

## Assessment of the biological parameters required for food industry workers on periodic inspections

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### Abstract

This study has as a purpose the evaluation of the biological parameters imposed by the current legislation for workers in the food industry, which come in direct contact with unpackaged food. These evaluations, performed during the year 2014, targeted a number of 535 workers to which clinical examinations were conducted, with particular attention to the teguments, coproparasitological tests and fecal bacteriological tests. From the total of all the workers in the analyzed lot, 12 presented pyodermitis, as a result throat swabs, nasal exudates and exudates of the purulent secretion have been indicated additionally. From the 12 persons which presented skin disorders, 8 have performed the employment medical control and 4 came from manufacturing at the indication of the head of unit.

The obtained results prove the absence of pathogenic organisms targeted by fecal bacteriological tests at the analyzed persons, the presence of some parasite cysts on 9 persons from the 535 analyzed and highlighting the presence of coagulase-positive staphylococci in the wounds of 8 of the 12 employees analyzed.

**Keywords:** biological parameters, food manufacturing, pathogen coli forms

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### 1. Introduction

The wholesomeness of food largely depends on the health conditions and on the hygiene compliance of the staff that comes in direct contact with it. The health condition of workers from the food industry is strictly monitored by means of the national legislation, adapted to the requirements of the European Community. Thus, according to the Government Decision 355/2007 completed by Government Decision 1169/2011, workers in the food industry which are working directly on food preparation in the kitchens of public food units or

in food manufacturing, respectively working in processing of animal or vegetable products, are binded to perform on employment and periodically (in the 2<sup>nd</sup> and 3<sup>rd</sup> quarter) certain medical examinations which aim to assess the health of the individual [9]. The mandatory examinations targets general clinical examination with careful attention to teguments, coproparasitological tests and fecal bacteriological tests. Contraindications for employees of establishments of obtaining, processing or service of food is the presence of dermatological transmissible diseases, acute or chronic (furunculosis,

pyoderma), evolving infectious diseases and respectively evolutionary pleural pulmonary tuberculous lesions [8,9]. Thus, workers in the field, in the event that shows one of these contraindications, should be removed from the workplace, treated, evaluated again at the end of treatment and then they can return to work. This conduct is absolutely necessary to avoid the occurrence of infection outbreaks, of certain diseases transmission through food and triggering of food poisoning episodes with serious alteration of the health of the consumer.

## 2. Materials and methods

To assess the presence of pathogen coli forms - *Salmonella*, *Shigella*, *Yersinia* and *Yeasts*, possibly present, the fecal bacteriological exam uses as culture mediums: DCLS agar (desoxycholate – citrate – lactose – sucrose), Hektoen agar, *Yersinia agar* and *Sabouraud GC agar*. In all of these cases the plates were inoculated in triplicate and were incubated under aerobic conditions.

DCLS agar is a modified form of Desoxycholate Citrate agar, which includes sucrose in its formulation. The addition of this fermentable carbohydrate increases the usefulness of the medium because non-pathogenic sucrose-fermenting organisms may be recognized by their red colonies - *Proteus*, *Enterobacter* and *Klebsiella species* [4,5]. DCLS agar was inoculated directly from the specimen. The Petri plates were incubated 24 hours at 35°C and examined for the presence of pale, translucent or colourless colonies. Subcultures can be cultivated into the Triple Sugar Iron agar confirmation medium or picked for transfer to nutrient broth for subsequent motility tests and serological agglutinations [4,5].

Hektoen Enteric Agar is used to isolate and differentiate *Salmonella* spp. and *Shigella* spp., both of which cause a variety of severe gastrointestinal human illnesses [4,10]. The culture medium was inoculated directly from the specimen. Cultural response on Hektoen Enteric agar at 35 ± 0,2°C appear after 18 - 24 hours incubation. *Shigella flexneri* appears as green colonies and has a fair to good growth and *Salmonella typhimurium* develops green colonies with black centers and also has a fair to good

growth [4,5,10].

*Yersinia* Selective Medium is recommended for the isolation and enumeration of *Yersinia enterocolitica* from clinical specimens and food. In *Yersinia* Selective Agar Base and the selective supplement the colonies of *Yersinia enterocolitica* have been developed specifically after 24 hours incubation at 32°C [5]. The culture media was inoculated directly from the specimen. The typical colonies of *Yersinia enterocolitica* will develop as a red bull's-eye surrounded by a transparent smooth border. The confirmation of *Yersinia enterocolitica* needs biochemical testing [5].

BD Sabouraud GC Agar is used for the selective isolation of fungi and for the isolation and identification of *Candida albicans*, *C. tropicalis* and *C. krusei* [3]. Sabouraud Agar with glucose is a widely used medium which, due to its low pH and the high glucose concentration, is partially selective for fungi. Due to the fact that many bacteria tolerate low pH and high glucose concentration and therefore grow on *Sabouraud agar*, especially during the prolonged incubation period often necessary for fungal isolation, several formulas containing antibacterial inhibitors have been developed. In *Sabouraud GC Agar* chloramphenicol and gentamicin are broad-spectrum antibiotics inhibitory to a wide range of gram-negative and gram-positive bacteria [3]. The inoculum was ribbed onto the surface of the culture medium and was incubated at 35°C, 24 - 48 hours. After sufficient incubation, the examination of Sabouraud GC Agar for fungal colonies exhibits typical color and morphology as follows: *Candida albicans* - white colonies, growth good to excellent; *Candida krusei* - white to creme, flat colonies, growth good to excellent, *Candida tropicalis* - white to creme colonies, growth good to excellent [3].

The nose and throat exudates or purulent secretions exudates, the inoculation was performed on Columbia agar culture medium with addition of 5% sheep blood and *Staphylococcus/Streptococcus* Selective Supplement. The advantage of this culture medium is the rapid appearance of characteristic colonies of the two types of gram positive germs and respectively the clear observation of beta hemolysis around them [7,10,11]. The inoculum is ribbed onto the surface of the culture medium, the incubation is

performed for 18 hours at 35°C, in aerobic conditions. The colonies have a characteristic aspect. *Staphylococcus aureus* develops cream coloured colonies and has good growth; *Streptococcus pyogenes* – develops pale straw coloured colonies with good growth. Following the development of specific staphylococcal colonies the antibiogram has been performed using Mueller-Hinton agar as a culture medium [10,11]. The inoculation was accomplished through inundation. After drying the surface of the culture medium, the antibiotic paper discs were dispensed at equal distances onto the surface of culture medium and then incubated for 18 hours at 35°C [7]. The antibiogram has been effectuated using the diffusimetric method, using 8 antibiotic micro tablets.

A faecal analysis used the microscopic evaluations. The sample examination was performed on native samples, with the Optika optical microscope, using the lens with 40X magnification.

### 3. Results and discussions

The obtained results, in the case of the fecal bacteriological tests were negative, on all the analyzed persons. Thus, none of the exponents of the analyzed lot presented the pathogenic germs targeted - *Salmonella spp.*, *Shigella spp.*, *Yersinia spp.* On a first evaluation, we could conclude, wrongfully, that this analysis was unnecessary. The importance of conducting these investigations, derives from the high degree of pathogenicity that these germs present [1,4,5]. For example, *Salmonella*, depending on the subspecies, can contaminate humans and animals. *Salmonella*'s usual habitat is the intestinal tract [5].

Salmonellosis can evolve from asymptomatic infections to typhoid-like syndromes and are responsible for most food poisoning diseases, which is why contaminated personnel isn't allowed to come in contact with food in the food industry units [5].

*Shigellosis*, caused by this germ genus *Shigella*, is an enteric disease presented by the persons that have been infected with this bacterium [5,10]. The contaminated persons can infect food or water they come in contact with, or the transmission may be

fecal-oral, when the application of hygiene rules of is deficient [7,10]. The correct way of washing hands is the safest prevention method of bacillary dysentery. Bacillary dysentery caused by *Shigella* is characterized by a fast transmission speed from a person to the other and has its very clear clinical symptoms, which requires that individuals are isolated at home during the convalescence period.

*Yersiniosis*, caused by infection with an enteric pathogenic strain of *Yersinia spp.* presents different symptoms which can occur at 4-7 days from exposure, their duration can range between 1 and 3 weeks [10]. Food is the most common source of contamination - for example improperly cooked pork meat [10]. The efficient prophylactic measures of prevention from yersiniosis consists in the correct application of hygiene rules and in respecting the protocol for obtaining meat products.

In the case of nasal and throat exudates the results of the bacteriological analysis were negative as well. In contrast, the exudates realized from purulent collections taken from the facial skin, there were identified germs belonging to the species *Staphylococcus aureus*, on 8 of the 12 analyzed persons. Following the isolation of pathogenic germs, antibiograms were performed and germ sensitivity was found for these antibiotic substances: gentamicin, ciprofloxacin, moxifloxacin and rifampicin. The germs presented resistance to the following antibiotics: penicilin, oxacillin, erythromycin and clindamycin [2]. All those found positive for coagulase positive staphylococci were oriented towards specialized medical services and after 14 days they were submitted to re-evaluation from the microbiological point of view, the harvesting was done from the facial skin squamous remaining after antibiotic treatment. Employed personnel were able to resume work, and the people that were going to get employed were issued a favorable opinion for employment by the medical specialist.

Microscopic evaluations of coproparasitological samples revealed the presence of parasitic cysts in 9 people from a total of the 535 analyzed. The distribution during the year was as follows: 1 - in January, 1 - in February, 1 - in March, 2 - in April, 1 - in May, 1 - in July, 1 - in September and 1 - October. There is a noticeable relatively uniform

distribution over the year. Analyzing the results obtained from reading the blades, 8 people are found with *Entamoeba coli* cysts present, and one of the analyzed individuals presents the cysts of *Giardia lamblia*. All the 8 people presented clinical manifestations consistent with the presence of this intestinal parasite, which is why they were removed from the food environment in which they worked and were directed to medical service, for appropriate treatment.

*Entamoeba coli*, normally part of the intestinal flora, acquires its pathogenic character, only in local immunity alteration conditions and is manifested by characteristic enteric symptoms, sometimes accompanied by skin manifestations [13].

*Giardia lamblia*, located in the small intestine, shows a very rapid multiplication, result being the emergence of symptoms characterized by digestive disorders, sometimes accompanied by allergodermia [12,13]. Contamination is digestive through non-compliance with hygiene - washing hands, washing fruit before being consumed and through ingestion of water contaminated with the cystic form of the parasite. After treatment coproparasitological reevaluation was performed after one month. In all cases the results were negative, proving the effectiveness of treatment.

#### 4. Conclusions

Investigations have focused a representative group of workers from the food industry, consisting of a total of 535 people.

The obtained results have proven the absence of pathogenic coli form germs from the biological products analyzed, on all the exponents of the lot, at the time of the fecal bacteriological analysis.

This does not confirm the absence of these germs throughout the whole year for food industry workers, but refers strictly to the time of analysis.

It is likely due to the clinical manifestations presented by patients with this type of germ infection - abdominal pain, nausea, vomiting, diarrhea, dizziness - personnel employed in the food industry or any other person who would present such symptoms doesn't appear at work, the infection making it impossible to get away from

home due to their altered general condition.

The persons presenting skin infections were found with coagulase positive *Staphylococcus* present. Simultaneously the absence of these germs from nose and throat exudates was proven.

Pathogen susceptibility revealed antibiotics effective for treating the staphylococcal pyoderma, their effectiveness being noticed by sterilization of the outbreak, 14 days after the first culture.

Coproparasitological examinations revealed the presence of parasitic cysts in 9 cases out of 535 analyzed, cysts of *Entamoeba coli* at 8 workers, and at one of the workers, the presence of cysts of *Giardia lamblia*.

*Entamoeba coli* is a commensal of the normal intestinal flora. If its presence in the intestine was not accompanied by symptomatic clinical manifestations on the analyzed staff working in the food environment, medical treatment would not have been required.

In the cases analyzed clinical manifestations were highlighted, which is why the workers were removed from the environment, treated and reassessed one month later, with positive results.

*Giardia lamblia*, the most frequently found parasite on the fecal exam, has a very low infective dose, approximately 10 cysts, and shows increased resistance-several weeks in chlorinated cold water.

The importance of compliance with individual and collective hygiene must be emphasized, which constitutes the most efficient prophylactic measures to combat illness of food environment staff and at the same time triggering of food poisoning, with negative effects on the health status of consumers.

**Compliance with Ethics Requirements.** Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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