ABSTRACT

Breeding of goat and sheep is one of the oldest human occupation small ruminants (goats and sheep) are the first animals domesticated by man to cover their food needs. Based on a limited number of species, located in today territories of Asia (Iraq, Iran, Syria and Turkey), there are now several hundred species of sheep and goats which totals more than 750 million goats and more than one billion sheep. Diversification inside species and numerical population evolution was accompanied by increasing of production traits, the contribution of highly productive species used in industry today, being much higher than species less ameliorated, usually raised only for limited needs of farmers.

Both the sheep milk and the goat is not without danger for the consumers. The literature indicates the presence of physical, chemical and microbiological hazards in milk of small ruminants especially if breeding and hygiene issues are not mastered properly.

Use of milk whose integrity, nutritional value and hygienic status are impaired is a major risk to its user. Due to the complex structure and chemical composition small ruminants milk is an excellent medium for various microorganisms, which could affect the quality and wholesomeness of milk.

Raw milk must comply with the physical and chemical limits of parameters imposed by the current legislative requirements with respect to the degree of freshness (pH, acidity), wholesomeness (fat content, protein content, lactose, non-fat dry matter), degree of contamination, and the number somatic cells.

The motivation of this thesis is rooted in:

- the need to ensure food quality without hazards to consumers;
- increasing of contribution of milk from small ruminants in human consumption of milk in the world;

- existence at present, a small amount of data on the situation in milk quality of small ruminants, in terms of physicochemical and microbiological contamination .

The present thesis aimed to:

- assessing the current status of sheep and goat milk quality in terms of physico-chemical, biological and microbiological
- identify key chemical and biological hazards in the milk of sheep and goats;
- providing useful data for the development of strategies to monitor the dangers of milk from sheep and goats;
- establish a set of measures necessary to manage the dangers of small ruminant milk.

The thesis is structured according to the legal criteria in force in two parts.

The first part, entitled "The current state of knowledge", comprises two chapters totaling 48 pages, during which are summarized the main bibliographic data in the literature regarding: structure and composition of milk from sheep and goat nutrition, physical and chemicals risks associated with consumption of milk from sheep and goats, microflora from sheep and goat milk, biological hazards and risks associated with the presence of these public health hazards in milk.

The second part entitled "Personal Research" contains the results research, spans 120 pages and consists of three chapters and nine subchapters. Each chapter of the second part deals with a specific topic, is structured as a typical scientific papers including: materials and methods, results and discussion and partial conclusions.

The thesis is finalized with a chapter of conclusions and recommendations where are presented the main aspects of the results obtained and recommendations to correct the identified deficiencies.

The thesis is illustrated with a number of 54 tables (of which 37 in the second part) and 71 figures, all in the personal research part.

Arguing of statements from the first part and of discussion and interpretation of results was done in accordance with information found in a total of 387 bibliographic titles, of which, the vast majority are articles published in scientific national and international journals .

The methods used in our investigation are accepted worldwide as commonly used in national and international laboratories.

In the fourth chapter entitled **"Investigations on the physicochemical quality of the milk of sheep and goats milk quality"** by means chemical and physical method of analysis it

was assessed the wholesomeness of sheep and goat milk (milk composition assessment), its freshness and identification of some specific substances that may accidentally could get into milk (contaminants) or ending accidentally the milk as a result of mismanagement of breeding and of animal care issues (residues).

Regarding the composition of sheep milk it was found that there are a normal seasonal variations in milk composition of sheep affecting all major constituents of milk and have resulted in a progressive decrease of dry matter content and the elements that compose it from January to October and increase of their concentration in the near period.

Goat milk presented, in terms of composition, seasonal variations, but unlike the sheep milk, the lowest values of dry matter content were found in the summer months.

The main factors that caused content variations of goat milk under this study, were lactation stage and climatic conditions. The heat of summer is a factor that caused the decrease of both milk production and the concentration of major milk constituents.

The results of investigations on pesticide residues in milk of sheep and goats presented in section 4.2 have shown that during the research period there were no exceeding of established legal limits for organochlorine pesticides determined (α-HCH, β -HCH, γ-HCH and DDT).

Even if organochlorine pesticides assessed were found in small quantities, without exceeding the legal limit, as a consequence of banning their use, their ability to concentrate in dairy products and to accumulate in the body of animals and milk consumers justify the need for further studies to monitor the presence of these substances in food.

Organophosphorus pesticide residues has not been identified in milk samples analyzed.

In section 4.3 are presented the results of investigations regarding identification and quantification of heavy metals from small ruminant milk. The content of heavy metals found in samples examined did not exceed the maximum limits established by legislation.

Arsenic and cadmium were absent in the milk samples examined.

Most of the metals determined in this study were found significantly higher in sheep milk compared to goat's milk. These particularities can be explained by the peculiarities of nutrition of this species.

Throughout the study period the antibiotic residues were identified in 0.73% of all examined milk samples. Antibiotic residues were found in 0.61% of milk samples from sheep and 0.88% milk samples from goat. Antibiotic residues were identified with greater frequency during the autumn (September - November) in both sheep and milk in goat milk.

In goat milk samples were found five of the ten analyzed antibiotics (gentamicin, neomycin, streptomycin, tylosin and enrofloxacin) and in sheep milk have been identified only three types of antibiotics: neomycin, tylosin and enrofloxacin. None of the analyzed antibiotics exceed the maximum legal limit.

Throughout the trial period it could be seen a progressive reduction of the annual frequency of antibiotic residues identification in milk.

According to our results for efficient detection of antibiotic residues in milk is recommended: starting with low prices screening tests with a method optimized in order to prevent false negative results and to obtain an acceptable number of false-positive (eg, tests, microbial growth inhibition) and use of an interim tests to identify the type of antibiotic (eg ELISA type tests) and finally, to confirm positive results, the use of quantitative methods optimized to exclude false positive results (eg chromatographic methods).

In Chapter V, entitled "Investigation of biological and microbiological quality of sheep and goat milk" are presented the results of research on micro-organisms in milk and the reaction of macroorganism to this kind of a aggression. The investigations concern: the determination of the number of somatic cell from milk, the identification of subclinical mastitis, the determination of total aerobic mesophile microorganisms, the determination of coliforms and the identification and characterization of psychroptrophic and pathogenic microflora from milk.

Normal variations of milk somatic cells in small ruminants are determined by many non-infectious factors this is why interpretation of somatic cell count values must be done in context, taking into account all factors that may contribute to their normal variation.

Results of research confirms that a high number of somatic cells in milk of sheep and goats is associated with decrease milk yield, milk composition changes and negatively affect the efficiency of milk processing.

Of the 1019 samples of ewes examined for the identification and characterization of mastitis milk during the period of study, 6.23% were considered, in accordance with established protocol, as originating from subclinical mastitis animals. Regarding goat milk samples examined, 7.03% of them were classified as characteristic of subclinical mastitis status.

Coagulase-negative staphylococci were the major group of bacteria responsible for subclinical mastitis etiology, according to the results of bacteriological examination.

The average of total aerobic mesophilic count (TAMC) was in 2007 for sheep milk samples 1108.57 CFU/ml ± 68.957, and 1905.50 CFU/ml ± 956.441 for goat milk sample. In

2008 the mean TAMC was 1154.13 ± 54 751 CFU/ml for sheep milk samples and 1463.60 ± 415.219 CFU/ml for goat milk samples.

The lowest average TAMC value was obtained in 2009 both for sheep and goat samples (983.08 ± 43.576 CFU/ml and 939,00 ± 43,883 CFU/ml, respectively). In 2010 average values of TAMC reached 939.00 ± 43.883 for sheep samples and 923.67 ± 40.252 for goat milk samples.

In milk samples examined during 2007 coliforms were found in 37 milk samples from sheep milk and in 26 samples of goat milk. In 2010 there was a decrease in non-compliant samples of both sheep milk and goat's milk.

The presence of psychrotrofic bacteria in raw milk (bacteria with high spoilage potential) is an important cause of degradation of milk and milk products thereof. The study demonstrated the existence of numerous phychrotrofic bacteria species with a rich enzymatic equipment sheep and goat milk samples examined;

Between psychrotrophic bacteria species isolated from milk samples were identified species belonging to genera with pathogenic potential (*Acinetobacter, Burkholderia, Aeromonas, Pseudomonas, etc.*) whose presence in milk pose a risk to milk consumers.

Although it was used a complex system of identification (API 20NE) there were strains of bacteria that could not be identified. System identification based on biochemical characteristics of bacteria used in this study is useful but must be completed whenever necessary with complex identification methods based on bacterial genotype assessment in order to identify all bacteria species involved in the degradation of milk and especially potential pathogen.

In section 5.5 are presented the results of investigations concerning human pathogenic bacteria from sheep and goat milk. The prevalence of major bacteria species investigated in sheep and goat milk was consistent with data published by other authors. *Staphylococcus aureus, Listeria monocytogenes and E. coli* were the main potential pathogenic bacteria species identified ă investigated milk samples. All these potentially pathogenic bacteria can be identified as etiologic agents of mastitis under certain conditions.

Data from this study demonstrates once again that people who consume raw milk products are at risk of disease by pathogens existing in raw milk. Based on these findings the study of rawmilk from sheep and goat should be continued in this direction in order to elucidate the epidemiological aspects related to the consumption of raw milk from sheep and goats to implement educational programs to target those consumer most exposed to this risk.