



## Short communication

## Results of a pilot antibiotic resistance survey of Albanian poultry farms

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## ABSTRACT

Global dissemination of antibiotic-resistant bacteria in food animals is a major public health concern. Whilst many countries have implemented prudent antibiotic use policies and surveillance systems both in clinical and veterinary settings, there are no such systems in place in Albania and little is known about the levels of antibiotic-resistant bacteria in food animals within the country. A total of 172 poultry samples were taken from six Albanian farms over a 3-month period and were tested for the presence of Enterobacteriaceae. In total, 91 bacterial isolates were obtained and were characterised by species (*Escherichia coli*, *Salmonella* spp. or other Enterobacteriaceae) and by susceptibility to 11 antibiotics. Resistance rates of *E. coli* and *Salmonella* isolates were, respectively: amoxicillin (86%, 64%); chloramphenicol (77%, 82%); ciprofloxacin (93%, 73%); cefotaxime (14%, 0%); gentamicin (12%, 0%); kanamycin (30%, 18%); nalidixic acid (91%, 73%); streptomycin (70%, 55%); sulphonamides (91%, 73%); tetracycline (95%, 73%); and trimethoprim (79%, 64%). Multidrug resistance to at least four antibiotics was observed in 95% of *E. coli* isolates and 82% of *Salmonella*. In conclusion, these data indicate that: (i) *Salmonella* and *E. coli* isolates from Albanian poultry farms exhibit high to extremely high levels of antibiotic resistance; (ii) *Salmonella* and *E. coli* isolates exhibit resistance to multiple antibiotics; and (iii) multidrug resistance profiles among Enterobacteriaceae are geographically widespread. Implementation of prudent antibiotic use policies in food animals and related surveillance will be necessary to reduce the emergence, spread and establishment of highly resistant strains across poultry farms in Albania.

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## 1. Introduction

In response to rising rates of antibiotic resistance among clinical bacterial isolates and data linking antibiotic use to resistance development [1–3], leading public health organisations such as the World Health Organization (WHO), the US Centers for Disease Control and Prevention (CDC) and the Royal Society of Medicine have published recommendations calling for (i) prudent use of antimicrobials, (ii) improved surveillance of antimicrobial use and resistance and (iii) awareness campaigns both for health professionals and the public on the control and risks of antimicrobial resistance [4]. Research has also

highlighted the public health impact of veterinary antibiotic use and the movement of antibiotic-resistant bacteria between animal and human populations [5,6]. Whilst antibiotics are commonly used to treat, prevent and control diseases in food animals as well as to promote growth, adequate data detailing the amount and frequency of antibiotic use in animal husbandry are lacking [7]. Institutions such as the European Food Safety Agency (EFSA), the European Centre for Disease Prevention and Control (ECDC), the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) and the US National Antimicrobial Resistance Monitoring System for Enteric Bacteria (NARMS) have been vital in illuminating the interplay between human and animal populations, antimicrobial use and antimicrobial resistance. The monitoring systems supported by these institutions, however, are primarily focused on Western Europe and North America, obscuring the global picture of antibiotic resistance. Research suggests that the prevalence of antibiotic-resistant bacteria is much higher in other regions [8]. Globalisation of

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the food supply chain and increased global travel means that antibiotic practices and the prevalence of antibiotic-resistant bacteria within these countries will have public health implications well beyond their borders. It is therefore critical to develop a more precise picture of global antibiotic resistance, to identify public health risks and to implement appropriate strategies for control where appropriate.

Albania is located in southeastern Europe and in 2014 it became an official candidate for accession to the European Union (EU). Albania currently lacks surveillance programmes for antibiotic consumption and resistance, thus it is difficult to gauge the potential health impacts of increasing travel and trade. Recent surveys have found poor control and misuse of clinically important antibiotics [9,10]. Agricultural exports are an important economic focus for Albania, but local food safety standards represent a hurdle for export growth [11]. There is little peer-reviewed published material on antibiotic use or levels of antibiotic-resistant bacteria in food animals in this country.

In this paper, we report the results of a short-term pilot surveillance study initiated as part of a joint WHO–World Organization for Animal Health (OIE) project on 'National Human and Animal Health Systems Assessment Tools and Bridges' to gain a preliminary understanding of bacterial resistance levels in food animals in Albania. This pilot survey looked at antibiotic resistance levels in Enterobacteriaceae, with a focus on *Salmonella* and *Escherichia coli*, isolated from six poultry farms over a 3-month period. To put these results in context, they were compared with the antimicrobial resistance levels in poultry reported by EFSA for the EU. We hope the results of this pilot survey will call attention to the antibiotic-related policies in Albania and support the long-term implementation of robust surveillance and prudent use programmes.

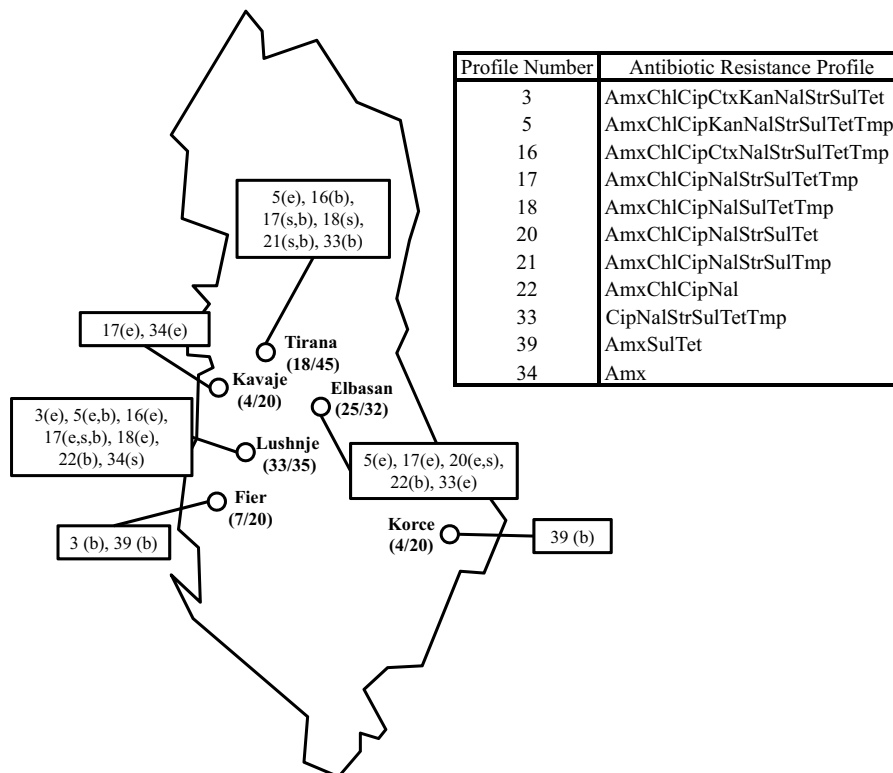
## 2. Materials and methods

### 2.1. Bacterial isolates

All isolates included in this study were obtained as part of a field survey examining levels of antibiotic resistance in Albanian poultry farms. Isolates included in this study were cultured from 172 poultry samples of the neck skin, stomach, intestines, stomach and cloacal swabs from slaughtered poultry. Samples were collected from six Albanian farms during three visits to each farm from December 2013 to early February 2014 (Fig. 1). Samples were processed using ISO 6579:2002 'Microbiology of food and animal feeding stuffs – horizontal method for the detection of *Salmonella* spp.' Subsequently, all colonies, including those that were not *Salmonella*-like on selective media, were characterised biochemically using API 20E (bioMérieux, Durham, NC). For the purposes of this study, isolates were classified as *E. coli*, *Salmonella* spp. or 'other Enterobacteriaceae' (e.g. *Klebsiella* spp., *Citrobacter* spp., etc.). All *Salmonella* spp. were serotyped. A total of 91 bacterial isolates were cultured from the 172 samples, including 3 samples that yielded 2 isolates each. There were 84 negative samples.

### 2.2. Antibiotic resistance profiles

All isolates were characterised for susceptibility to 11 antibiotics, including amoxicillin, chloramphenicol, ciprofloxacin, cefotaxime, gentamicin, kanamycin, nalidixic acid, streptomycin, sulphonamides, tetracycline and trimethoprim, using MIC Test strips (Liofilchem Diagnostics, Roseto degli Abruzzi, Italy). Interpretation was based on epidemiological cut-off values (ECOFFs) from the European Committee on Antimicrobial Susceptibility Testing (EUCAST) [12]. *Salmonella* ECOFFs for kanamycin



**Fig. 1.** Distribution of antibiotic resistance profiles across Albanian poultry farms. Farm location followed by (number of bacterial isolates/total number of samples taken). For each farm, a box contains the profile number and the letters in parenthesis indicate isolate types with the profile: e, *Escherichia coli*; s, *Salmonella* spp.; b, Enterobacteriaceae. Amx, amoxicillin; Chl, chloramphenicol; Cip, ciprofloxacin; Ctx, cefotaxime; Gen, gentamicin; Kan, kanamycin; Nal, nalidixic acid; Str, streptomycin; Sul, sulphonamides; Tet, tetracycline; Tmp, trimethoprim.

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