2nd Sci.Congr. of Egypt. Soc. Anim. Mang., 29-31 Oct.(2007):46-60

MICROBIOLOGICAL AND SENSORY QUALITY OF CHICKEN LIVER PATE

By

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SUMMARY

Twenty random samples of ready to eat chicken liver pate were collected from different markets in Cairo and Giza to be evaluate its sensory and microbiological quality parameters. The results showed that sensory traits were satisfactory and the mean aerobic, anaerobic, enterobacteriacea , psychrophilic, thermophilic aerobic spore formers, presumptive *Bacillus cereus* . *Staphylococcus aureus* and yeast and mold Count was:-$31x10^4$, $2x10^2$, $5x10^3$, $13x10^2$, $3x10^2$,0, 0, 0 and 1 cfu/g respectively. *S.typhimurium S.virginia* and mold were isolated with an incidence of 10%,while *B. cereus, Campylobacter spp. E.coli, Listeria monocytogene, S. aureus,* and Yeast could not be isolated from any of the examined samples. Aflatoxins (AFs) B1, B2 and Ochratoxin A(OA) could be detected in percentages of 40%, 10%, and 30% of all samples with mean values of 10.97, 1.00, and 1.04 ppb respectively. The significance of the results as well as the suggestive hygienic measure for processing , handling and storage of product were discussed.

INTRODUCTION

Chicken liver is one of food product of non negligible concern in the Egypt markets due to its nutritional contribution as source of high quality protein, energy, minerals and vitamins as well as its low price. Owing to the continuous consumers demand for poultry products, ready to eat chicken liver pate appears in Egyptian markets. Although processed meat products supply consumer with animal protein of high biological value yet it may at times constitute a public health hazard due to presence of spoilage micro organisms responsible for

objectionable changes or pathogens leading to infection and /or intoxication. **(Hanninn, 1980 and FAO/ WHO , 1983).**

In this respect poultry meat products play an important role because it harbor various food pathogens as Salmonella, Staphylococci **(Bryan, 1980, National Academy of Sciences 1985).**Also food additives such as spices play an important role as a source of food born pathogens and may at time harbor a high microbial loads and mycotoxins due to bad manipulation during harvesting and collection **(Little et al.,2003)** . It is necessary to produce food of animal origin using an extend quality definition, not only must product quality be considered, but also quality of production processes must be included, so that the consumer is reassured that health risks have been excluded and ethical environmental concerns have been met **(Branscheid, 1993 and Madden, 1994).** Therefore ,the present study was conducted to evaluate the quality of chicken liver pate sold in retail outlets.

MATERIALS AND METHODS

Sampling

Twenty samples of ready to eat chicken liver pate were collected randomly from different markets in Cairo and Giza.

I- Organoleptic and Sensory attributes

Color, flavor, texture, odor and overall acceptability of collected samples were examined according to **Anna (1998)** by using the 9- point hedonic scale

II- Bacteriological Examination.

Collected samples were prepared according to the technique recommended by **(ICMSF, 1978),** and investigated as follows:

II-1- Bacteriological counts

Determination of Aerobic Plate Count **(ICMSF, 1978).**

Determination Anaerobic Plate Count **(FAO,1992)**

Determination of Entero bacteriacsae Count **(ICMSF, 1978).**

Determination of psychrophilic Count According to **(ICMSF,1978** and **Banwart,1981).**

Determination of thermophilic aerobic spore formers Count **(APHA, 1985)**

Determination of presumptive *Bacillus cereus* Count **(Oxoid, 1990).**

Determination of presumptive *Staphylococcus aureus* count **(FAO, 1992).**

Determination of yeast and mold Count **(APHA, 1979).**

II-2- Isolation and Identification of some food borne pathogens:-

Isolation and Identification of *Bacillus cereus* **(Oxoid, 1990).**

Isolation and Identification of Campylobacters spp. **(APHA, 1992)**

Isolation and Identification of *Escherichia coli* **(Macfadin, 1980and FAO,1992).**

Isolation and Identification of *Listeria monocytogene* **FAO (1992).**

Isolation and Identification of yeast and mold Count **(APHA, 1979).**

Isolation and Identification of Salmonellae**(Iso,1981 and Fricker,1987).** Isolation and Identification of *Staphylococcus aureus* **(Seddik, 1982).**

III- Mycotoxins Analysis

Detection and Determination of AFs and OA residues were adopted by the technique described **Jonsyn et al., (1995)** and **Trucksess (2000).**

RESULTS

Table (1): Results of Sensory attributes of examined chicken liver pate (n=20)

Sensory attributes	Min	Max	Mean±SE
Color	6	9	7.3±0
Odor	6	9	7.2±0.31
Texture	7	9	7.8±0.23
Flavor	5	8	6.1±0.23
Over all acceptability	5	7	6.2±0.25

Table (2) : Results of Bacterial Counts. cfu/g of examined chicken liver pate (n=20)

Microbial Counts	+ samples		Min	Max	Mean±*SE
	No	%			
Aerobic Plate counts	20	100	$4x10^4$	$14x10^5$	$31x10^4 \pm 14x10^4$
Anaerobic count	10	50	$<10^2$	$8x10^2$	$2x10^2 \pm 9x10$
Enterobacteriacea count	20	100	10^3	$7x10^3$	$5x10^3 \pm 10^3$
psychrophilic count	10	100	$9x10^2$	$3x10^3$	$13x10^2 \pm 10^2$
Thermophilic count	12	60	$<10^2$	$7x10^2$	$3x10^2 \pm 10^2$
Bacillus cereus count	*ND	ND	$<10^2$	$<10^2$	$<10^2$
S. aureus count	ND	ND	$<10^2$	$<10^2$	$<10^2$
Mould count	2	10	<10	10	1±1
Yeast count	ND	ND	<10	<10	<10

SE: standard error for positive samples ND: not detected.

Table (3); Incidence of isolated pathogenic microorganisms from Examined chicken liver pate (n=20).

Isolated pathogenic		chicken liver pate		
		No. of samples	No	%
B.cereus		20	ND	ND
Campylobacters		20	ND	ND
E.coli		20	ND	ND
L .monocytogene		20	ND	ND
Mould		20	2	10
Salmonellae	*S.typhimurium*	20	1	5
	S.virginia	20	1	5
S. aureus		20	ND	ND
Yeast		20	ND	ND

Table (4): Incidence and concentrations of Aflatoxin (B1, B2) and Ochratoxin A (ppb*) in examined chicken liver pate.

Mycotoxin	Positive samples		min	max	Mean ±SE*
	No,	%			
Aflatoxin B1	8	40	0	20.00	10.97 ± 3.12
Aflatoxin B2	2	10	0	10.00	1± 1
Ochratoxin A	6	30	0	7.14	1.04± 0.71

ppb = parts per billion= µg / kg

DISCUSSION

Sensory analysis

Results achieved in Table (1) revealed that the mean sensory panel scores for color, odor, texture , flavor and the overall acceptability of examined chicken liver pate were: - 7.3, 7.2, 7.8 , 6.1 and 6.2 respectively. And these results were satisfactory as food Processors always want to take advantage of the consumer's demands to develop and expand products which meet the market need, and first of all sensory attributes (color, odor, texture, flavor and the overall acceptability)which are very important items for consumer to accept any new product and as a result food processors make high efforts to overcome any defects which may interfere with consumer acceptability of this product. But any new food product in the food market must not only be tasty but also of good nutritional value , and most importantly convenient **(Miller et al., 1980)**

Microbiological quality

From results achieved in Table (2) it's observed that the mean values of aerobic plate counts cfu/g was; $31x\ 10^4$. The result was lower than those obtained by **(Hala, 1996)** for either fresh liver ($1.5x10^8$) or in frozen liver samples($1.6x10^7$). Higher count of fresh and frozen liver samples may be due to cross contamination during washing and chilling of chicken giblet. Crops and gizzards in broiler carcasses are frequently damaged during processing and the ingest may contaminate the carcasses and organ. **(Smith D P and Berrang M E, 1997).** Aerobic plate counts monitoring give some indication about the conditions under which food is produced, e.g inadequate heat treatment, post processing contamination or keeping at temperature above those recommended

for storage and retail marketing which may cause spoilage of the product or food poisoning to the consumers . **(ICMSF, 1986).**

The mean values of Enterobacteriacae count of the liver pate samples was $5x10^3$ Table (2) .The result was lower than those obtained by **Samaha et al., (1993)** $3.6x10^4$, from fresh liver. Determination of Enterobacteriacae, count indicates the enteric contamination and declares the hygienic quality of the raw food **(Mercuri and Cox, 1979).**

Food of animal origin, particularly meat products, especially those prepared under bad hygienic condition has been implicated in human outbreaks. Mishandling, inadequate cooking, preparation and distribution of the meat products are probably the most common problem in many foods borne outbreaks, **(Ray. 1996 and Rahkia et al; 1998).**

The mean values of psychrophilic counts of examined samples were $5x10^2$ (Table 2) the presence of such organisms in liver pate samples indicate either inadequate heat treatment of the product or post manufacture contamination with subsequent growth and multiplication during storage . The mean values of thermophilic aerobic spore formers count was $5x10^2$.(Table 2). However, *B.cereus* could not be detected in any of examined liver pate samples. Aerobic spore formers are widely distributed in nature because of the resistance of their endo spores to various stresses and their long term survival under unfavorable condition,. Therefore, most aerobic spore formers can be isolated from a wide variety of sources including foods **(Claus and Berkeley, 1986).** *S. aureus* failed to be detected in any of examined liver pate samples the same result was obtained by **Hala 1996** in frozen liver .

Regarding the results recorded in table (2) The incidence of mold and yeast in tested liver pate samples were 10%and 0% respectively. Meat is subjected to contamination with several types of yeast and mold originating from outside the raw materials ,workers and equipment. Such contamination may render the product of inferior quality or even unfit for consumption; Thus, resulting in economic losses and constitute a public health hazard. So all preparation steps of meat from the time of slaughtering till it is ready to cook should be placed under ideal conditions of hygiene. **(Schmidt and Ben, 1978; Costa, 1979 and Stiles and Ng, 1981).**

It is evident from the results recorded in table(3) that *E.coli*, Campylobacters, and *Listeria monocytogen* could not be detected in any of the examined samples.This may be attributed to heat treatment of samples during processing ,these results were lower than those obtained by **Samaha et al., (1993) and Hala (1996) for E. coli and De Boer and Haline(1990), Khalafalla (1990), Laid et al., (1991), Hala (1996) and Bartkowiak -Higgo A J et al., (2005)** for Campylobacter spp.

Results in table (3) indicated that the incidence of *Salmonella typhmyrium* and *Salmonella virginia* were 5% for each ,these results nearly the same obtained by **Ibrahim et al., (1989) and Hala (1996)** and lower than those results obtained by **DeBoer &Haline (1990) and Tibaijuka B et al., 2004** and higher than those obtained by **Rodrigo S et al., (2002).** Salmonellae continue to be a major foodborne pathogens, and raw poultry is considered to be an important source of these bacteria. Crop contents are the source of salmonella contamination on processed carcasses although lees information is available on gizzard contents. **(Smith D P and Berrange M E (1997).**

Myctoxins Analysis

Data illustrated in table (4) revealed that the range and the mean ±SE of AFs, B1, B2 and OA in analyzed liver pate samples. The recorded results showed that the percentages of Aflatoxin B1and B2 were40% and10% respectively, and the mean values were 10.97 and 1.00 ppb respectively. As regard to comparing the recorded results to the permissible limits for AFs (B1, B2, G1, G2) (20ppb) established by the Food and Drug Administration **(FDA)** and the Center for Food Safety and Applied Nutrition**(CFSAN),Shanahan et al., (2004),** two samples contained AFsB1(20.00ppb) which more than **WHO** limit (15ppb); **Jelinek et al.,1989),** It was also clear that five samples contained AFs B1 residues more than the permissible limit (10ppb AFs B1+ B2+G1+ G2 for all food) of Italy, Greece, Peru South Africa, Spain, Trinidad and Tobago and Egypt **FAO(1997),** and six samples exceed the tolerance limit (5ppb) AFs (B1+B2+G1+G2) for all food set in Austria, Bulgarian Finland, New Zealand, Norway and Sweden**(FAO, 1997)** . Carcinogenic, mutagenic, and teratogenic effects of AFs have been reported for several animal species, and humans **(Sabbioni and Sepai, 1998).** From table (4) the recorded results show that 6/20 (30%)from examined samples were positive for Ochratoxin A ,and One sample (7.14ppb) exceed the maximum limit (3ppb)for OA in cereals established in EU **(Miraglia et al., 2002),**

It could be concluded that liver pate is considered as an excellent source of high quality protein which promote the growth and multiplication of various organisms including pathogens especially Enterobacteriacae bacteria, which may constitute health hazards to the consumers. The problem at the plant can therefore be inferred to be due to lapses in good sanitary practices ,inadequate heat treatment or presence of pathogen on different surfaces contaminating

finished product. So we suggested that improved sanitary practices and application of quality control programs during production of such products.

Since, this product is ready to eat; it is not further heated by the consumers. So, **HACCP** points system should be strictly practiced to improve its quality, as well as, other factors must be considered include:-

I- Factors during processing and manufacture:

A- Quality of used raw materials (raw meat, spices, seasoning, starch, salt ...etc).

B- Good manufacturing practice should be followed in order to assure safety and quality of the product.

C- Careful periodical microbial examination of production lines, conveyers, refrigerators, water supply and storing manufacturing tanks

D- Design of the production environment must be considered, such as, air condition, material flow, equipment, cleaning procedures and personal hygiene of food handles.

E- Positive pressure should be used in clean areas, controlling the air flow from unclean to clean areas.

F- Using updated machines and vacuum type chopper, and mixer.

G- Eradication of pests and from meat processing factories.

II- Factors during sale:

As cold storage area, slicing and packaging area are the most significant sites for microbial contamination, so:-

A- Product should be physically hand as little as possible to reduce the risk of contamination.

B- Refrigeration temperature must be periodically checked to assure typical and efficient refrigeration.

C- Personal hygiene should be strictly employed.

D- Education program must be imposed for food handlers.

E- Slicing machines and working areas must be kept cleaned and disinfected

REFERENCES

American Public Health Association (APHA) (1979): Compendium of methods for the microbiological examination of foods. Washington, D. C., USA.

American Public Health Association (APHA) (1985): Compendium of methods for the microbiological examination of foods. 2nd Ed. American Public Health Association. Washington, D. C., USA.

American Public Health Association (APHA) (1992): Slandered method for examination of dairy products, 13 rd .Ed, Husler, W.J.; Ed.Washington.

Anna, V.AResurreccion (1998): Consumer sensory testing for product development. A Chapman and Hall Food Science Book.

Banwart,J.G.(1981): Basic food microbiology.2nd Ed.,Avi Publishing Company, Inc.Westport,Connecticut.

Bartkowiak-Higgo AJ, VearyCM, VenterEH, Bosman AM (2005): A pilot study on post-evisceration contamination of broiler carcasses and ready-to-sell livers and intestines with C.jejuni and C.coli in high –throughput South African poultry abattoir Food Prot. Jul; 68(7):1340_5.

Braschcid, W. (1993): consumer expectation on the quality of food of animal origin.Kongress and Hambuge vortage zum. Generalthema d, VDL ES 105UFA.kongress von, 20-25.9.1993, 23

Bryan, F. L. (1980): Food-borne diseases in the United States associated with meat and poultry. J. Food Prot., 43: 149.

Claus, D. and Berkeley, R.C.W: (1986): Genus Bacillus. In Bergeys Manual of Systemic Bacteriology vol.2, pp1105. Baltimorm MD, Williams and Wilkinson.

Costa, F.M. (1979): Microbiology contamination in food processing plant. Preventive measures. Rivista Della Societa Italian Discienzadells Alimentazion, 8:258.

DeBoer, E, and Haline, M. :(1990): Cross-contamination with C. jejuni and Salmonella Spp. From raw chicken products during food preparation. Of food protection 53, 1067.

FAO/WHO (1983): WHO surveillance program for control of food borne infection and intoxication in Europe. Inst. Vet. Med; 2nd report, Berlin

FAO (1992): Meat and meat products in human nutrition in developed countries. Food and Agriculture Organization of the United Nations. Rome. Food and Nutrition paper, 53.

FAO (1997): Worldwide regulation for mycotoins1995.ACompendium 64:7-28.

Fricker, C. R. (1987): The isolation of Salmonella and Campylobacters. J. Appl. Bacteriol., 63: 99.

Hala F.M. Hassan (1996): Microbiologic Quality of Edible Offals of Poultry M.V.Sc. thesis faculty of Vet .Medicine, Cairo University

Hannine, M.L (1980): Ecolab, Y. enterocolitica and C.fetus spp.jejuni causing food born disease. Arevie soumen Elainla Akarileti, 86,175.

Ibrahim, A.; Yasin, N and El-Dali, E. (1989): Salmonella in chicken giblet Egyptian J.of applied Sci. 4: (3); 673.

ICMSF (1986): Microorganisms in foods. Sampling for microbiological analysis: principles and specific application... 2 Ed Blackwell Sci. publications.

ICMSF (International Commission on Microbiological Specifications for Foods) (1978): Microorganisms in foods; their significance and methods of enumeration. Vol., 1, 2nd Ed.; Univ. of Toronto Press. Toronto, Canada

ISO (1982): Microbiology - General guidance for the detection of Salmonella". International Organization for Standardization, 6579, Geneva, Switzerland.

Jelink, C.F., Pohland, A.E. and Wood, G.E.(1989): Worldwide occurrence of myctoxin in foods and feeds, an update. J.AOAC72:223-230.

Jonsyn F.E., Maxwell, S.M. and Hendrickse, R.G. (1995): Ochratoxin A and aflatoxins in breast milk samples from Sierrleone. Mycopathologia 131: 121.

Khalafalla, F. (1990): Campylobacter jujni in poultry giblets. J.VET.Med.B.37, 31-34.

Laid, B.; Serge, M. and Yves, R. (1991): Isolation of Campylobacter from liver of broiler chicken with and without of necrotic hepatitis lesion. Avian Diseases 35:714-717.

Little, C.L.; Omotoye, R. and Mitchell, R.T. (2003): The microbiological quality of ready to eat foods with adds spices.J Environ Health Res.13, (1):31.

Macfadin, J. (1980): Biochemical tests for identification of medical bacteria 2nd Ed. Williams and Wilkins Co. USA.

Madden, R.H. (1994): Microbial hazard in animal products proceeding of the nutrition society, 5:309.

Mercuri, A. J. and Cox, N. A. (1979): Coliforms and Enterobacteriaceae isolated from selected foods'. Food Prot., 42: 712.

Millar, M, F., Keeton.J.T. Cross, H.R., Leu, R., Gomez, F. and Wilson. J.J. (1980): Evaluation of the physical and sensory properties of jerky processed from beef heart and tongue.J.food Quality11, 63.

Miraglia ,M., Brera, C.,Pazzaglini, B and Grossi, S.(2002):assessment of dietary intake of Ochratoxin A by the population of EU Member States. Report of experts participating in task 3.2.7p.27.

National Academy of sciences (1985): An evaluation of the role of microbiological criteria for foods and food ingredients. National Academy press, Washington, D.C.

Oxoid manual (1990): Culture media, ingredients and other laboratory services. 6th Ed.Unipath limited, Wade Road

Rahkia, M., Niemi, V., and Pakkala, P. (1998): Food-born outbreaks in Finland in 1995 and 1996.4thWorld congress Food-borne infections and intoxications. 173, 7-12 Jun, Berlin.

Ray, B. (1996): fundamental Food Microbiology quantity of shwarma in Assiut. Assuit Vet. Med. J. - 24, (47), 153.

Rodrigo S, Adesiyun A, Asgarali Z, SwanstonW. (2002): Occurrence of selected food borne pathogens on poultry giblets from small retail processing operation in trindad. Int J food Microbial, Jun5; 76(1-2):151_64.\

Sabbioni, G. and Separi, O.(1998): Determination of human exposure to aflatoxins.183-226.In:Mycotoxins in Agriculture and Food safety.K.K sinhaand D.Bhatnagar(ed) Mercel Dekker Inc., New York.

Samaha, I.A.; Mousa, M.M.andElGohary, (1993): Occurrence and Public health importance of Enterobacteriaceae in giblets at consumer level.Alex.J.Vet.Sci.9, 4.79.

Schmidt, V.and Ben, Z (1978): How should meat products factory be cleaned and disinfected and how the effects of these processes should be controlled. Die fleischwirschaft. 91:1442.

Seddik, M. F. (1982): Incidence of enterotoxigenic Staphylococci in frozen meat and chicken products. J. Egypt. Vet. Med. Ass., 42: 31.

Shanahan, J.F., Brownor, W.M. and Blunt, T.O.(2004): Aflatoxins. http: www.ext.colostate. Edu/menufood.html.

Smith DP and BerrangME. (1997): Prevalence and numbers of bacteria in broiler crop and gizzard contents.Poult Sci.Jul:76(7):1037-41.

Stiles, M.E and NG, L.K. (1981): Enterobacteriacae associated with meats and meat handling, J. Appl. Environ. Microbiol., 41:867.

Tibaijuka B, MollaB, Hildebrandt G, Kleer EJ. (2004): Occurrence of Salmonella in retail raw chicken products in Ethiopia.JFoodProt. Sep: 67(9):1892-903.

Trucksess, M. W. (2000): Natural toxins. In official methods of analysis of AOAC international. Horwitz, W. (ed).17th ed. Chapter 49, p. 1-64, Gaithersburg, Maryland 20877-2417 USA.

الجوده الحسية و الميكروبيولوجية لباتية كبد الدجاج

سلوى رجب سليمان حجازي و غادة سعد الدين سالم والسيد صلاح السيد شبانة

قسم صحة الاغذية معهد بحوث صحة الحيوان الدقى

اجرى البحث على 20 عينة من باتية كبد الدجاج المعد للأكل ولقد جمعت هذة العينات من محلات مختلفة فى القاهرة والجيزة.لإجراء الفحص الحسي و الميكروبيولوجى .

و لقد كانت نتائج الفحص الحسى للعينات مرضية حيث حصل المنتج على 6.2 من 9 درجات . بينما أظهرت نتائج الفحص البكتيري أن متوسط العد البكتيري الكلى للميكروبات الهوائية و اللاهوائية و الميكروبات المعوية و الميكروبات المحبة للبرودة و المقاومة لدرجات الحرارة العالية و الباسيلس سيرس والميكروب المكور العنقودى الدهبى و الفطريات والخمائر كالاتى:31 $\times 10^4$، 8$\times 10^2$، 5$\times 10^3$، 13$\times 10^2$، 3$\times 10^2$، 0، 0,0، 1 على التوالى.

وتم عزل ميكروب السالمونيلا تيفميوريم والسالمونيلا فرجينيا والفطريات بنسبة 10 ٪ وكانت العينات خالية من ميكروبات الباسيلس سيرس الكامبيلوبكتر والميكروب القولونى وميكروبات الليستريا والميكروب المكور العنقودى الدهبى و الخمائر. بينما تم عزل السموم الفطرية من العينات بتركيزات مختلفة حيث كانت نسبة الافلاتوكسين ب1و ب2 والأوكراتوكسين أ: 40٪، 10 ٪،30 ٪ على التوالى.وكان متوسط تركيز السموم كالاتى17.97 ،1.00 ،1.04، جزء فى البليون. ولقد تم مناقشة النتائج والأهمية الصحية للميكروبات ووضع التوصيات للحد من تلوث المنتج ورفع جودة المنتج.