Euro Analytica 2020: CV for GC-MS A Hands on Approach Application Process in Nigiria - Pascal - National Centre of Food Technology/Biochemistry Laboratory

Abstract

Brief introduction:

Mr. Pascal is a qualified professional Analytical Chemist with over 7 years professional experience in the field of Laboratory Quality Management, Laboratory auditing /assessment and Analytical Chemistry. I'm a trained trainer of ISO /IEC 17025 and Practical Laboratory analytical skills.
I'm currently heading the Biochemistry Laboratory of National Centre of Food Technology. I played a key role in the initiation, designing, and implementation of Laboratory Quality management system based on ISO/IEC 17025:2005.
I have trained many Laboratory practitioners in Burundi in ISO 17025:2005 and Laboratory Analytical Quality Assurance and he is a focal point and contact person for training in Analytical Laboratory Quality Assurance in Burundi. I'm also very proficient in the guidance of developing Standards.

I'm very proficient in developing Quality Management and Analytical Quality Assurance systems based on ISO/IEC 17025:2005, ISO 9001/ISO 2200 leading to accreditation and ISO 9001/ ISO 2200 leading to Certification.

I'm specialized in the analysis of food and non-food products for contaminants such as heavy metals, pesticide residues, environmental contaminants, mycotoxins, antibiotics, organic pollutants (PAHs, PCBs etc.) using sophisticated instruments such as GC, GC-MS/MS, GC-MS, HPLC, AAS, UV/VIS spectrophotometer, flame photometer, Ion chromatograph etc. while carrying out research of new Burundi products on market for National Centre of Food Technology.The use of veterinary drugs in livestock production is inevitable as they are essential for treatment of diseases (therapeutic), prevention of diseases (prophylaxis), modification of physiological functions (such as tranquilizers, anesthetic drugs), improvement of growth and productivity (growth promoters) as well as for ensuring food safety [1]. The veterinary drugs are used throughout the world and they comprise a broad variety of classes of chemical compounds including vaccines, antimicrobials, antiparasitics and β-agonists [2]. These drugs have been used to strengthen profitability and productivity of modern food-animal production by facilitating earlier weaning, higher animal densities, carcass yield and meat quality as well as the use of cheaper feed sources [2]. Among the antimicrobials that are commonly used in livestock production are applied at low concentrations without causing host damage [5]. In the course of this study, "antimicrobial" will be considered an equivalent term to "antibiotic". Many antimicrobials that are used in livestock are identical or closely related to antimicrobials used in humans. Most of the antimicrobials use in livestock can lead to development of antimicrobial-resistant bacteria in

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Application of veterinary drugs in livestock production is inevitable as they are essential for treatment of diseases, prevention of diseases, modification of physiological functions, improvement of growth and productivity as well as for ensuring food safety. However, recent reports have revealed that the use of veterinary drugs in large amounts and consistently could result in deposition of antimicrobial residues in muscle and organs of animal. Consumption of these residues in animal products may pose health risk to consumers including development of antibiotic resistance bacteria, allergy, reproductive disorder and hypersensitivity reaction. It is in line with this that this chapter seeks to examine the cause, occurrence, mode of detection, health implication and possible solution to veterinary drugs residues in meat and meat products.

Keywords

The use of veterinary drugs in livestock production is inevitable as they are essential for treatment of diseases (therapeutic), prevention of diseases (prophylaxis), modification of physiological functions (such as tranquilizers, anesthetic drugs), improvement of growth and productivity (growth promoters) as well as for ensuring food safety. However, recent reports have revealed that the use of veterinary drugs in large amounts and consistently could result in deposition of antimicrobial residues in muscle food, which can then be transmitted to humans via food and other transmission routes [1].

At present the global average annual consumption of antimicrobials per kilogram of animal produced is estimated at >100 mg/kg [6]. It has also been showed that about 80% of all the antibiotics administered in veterinary field are used as growth promoters and in most cases, this exceeds the total antibiotics use for human medical care [6]. In a study, Aarestrup [7] observed that global consumption of antibiotic in animals is twice that of humans. In fact, in developed countries like USA, Food and Drug Administration [8] reported that about 80% of counties total antimicrobial consumption are used in food animals. On estimate, Van Boeckel et al. [9] found that about 45, 148 and 172 mg/kg of antimicrobial per animal are used annually for cattle, chicken and pig production globally, respectively. It has been predicted that global consumption of antimicrobial by livestock will increase 67% from 63,151 tons in 2010 to 105,596 tons by 2030 [9].

However, recent reports have revealed that the use of antimicrobial drugs in large amounts and consistently could result in deposition of antimicrobial residues in muscle and organs of animal [10]. Consumption of these residues in animal products (especially through meat and meat products) may cause health risk to consumers including development of antibiotic resistance and hypersensitivity reaction. FAO/WHO reported that antimicrobial residues edible animal products has grown beyond permissible level (very high) is in developing countries [11]. In order to curtail this, the European legislation has set maximum residue limits for veterinary drug residues in different animal food products (European Commission Council Regulation (EEC), [12]). Nisha [13] highlighted that the maximum veterinary residue limits for tetracycline, oxytetracycline, streptomycin, gentamicin, sulphonamides, quinolones, among others, to be 100, 100, 200, 200, 100 and 75 μg/kg respectively. It is therefore imperative that animal products (particularly meat and milk) should be analyzed to ensure that residues do not exceed maximum residue limits. Since unintentional consumption of antimicrobial residues in food products leads to drug resistance of bacteria that are pathogenic to humans with consequence of serious threat to human health [14]. It is in line with this that this chapter will focus on recent findings on causes, occurrences, mode of detections, health implication and possible solution to veterinary drugs residues in meat and meat products.

food safety [1]. The veterinary drugs are used throughout the world and they comprise a broad variety of classes of chemical compounds including vaccines, antimicrobials, antiparasitics and β-agonists [2]. These drugs have been used to strengthen profitability and productivity of modern food-animal production by facilitating earlier weaning, higher animal densities, carcass yield and meat quality as well as the use of cheaper feed sources [2]. Among the antimicrobials that are commonly used in livestock production are tetracyclines, amprolium, penicillin, streptomycin, sulphonamides, tylosin, aminoglycosides, β-lactams, macrolides and lincosamides, quinolones, sulfonamides and tetracyclines [3, 4] while that of antiparasitic agents include anthelmintics or coccidiostats, stilbenes, amphenicols, nitrofurans, nitroimidazoles, carbamates, pyrethroids and sedatives.

Antimicrobials are medicine (natural, synthetic or semi-synthetic origin) that inhibits the growth of or destroys microorganisms when applied at low concentrations without causing host damage [5]. In the course of this study, "antimicrobial" will be considered an equivalent term to "antibiotic". Many antimicrobials that are used in livestock are identical or closely related to antimicrobials used in humans. Most of the antimicrobials use in livestock can lead to development of antimicrobial-resistant bacteria in muscle food, which can then be transmitted to humans via food and other transmission routes [1].

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2.1 Outbreak of livestock diseases

Livestock production is one of the fastest growing agricultural sectors in most countries of the world. However, the health and growth of this livestock are plagued by many diseases caused by different infectious microorganisms globally. The past decade has seen the rise of many new diseases, with more of new potential pathogens anticipated to occur by 2020 [15, 16]. The outbreak of infectious microorganisms has necessitated widespread use of antimicrobial drugs to protect and maintain the health of the animal during production and also ensure safe food after harvest. Since animals that are sick and untreated grow more slowly and may eventually results in mortality, imposing a considerable economic burden on producers and government by dramatically reducing income and means of livelihood to farm owner and workers [17]. In treatment and prevention of these diseases, FAD [18] observed in a study that 60% of domestic sales and distribution of medically important antimicrobials in year 2016 were used in food-producing animals in in United States. Of this estimate, the same author reported that Tetracyclines accounted for 70% of these sales, penicillins for 10%, macrolides for 7%, sulfas for 4%, aminoglycosides for 4%,

2.2 Excessive demand for meat and meat products

Meat represents a substantial portion of the diet of most people worldwide. Its consumption has significant health benefits as good source of proteins, essential amino and fatty acids, vitamins and minerals and other bioactive compounds [22]. The worldwide average meat consumption is estimated at 42.9 kg per capita, with industrial countries consuming about 76.1 kg, twice the quantity in developing countries (33.6 kg) [23, 24]. However, it has been indicated that the consumption of meat and meat products will double by 2050. Meat consumption will continue to expand due to increase in population growth across the world, with the developing world having most demand growth over the coming decades [25]. In an attempt to produce sufficient meat to meet this demand, lincosamides for 2%, and cephalosporins and fluoroquinolones each for less than 1%. Often time, the amount of antimicrobial use in livestock depends on the number of animals, the production system, prevailing risk factors for disease and ability to acquire antimicrobial agents income [17]. However, misuse or excessive use of antimicrobials among livestock and in adherent to withdrawer time has resulted to spread of antimicrobial residues (either the parent compound or its metabolite) in muscles especially meat and meat products [19, 20].

The occurrence of antimicrobial residues in muscle food pose a risk to human health by being acutely or cumulatively allergenic, organotoxic, mutagenic, teratogenic or carcinogenic [11]. In fact, report has shown that antimicrobial resistant bacteria can represent a reservoir of resistance genes transferable to pathogenic or commensal bacteria in digestive tract [21], and therefore compromise the effective treatment of bacterial infections. This could be a serious threat to disease treatment in humans and animals. Therefore, it is imperative that precise antimicrobial drugs be used in livestock production for overall decrease in animals suffering due to infectious diseases.

antimicrobials are being increasingly used for the treatment of livestock diseases and increase productivity (growth promoters). Currently, more than 300 antimicrobials, anti-coccidials, feed additives and hormone-type agents are used in livestock production globally [26, 27, 28].

According to OECD/FAO [25] statistic, about 323 metric tons of meat was produced globally in 2017 and this has been projected to be 15% higher in 2027. Most of this increase in the next decade will emanate due to higher demand in beef and sheep meat than poultry and pig meat [25]. It has also been reported that much of the increase in production will originate from United States, India, Argentina, Mexico, China, Turkey and the Russian Federation. Report has showed that the increase in antimicrobial consumption is due to the growing number of animals raised for food production coupled

with increase in consumer demand for livestock products including meant and meat products [9]. On average, worldwide consumption of antimicrobials in food animal production was estimated at 63,151 (±1560) tons in 2010 and by 2030, it has been projected to increase by 67%, to 105,596 (±3605) tons or even double in countries such Brazil, India, Russia, South Africa and China [9]. In Asia for instance, antimicrobial consumption in chicken and pig production has been projected to grow by 129% and 124%, respectively, by 2030 [9]. Antimicrobial resistant strains have been isolated in food animals in both the developed and developing countries especially where the use of antimicrobials for growth promotion remains largely unregulated . Skockova et al. in their study found that some strains of Escherichia coli isolated from retail meats (pork, poultry, beef, venison) were resistant to one or more groups of antimicrobial agents (tetracycline, b-lactams and quinolones) [29]. In addition, Moniri and Dastehgoli isolated a fluoroquinolone-resistant Escherichia coli from broilers due to their exposure to fluoroquinolones drugs. Because of use of antimicrobial drugs in livestock production, bacteria originating from food animals frequently carry a resistance to a range of antimicrobial agents, including those commonly used in humans.

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