WEEKLY EPIDEMIOLOGICAL REPORT

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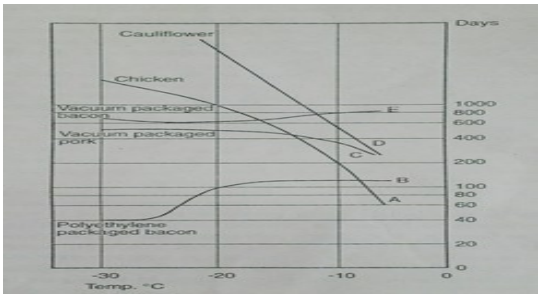
Shelf-life

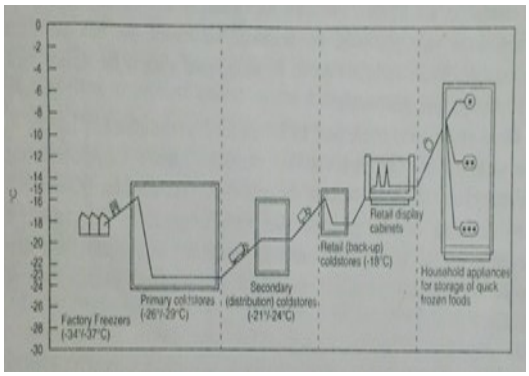
Shelf-life is considered as "the period within which food is safe to consume and/or has an acceptable quality to consumers"(Labuza et al, 1984). Upon storage and distribution for a certain period, foods are exposed to a wide range of environmental conditions such as temperature, humidity, oxygen and light (Singhe R P et al, 2000). Storage temperature plays a major role in causing changes in the quality and safety of chicken during storage. Since most degradation reactions are "Arrhenius" type reactions, higher temperatures are known to speed the rate of degradation.
A typical frozen product will spend part of its shelf life in a bulk cold store, a refrigerated vehicle or container, a distribution store, a retail display cabinet or institutional frozen food storage cabinet, a period out of refrigeration during the journey from the retail outlet to home and time in a home freezer (Symons H, 2000). Due to these fluctuations in temperature, the food product may become microbiologically unsafe before or very close to the end of their sensory quality shelf life if temperature-abused (Shimoni, 2000).
During shelf life, the product should retain its desired sensory, chemical, physical, functional and microbiological characteristics, as well as accurately comply with any nutritional information printed on the label. Periodic determination of shelf life helps to assure that the product remains consistent over time concerning quality. Many frozen meat products probably have a shelf life of over two years if product quality, processing and packaging (PPP) factors are well managed. P. Zeuthen, et al., demonstrated the estimated shelf life by different temperatures for various frozen foods. At 20 centigrade, chicken can be consumed after 1000 days, but if it was at 10 centigrade, it needed to be consumed before 200 days. So, with declining of stored temperature maximum shelf life varies inverse proportionately.

Figure 1. Estimated shelf life by different temperatures for various frozen foods. (Source: Zeuthenet al, 1984).



1.1 Importance of maintenance of standard temperature

Environmental factors such as temperature, humidity and light can trigger several reaction mechanisms that may lead to food degradation. There is considerable evidence in the literature that temperature plays a major role in causing changes in food quality during storage. Higher storage temperatures generally lead to increased quality deterioration.
Fluctuating temperatures cause a more detrimental change in frozen foods than storage at a constant temperature. Food products may become microbiologically unsafe before or very close to the end of their sensory quality shelf life if the temperature fluctuates. But it is not practicable to store frozen foods at a steady temperature of -18 ◦C.
Figure 2 Temperature profile of a typical cold chain in Europe. (Source: Zeuthenet al, 1984)



1.2 Microbial growth in frozen meat products

Minus 34◦C is the lowest temperature at which a microorganism has been reported to grow Kokeala, 1995). Lactobacillus sake and Lactobacillus curvatus have been shown to be common species in frozen meat products. L. sake seems to form the predominant part of the spoilage population.
Spoilage lactic acid bacteria produce mostly lactic and acetic acids during logarithmic growth. Spoilage of vacuum-packed meat is characterized by the development of sour acid odours and taste. Methane, ethiol and dimethyl sulfide may contribute to the sour acid odour.

1.3 Pathogenic microbes with significant public health impact in frozen meat products

The pathogenicity of certain microorganisms is a major safety concern in the processing, handling, and stor-

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age of foods. Upon ingestion of small quantities, microorganisms such as Salmonella species and Escherichia coli strains cause infection. Others such as Aspergillus flavus, Clostridium botulinum and Staphylococcus aureus produce chemicals in foods that are toxic to humans (Mann, 1994). The more common foodborne pathogens such as Salmonella, Staphylococcus aureus and Clostridium perfringens belong to the group of "mesophiles". Table 1 shows some reported minimum pH values for the growth of some/certain food-borne organisms. Sri Lankan standards for microbiological specifications of comminuted meat products are shown in table 2. The emergence of low infectious dose pathogens presents a significant challenge to predictive microbiology.

Table 2.1. Reported minimum pH values for the growth of some food-borne organisms (Source: Jay et al., 2005)

Foodborne organism	Minimum pH for growth
Clostridium botulinum, Group 1	4.6
Escherichia coli	4.5
Lactobacillus brevis	3.16
Salmonella spp.	4.05
Staphylococcus aureus	4.0

3. Discussion

Microorganism	Limit
Staphylococcus aureus	Not more than 100 per gram
Escherichia coli (indicator)	Absent in 1 g
Escherichia coli O157 : H7	Absent in 1 g
Salmonella spp.	Absent in 25 g

Table 2.2. Microbiological specifications of comminuted meat products (Source: SLS 1218, 2001).

Chemical, physical and microbiological changes are the leading reaction mechanism of food deterioration (Singh, 1994). But lipid oxidation and microbial growth are major causes of deterioration and reduced shelf life in minced meat products (Jayawardana et al., 1994). Lipid oxidation may produce changes in meat quality parameters such as colour, flavour, odour, texture and even nutritional value (Aguirrezábal et al., 2000). Microbial contamination can cause public health hazards and economic loss in terms of food poisoning and meat spoilage. Lack of proper temperature maintenance at any stage leads to the growth of microbes and lipid oxidation of chicken. But the discussion with an approved additional government analyst of Sri Lanka revealed that it had never been done any chemical analysis for chicken, and if done any microbial analysis sometimes would give "no growth report" in a similar type of situations mentioned above.

Regulatory provisions related to above mentioned food safety violations are defined under the Gazette Notification No 1724/26 dated 26.01.12 titled Food (Hygiene) Regulations – 2011 published under the Food Act No 26 of 1980.

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Table 1: Selected notifiable diseases reported by Medical Officers of Health 15th – 21st May 2021 (21st Week)

RDHS	Dengue Fever		Dysentery		Encephaliti		Enteric Fever		Food Poi-		Leptospirosis		Typhus Fe-		Viral Hep-		Human		Chickenpox		Meningitis		Leishmania-		WRCD	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	T*	C**
Colombo	34	1288	0	8	0	0	0	3	0	3	2	98	0	1	0	2	0	2	0	20	0	6	0	1	**56**	**87**
Gampaha	15	640	0	1	0	1	0	1	0	0	0	121	0	2	0	3	0	2	0	13	0	5	0	3	**35**	**69**
Kalutara	20	468	0	11	0	2	0	0	0	0	8	285	0	3	0	1	0	1	1	55	0	9	0	0	**41**	**100**
Kandy	5	285	0	15	0	1	0	1	0	2	1	75	1	24	0	1	0	0	2	27	0	9	0	16	**59**	**100**
Matale	0	43	1	4	0	4	0	0	0	0	0	33	0	4	0	1	0	0	0	9	0	1	0	100	**60**	**100**
NuwaraEliya	2	26	1	11	0	1	0	1	0	0	1	34	3	32	0	2	0	0	0	19	0	4	0	1	**36**	**89**
Galle	1	113	0	2	0	1	0	5	0	4	1	360	0	20	0	2	0	0	1	27	0	18	0	1	**48**	**95**
Hambantota	5	142	0	6	0	2	0	2	0	4	7	132	1	36	0	6	0	0	1	29	1	15	3	207	**75**	**100**
Matara	3	158	0	3	1	1	0	1	0	0	3	131	0	12	0	2	0	0	1	39	0	3	6	169	**40**	**100**
Jaffna	2	105	0	31	0	3	0	12	0	25	1	13	1	408	0	0	0	1	0	23	0	2	0	2	**19**	**88**
Kilinochchi	0	21	0	13	0	0	0	0	0	9	0	39	0	52	0	0	0	0	0	8	0	0	0	1	**50**	**100**
Mannar	0	19	0	0	0	0	0	4	0	0	0	23	1	2	0	0	0	0	0	3	4	12	0	1	**51**	**80**
Vavuniya	0	28	0	2	0	1	0	0	0	0	0	17	0	2	0	1	0	0	0	5	0	1	0	1	**38**	**100**
Mullaitivu	0	5	0	1	0	0	0	0	0	0	0	23	0	7	0	0	0	0	0	8	0	4	0	0	**25**	**98**
Batticaloa	16	2891	0	17	0	3	0	2	0	15	2	32	0	0	0	1	0	0	0	8	0	17	0	0	**46**	**100**
Ampara	2	20	0	5	0	0	0	1	0	0	0	37	0	0	0	1	0	0	0	26	0	9	0	3	**62**	**100**
Trincomalee	1	93	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	2	14	0	2	0	0	**40**	**81**
Kurunegala	15	477	0	11	0	3	0	0	0	3	5	165	0	7	0	0	1	1	2	31	1	72	4	193	**45**	**95**
Puttalam	4	191	1	2	0	1	0	0	0	0	1	16	0	14	0	0	0	1	0	14	0	21	1	8	**48**	**93**
Anuradhapur	8	102	0	8	0	0	0	0	0	3	3	179	0	20	0	2	0	0	1	22	0	18	1	112	**33**	**81**
Polonnaruwa	5	39	0	3	0	0	0	2	0	1	9	78	0	2	0	1	0	0	0	18	0	1	6	212	**39**	**100**
Badulla	2	55	0	9	0	0	0	1	0	0	7	165	2	27	2	8	0	0	1	27	0	11	0	12	**48**	**94**
Monaragala	0	51	0	5	0	0	0	2	0	3	12	184	0	13	2	40	0	0	0	19	2	33	1	12	**46**	**98**
Ratnapura	8	263	0	21	0	5	0	0	0	4	11	433	0	16	0	5	0	1	1	35	1	42	1	44	**39**	**97**
Kegalle	9	235	0	4	0	6	0	0	1	1	5	149	0	7	0	1	0	0	6	69	0	14	0	11	**45**	**100**
Kalmune	8	238	0	9	1	2	0	1	0	1	0	14	0	0	0	2	0	2	1	10	2	7	0	2	**42**	**100**
SRILANKA	**165**	**7996**	**3**	**202**	**2**	**37**	**0**	**39**	**1**	**78**	**79**	**2839**	**9**	**711**	**4**	**84**	**1**	**11**	**20**	**578**	**11**	**336**	**23**	**1112**	**46**	**93**

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk).

*T=Timeliness refers to returns received on or before 21st May , 2021 Total number of reporting units 357 Number of reporting units data provided for the current week: 352 **C****-Completeness

Table 2: Vaccine-Preventable Diseases & AFP

15th – 21st May 2021 (21st Week)

Disease	No. of Cases by Province									Number of cases during current week in 2021	Number of cases during same week in 2020	Total number of cases to date in 2021	Total number of cases to date in 2020	Difference between the number of cases to date in 2021& 2020
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	01	00	00	00	00	00	00	00	00	01	00	21	12	75%
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0%
Mumps	00	00	00	00	00	00	01	00	00	01	08	42	71	40.84%
Measles	00	00	00	00	01	00	00	00	00	01	01	09	28	-67.85%
Rubella	00	00	00	00	00	00	00	00	00	00	00	00	00	0%
CRS**	00	00	00	00	00	00	00	00	00	00	00	00	00	0%
Tetanus	00	00	00	00	00	00	00	00	00	00	00	02	03	-33.33%
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	00	00	00	0%
Japanese Encephalitis	00	00	00	00	00	00	00	00	00	00	01	01	08	- 87.5%
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	00	04	-100%
Tuberculosis	33	15	28	00	04	05	00	00	14	99	214	2580	1801	43.25%

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

RDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Neonatal Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps., Rubella, CRS,

Special Surveillance: AFP* (Acute Flaccid Paralysis), Japanese Encephalitis

CRS =**Congenital Rubella Syndrome

NA = Not Available

Number of Malaria Cases Up to End of May 2021,

03

All are Imported!!!

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