

**Original article**

**The prevalence of *Sarcocystis* infection in meat-production by using digestion method in Ahvaz, Iran**

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**Abstract**

**Introduction and objective:** *Sarcocystis* is an obligatory intercellular protozoan parasite which can induce infection and clinical signs in carnivorous and herbivorous host. Humans acquire infection by ingestion of cyst or eating raw and undercooked infected meat or meat-production. The main goal of this study is to detect prevalence of the parasites in meat-production such as hamburger, sausage and hot dogs and determine its important role in human health.

**Materials and methods:** Seventy five samples of hamburger, sausage and hot dogs (each 25 samples) were collected from retail stores in Ahvaz southwest of Iran. The samples were examined by digestion method using pepsin and HCl for detecting *Sarcocystis* parasite by light microscope.

**Results:** *Sarcocystis* species were seen in 56% for hamburger, 20% for hot dogs and 8% for sausage.

**Conclusion:** The results of this study indicated that the rate of the *Sarcocystis* sp. infection in meat-production is considerable and would be important for human. Many *Sarcocystis* sp. can infect meat many species from canine and feline definitive host. A molecular test such as PCR is needed to identify the parasite species. Digestion method is a sensitive, rapid and simple test for diagnosing *Sarcocystis* infection in meat. To prevent human infection, consumption of raw or under-cooked meat and meat-produced hyper endemic area should be avoided.

**Significance and impact of the study:** Regarding to meat-born disease transmitted to human, to detect protozoa parasites in meat and their products can be important to prevent transmission of parasites which have cyst stage and promote hygienic level in human community.

**Keywords:** Sarcocystis; Meat-production; Digestion method

## Introduction

*Sarcocystis* is an obligatory intracellular protozoan parasite which can infect humans and animals. Distribution of the parasite is world wide and has been reported by many investigators from different parts of the world. The life cycle of the parasite consist of an intermediated host (man and herbivorous animals) and definitive host (man and carnivorous animals). Carnivorous such as canine and feline family, infect environment by passing 200million oocyst during infection via faeces [1,2].

Humans acquire infection by eating raw and under cooked beef, pork or meat products (hamburger, sausage and hot dogs) containing schizonts of *Sarcocystis hominis* and *S. suihominis*. The prevalence of sarcocystosis in slaughtered animals has been investigated in many studies in different parts of the world [3-8] and Iran [9-13] which indicated the infection rate is ranged between 3.5 % up to 100% in different food animals using different methods. The clinical signs of intestinal sarcocystiasis in human are digestive system disturbances such as nausea, vomiting, and diarrhea [14] especially in immunocompromised patients [15].

Li *et al.* [16] in a human experimental infection model, showed abdominal distension in about five hours after infection, with watery diarrhea 13 times from the 8<sup>th</sup> to 36<sup>th</sup> hour of infection, vomiting four times, chilling and fever with a temperature of 38.5°C, dizziness, headache, joint and muscle ache, epigastralgia, and anorexia. Un-sporized sporocysts were found in the faeces 10 days after infection and sporocysts appeared on the 12<sup>th</sup> day. Muscular sarcocystosis disease in human is caused by *S. lindemanni*. The infection is induced by ingestion of oocysts which passed through faeces of infected dogs [17].

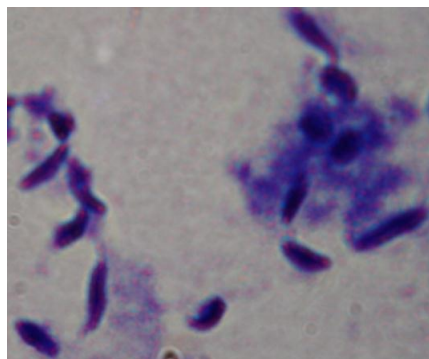
The consumption of meat products (hamburger, sausage and hot dogs) as fast food is increased in recent years in Iran. Because of easy transmission of *Sarcocystis* infection via eating raw or undercooked meat or fast food, we decided to investigate meat products to detect *Sarcocystis* infection rate.

## Materials and methods

### Samples

Seventy five samples of hamburger, sausage and hot dogs with different trade marks, were collected from retail fast food stores in Ahvaz southwest of Iran. Name of the factory, date of collection and percentage of meat content in the hamburger, sausage and hot dogs were recorded. The meat content in hamburger samples was ranged from 30% to 90% according to factory information. In this study digestion method was selected for detection of *Sarcocystis* bradyzoites [18,19].

Fifty grams of each sample, without being heated were ground by blender and digested in 1.5% HCL and 0.5% pepsin solution at 28°C overnight. The digested samples were sieved through mesh and centrifuged 1500rpm for 5mins. After discarding the supernatant fluid, the sediment were stained by Giemsa and examined microscopically for detecting *Sarcocystis* bradyzoite [18,19]. *Sarcocystis* bradizoite was shown in figure 1.



**Fig. 1:** *Sarcocystis* spp. bradyzoite in hamburger after digestion

## Results

### Hamburger

This research indicated that 56% of hamburger samples were infected. A significant difference between meat content

and *Sarcocystis* infection rate was observed ( $p < 0.05$ ). Table 1 shows the results of hamburger analysis in details.

**Table 1:** The percentage *Sarcocystis* infection in hamburger

Hamburger (meat content %)	Number	Positive	Negative	%
A (30%)	9	4	5	44.5%
B (60%)	12	7	5	58%
C (90%)	4	3	1	75%
Total	25	14	11	56%

### Sausages

This study showed two out of 25 (8%) sausages were infected. The samples were collected from nine brand marks with a variety of meat content. The brands were anonymously designated A to C to leave the manufacturer unknown in study.

### Hot dogs

*Sarcocystis* bradyzoites were seen in 20% of the hot dogs and 8% of sausage samples ranged from +1 to +3 in severity.

## Discussion

*Sarcocystis* is an obligatory intercellular parasite of mammals in many parts of the world. Humans are also infected with the parasite as intermediate and final host in which the parasite habitat in muscular and intestinal tract respectively. Humans demonstrate some clinical intestinal symptoms as final host by eating under-cooked or raw infected meat or meat products. Consumption of fast food is increased in recent years. This style of feeding in human community can increase prevalence of infection in humans. For example, Americans consume about five billion hamburgers a year [18]. Several investigations showed that there are considerable infection rate in sheep and

cattle that infected with *Sarcocystis* spp. in Iran and world [3-13].

These results point out that the environment is heavily contaminated with different species of the parasite. This study indicated that hamburger, sausage and hot dogs as meat products, were infected with *Sarcocystis* in considerable percentage in 56%, 8% and 20%, respectively. The results shows there is a significant difference between meat content and infection severity in hamburger samples ( $p < 0.05$ ). There are little investigation on meat product contaminated with *Sarcocystis* in Iran.

Jahed Khaniki *et al.* [19] showed 6 (25%) hamburgers were infected with the parasite in Garmsar. They used histological method for detecting the parasite in hamburger. Their finding is in controversy with our results- the infection rate was 56% in hamburger samples. This inconvenience could be due to using different methods. Prayson *et al.* [18] confirmed that two out of 8 (25%) of hamburgers were infected with the parasite. This study did not determine the species of *Sarcocystis*.

## Conclusion

With regard to the high prevalence *Sarcocystis* infection in meat products in this study, it is strongly recommended to avoid eating raw or under-cooked meat-

product or place them at frozen temperature for at least 3-5 days.

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**Conflict of interest statement:** All authors declare that they have no conflict of interest.

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