ISSN: 2640-1223

Journal of Veterinary Medicine and Animal Sciences

Open Access | Research Article

Monitoring of the Use of Veterinary Medicines Containing Antibiotics in Côte d'Ivoire in 2013

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Received: Jul 16, 2020

Accepted: Aug 28, 2020

Published Online: Sep 03, 2020

Journal: Journal of Veterinary Medicine and Animal Sciences

Publisher: MedDocs Publishers LLC

Online edition: http://meddocsonline.org/

Keywords: Antibiotic; Antimicrobial; Active ingredient; Species; Côte d'Ivoire

Abstract

Background and purpose: The intensive use of antibiotics in veterinary medicine has two major consequences, namely antimicrobial resistance and the presence of residues of active molecules in animal products. In the frame of the fight against antimicrobial resistance, the surveillance plan of antibiotics sales is one of the important sources of information used for risk assessment and risk management. The quantitative monitoring of antibiotic consumption is a tool that gives a macroscopic view of the use of antibiotics for livestock animals and pets. This study aimed to examine the antibiotic medicines used in Côte en d´Ivoire in 2013.

Methods: This study is based on the analysis of definitive import authorizations of veterinary drugs for wholesalers in Côte d'Ivoire in 2013. Quantities, routes of administration, active ingredients, families, target species and country of origin were recorded in a database. Calculations were then made following the protocol described by Moulin and Roux [1] in order to obtain the imported quantity into weight quantity of active substance and put it in rapport with the biomass of animals that can be treated with antibiotics. For some active ingredients expressed in IU, a conversion coefficient (WHO standard value) was used.

Results: The investigations conducted nearby these authorized importers revealed that 47886692.3 grams (over 47 tonnes) of antibiotic active ingredient were sold in Côte d'Ivoire in 2013. This market is, however, heavily dominated by four families (Tetracyclines, Sulfamides, Beta-lactams, Macrolides) which represent 87.1772% of the total amount of antibiotics sold. Sulfonamides and Tetracyclines represent more than the half (60.599%). Consumable animals re-

Cite this article: Kaba S, Konan BA, Atto V, Datte JY. Monitoring of the Use of Veterinary Medicines Containing Antibiotics in Côte d'Ivoire in 2013. J Vet Med Animal Sci. 2020; 3(1): 1033.

ceived 84.64% antibiotics compared to 0.24 for pets and 15.11 for consumable animals and pets. Considering the total quantity of antibiotics used in 2013, which was 47 886 692.3 g and the mass of treated animals (450 485 905 kg), the quantity of active substance referred to the animal population mass was estimated at 106.30 mg / kg body weight.

Conclusion: These investigations show that various antibiotic molecules were used in veterinary medicine in Côte d'Ivoire in 2013. These veterinary products are supplied by 8 countries. France, Belgium and the Netherlands represented the main suppliers. Sulfonamides with Tetracyclines and Beta-lactams have been the most used families. Most of the antibiotics were used for the treatment of animals intended for human consumption.

Introduction

The Ivorian veterinary drug market is a very lucrative market estimated at 3 390 304 Euros in 2008 [2]. Among veterinary drugs, antibiotics are the second therapeutic class the most used with an income of 906 058.32 Euros in 2008 [2]. The use of antibiotics in breedings permited a significant increase in the availability of animal protein. Veterinary products containing antibacterial are used in animals with different objectives [3]. Moreover, the use of antibiotics can cause an accumulation of residues in food and the selection of bacterial resistance that can disseminate themselves in the environment or the food chain, causing a serious problem of public health. Indeed, the intensive use of antibiotics in human and veterinary medicine has two major consequences namely antimicrobial resistance and the presence of residues of active molecules in animal products [4]. The monitoring of sales of antibiotics is one of the important sources of information used for the evaluation and risk management on Antibiotic Resistance. The quantitative monitoring of antibiotic consumption is a tool that provides a macroscopic view of the use of antibiotics for the livestock animals and pets. This monitoring should be finalized by inquiries in breeding or from veterinarians allowing to better understand the modalities of usage and factors that can influence their consumptions [5].

Our study aims at monitoring the consumption of antibiotics with veterinary usage in Cote d'Ivoire in 2013 in order to contribute to the implementation of a program of surveillance of antibiotics used.

Methods

Method of survey

This study is focused on the analysis of the definitive authorizations of importations of veterinary medicines for wholeselers in Cote d'Ivoire. Sales data were collected from these authorized importers for all medicines containing antibiotics and sulfonamides. For each presentation, quantities, routes of administration, the active ingredients, the families, the target species and the supplier countries have been recorded in a database. The analysis was focused on all authorizations of the year 2013.

Calculation of various quantities of veterinary antibiotics and biomass of treated animals

Calculations were then made following the protocol described by Moulin and Roux [1] in order to obtain the sold quantity into weight quantity of active substance and put it in rapport with the biomass of animals that can be treated by antibiotics. For some actives molecules expressed in IU, a conversion coefficient (WHO standard value) was used (Table 1). The ciphers were then gathered by active molecule and by family of antibiotics. The animals receiving these antibiotics were divided into "consumable animals" and "pets". The administration routes were subdivided into oral, parenteral and external route

In the frame of this study, two of the different indicators developed by the experts to better evaluate the use of antibiotics in animals are applied. Those are:

- The results are expressed in weight quantity of active material (Wacti = Weight of Active Ingredient) (unit: tones of antibiotics). It is the indicator for monitoring commercialization of antibiotics. It is used in many countries. It permits to monitor the evolution of sales in time. However, it does not actually reflects the use of antibiotics since neither the differences of posology and duration of treatment ,nor the evolution of animal population are taken into account.

- The results expressed in quantity of active ingredient related to the mass of animal population (Wacti / WAP = Weight of Animal Population) (unit: mg / kg b.w.). This indicator corrects Wacti with the consideration of the animal population that is potentially consumer of antibiotics. But, the dosage and duration of treatment are excluded once again.

Data analysis

The results were analyzed using Excel software (Microsoft, USA).

Results

Sales distribution by families of antibiotics

Investigations with these approved importers have revealed that in Côte d'Ivoire, 47 886 692.3 grams (over 47 tonnes) of antibiotic substances were sold in 2013. They also showed that only ten (10) families of antibiotics are distributed in Côte d'Ivoire (Table 2). This market is, however, widely dominated by four families (tetracyclines, sulfonamides, beta-lactams, macrolides). Those four families have represented 87.1772 % of veterinary antibiotics that were sold. Sulfonamides and tetracyclines represented more than the half (60.599 % of sales). The molecules belonging to the most recent families of antibiotics with the tonnages relatively low were bit sold (cephalosporins, 0.0001315 %).

Sales distribution by active principles

Thirty two (32) active molecules were identified. Six (6) of those active molecules namely Sulfadiamidine (21.40 %), sulfadiazine (15.65 %), Amoxyline (14.57 %), oxytetracycline (13.82 %), tylosin (8.53 %) and Doxycycline (6.62 %) represented 80.59 % of total antibiotics quantity sold (Table 3).

Sales distribution by animal groups

It is difficult to give values per animal species because the same drug may be intended to several species. Nevertheless, it is easier to gather these veterinary drugs according to three (3) animal categories: Pets, consumable animals and mixed animals. Following this categorization, sales are mainly oriented to treatment of consumable animals (Table 4). Consumable animals received 40 554 106.982 g of antibiotic substances compared to 116 639.039 g for pets and 7 134 167.169 g for mixed animals. These values correspond respectively to 84.64 %, 0.24% and 15.11 % of the veterinary antibiotics sales in Côte d'Ivoire.

Sales distribution by administration routes

Four administration routes were identified (Table 5). The main route of administration was oral with a quantity of 39 686 352.243 mg (76.58 % of drugs sold) followed by the parenteral route with a quantity of 6 803 292.763 mg or 14.20 %. These two routes represented 90.78 % of administration routes of veterinary antibiotics sold in Côte d'Ivoire. Beside these major routes, there were the oral/parenteral and external route respectively representing 1 253 073.850 mg with a percentage estimated to 2.61674 % and 162 195,007 with a percentage estimated to 0.3387 % of sales respectively.

Sales distribution by provider countries

Veterinary antibiotics drugs used in Côte d'Ivoire were not locally produced. They were imported from abroad. According to investigations carried out nearby authorized importers, these veterinary drugs did not come from Africa, they were rather imported from Europe and Asia (Table 6). Eight (08) countries were concerned by these importations of veterinary antibiotics. However, by taking account the imported quantities, these countries could be grouped into three (03) categories: main suppliers, intermediate suppliers and small suppliers. Thus, the first group of the main supplier countries, was formed by France (17 472 265.71 g), Belgium (11 139 951.59 g) and the Netherlands (8 346 439 894 g) with respective importation rates of 36.486 % 23.263 % and 17.429 %. The second group, the intermediate suppliers consisted of Jordan with 5 085 405.37 g of antibiotic medicines (10.619 % of imports), China with 4 176 390.832 g (8.721 % of imports) and Spain with 1 341 188.88 g (2.80 % of imports). Finally, India (169 250 g) and Vietnam (155 800 g) were smaller suppliers (third group). The rates of antibiotic products imported from these two countries were respectively estimated to 0.353 % and 0.325 %.

Table 1: Correspondence of quantity of active substances in gram and in IU.

Active substances	Quantities	
	mg	IU
Spiramicyne	1	3 200
Polymixyn B	1	8 403
Colistin	1	20 500
Colestine méthene sulfonate sodique	1	12 700
Erythromycin	1	920
Gentamicin	1	620
Néomycin	1	755
Bacitracin	1	74
Tylosin	1	1 000
Chortetracycline	1	1 000
Etracycline	1	900
Peniciline	1	1 670
Oxytetracycline	1	900

Table 2: Breakdown of sales by family of antibiotics.

Antibiotic families	Quantity (g)	Quantity (%)
Beta-lactam	7 556 260.71	15.7794
Tetracycline	9 890 408.3	20.6537
Cephalosporin	63	0.00013156
Aminoside	1 266 417.86	2.6446
Phénicole	0,0285	5.95e^{-08}
Macrolide	5 171 450.86	10.799
Polypeptides	1 234 166.89	2.57726
Quinolones	3 136 660	6.55017
Trimethoprims	502 656.912	1.049679
Sulfa drug	19 128 607.7	39.9455
Total	47 886 692.26	100

Table 3: Breakdown of sales by family of antibiotics.

Actives molecules	Quantity (g)	Quantity (%)
Sulfaquinoxaline	982 190	2.05107
Sulfamethoxazole	1 920	0.004009
Sulfanilamide	50 400	0.105248
Sulfadimethoxine	298 982.1	0.62435
Sulfamethoxypyridazine	51 387	0.107309
Sulfadimidin	10 247 812.17	21.4001
Sulfadiazine	7 495 916.44	15.65344
Cefalexine	63	0.0001315
Tiamphenicol	0.0285	5.95e^{-08}
Dihydrostreptomycin	1 211 798.54	2.5355
Neomycin	23 830.889	0.049765
Gentamycin	30 788.432	0.06429
Penicillin G	569 630.707	1.18953
Ampicillin	7 800	0.016288
Amoxylline	6 978 820	14.5736
Acclavulamique	10	0.00002088
Trimethoprim	502 656.912	1.049679
Fluméquin	1 146 970	2.365174
Enrofloxacin	1 710 330	3.571618
Marbofloxacin	960	0.0020047
Norfloxacin	278 400	0.58137
Colistin	1 234 166.846	2.57726478
Polymyxin B	0.039	8.144e^{-08}
Tiamulin	168 178	0.3511
Lyncomycine	204 984	0.42806
Tylosin	4 085 002	8.53055
Spiramycin	68 679.5	0.14342
Erithromycine	644 607.364	1.346109
Oxytetracycline	6 618 895.33	13.82199
Tetracycline	45.172	0.00009434
Doxycycline	3 174 566	6.629328
Chlortetracycline	96 901.8	0.202356
Total	47 886 692.27	100

Table 4: Sales breakdown of active molecules by animal category.

Active molecules	Quantities sold (g)		
	Consumable animals	Pets	mixed
Sulfaquinoxaline	982 190	0	0
Sulfamethoxazole	0	0	1 920
Sulfanilamide	0	0	50 400
Sulfadimethoxine	317 204.02	0	0
Sulfamethoxypyridazine	30 360	12 312	8 715
Sulfadimidin	8 560 861.5	0	1 686 950
Sulfadiazine	6 678 436.44	0	817 480
Cefalexine	0	63	0
Tiamphenicol	0	0	0.0285
Dihydrostreptomycin	168 828.09	0	1 042 970.45
Neomycin	23 817.75	0	13.139
Gentamycin	28 130	0	2 658.432
Penicillin G	31 378.995	0	538 251.712
Ampicillin	0	0	7 800
Amoxylline	6 973 200	40	5 580
Acclavulamique	0	10	0
Trimethoprim	388 299.512	2 448	11 909.4
Fluméquin	1 146 970	0	0
Enrofloxacin	1 529 370	0	180 960
Marbofloxacin	0	960	0
Norfloxacin	278 400	0	0
Colistin	1 226 276.639	0	7 890.207
Polymyxin B	0	0.039	0
Tiamulin	168 178	0	0
Lyncomycine	204 984	0	0
Tylosin	2 375 420	0	1 709 582
Spiramycin	55 624.5	0	13 055
Erithromycine	644 607.364	0	0
Oxytetracycline	5 768 565	0	850 330
Tetracycline	45.172	0	0
Doxycycline	2 972 960	100 806	100 800
Chlortetracycline	0	0	96 901.8
Total	40 554 106.982	116 639.039	7 134 167.169

Table 5: Distribution of sales of active antibiotic molecules by administration route.

Actives molecules	Quantities sold by Administration Route (g)			
	oral	Parentéral	Oral/parentéral	External
Sulfaquinoxaline	982 190	0	0	0
Sulfamethoxazole	0	1 920	0	0
Sulfanilamide	0	0	0	50 400
Sulfadimethoxine	312 349.82	4 854.2	0	0
Sulfamethoxypyridazine	21 027	30 360	0	0
Sulfadimidin	8 177 417.773	1 100 030.4	970 364	0
Sulfadiazine	7 226 636.44	0	269 280	0
Cefalexine	63	0	0	0

Tiamphenicol	0	0	0	0.0285
Dihydrostreptomycin	121 643.04	1 088 955.5	1 200	0
Neomycin	23 817.75	0	0	13.139
Gentamycin	30 452.432	336	0	0
Penicillin G	0	569 055.857	574.85	0
Ampicillin	0	7 800	0	0
Amoxylline	6 971 140	7 680	0	0
Acclavulamique	10	0	0	0
Trimethoprim	495 150.512	7 506.4	0	0
Fluméquin	1 146 970	0	0	0
Enrofloxacin	1 528 890	181 440	0	0
Marbofloxacin	960	0	0	0
Norfloxacin	278 400	0	0	0
Colistin	1 145 404.94	88 761.906	0	0
Polymyxin B	0	0	0	0.039
Tiamulin	168 178	0	0	0
Lyncomycine	204 984	0	0	0
Tylosin	2 295 200	1 789 802	0	0
Spiramycin	44 837	12 187.5	11 655	0
Erithromycine	644 607.364	0	0	0
Oxytetracycline	4 691 412	1 912 603	0	14 880
Tetracycline	45,172	0	0	0
Doxycycline	3 174 566	0	0	0
Chlortetracycline	0	0	0	96 901.8
Total	39 686 352.243	6 803 292.763	1 253 073.85	162 195.007
Rate (%)	76.5828	14.1969	2.61674	0.3387

Table 6: Quantities of veterinary antibiotics by supplier country.

Suppliers countries	Quantities provided (g)
France	17 472 265.71
Belgium	11 139 951.59
Netherlands	8 346 439.894
Jordan	5 085 405.37
China	4 176 390.832
Spain	1 341 188.88
India	169 250
Vietnam	155 800

Body mass of animals consuming antibiotics

This indicator corrects the weight quantity of active material (Wacti) only with the consideration of animal population potentially consumer of antibiotics. It permits to calculate the quantity of active material relative to the mass of animal population (Wacti/WAP = Weight of Animal Population). This ratio is expressed as mg/kg b.w. Thus, considering the total quantity of antibiotics used in 2013 which was 47 886 692.3 g and the mass of treated animals (450 485 905 kg), the quantity of active material relative to the animal population mass was estimated at 106.30 mg/kg b.w. (Table 7).

Table 7: Quantities of veterinary antibiotics by supplier country.

Species	Numbers	Body weight (kg)	Total Weight (kg)
Cattle	1 585 585	190	301 261 150
Sheep	1 725 207	25	43 130 175
goats	1 378 941	15	20 684 115
Traditional pigs	281 826	38	10 709 388
Modern pigs	80 867	80	6 469 360
Traditional poultry	25 542 317	1	25 542 317
Modern poultry	32 838 000	1.3	42 689 400
Total	-	-	450 485 905

Discussion

In Côte d'Ivoire, 47 886 692.3 g (about 48 tonnes) of antibiotics were sold in 2013. Whereas for the year 2006, the Public Health Agency of Canada has estimated, through data that were provided to him by the Canadian Animal Health Institute, that 1 760 tonnes of active molecules were used in Canada to treat both farm animals and pets (especially cats and dogs) [6]. In the United States, it was revealed that 13 100 tonnes of antimicrobial agents were sold for veterinary usage in 2009 and 13 241 tonnes of antibiotics in 2010 [7]. In France, in 2002, the quantity of antibiotics used in veterinary medicine was 1 295 tonnes for the year 2002 and 782 tonnes in 2012 [8,9]. In Denmark, however, the quantity of veterinary antimicrobial agents increased from 93 tonnes in 2001 to almost 127 tonnes in 2010 [10]. In Norway, the quantity of antimicrobial agents used in veterinary medicine was around 6 tonnes in 2009 (excluding fish farming uses) [11]. This low quantity could be explained by the fact that in Côte d'Ivoire a policy of development of plant production was made by decision makers since colonization to the detriment of animal production. It could also, be compared to European countries, Canada and the United States are justified by the high numbers of animal populations in these countries, compared to Côte d'Ivoire.

This study showed that, in Côte d'Ivoire, the quantity of active ingredients in mg per kg of live weight is 106.30 for livestock species. This quantity, although lower than that obtained by Khalen-Wouembe in 2013 in western Cameroon (726.40 mg/kg live weight) [12] and Dosso in 2014 in east of the cote d'Ivoire, in Agnibilekro, in poultry farms (912.52 mg/kg live weight) [13], does not reflect the reality for several reasons: first, we did not take into account the quantities of antibiotics incorporated in imported medicated food and the quantity of antibiotics from the parallel market. it should also be mentioned that, compared to Dosso's work in 2014, this work was achieved for all animal species and at the national level whereas t Dosso's work was achieved on the poultry sector and in the department of Agnibilekro. Finally, it should be noted that the data used to calculate the biomass come from the estimation of the animal population based on data from the last census (2002), which dates before the socio-political crisis that the country has experienced. The European average of veterinary antibiotic consumption is 103 mg/kg of biomass in 2009 and 111.1 mg/kg of biomass in 2011 [14]. It has decreased by 8.3 % since 2005. In comparison, in human medicine the consumption of antibiotics has decreased by 7.5 % between 2005 and 2009 [15]. In France, it was sold in 1999, 76.8 mg of antibiotics per kilogram of animals against 63.9 mg/kg in 2010 (with significant disparities among species). Expressed in tonnage of active molecules sold and in quantity of antibiotics sold per kg of produced animals, sales of antibiotics in veterinary medicine decreased between 1999 and 2010 [16]. This massive use could cause some risks of public health because antibiotics are in fact the only group of drugs that, when administered to a few individuals, can have an impact on whole populations [17]. The risk of developing resistance will be even greater that the usage will be frequent (continuous or repeated) and extended to a large proportion of a herd [18]. The correlation between antibiotic consumption and the evolution of resistant bacterial strains was also revealed in a study by Schentag et al. in (1998) [19]. Another study was achieved in hospitals in the United States. This study showed an increase at the level of *Staphylococci* initially resistant to methicillin become resistant to vancomycin after an increased consumption of this antibiotic. These observations were also made on the evolution of resistance to imipenem *Klebsiella* initially resistant to cephalosporins according to the quantity of this antibiotic consumed [20]. Indeed, the frequencies of apparition of resistance and multiresistance are often the most conditioned by an increased use of antibiotics. The pressure of these molecules on the bacterial flora seems to be at the origin of the emergence of bacterial resistance [21-23]. From this atmosphere, the first concern is that the increased and inappropriated consumption of antibiotics leads to a decline in the effectiveness of antibiotics. There is a paradox, the more the antibiotics are used, the more they lose their effectiveness [24]. Risks of accumulation of antibiotic residues are also to be treated with attention because studies showed the presence of residues in products derived from these animals, especially when the deadlines of waiting and therapeutic doses are not respected by users [25,26]. This study showed that in Côte d'Ivoire, four families of antibiotics (Tetracyclines, Sulfamides, Beta-lactams, Macrolides) represent 87.1772 % of the total quantity of antibiotics sold. Sulfonamides and Tetracyclines represent more than the half (60.599 %) and the main family is sulfonamides (39.94 %). We can ascertain from these ciphers that the molecules belonging to the most recent families of antibiotics relatively represent low tonnages (cephalosporins: 0.0001315 %). In France, 80 % of the tonnage sold is represented by four families of molecules. The main family used in the veterinary world remains tetracyclines (41 % of tonnages sold). Then come the sulfonamides, penicillins and macrolides. The very important antibiotics - fluoroquinolones and C3G / C4G - represent 0.9 % of tonnage sales. Thus, the oldest families of molecules are still predominantly used [16,27]. The main family of antibiotics in Côte d'Ivoire is the family of sulfonamides whereas in France the main remains tetracyclines. This difference could be justified by the massive use of sulphonamides by breeders in the treatment of coccidiosis in the swine and poultry sector.

The results of this study have also shown that in Côte d'Ivoire, antibiotics used in animals intended for human consumption represent the major sales of antibiotics (84.64 %) followed by antibiotics administered for both consumable and pets animals (15.10 %) and for pets (0.24 %). In France, from 1999 to 2002, approximately 92.3 % of tonnage of antibiotics sold is intended for animals whose products are intended for human consumption (consumable animals), 1.18 % is intended for pets and 6, 54 % are administered for both consumable animals and pets on the Marketing Authorization basis [1, 16]. In 2010, this dispatching of sales was expressed by species. Thus 44 % of the tonnage of antibiotics sold is intended for pigs, 20% for poultry, 18 % for cattle, 7.88 % for rabbits, 6.7 % for small ruminants, 1.16% for horses, 1.72 % to domestic animals and 0.28 % for fish [5]. Regarding the repartition by route of administration, the results of this study showed that the main route of administration is the oral route (76.58 %), followed by the parenteral route (14.19 %), the oral route as well as the parenteral and the external route (0.33 %). In France, in 2002, 86.8 % of sales of antibiotics were made for oral presentations whereas 11.9 % and 1.3 % of treatments were respectively administered by the parenteral and external routes. The main route of administration is the oral route in exception of aminoglycoside antibiotics, beta-lactam antibiotics and phenicoles whose favourite route of administration is the parenteral route [1, 16]. In 2010, the main route of administration is oral, in exception of Aminoglycosides of 3rd and 4th generation Cephalosporins, Penicillins and Phenicolates, whose favourite route of administration is the parenteral route [5]. The massive administration of oral antibiotics could cause serious problems in both animals and humans because the use antibiotics through per os disrupts the balance of the digestive flora and induces a selection of pressure favoring resistant bacteria. Although resistant enterobacteria can be found in populations non submitted to the use of antibiotics, the frequency of these cases is widely low than in populations submitted to an antibacterial treatment [8,28]. In breeding, studies have clearly established the link between the use antibiotics per os and the development of resistance in commensal flora. A consensus is shared by all: during the interruption of antibiotics administration by oral route (in the frame of their use as growth promoter), the number of resistant bacteria found in the faecal flora of healthy people decreases. This frequency of resistant bacteria in the feces of healthy persons increased in Italy from 15 % to 8 % between March 1997 and August 1998. In Germany, it increased from 12 % in 1997 to 3 % in 1999 [28,29].

Conclusion and perspectives

The amplification of antibiotic resistance is a danger for public health that requires interventions at human and animal level. This study is the first on the quantification of active ingredients of veterinary antimicrobial in Cote d'Ivoire. It helped to know the consumption of antibiotics for veterinary use during one year. In Côte d'Ivoire, this consumption is about 48 tonnes of antibiotics per year. It also indicated that the quantity of active molecules in mg per kg of live weight is 106.30 for the livestock species. Four families of antibiotics (Tetracyclines, Sulfamides, Beta-lactams, Macrolides) were the most used. Sulfonamides and Tetracyclines represented more than the half of the use and the main family was that of sulfonamides. Antibiotics used in animals intended for human consumption represented the major part of sales of antibiotics, followed by antibiotics administrated to both consumables and pets and pets. Finally, these veterinary antibiotics were administrated preferentially by the oral route (*per os*), followed by the parenteral route, the oral and parenteral route and finally the external routes.

This study is the beginning of a series of studies in the frame of the implementation of the national antimicrobial resistance plan. Studies on the use of antibiotics on farms, analysis of veterinary drug supply spinnerets in Côte d'Ivoire (parallel market, counterfeiting market and importion of medicated feed) and risk factors related to the use of antibiotics in breeding should complete this study. The use of antibiotics increasingly observed in Western countries because of many concerns about the importance of their use for humans justifies the decline in the use of veterinary antibiotics.

Authors' contribution

SK proposed the research idea, collected the data from the respondents, organized the data in computer and did the analysis and interpretation wrote the manuscript. **BAK** proposed the research idea, collected the data from the respondents, organized the data in computer, did the analysis, interpretation and wrote the manuscript. **VA** collected the data from the respondents. **JYD** revised the manuscript for scientific content and did the language check. All authors gave final approval for its submission to the journal for consideration of publication.

Acknowledgements

The authors are grateful to all wholesalers of veterinary drugs for their cordial cooperation for the realization of this work.

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