسم : أ. د. / محمد عبد الرحمن عشوب.

أثر التبريد فى حفظ اللحم

سوسن رشدى ، فؤاد صديق ، محمود زيدان* .

تناول البحث حفظ عينات من اللحم الحمراء من ذبائح الجاموس ـ البقر ـ الاغنام والجمل على درجة حراره صفر مئوى ونسبة رطوبة ٨٨ ـ ٩٠٪ وفحصت ظاهريا وكيميائيا وبكتريولوجيا على فترات حتى ابتداء فسادها وعدم صلاحيتها للاستهلاك.

ودلت النتائج على أن لحوم الجمال أقلها احتمالا للتخزين بالتبريد اذا احتفظت صلاحيتها لمدة (١٧ يوما) تليها لحوم البقر (٢٨ يوما) ثم الجاموس والاغنام (٣٤ يوما).

واتضح كذلك أن اللحوم التى بدأت فى الفساد تراوحت نسبة أيون الايدروجين فيها بين ٦ر٤ ـ ٦ر٦.

كما تراوح النتروجين المتطاير بين ١٦ر٦ ـ ١٦ر٨ / ١٠٠ جم لحم وكان العدد الكلى للميكروبات عند فساد اللحوم ١ر٩١ × ١٠^{٦} ـ ١ر٩٨ × ١٠^{٧} وقد تبين أن تقدير العدد الكلى للميكروبات يزيد على درجة ٢٥°م عنها فى درجتى ٥ر٣٥°م كما تبين أن تقدير النيتروجين المتطاير الكلى يمكن الاعتماد عليه فى الكشف عن هذه اللحوم.

وناقش الباحثون أهمية حفظ اللحوم بالتبريد.

* : قسم الصحة ومراقبة الأغذية ـ كلية الطب البيطرى ـ جامعة الزقازيق.
رئيس القسم : أ. د. / عادل نصر.

Dept. of Food Control & Animal Hygeine,
Faculty of Vet. Med., Cairo University,
Head of Dept. Prof. Dr. M.A. Ashoub.

EFFECT OF CHILLING ON THE STORAG LIFE OF MEAT
(WITH ONE TABLE)

BY
S.A. ROUSHDY, M.F. SEDIK and M. ZEIDAN*
(Received at 27/5/1982)

SUMMARY

Samples of edible lean meat (semi membraneous muscles) of adult buffaloe,cattle,sheep and camel carcasses, were held in chilling chamber adjusted at 0°C and at a R.H. 88-90%.

Storage-life of chilled meat was determined through application of organoleptic, chemical and bacteriological examination.

Chilled meat retained its freshness for a relatively long duration. Camel meat showed the shortest duration (17 days), those of buffaloes and sheep for longest period (34 days), while that of cattle for 28 days.

Meat showing incipient decomposition had a pH value 6.4-6.6, a total volatile nitrogen 16.6-16.8 mg/100 gm meat and a total viable count of $91x10^6$ - $98x10^7$ / gm meat.

Higher T.V.C. could be obtained at 25°C than at 5°C or 35°C incubating temerature.

Determination of T.V.N. as well as T.V.C. at 25°C proved efficiency in detecting incipient decomposition of meat.

INTRODUCTION

The importance of meat in human nutrition has been emphasized by different authors, and nearly always the diet constitutes partly meat or meat product.

Contamination of meat with spoilage microorganisms under prevailing conditions is almost unavoidable. Such meat, sooner or later, will get spoiled depending on animal species, rate of contamination, and environmental conditions.

To prolong the storage life of meat, chill storage, effectively slow down the enzymatic and microbial changes in the meat and thus it retains its freshness for a relatively longer period.

The storage life of chilled meat, of food animals commonly used in our conuntry, has not yet been tackled. Therefore, this work was planned to fulfill this gap, and to evaluate the different methods used for detection of incipient spoilage of chilled meat.

MATERIAL AND METHOD

Sampling, and Treatment of Meat Samples:

On arrival of carcases to butchers shops, about 2½ kg of lean meat (semimembraneous muscles) were bought from adult buffaloe, cattle,sheep and camel carcases and transferred to the laboratory with a minimum of delay. These meat samples were examined macroscopically before being held in a chilling chamber adjusted at 0°C at a R.H. 88 - 90%.

The storage life of chilled meat was dtermined through the application of the following tests at time 0 and at prescribed intervals up to the end point of keeping quality:-

I- Physical Examination:

It included detection of characteristic changes in colour, texture and odour (boiling test). The inside temperature of meat was also determined.

II- Chemical Examination:

a) The pH value was estimated using Beckman pH meter.

b) The total volatile nitrogen was determined using macrodistillation method (PEARSON, 1976).

* Faculty of Vet. Med. Zagazig Univ. A.R.E. Head, Prof. Dr. A. Nasr.

III- Bacteriological Examination:

Determination of total colony count (plate count).

The technique adopted is that recommended by Micro-organismss in food (1978). Inoculated plates were incubated at three different temperatures (25, 5 and 35°C).

RESULTS

Results obtained were recorded in the Table (1).

DISCUSSION

It is well known that meat of adult animals varies in its characteristic feature depending on animal species, breed, plane of nutrition and management, age and sex. Examination of collected meat samples showed the following characteristics: Buffaloe meat showed a red colour with slightly dark tinge. The surface appeared shiny while the transverse fibres were coarse and connected together with a loose connective tissue. The texture was fine and somewhat smooth. Some fat was present.

Sheep meat (mutton) showed a reddish colour with a loose binding qualities. The texture was slightly firm. Transverese fibres were fine and smooth. Much fat was present inbetween the muscles fibres.

Camel meat has a slightly dark red colour. The transverse fibres were finer while longitudenally covered with a coarse and firm yellowish-white layers.

The results of organoleptic examination reported herein, reveal that the colour of meat samples remained normal for 7 days chilling, after which it became distinctly darker in colour. The texture was comparatively firm. The odour smelled specific and acceptable in all samples unitl decomposition started, where a soft texture, sliminess and foetid odour could be detected (end point of keeping quality).

The storage life of chilled meat, under prevailing conditions, was variable. Camel meat showed the shortest storage period (17 days), while those of buffaloes and sheep (mutton) remained acceptable for the longest period (34 days). Chilling storage limit for beef was 28 days. The short storage life of camel's meat is expected as the connective tissue found favours the penetration and growth of existing microorganisms.

Nearly similar findings were reported by KAMEL and IBRAHIM (1967), WILLIAMS (1968), CIOBANU ET AL. (1976) and FRASIER (1978).

Results of Chemical Examination:

pH value:

The pH values in all samples of meat up to the six day storage remained nearly constant and ranged between 5.5 and 6.1, then slowly increased to reach pH 6.4 to 6.6 in meat showing incipient decomposition as judged by the organoleptic tests.

Total Volatile Nitrogen:- (T.V.N.)

The T.V.N. in examined samples varied from 7 to 11.2 mg/100 gm meat before chilling. Then it gradually increased to reach 16.6 or 16.8 mg/100 gm. chilled meat at the end point of keeping quality.

This finding substantiates what has been reported by PEARSON (1976).

Results of Bacteriological Examination:

The total colony count at time 0 ranged between 25×10^3 and 37×10^4/gm meat. This count remained nearly constant up to the 7th days storage, after which the count gradually increased to reach 91×10^7 at 25°C incubating tmeperature in decomposed meat, judged by physical and chemical examinations. Higer counts could be obtained at 25°C then at 5°C or 35°C incubation. Therefore, it is preferable to incubated chilled meat on bacteriological examination at 25°C. Generally speaking bacteriological standards for raw foods after no essurance that such foods are safe for consumption. Yet the enumeration of microbial population indicates whether or not excessive bacterial growth has taken place in food as a result of contamination, improper storage, or both.

In conclusion, from the results obtained, one may safely conclude that chilled meat held in cold storage and at an appropriate humidity retains its freshness for a relatively long duration through hindering the rate of growth of deteriorating microorganisms (Psychrotrophic saprophytes).

Moreover, determination of total volatile nitrogen for detection of incipient decomposition of meat proved its efficiency. Presence of 16.6 mg/100 gm meat is indicative of starting decomposition.

REFERENCES

Ciobanu, A.; Laux, G.; Bercexu, V. and Niculescu, L. (1976): Cooling technology in the food inductry, Abacus House, Speldhwrst Road, Iunbridge wells, Kent, England.

El-Afifi, A. and El-Mossalami E. (1961): The hydrogen ion concentration of meat of various food animals. The Egypt. Vet. Med. J., Fac. Vet. Med., Cairo Univ., Vii, No. 7/8, 1961.

Frazier, W.C. Westthoff, O.C. (1978): Food microbiology, 3rd Ed. McGraw-Hill publishing company, Ltd.New Delhi.

Kamel, S.H. and Ibrahim, T.M. (1967): Notes on Forensic Medicine and Toxicology. Fac. Vet. Med., Cairo Univ.

Krieger, W.(1938): Zur Bewertung der Wesserstoffio-ne-konzentration fur dur die untersuchung des Rind fleischer auf Grund elektrometrischer messungen. Diss. Gieben 1937 Ref, Jber. Vet. Med. 63, 105.

Lenfeld, J. (1929): Zur charakteristik der postmortalen verand erungen des flexihes gesunder, kraner und verendeter Tiere. Ztscher. Inf. Krkhtn. Hausteire 36, 34.

Michalka, J. (1942): Beitrag zur biochemischen Fleischuntersuchung. Ztxh. Fleisch-milkhyg. 52, 145.

Microorganisms in foods, Vol. 1, 2nd edition (1978): A publication of the ICMSF. University of Toronto Press, Toronto, Buffaloe London.

Pearson, D. (1976): Chemical analysis of food, 7th Ed. (1976): Churchill Leungstone, Edinburgh London, and New York.

Thornton, H. and Gracey, I.F. (1974): Textbook of meat hygiene. 6th Ed. The England B. Society and Bailliere Tindall.

Thornoton, H. (1957): Textbook of meat inspection, Bailliere Tindall and Cox, London.

Williams (1968): Quality control in the food industry. Vol. 2 meat and Meat Products. Edited by S.M. Herschdoerfer. Academic Press, London and New York.

Table : Indicating the results concerning the storage life and laboratory tests

Kind of meat	Date	Temperature		Organoleptic examination			Chemical examination		Total colony count/g muscle		
		Chilling room	Inside of meat	Colour	Texture	Odour	pH	T.V.B.N./mg/ 100 gs	25°C	0-5°C	35°C
I	4/1	0°C	19	Bright	Firm	Specific	6.7	8.4	$39x10^3$	$34x10^3$	$4x10^3$
II				Red		odour	6.0	11.2	$25x10^3$	$11x10^3$	$17x10^3$
III							6.0	7.0	$37x10^4$	$67x10^3$	$27x10^4$
IV							6.1	7.0	$17x10^4$	$94x10^3$	$44x10^3$
I	6	0°C	2	Bright	Firm	Specific	5.5	11.2	$27x10^3$	$40x10^3$	$3x10^3$
II				red		odour	6.0	11.9	$19x10^3$	$9x10^3$	$9x10^3$
III							6.1	8.4	$200x10^3$	$83x10^3$	$106x10^3$
IV							6.0	8.4	$136x10^3$	$85x10^3$	$25x10^3$
I	9	0°C	0	Bright	Firm	Specific	5.6	12.6	$61x10^4$	$56x10^4$	$24x10^4$
II				red		odour	6.1	12.6	$3x10^4$	$10x10^3$	$9x10^3$
III							6.0	9.6	$134x10^4$	$59x10^3$	$95x10^3$
IV							6.0	8.4	$24x10^4$	$18x10^4$	$3x10^4$
I	11	0°C	0	Dark	Firm	Specific	8.8	9.6	$35x10^6$	$20x10^5$	$12x10^5$
II				red		odour	6.1	12.6	$17x10^5$	$10x10^5$	$6x10^5$
III							6.2	9.6	$11x10^5$	$6x10^5$	$4x10^5$
IV							6.0	12.6	$37x10^5$	$19x10^5$	$11x10^5$
I	14	0°C	0	Dark	Firm	Specific	5.8	12.6	$44x10^5$	$36x10^5$	$10x10^5$
II				red		odour	6.2	12.6	$32x10^5$	$20x10^5$	$14x10^5$
III							6.0	7.6	$15x10^5$	$11x10^5$	$6x10^5$
IV							6.0	8.4	$39x10^5$	$23x10^5$	$18x10^5$
I	17	0°C	0	Dark	Firm	Specific	6.0	11.2	$35x10^5$	$32x10^3$	$30x10^5$
II				red		odour	6.1	12.6	$10x10^4$	$4x10^3$	$70x10^3$
III							6.1	12.6	$44x10^4$	$22x10^4$	$153x10^3$
IV							6.1	11.2	$15x10^6$	$12x10^6$	$25x10^4$
IV	21	0°C	0	Dark red	Soft	Pasted odour (slimy)	6.5	16.6	$20x10^7$	$15x10^7$	$65x10^5$
I	25	0°C	0	Dark	Firm	Specific odour	5.9	11.2	$55x10^5$	$33x10^3$	$25x10^4$
II				red			6.3	12.6	$25x10^4$	$20x10^4$	$45x10^3$
III							6.1	12.6	$80x10^5$	$22x10^4$	$190x10^3$
I	28	0°C	0	Dark	Firm	Specific	5.9	11.2	$66x10^5$	$36x10^3$	$95x10^3$
II				red		odour	6.3	12.6	$80x10^4$	$32x10^5$	$43x10^3$
III							6.2	12.6	$66x10^6$	$17x10^5$	$11x10^4$
I	1/2	0°C	0	Dark	Firm	Specific	5.9	12.6	$78x10^5$	$41x10^4$	$55x10^3$
II				red	Soft	Pasted	6.4	16.8	$11x10^6$	$35x10^7$	$28x10^3$
III					Firm	Specific	6.3	12.6	$76x10^6$	$58x10^6$	$200x10^3$
I	4	0°C	0	Dark	Firm	Specific	6.2	12.6	$40x10^7$	$12x10^5$	$40x10^4$
III				red		odour	6.3	12.6	$16x10^7$	$92x10^6$	$45x10^5$
I	7	0°C	0	Dark	Soft	Pasted	6.5	16.8	$74x10^7$	$32x10^7$	$98x10^4$
III				red		odour	6.5	16.8	$98x10^7$	$49x10^7$	$72x10^5$

I : Buffalo II : Cattle III : Sheep IV : Camel