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Occurrence of *Listeria monocytogenes* in Food and Ready to Eat Food Products Available in Tiruchirappalli, Tamil Nadu, India

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ABSTRACT [ENGLISH/ANGLAIS]

To investigate the occurrence of a food borne pathogen, *Listeria monocytogenes*, a total of 134 food samples of vegetable, milk, white meat, red meat, refrigerated ready to eat (RTE) food stuff, were collected from various supermarkets, retail stores, and local shops situated in Tiruchirappalli, Tamilnadu, India. Pathogen was isolated from the food samples after enrichment and further it was confirmed through various biochemical tests. From the study it was found that out of 134 sampled food items, 51 (38.1%) samples had the listeriosis causing pathogen and this include cheese(100%), white meat (66.7%), milk samples (60.6%), red meat (50%), ice creams (41.7%), soft drinks(28.6%), fruit juices (20%) and vegetables(12.5%). Fruit salad did not contain *Listeria monocytogenes*. The present study demonstrates the possible risk of consuming dairy products, meat and RTE food stuffs available in the markets and also highlights the need for an effective and efficient storage process to keep such food safe, till they reach the consumers.

Keywords: Food borne pathogen; *Listeria monocytogenes*; ; food safety; RTE food safety

RÉSUMÉ [FRANÇAIS/FRENCH]

Pour enquêter sur l'apparition d'un pathogène d'origine alimentaire, *Listeria monocytogenes*, un total de 134 échantillons d'aliments d'origine végétale, lait, viande blanche, viande rouge, réfrigérés prêts à consommer produits alimentaires (RTE), ont été recueillies auprès de divers supermarchés, magasins de détail, et commerces de proximité situés à Tiruchirappalli, Tamil Nadu, en Inde. Pathogène a été isolé à partir des échantillons alimentaires après enrichissement et. De plus, il a été confirmé par plusieurs tests biochimiques. De l'étude a révélé que sur 134 articles alimentaires échantillonnés, 51 (38,1%) des échantillons avaient des listériose provoqué des pathogènes et ce fromage comprennent (100%), les viandes blanches (66,7%), des échantillons de lait (60,6%), la viande rouge (50%), des glaces (41,7%), les boissons gazeuses (28,6%), jus de fruits (20%) et légumes (12,5%). Salade de fruits ne contiennent pas de *Listeria monocytogenes*. La présente étude montre le risque possible de consommer des produits laitiers, la viande et des aliments pour animaux disponibles RTE dans les marchés et souligne également la nécessité d'un processus de stockage efficace et efficient de garder ces aliments sûrs, jusqu'à ce qu'ils atteignent les consommateurs.

Mots-clés: Alimentation pathogène; *Listeria monocytogenes*; ; sécurité alimentaire, la sécurité alimentaire de RTE

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INTRODUCTION

Listeria monocytogenes is a food borne pathogen, widely distributed in food stuffs such as vegetables, fruits, dairy products and processed food items. Consumption of raw and partially cooked contaminated food stuffs develop Listeriosis, among the immuno suppressed people like elderly persons, pregnant women, neonates [1, 2]. As these pathogens are capable of surviving even under refrigerated conditions, posing threat to the food industries and there by the consumers. [3, 4]. After the frequent outbreaks of listeriosis in USA, Canada and

Europe, WHO has decided to notify the organism as a severe threat to food and consumer safety [5]

Among the fish varieties, studied fishes such as Shellfish [6, 7]; Shrimps [8] cold-smoked Rainbow Trout [9] are more susceptible for the pathogen. In addition, its incidence in raw chicken, raw meat, red meat [10], minced chicken [11], ice creams, vegetables [12], fruits [13], milk and milk products [14] has also been reported in European countries. As the outbreaks of listeriosis is linked to the consumption of contaminated food stuffs

[15, 16], the development of database containing food items vulnerable for *Listeria sp* is of importance.

Furthermore, only very little work about the pathogen has been done in Asia particularly, India. And the existing few works are associated to clinical studies. Hence, the proposed work of creating database of foodstuffs vulnerable for *L. monocytogenes* would create awareness among people about the pathogen and the food stuffs that are associated to it.

MATERIALS AND METHODS

Food Samples

To study the prevalence of *Listeria monocytogenes*, on eatables, food samples were collected from the markets, shops and restaurants, located in various places of the city, Tiruchirappalli, Tamilnadu, India. A total of 134 food samples (including replication) were collected during March 2010 to October 2010 (Fig. 1). The number of samples considered in each category are: 8 kinds of vegetables (5* *Solanum melongena*, 5* *Brassica oleracea*, 5* *Daucus carota*, 5* *Phaseolus lunatus*, 5* *Brassica rapa*, 5* *Hibiscus esculenta*, 5* *Solanum tuberosum*, 5* *Raphanus sativus*), 13 brands of Milk samples (3* un pasturised raw milk and 10* pasturised branded milk), 5 White meat (3* chicken, 3* pork, 3* red snapper, 3* malabar travelly, 3* cat fish) 2 Red meat (3* beef, 3* mutton), 5 Ready-To-Eat food stuffs such as 7 Soft drinks, (3* Mazza, 3* Slice, 3* Maa, 3* Mirinda, 3* 7Up, 3* Badam milk, 3* Rose milk), 5 Fruit juices (Apple, Sappota, Grape, Pomogranate, Pineapple), 4 ice creams (3* Vanilla, 3* Chocolate, 3* Butterscotch and 3* Pistha) 1 Salad (mixed Fruit salad) and 1 Cheese. The samples immediately after collection were stored in ice-box (4° C) and brought to the laboratory for enumeration.

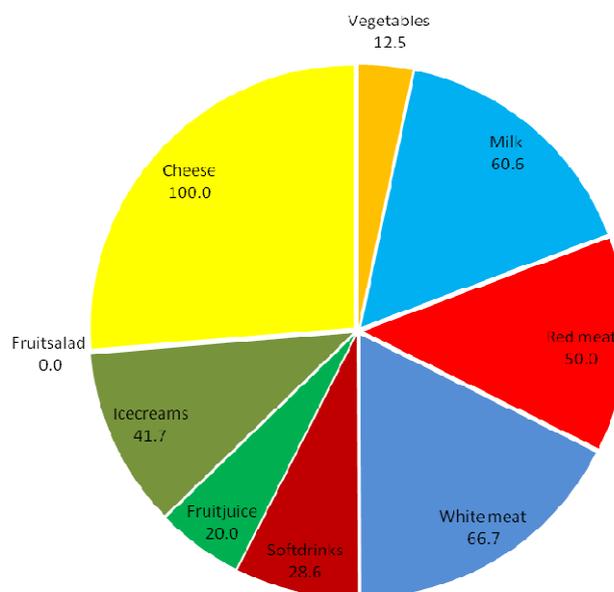
Isolation and Identification

To recover the stressed organisms the samples, prior to isolation were enriched. For enrichment, 25 grams of food sample was taken in a sterile conical flask with 225 ml of Buffered Peptone Water (pH 7.2±0.2) and stored for 1 h ± 5 min at 20 ± 2 °C. One ml of the sample from the enrichment buffer was poured in Petri plates in duplicate on PALCAM® agar and the plates were incubated for 48h at 37 °C. Typical colonies were counted and isolated in Trypticase Soy Agar with Yeast extract (TSAY) as prescribed by NF EN ISO 11290-2 [17]. The purified isolates were tested for Gram staining, catalase activity, oxidase activity, MR-VP, indole production, citrate

utilization, and carbohydrate fermentation [18] and CAMP tests [19].

FIGURE 1

Figure 1 shows the list of eatables tested for *L. monocytogenes*



RESULTS AND DISCUSSION

Of the total 134 samples examined, 51 (38.1%) were positive for *L. monocytogenes*. Among the food stuffs studied, the per cent prevalence of the pathogen was very high in Cheese (100%) followed by White meat (66.7%), Milk (60.6%), Red meat (50%), Ice creams (41.7%), Soft drinks (28.6%), Fruit juices (20%) and Vegetables (12.5%). And in fruit salad, no contamination was seen (Fig. 2). Among the milk samples tested, the pathogen was detected in both raw and pasteurized milk, but the incidence was 100 per cent in milk that are locally available, than the unpasteurized raw milk (Fig. 3). Usage of inadequately cleaned milking vessels and containers, absence of pasteurization treatment could be the reason for the high level contamination [14]. Compared to vegetables, all meat varieties were found to have *Listeria sp* and was very high in Pork and Beef (100%) than in Chicken (Table 1 and 2). From the study, it was found that the prevalence of the *L. monocytogenes* is seen in variety of food stuffs sold in Tiruchirappalli, and the incidence is high among cheese, Meat and Milk. "Ready to Eat" food stuffs which contain milk as base also have *Listeria* contamination, which

FIGURE 2

Figure 2 shows the occurrence of *L. monocytogenes* in selected Eatables

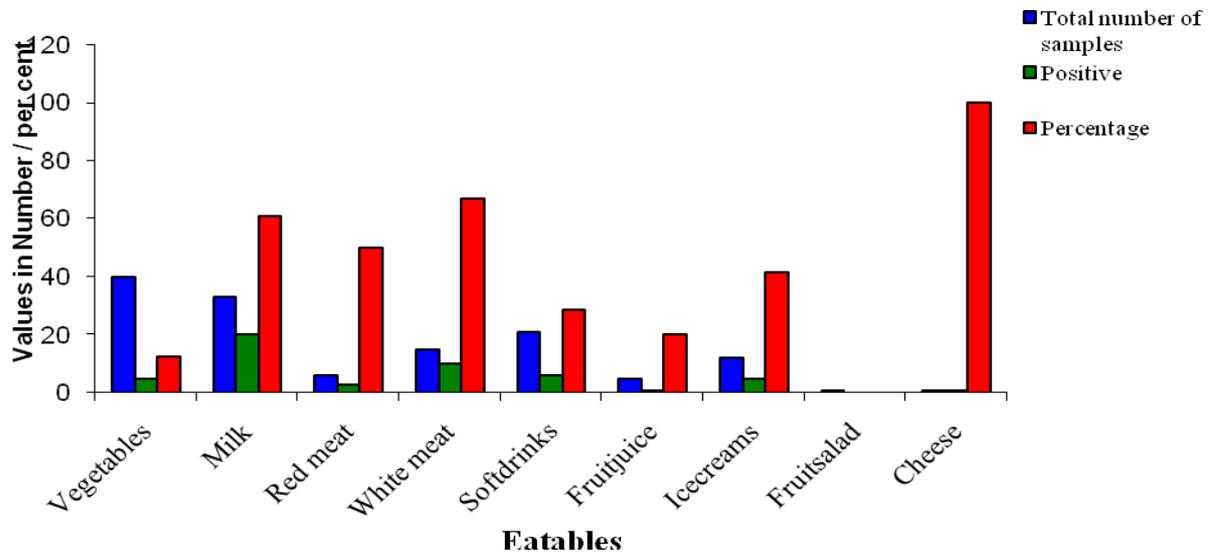


FIGURE 3

Figure 3 shows the prevalence of *L. monocytogenes* in Pasteurized and Unpasteurized Milk

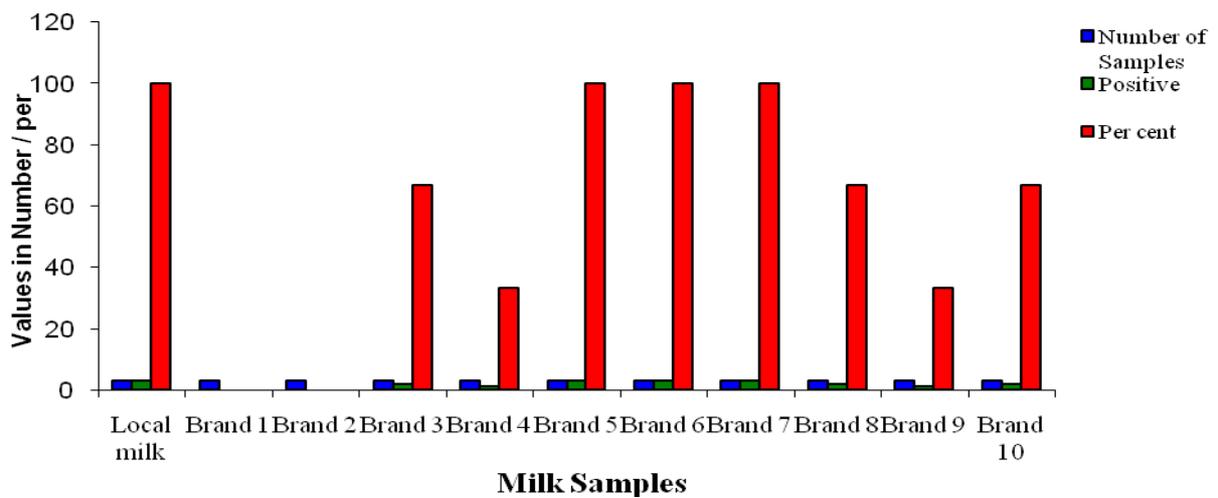


TABLE 1

Table 1 shows the prevalence of *Listeria monocytogenes* in White meat

White meat	No. of Samples	Positive	Percentage
Chicken	3	1	33
Pork	3	3	100
Red snapper	3	3	100
Malabar			
travelly	3	3	100
Cat fish	3	0	0

TABLE 2

Table 2 shows the prevalence of *Listeria monocytogenes* in White meat

Red meat	No. of Samples	Positive	Percentage
Mutton	3	0	0
Beef	3	3	100

include Badam, Rose milk, Apple juices, and Ice creams (Figures. 4-7). The results of the study indicate the potential risk of eating “ready to eat”, chilled food or raw food available in the city.

Of the 8 kinds of vegetable tested, the pathogen was found (100%) only in *B. oleracea*, and not in others (Table 3). In India *L. innocua* has been reported at 10% in Palak leaves and 30% in Coriander leaves [12].

From the study, it is found that the prevalence of the *L. monocytogenes* is seen in variety of food stuffs sold in Tiruchirappalli. And the incidence is high among cheese, Meat and Milk. "Ready to Eat" food stuffs such as Badam, Rose milk, Apple juices, Ice creams which contain milk as base also have *Listeria* contamination (Figures. 4-7). The results of the study indicate the potential risk of eating "ready to eat", chilled food or raw food available in Tiruchirappalli city.

TABLE 3

Table 3 shows the occurrence of *Listeria monocytogenes* in Vegetables

Vegetables	No. of Samples	Positive	Percentage
<i>S. melongena</i>	5	0	0
<i>B. oleracea</i>	5	5	100
<i>D. carota</i>	5	0	0
<i>P. lunatus</i>	5	0	0
<i>B. rapa</i>	5	0	0
<i>H. esculenta</i>	5	0	0
<i>S. tuberosum</i>	5	0	0
<i>R. sativus</i>	5	0	0

FIGURE 3

Figure 3 shows the occurrence of *L. monocytogenes* in Chilled RTE Foods from Tiruchirappalli

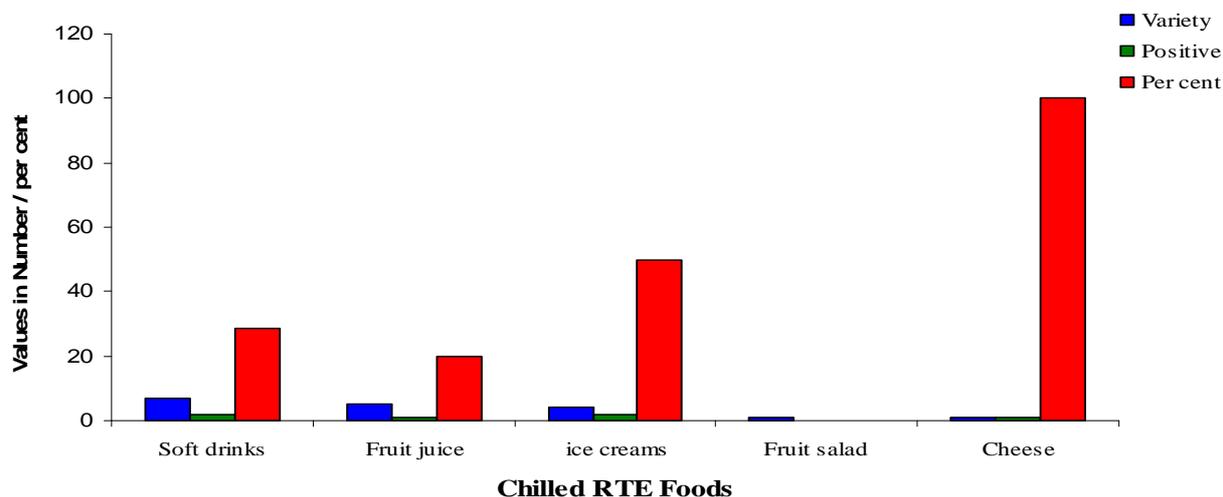


FIGURE 5

Figure 5 shows the prevalence of *L. monocytogenes* in Soft Drinks

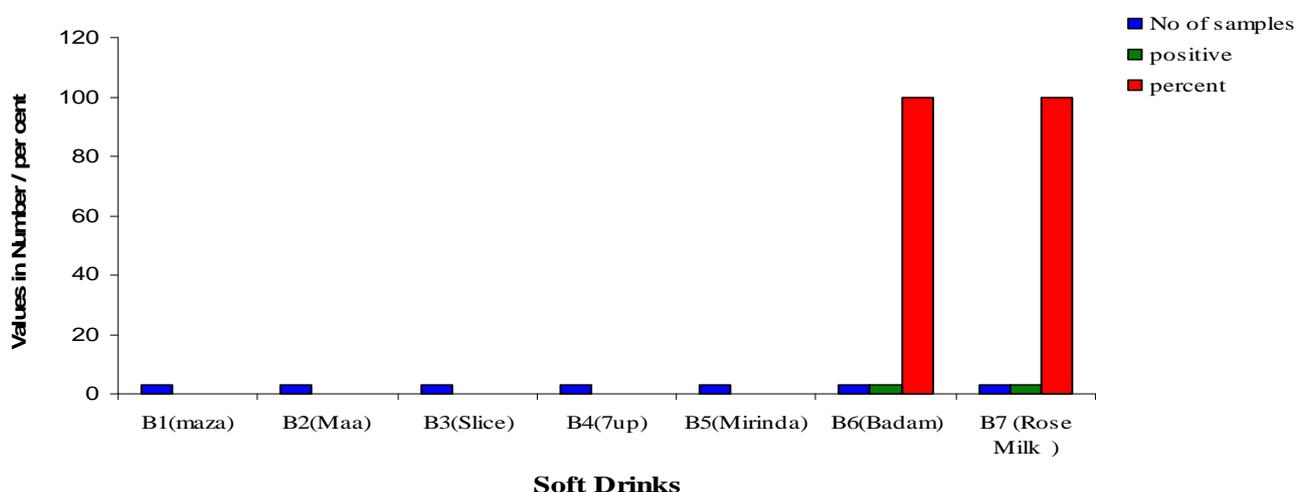


FIGURE 6

Figure 6 shows the prevalence of *L. monocytogenes* in Fruit juices

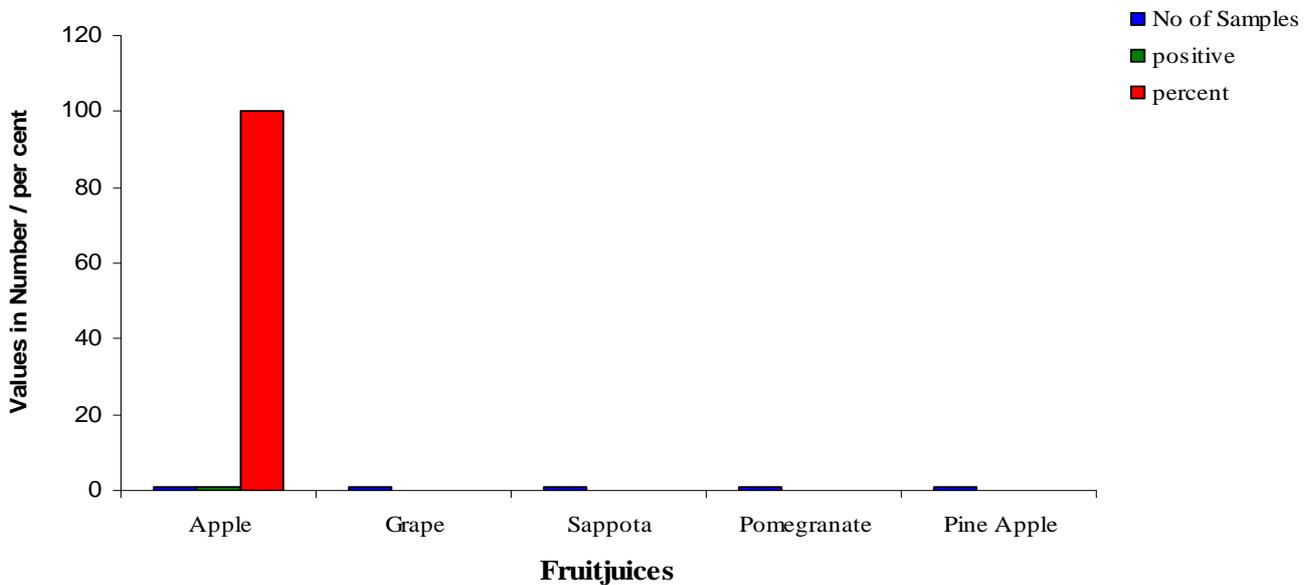
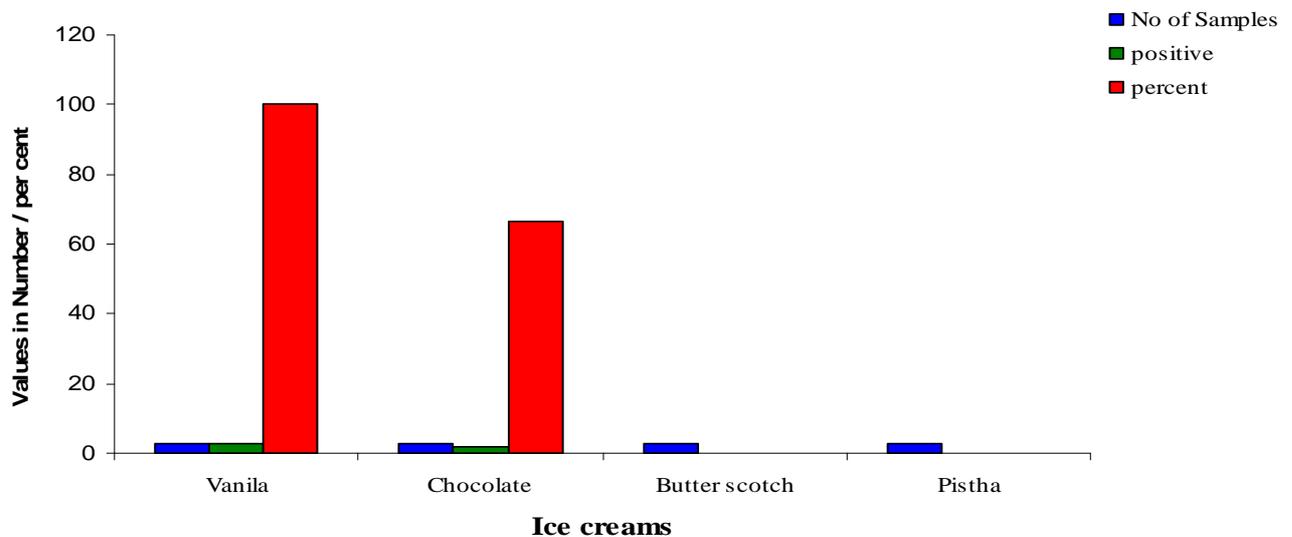


FIGURE 7

Figure 7 shows the prevalence of *L. monocytogenes* in Ice creams



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CONFLICT OF INTEREST

No conflict of interest was declared by authors.

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