

## **Detection of $\beta$ -Lactams and Tetracyclines Antimicrobial Residues in Raw Dairy Milk for Human Consumption in Palestine**

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*Received: 19 February 2012, Revised: 25 March 2012, Accepted: 4 June 2012*

### **Abstract**

Milk and milk products are among the most important daily consumed foodstuffs. The quality and safety of raw milk for human consumption in developed countries is not adequately monitored. The lack of studies about the antimicrobial residues in milk keeps this vital topic under observation. In this brief study, 34 raw dairy milk samples were tested for detection of antimicrobial residues of  $\beta$ -lactams and tetracyclines above Maximum Residual Limits (MRLs). Rapid screening test, IDEXX Snap test kit was used in this study. Eighteen samples were tested for  $\beta$ -lactams residues, of which 22.2 % (4 of 18) appeared to be above MRLs. Sixteen samples tested for tetracycline of which 18.7 % (3 of 16) were above MRLs. This is the first report that highlights the occurrence of antimicrobial residues marketed raw milk for human consumption in Palestine.

**Keywords:** Antimicrobial residues, raw milk, Palestine, tetracycline,  $\beta$ -lactams

### **Introduction**

Dairy cattle in Palestine are widely distributed and considered as an important component for national food security [1]. As milk and milk products are among the most important foodstuffs and almost consumed daily, the quality and safety of milk and its products are of significant importance to human health. Currently, there are few or inactive Governmental and non-governmental consumer protection agencies and other regulatory agencies in Palestine [1].

Good quality milk must contain no harmful or toxic residues, such as antimicrobial drugs. Antimicrobial drugs are frequently used for treatment of bovine mastitis; it may be used as intramammary formulations or by parental administration. Penicillin and tetracyclines are of the most commonly used antimicrobials for the treatment of mastitis in farm animals [2].

The extensive use of these antimicrobials, insufficient withdrawal period and lack of records are the most common causes of residues in milk above the acceptable Maximum Residue Limits (MRLs) [3]. The lack of good veterinary practice

and illegal use of veterinary drugs by farmers exacerbate the problem [4,5].

The risk of consuming marketed milk containing antimicrobial residues have a great concern in human health implication, which include bacterial resistance, hypersensitivity reactions and gastrointestinal disturbance [6,7]. In addition, these antimicrobials inhibit the activity of starter cultures of dairy products, which affect milk processing [8].

Because of their significant adverse effect on human health and dairy industries, much attention must be paid to milk-producing animals, and more efforts on activating monitoring regulations by laboratories, governmental and consumer protective agencies responsible for ensuring the safety of food for human consumption. Legislation regarding the control of antibiotic residues in animals and animal products must be placed and enforced by these agencies. Laboratory detection of milk antibiotic residues is time-consuming, expensive, and requires complex laboratory equipment and trained personnel. Also, it requires

tedious sample-preparation procedures. Fortunately, screening tests for detection of antimicrobials in milk are widely applicable with excellent specificity and sensitivity, easy to use, short analysis time, good selectivity and low cost.

The extent of this problem in Palestine has not been quantified in the past. As a result, policy makers remain largely unaware of the extent of the problem and no quality assurance programs are in place to prevent sales of food products of animal origin which may contain antimicrobial residues. This preliminary study indicated that milk and milk products marketed for human consumption in Palestine may contain antimicrobials residues above recommended MRLs reported by the Codex Alimentarius Commission [9].

## Materials and methods

### Milk samples

The study was conducted at the Pharmacology Laboratory, Faculty of Veterinary Medicine at An Najah National University, Khadouri-Tulkarm, Palestine. All samples of raw dairy milk were directly collected from the farms in Nablus and Tulkarm cites Northern Palestine during August 2010. All samples appeared grossly normal.

### Sample preparation and analysis

Samples were thoroughly mixed and 450  $\mu$ L milk samples were added to IDEXX kit tube (IDEXX Laboratories Inc., Westbrook, ME) and heated at 45 °C in a heater block as recommended by the manufacturer. Then the content of the tubes was poured into a SNAP device and the device activated and incubated for the specific time according to the kit procedure manual. Test results were obtained by insertion of the SNAP device in SNAPshot® reader.

Test sensitivity for penicillin G is 4 ppt, with cross-reaction with: Ampicillin, Amoxicillin, cloxacillin, dicloxacillin, ticraclin, nafcillin, oxacilline, cephalonium, cefquinone, cephapirin, ceftiofur, cefacetil, cefaperazone, cefalexine, and cefadroxyll.

The SNAP tetracycline test kit detects the following drugs in raw commingled cow milk: tetracycline  $\leq$  50 ppb, chlortetracycline  $\leq$  100 ppb and oxytetracycline  $\leq$  50 ppb.

## Results

The results of the 34 milk samples tested by SNAP screening test are summarized in **Table 1**.

**Table 1** Occurrence of  $\beta$ -lactams and tetracycline residues in raw milk in Palestine.

	Positive	Total	Percentage
$\beta$ -lactams	4	18	22.2 %
Tetracycline	3	16	18.7 %
Total	7	34	20.6 %

## Discussion

Antibacterial residues in milk and milk products are common in many regions in the world especially low income and underdeveloped countries [10-13]. Unfortunately, there are no reports investigating this problem in Palestine to date. The high occurrence of antibacterial residues in milk is related to the lack of quality assurance programs, and the costs of analyses [14]. For example, in Kuwait Alomirah *et al.* reported that the prevalence of antimicrobial residues above the MRL in local fresh milk is high with tetracycline the most predominant residue [13]. In Poland, Rybinska *et al.* reported that 13 - 22 % of raw milk contained antibiotic residues [10]. In Uganda, 13 % of cow's milk contained penicillin G levels above the acceptable levels set forth by the European Union [15].

Results obtained from the present study indicate that the situation in Palestine is not better than those in most of the developed countries, and those authorities, food safety and dairy scientist along with consumer protection agencies must be concerned and much more effort must be made to produce safer wholesome milk and milk products for human consumption. Residues can be avoided by prudent and careful use of antibiotics in food producing animals in the farm by the veterinarian and farmer, and by enforcing governmental regulations, and observing drug withdrawal periods [16].

## Conclusion

The implementation of a national food safety program and performance of periodic and regular surveillance studies to detect residues in dairy products will limit or minimize the risks of marketing contaminated products to the consumers. Results of this study are preliminary because of the small sample size and lack of sufficient funds, but it could be considered as a baseline data indicating perhaps that it is widespread in locally produced raw milk in the Palestine Authority. The Palestinian Authorities food safety agencies and consumer protection agencies are urged to act to more effectively monitor the use and misuse of antimicrobial drugs in dairy animals.

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