

RESAPATH

French surveillance
network for antimicrobial
resistance in pathogenic
bacteria of animal origin

2015 Annual Report

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INTRODUCTION

Monitoring of Antimicrobial Resistance in Pathogenic Bacteria in Animals in France in 2015: Summary Report of the RESAPATH network (www.resapath.anses.fr)

The French surveillance network for antimicrobial resistance in pathogenic bacteria of animal origin (RESAPATH) was set up in 1982 under the name of RESABO (BO for bovines). In 2000, it was expanded to pigs and poultry and in 2007, to other animal species such as small ruminants, companion animals or horses. RESAPATH is a long-term cooperative effort by 74 local routine laboratories throughout France coordinated by the Lyon and Ploufragan-Plouzané Laboratories at the French Agency for Food, Environmental and Occupational Health Safety (ANSES). As mentioned below, the information presented here is based on data from an on-going surveillance system estimating the proportion of resistances to relevant antibiotics in diseased animals treated by veterinarians as part of their regular clinical services. RESAPATH is a key component of the strategic national action plans (EcoAntibio 1, 2011-2016; EcoAntibio 2: 2017-2021) adopted by the French Ministry of Agriculture, Food and Forest to combat antimicrobial resistance in animals. RESAPATH is also part of the recent intersectorial "One Health" national action plan against antimicrobial resistance in humans, animals and the environment adopted by the French Prime Minister on november 2016, 17th. The epidemiology of resistance is increasingly complex and we strongly believe that providing annual data of resistance trends in animal pathogens contributes to a comprehensive overview of antimicrobial resistance in veterinary medicine. We especially thank all laboratories and staff who are contributing to these surveillance efforts and to a better control of this major issue in animals.

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ORGANISATION AND KEY FIGURES

The objectives of the RESAPATH are the following:

- To monitor antimicrobial resistance in pathogenic bacteria of animal origin in France,
- To collect resistant isolates of particular interest and to characterize their genetic background (including deciphering mechanisms of resistance),
- To provide technical support to local laboratories.

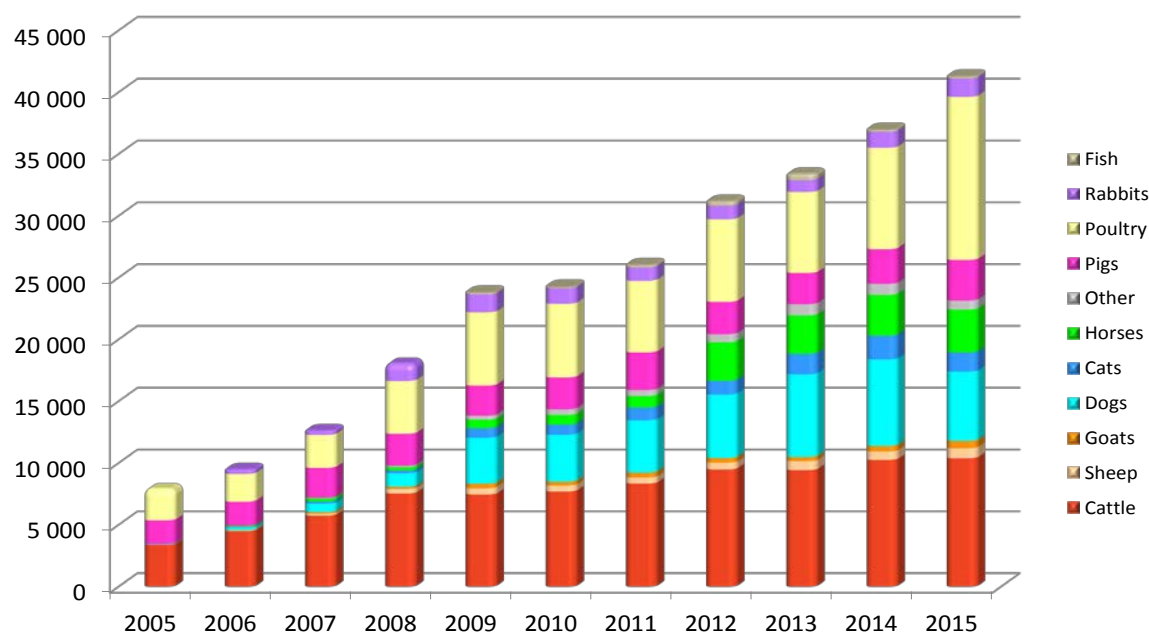
Bacteria recovered from diseased animals and sampled by veterinarians for diagnostic purposes as part of their routine activity are tested for antimicrobial susceptibility by private or public local veterinary laboratories throughout France. Antibigrams are performed by disk diffusion according to the guidelines of the veterinary part of the Antibigram Committee of the French Society of Microbiology (CA-SFM) and of the AFNOR NF U47-107 standard, and inhibition zone diameters are transmitted to ANSES. Isolates are then categorized as susceptible (S), intermediate (I) or resistant (R) according to the recommendations provided by the veterinary part of the CA-SFM. Should no established breakpoints be available, critical values provided by the manufacturer for the corresponding molecules are used.

In addition to data collection, RESAPATH also allows the collection of isolates harbouring resistance profiles of specific interest, which are then subjected to in-depth molecular studies. Laboratories participate to annual ring trials (External Quality Assurance System), which contribute to the quality control of the data gathered by RESAPATH. In addition, annual training sessions, technical support, on-site training and other actions are also provided.

RESAPATH is the unique veterinary member of the French National Observatory for Epidemiology of Bacterial Resistance to Antimicrobials (ONERBA), which encompasses 17 other surveillance networks throughout France, all in private or public medical practices (community of health-care centres). RESAPATH is a passive or 'event-based' surveillance network. Member laboratories join the RESAPATH on a voluntary basis and data collected depend on the initial decision of veterinary practitioners. Hence, those data cannot be considered as perfectly representative of the global resistance of pathogenic bacteria but are a good indicator of their resistance rates in field conditions. In all, the significance of this monitoring relies on its ability to detect most resistant bacteria and to measure trends over time in antimicrobial resistance in diseased animals in France.

In 2015, 74 laboratories were members of RESAPATH and a total of 41,298 antibigrams were transmitted to ANSES, all animal species included. The evolution of the distribution of antibigrams per animal sector is presented in Figure 1.

Figure 1: Annual number of antibigrams collected per animal sector



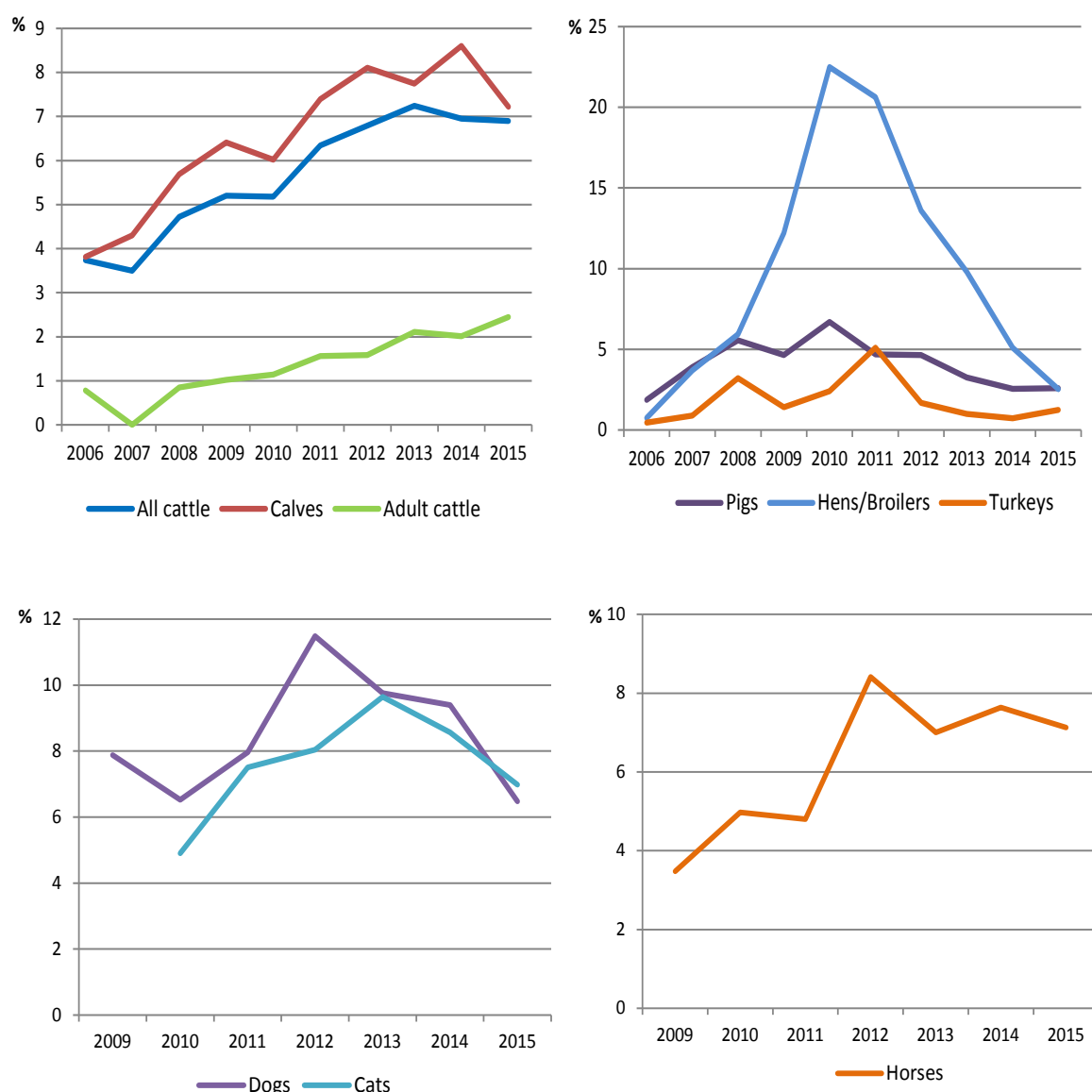
RESISTANCE DATA

This chapter summarizes the key results on resistance trends to the different antimicrobial classes, especially to broad-spectrum cephalosporins and fluoroquinolones that are considered of critical importance both in human and veterinary medicine. Other important topics such as resistance trends to other antibiotics or on specific relevant phenotypes are also included. Detailed information on resistances of the clinical isolates is available for each animal species and infection type in the Annex section.

Resistance to broad-spectrum cephalosporins

Isolates are routinely tested for their susceptibility to ceftiofur and cefquinome in food animals and horses, and to ceftiofur and cefovecin in companion animals. Resistance is mainly observed for *Escherichia coli* and to a lesser extent for *Klebsiella pneumoniae* and *Enterobacter* spp. In 2015, the highest rate of resistance to ceftiofur in clinical *E. coli* isolates of animal origin in France was around 6-7%, and was found in veal calves, cats and dogs, and horses. Ceftiofur resistance in *E. coli* in other animal species was less than 3% (poultry: 2.5%, pigs: 2.6%, adult cattle: 2.4%, turkeys: 1.2%).

Figure 2: Evolution of proportions of *E. coli* isolates non-susceptible (R+I) to ceftiofur in cattle, pigs, poultry, turkey, horses, cats and dogs (2006-2015)



In broilers, resistance to ceftiofur in clinical *E. coli* has been continuously decreasing from 22.5% in 2010 to 2.5% in 2015, and this almost ten-fold reduction in 5 years is a very positive result (Figure 2). A similar decrease has been observed in diseased turkeys and pigs suggesting that the recent strategic actions set up on the use of antimicrobials in food animals in France had a global impact on the ESBL spread in those sectors. Also in cats and dogs (Figure 2), a decreasing trend has been observed over the last three years, suggesting that more responsible practices were not only considered in food but also in companion animals. On the other hand, a steady trend has still been observed in horses over the 2012-2015 period of time.

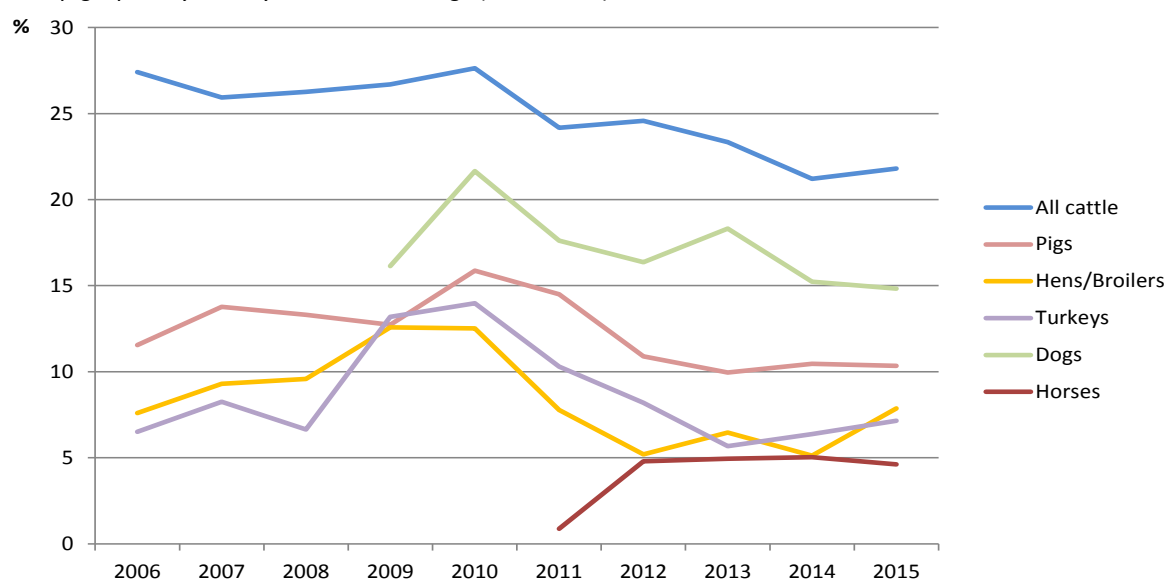
Of note, and as in many European countries, calves are the main contributor to resistance to broad-spectrum cephalosporins in cattle production. These data are in line with a scientific opinion recently issued by EFSA arguing on the risk for the development of antimicrobial resistance due to feeding calves with milk containing residues of antibiotics, which may constitute a strong hypothesis for the selection and spread of ESBL-producing Enterobacteriaceae in those animals. Complementary investigations in calves are in progress in France to clarify this issue.

Resistance to fluoroquinolones

Isolates are routinely tested for their susceptibility to enrofloxacin, marbofloxacin or danofloxacin. Other fluoroquinolones are also tested depending on the animal species, including the recently marketed pradofloxacin in companion animals. In Figure 3, resistance to either enrofloxacin or marbofloxacin in *E. coli* was used as an indicator of resistance to fluoroquinolones.

Data gathered in 2015 show that the highest rate of fluoroquinolone resistance in clinical *E. coli* of animal origin is found in cattle (22%). Overall, a continuous downward trend in fluoroquinolone resistance has been observed over the last 5 years in almost all animal species. Nonetheless, in certain sectors such as pigs, broilers and turkeys, fluoroquinolone resistance has mostly decreased between 2010 and 2013 and not over the last 2 years. Of note, rates of fluoroquinolone resistance in clinical *E. coli* range from 5% to 22% among animal species, to be compared with the much lower range of 1.2% to 6-7% of resistance rates to broad-spectrum cephalosporins. It highlights that fluoroquinolone resistance, while not transmitted through highly mobile genetic elements bearing ESBL/AmpC-encoding genes, should be considered as a major issue which has still not been efficiently counter-acted by national strategic actions.

Figure 3: Evolution of proportions of *E. coli* isolates non-susceptible (R+I) to enrofloxacin or marbofloxacin in cattle, pigs, poultry, turkeys, horses and dogs (2006-2015)



Resistance to other antibiotics

Trends were investigated for *E. coli*. Antimicrobials that were considered here included those most frequently tested by the RESAPATH laboratories according to relevant classes in veterinary practice (excluding broad-spectrum cephalosporins and fluoroquinolones that have been studied separately). Seven antibiotics (5 classes) were chosen, namely gentamicin, spectinomycin or streptomycin, trimethoprim-sulfonamides in combination, tetracycline, amoxicillin, amoxicillin and clavulanic acid in combination, and a quinolone (nalidixic or oxolinic acid). Trends were analysed over the 2006-2015 period in cattle, pigs and poultry.

The global decreasing trend identified in the previous years should still be considered as such in 2015. However, resistance levels have slightly increased between 2014 and 2015 for nearly all animal species and antimicrobials. It needs to be confirmed in 2016 to be considered as significant. Nevertheless, such a trend observed for all animal species and nearly all antibiotics may also indicate a possible reverse shift towards re-increasing resistance rates.

Resistances in cattle have slightly increased between 2014 and 2015 for all antimicrobials (Figure 4). Over the whole period (2006-2015), resistances have shown a significant but low decrease for tetracycline, aminoglycosides (except for gentamicin), quinolones and trimethoprim-sulfonamides in combination. Resistance to amoxicillin and clavulanic acid in combination has presented an overall decrease since 2006 but has been increasing again since 2013.

In pigs, resistances to trimethoprim-sulfonamides, aminoglycosides (except for gentamicin), quinolones and amoxicillin and clavulanic acid in combination has been increasing between 2014 and 2015 (Figure 5). However, resistances to tetracycline and gentamicin have followed a downward trend since 2009 and 2012, respectively. Resistance rates in poultry have been less linear over the 2006-2015 period. For hens and broilers (*Gallus gallus*), all resistance rates have increased between 2014 and 2015 except for tetracycline (Figure 6). Obviously, the major drop observed for resistance to amoxicillin (alone or in combination with clavulanic acid) and tetracycline since 2009/2010 might have reached a limit. Resistance to gentamicin is still low but has increased since 2011. For turkeys, increases in resistance rates between 2014 and 2015 are of lower magnitude than for other animal species and an overall decreasing trend over the period 2006-2015 has still been observed (Figure 7).

Figure 4: Evolution of proportions (%) of *E. coli* isolates non-susceptible (R+I) to seven antimicrobials in cattle (2006-2015)

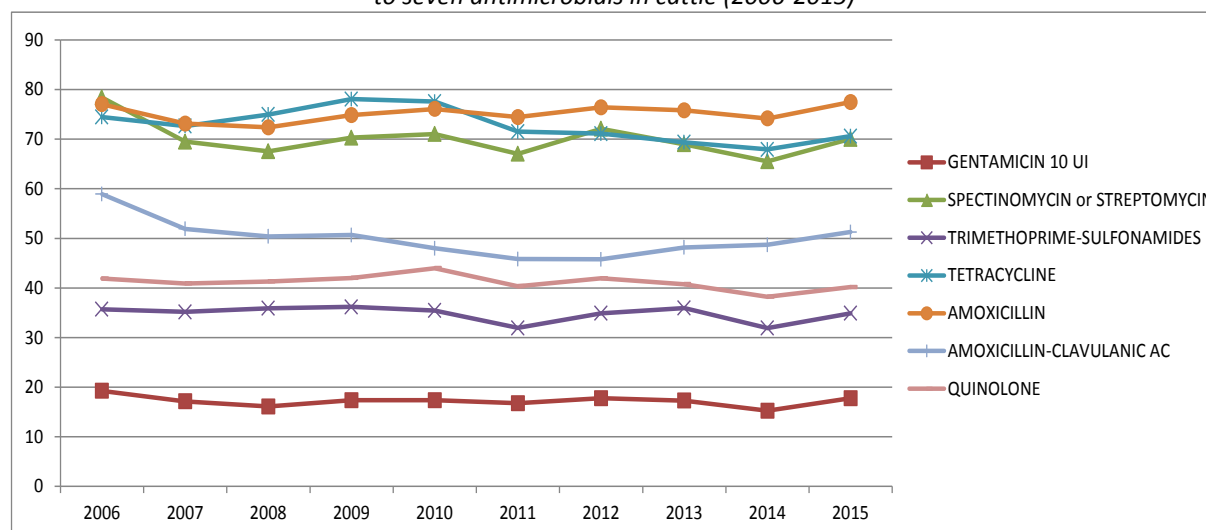


Figure 5: Evolution of proportions (%) of *E. coli* strains non-susceptible (R+I) to seven antimicrobial in pigs (2006-2015)

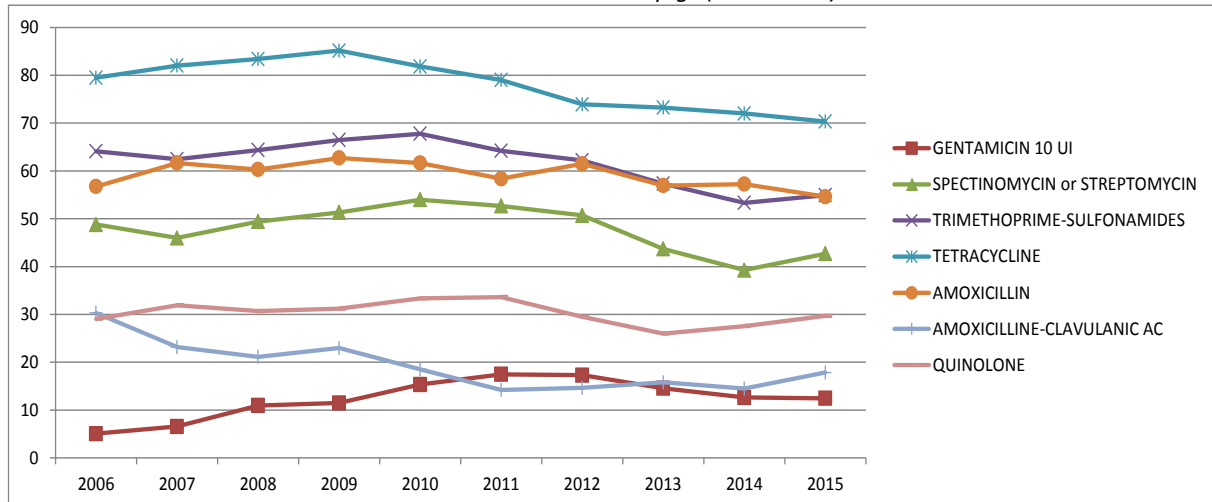


Figure 6: Evolution of proportions (%) of *E. coli* isolates non-susceptible (R+I) to seven antimicrobials in hens and broilers (2006-2015)

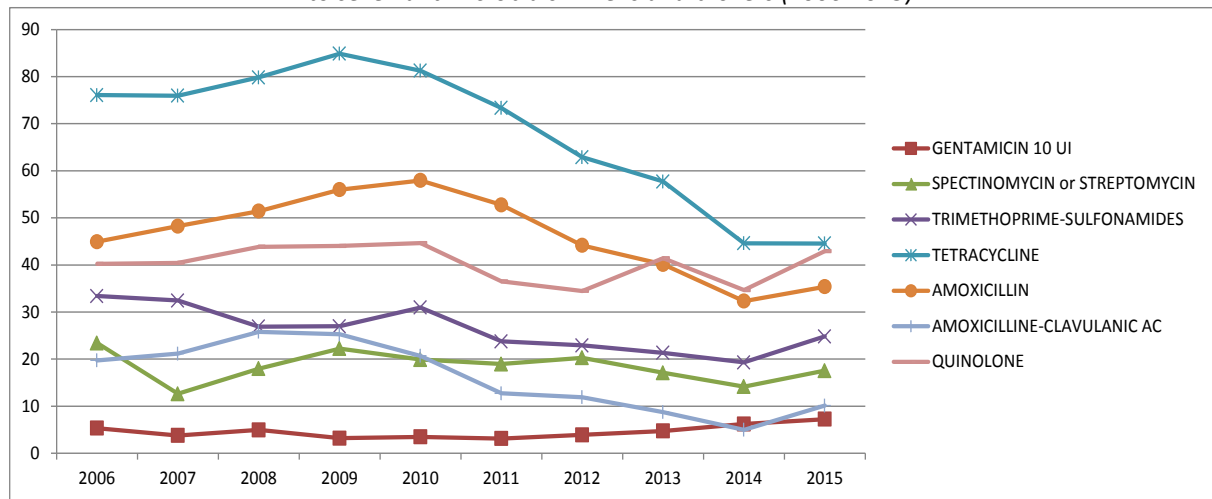
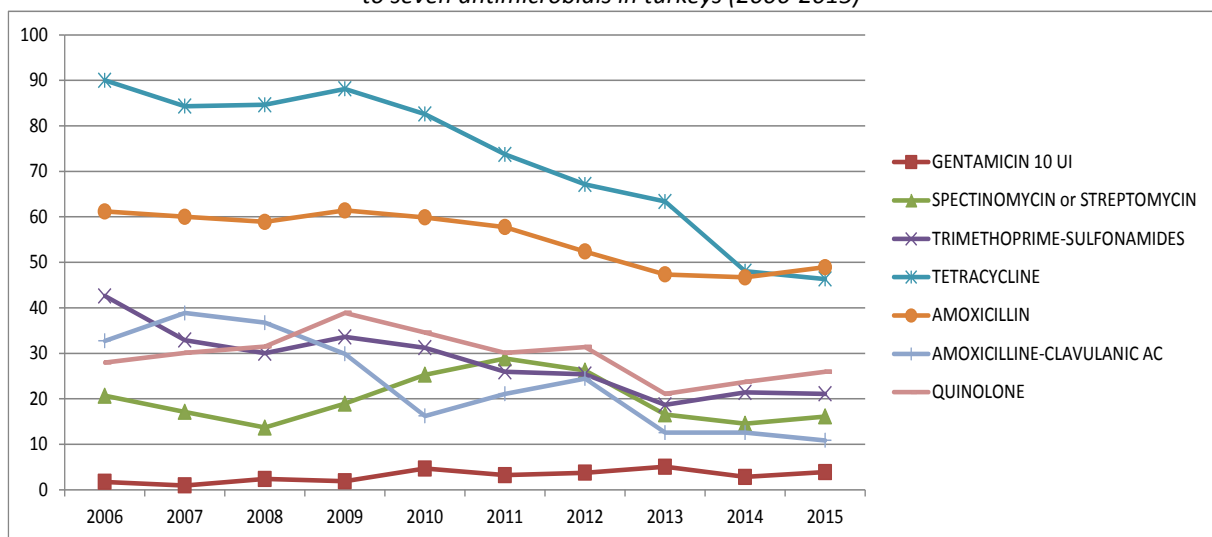


Figure 7: Evolution of proportions (%) of *E. coli* isolates non-susceptible (R+I) to seven antimicrobials in turkeys (2006-2015)



Multidrug resistance

Multidrug resistance was investigated in *E. coli*, the most frequent bacterial species among the RESAPATH data. The selective criteria used to select antibiotics analyzed here were: i) relevance in veterinary and human medicine, ii) a single antimicrobial per class (as resistance mechanisms within a class often overlap), iii) antimicrobials frequently tested by the RESAPATH laboratories to guarantee a good representativeness of the data. Five antibiotics were selected, namely ceftiofur, gentamicin, tetracycline, trimethoprim-sulfonamide in combination, and either enrofloxacin or marbofloxacin. For dogs, tetracycline was not considered further due to poor usage in companion animals and subsequent limited resistance data available.

In food animals (cattle, pigs, poultry), the proportion of isolates collected by RESAPATH that were susceptible to all antimicrobials considered here ranged from 18.3% (pigs) to nearly 50% (hens/broilers and turkeys) (Table 1). Since 2011, this proportion has been stable in cattle, has regularly increased over time in pigs (Chi² test for trend, $p < 0.0001$) and has doubled in poultry (Figure 8).

The proportion of multidrug resistant isolates (resistant to at least 3 classes of antimicrobials among the 5 considered) is the highest in cattle (22.8%, stable since 2011), has decreased to 15.3% in pigs (Chi² test for trend, $p < 0.00001$) and was twice lower in 2015 compared to 2011 in poultry (Figure 9). In cattle, contrary to pigs and poultry, ceftiofur resistant isolates harboured numerous co-resistances, such as to tetracycline and fluoroquinolones.

Table 1: Number and proportion of resistant isolates (R/I) from a list of five antimicrobials in *E. coli* in cattle, pigs and poultry

Resistance number (R/I)	Cattle		Pigs		Hens/broilers		Turkeys	
	n	%	n	%	n	%	N	%
0	1,115	22.6	229	18.3	1,827	44.6	572	49.7
1	1,789	36.3	381	30.5	1,280	31.3	337	29.3
2	902	18.3	449	35.9	776	19.0	190	16.5
3	611	12.4	165	13.2	196	4.8	47	4.1
4	410	8.3	26	2.1	13	0.3	4	0.3
5	106	2.1	0	0.0	0	0.0	2	0.2
Total	4,933	100	1,250	100	4,092	100	1,152	100

Figure 8: Evolution of proportions (%) of *E. coli* isolates **susceptible** to all the five antimicrobials considered in the different animal species (only four antimicrobials considered for dogs)

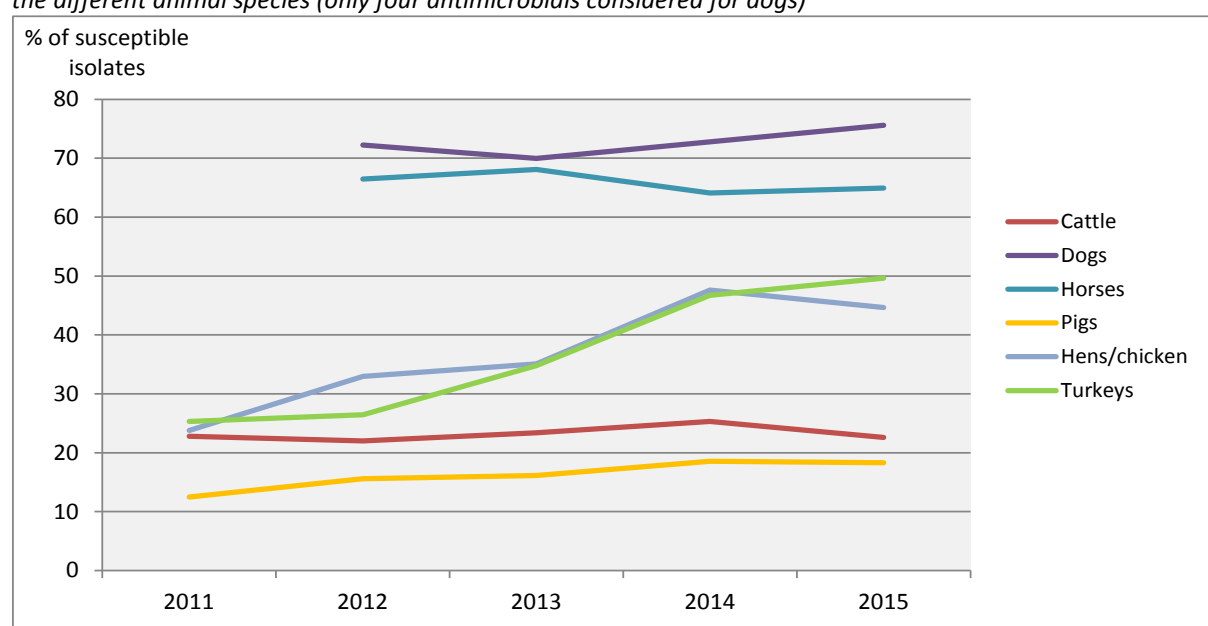
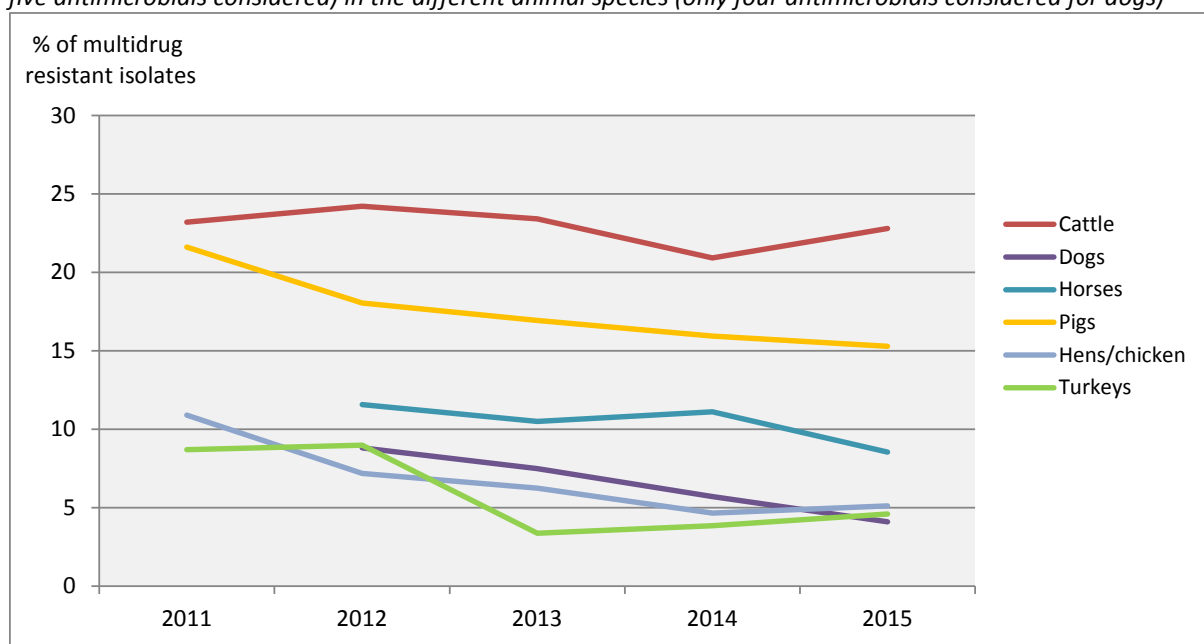


Figure 9: Evolution of proportions (%) of **multidrug resistant** *E. coli* isolates (resistant to at least three out of the five antimicrobials considered) in the different animal species (only four antimicrobials considered for dogs)



For horses and dogs, the huge majority of the isolates (65% to 76%) were fully susceptible to the antimicrobials considered (Tables 2 and 3). In horses, the proportion of multidrug resistant isolates (resistant to at least 3 antimicrobial classes) (8.5%) is lower than in cattle or pigs. For dogs, the proportion of multidrug resistant isolates has decreased significantly from 8.8% in 2012 to 4.1% in 2015 (Chi² test for trend, $p < 0.0001$), but a direct comparison with the other animal species is hardly relevant as only four antimicrobials were considered for dogs versus five for the other species. As in cattle, ceftiofur-resistant isolates from horses and dogs had numerous co-resistances.

Table 2: Number and proportion of resistant isolates (R+I) from a list of five antimicrobials in *E. coli* in horses

Resistance number (R+I)	Horses	
	n	%
0	365	64.9
1	92	16.4
2	57	10.1
3	12	2.1
4	29	5.2
5	7	1.2
Total	562	100

Table 3: Number and proportion of resistant isolates (R+I) from a list of four antimicrobials in *E. coli* in dogs

Resistance number (R+I)	Dogs	
	n	%
0	711	75.6
1	112	11.9
2	80	8.5
3	28	3.0
4	10	1.1
Total	941	100

Altogether, these data highlight to what extent diseased animals have become a major reservoir of multiple resistance genes. The abundance of multidrug resistant isolates confirms that not only critically important antibiotics such as broad-spectrum cephalosporins and fluoroquinolones may drive the selection of antimicrobial resistance but also ancient molecules, such as tetracyclines. Of note, rates of multidrug resistance in *E. coli* dramatically vary among animal sectors, which may reflect the diversity of usages or production systems.

Colistin resistance in veterinary medicine

Colistin has been used for a long time in veterinary medicine and reports of resistant isolates were scarce until 2015. For example, the first colistin-resistant *Klebsiella pneumoniae* of animal origin was described recently¹. However, colistin use is now seriously challenged by the discovery of the plasmidic resistance gene *mcr-1*. One year after its discovery, more than one hundred publications reported its worldwide dissemination, mainly in *E. coli*. In France, the *mcr-1* gene was described in *E. coli* isolated from livestock (with a prevalence of 21 % in ESBL-producing *E. coli* from diarrheic veal calves², versus 2-6 % in other healthy animal species³) and in *Salmonella* isolates⁴. In Europe, the *mcr-1* prevalence in the digestive flora of healthy animals is also considered as low (1 à 2 %)⁵. Interestingly, colistin use is continuously decreasing in France but the prevalence of *E. coli* isolates presenting both the ESBL and *mcr-1* genes follows a reverse trend, suggesting other selecting factors than colistin usage.

Colistin use had been recurrently questioned over the last years because of the renewed interest of this molecule in human medicine to treat pan-resistant Enterobacteriaceae. Several official opinions had thus been released (European Medicine Agency^{6,7}, ANSES⁸, European Commission⁹) which considered colistin as an important antibiotic for veterinary medicine and did not restrict its use. These opinions were of course revised in 2016, after the discovery of the *mcr-1* plasmidic (and transferable) gene¹⁰.

The Resapath network collects antibiograms performed by disc diffusion, a method which is not entirely reliable for the monitoring of colistin resistance. Consequently, the low levels of colistin-resistance (<2 %) observed for several years had always been considered as a probable under-estimation of the true prevalence. Nevertheless, since biases were *a priori* constant, the evolution of the resistance over the years is reliable. Moreover, according to the experimental data accumulated by the veterinary laboratories as well as the ANSES laboratories, interpretation rules for diameters zones around the colistin disc (50 µg) were defined. Indeed, for *E. coli*, diameters of < 15mm or ≥ 18mm correspond to MICs of > 2 mg/L (resistant) or <2 mg/L (susceptible), respectively. Intermediate diameters (15, 16 and 17 mm) are non-informative and require the determination of the MIC. However, the probability for the MIC to be > 2 mg/L (resistant) is decreasing in parallel with the increase in diameters.

¹ Kieffer N., Poirel L., Nordmann P., Madec J.-Y., Haenni M. (2015) [Emergence of colistin resistance in *Klebsiella pneumoniae* from veterinary medicine](#). *Journal of Antimicrobial Chemotherapy*, 70 (4): 1265-1267.

² Haenni M., Poirel L., Kieffer N., Chatre P., Saras E., Metayer V., Dumoulin R., Nordmann P., and Madec J.Y. (2016). Co-occurrence of extended spectrum beta lactamase and MCR-1 encoding genes on plasmids. *Lancet Infect Dis* 16, 281-282. doi: 10.1016/S1473-3099(16)00007-4

³ Perrin-Guyomard A., Bruneau M., Houee P., Deleurme K., Legrandois P., Poirier C., Soumet C., and Sanders P. (2016). Prevalence of *mcr-1* in commensal *Escherichia coli* from French livestock, 2007 to 2014. *Euro Surveill* 21. doi: 10.2807/1560-7917.ES.2016.21.6.30135

⁴ Webb H.E., Granier S.A., Marault M., Millemann Y., Den Bakker H.C., Nightingale K.K., Bugarel M., Ison S.A., Scott H.M. and Loneragan G.H. (2016). Dissemination of the *mcr-1* colistin resistance gene. *Lancet Infect Dis* 16, 144-145. doi: 10.1016/S1473-3099(15)00538-1

⁵ Kempf I., Fleury M.-A., Drider D., Bruneau M., Sanders P., Chauvin C., Madec J.-Y., Jouy E. (2013). What do we know about resistance to colistin in Enterobacteriaceae in avian and pig production in Europe? *International Journal of Antimicrobial Agents*, 42: 379-383.

⁶ European Medicines Agency. (2013). Use of colistin products in animals within the European Union : Development of resistance and possible impact on human and animal health. EMA/755938/2012, 19 July 2013. URL : http://www.ema.europa.eu/docs/en_GB/document_library/Report/2013/07/WC500146813.pdf

⁷ European Medicines Agency. (2014). Answers to the requests for scientific advice on the impact on public health and animal health of the use of antibiotics in animals. EMA/381884/2014, 18 December 2014.

⁸ Avis de l'Anses relatif à l'évaluation des risques d'émergence d'antibiorésistance liés aux modes d'utilisation des antibiotiques dans le domaine de la santé animale. (2014). URL <https://www.anses.fr/fr/system/files/SANT2011sa0071Ra.pdf>.

⁹ Décision adoptée le 16 mars 2015, suite à un référé pris au titre de l'article 35 de la directive 2001/82/CE relative aux médicaments vétérinaires et concernant toutes les AMM de formes orales de colistine (EMA/EC/2015)

¹⁰ European Medicines Agency. (2016). Updated advice on the use of colistin products in animals within the European Union: development of resistance and possible impact on human and animal health. EMA/231573/2016, 26 May 2016.

The evolution of the proportions of the different diameters was observed between 2003 and 2015 (Figures 15 to 19), and a Chi² test for trend was performed on diameters ≥ 18 mm.

A significant increase in the proportion of susceptible strains was observed in all animal species, even though with specific dynamics. These data suggest that the diffusion of colistin-resistant *E. coli* that are pathogenic for animals is under control.

Figure 15 : Relative proportion of diameters < 15 mm, 15 mm, 16 mm, 17 mm and ≥ 18 mm around the colistin disc (50 μ g) for *E. coli* isolated from digestive pathologies in piglets (n min.: 296 (2005); n max.: 776 (2011))

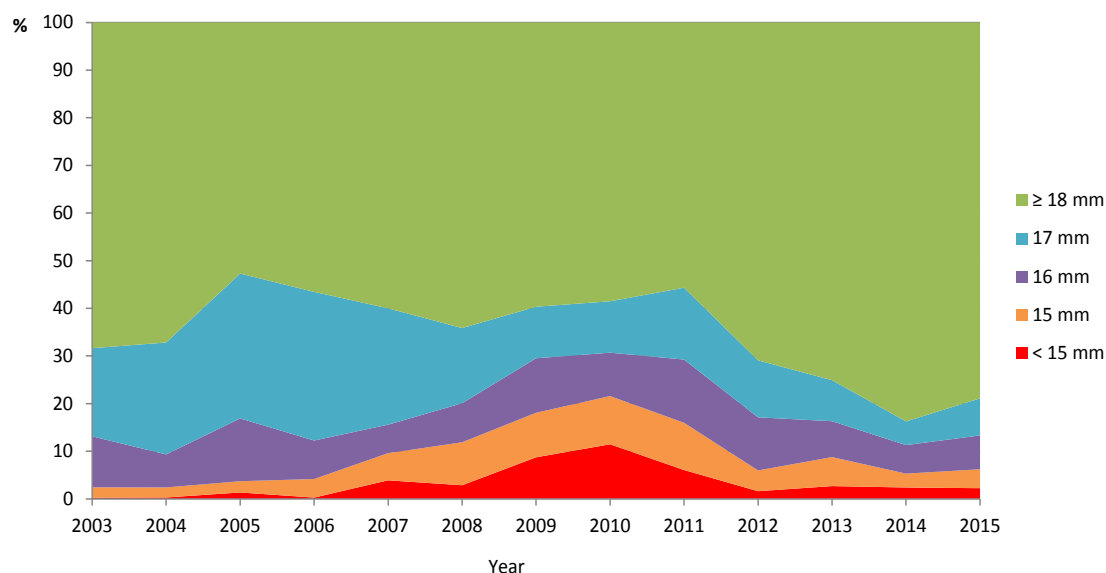


Figure 16 : Relative proportion of diameters < 15 mm, 15 mm, 16 mm, 17 mm and ≥ 18 mm around the colistin disc (50 μ g) for *E. coli* isolated from digestive pathologies in veal calves (n min.: 1139 (2003); n max.: 3412 (2015))

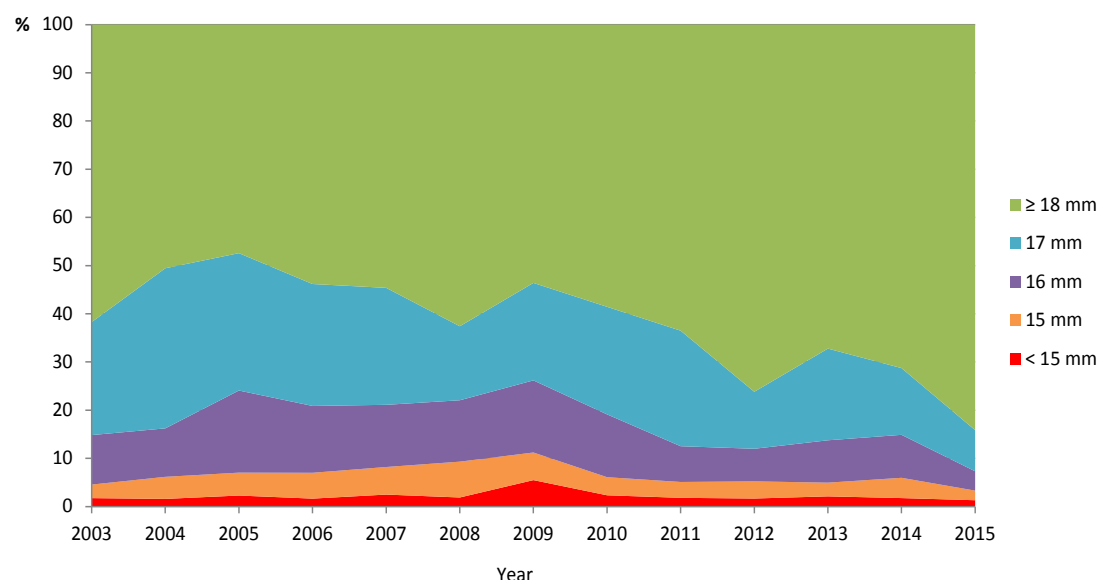


Figure 17 : Relative proportion of diameters < 15 mm, 15 mm, 16 mm, 17 mm and ≥ 18 mm around the colistin disc (50 µg) for *E. coli* isolated from bovine mastitis (n min.: 188 (2004); n max.: 785 (2014))

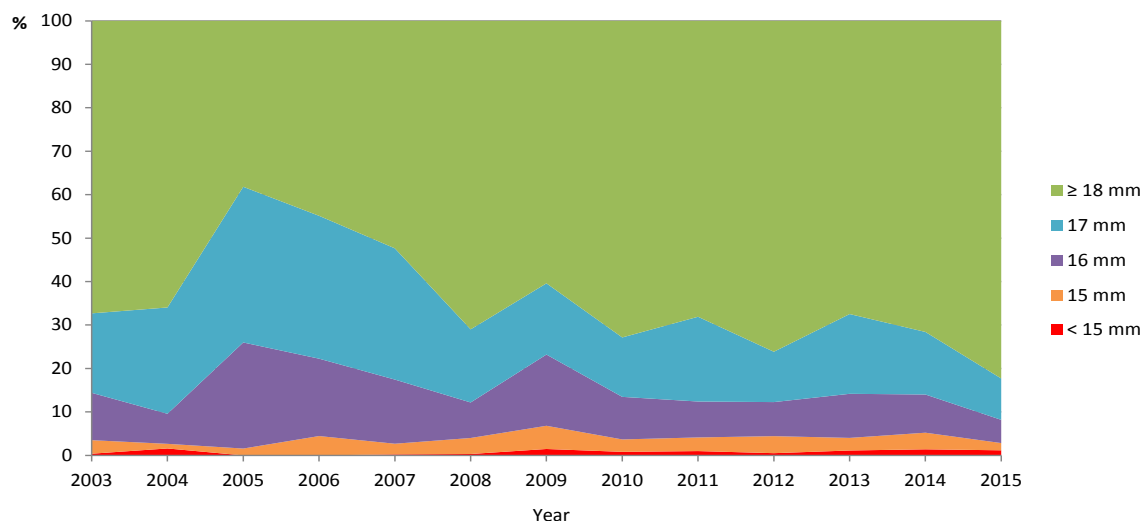


Figure 18 : Relative proportion of diameters < 15 mm, 15 mm, 16 mm, 17 mm and ≥ 18 mm around the colistin disc (50 µg) for *E. coli* isolated from turkey (n min.: 862 (2013); n max.: 2220 (2015))

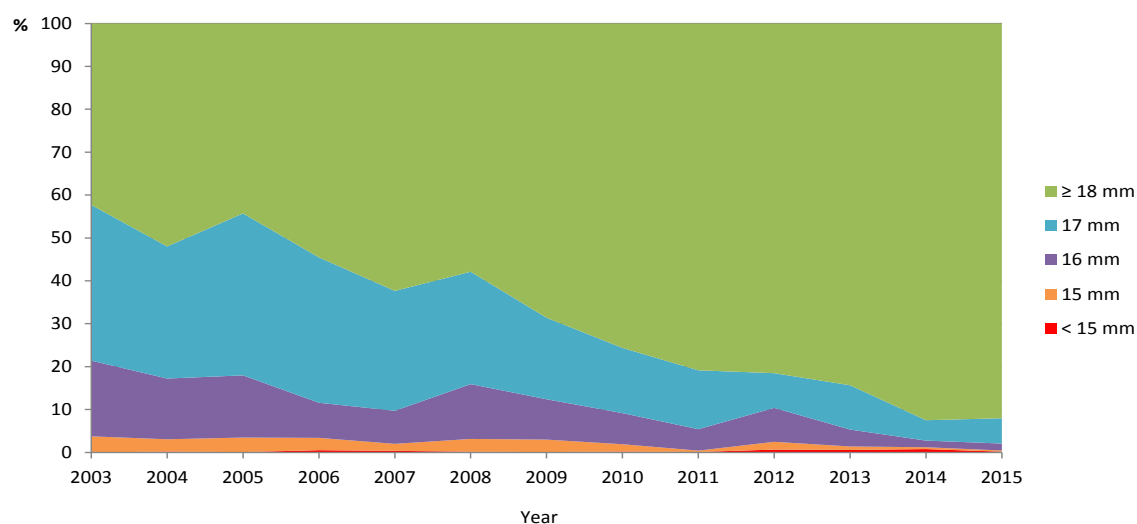
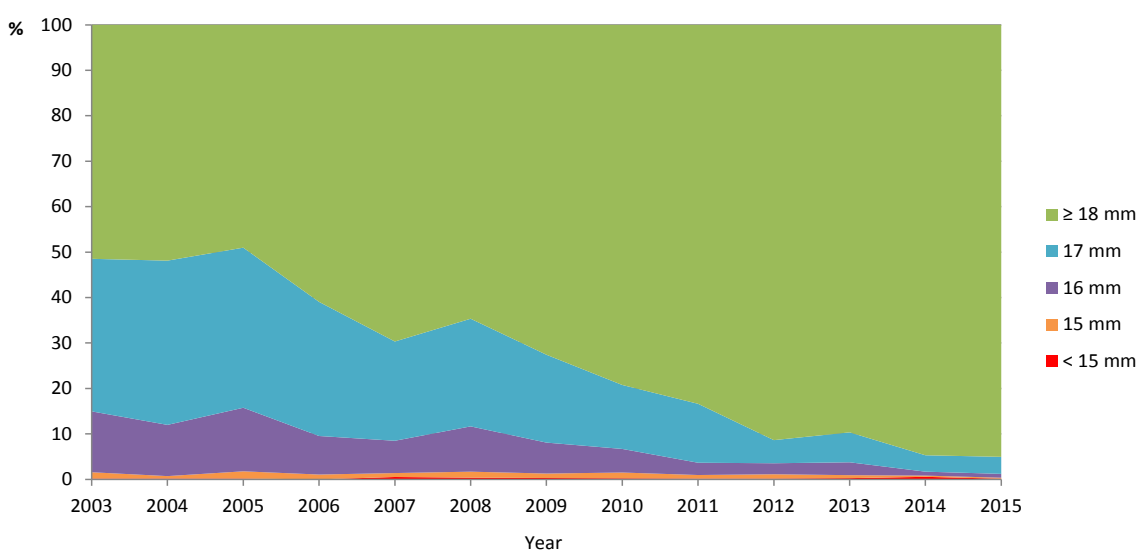


Figure 19 : Relative proportion of diameters < 15 mm, 15 mm, 16 mm, 17 mm and ≥ 18 mm around the colistin disc (50 µg) for *E. coli* isolated from hens and chickens (n min.: 559 (2004); n max.: 6379 (2015))



Carbapenem-resistant *Acinetobacter baumannii* in French companion animals

Acinetobacter baumannii is responsible for infections in animals involving the urinary and respiratory tracts, the skin and mucous membranes, with elevated mortality. The development of the infection is favored by the presence of a foreign body and occurs more frequently in horses, dogs and cats¹¹. *A. baumannii* is infamous as an opportunistic pathogen in critically ill humans as well, and carbapenems are considered as a therapeutic reference. Unfortunately, clones producing enzymes hydrolyzing carbapenems, especially OXA-23, have spread globally. This situation, together with the propensity of *A. baumannii* to develop multidrug-resistance, raises a serious threat for public health.

A. baumannii producing OXA-23 have been recovered also in animals. These isolates belonged to Sequence Type (ST) 2, the most prevalent ST among multidrug-resistant isolates of human origin, suggesting a contamination of animals by humans. During 2011-2015 in the framework of the RESAPATH, seven isolates found in the urines of cats (n=5) and dogs (n=2), which were resident in different households and five different municipalities, demonstrated high-level resistance to carbapenems and all produced an OXA-23. Surprisingly, the genotyping demonstrated that the isolates were highly similar (>98.8%) and all belonged to ST25. These observations suggest that *A. baumannii* ST25 resistant to carbapenems has clonally disseminated and that ST25 isolates are more prevalent among animals than ST2 isolates, which, on the other hand, are the most prevalent among isolates of human origin in France.

In conclusion, companion animals might constitute a further reservoir of carbapenem-resistant *A. baumannii* and not only be subject of contamination by humans. Considering the difficulties for treatment of *A. baumannii* infections, monitoring the reservoir of carbapenem-resistant isolates and preventing the contamination of companion animals are a priority to preserve public health.

Detection of high risk human *Enterobacter cloacae* clones in animal strains

Enterobacter cloacae is a nosocomial pathogen that is intrinsically expressing its chromosomal *ampC* gene but can also acquire plasmidic resistances such as ESBL genes. An MLST scheme was recently developed to characterize human strains and highlighted the presence of high risk clones for humans, most of which are associated with ESBLs. In animals, *E. cloacae* is a minor pathogen. Nevertheless, between 2010 and 2013, antibiograms of 635 clinical isolates collected in horses, cats and dogs were reported through the RESAPATH network. A total of 36 (5.7%; 36/635) isolates were resistant to ceftiofur and all presented an ESBL phenotype. The *bla*_{CTX-M-15} was detected in 66.6% of the isolates and was mostly carried by IncHI2/ST1 plasmids. PFGE and MLST analysis allowed to group isolates in 23 PFGE profiles and 13 different STs. A total of 25/36 of the animal isolates (69.4%) corresponded to high risk clones for humans, and the CTX-M-15-producing ST114 was highly prevalent (44 %, 16/36). These results raise questions on the transfer of such resistant strains between the animal and human reservoirs. Finally, further studies should also determine whether these high risk clones are strictly associated to ESBL-presenting *E. cloacae* or are also prevalent in susceptible isolates.

¹¹ Francey T., Gaschen F., Nicolet J., Burnens AP. (2000). The role of *Acinetobacter baumannii* as a nosocomial pathogen for dogs and cats in an intensive care unit. *J Vet Intern Med.*, **14**:177-183.

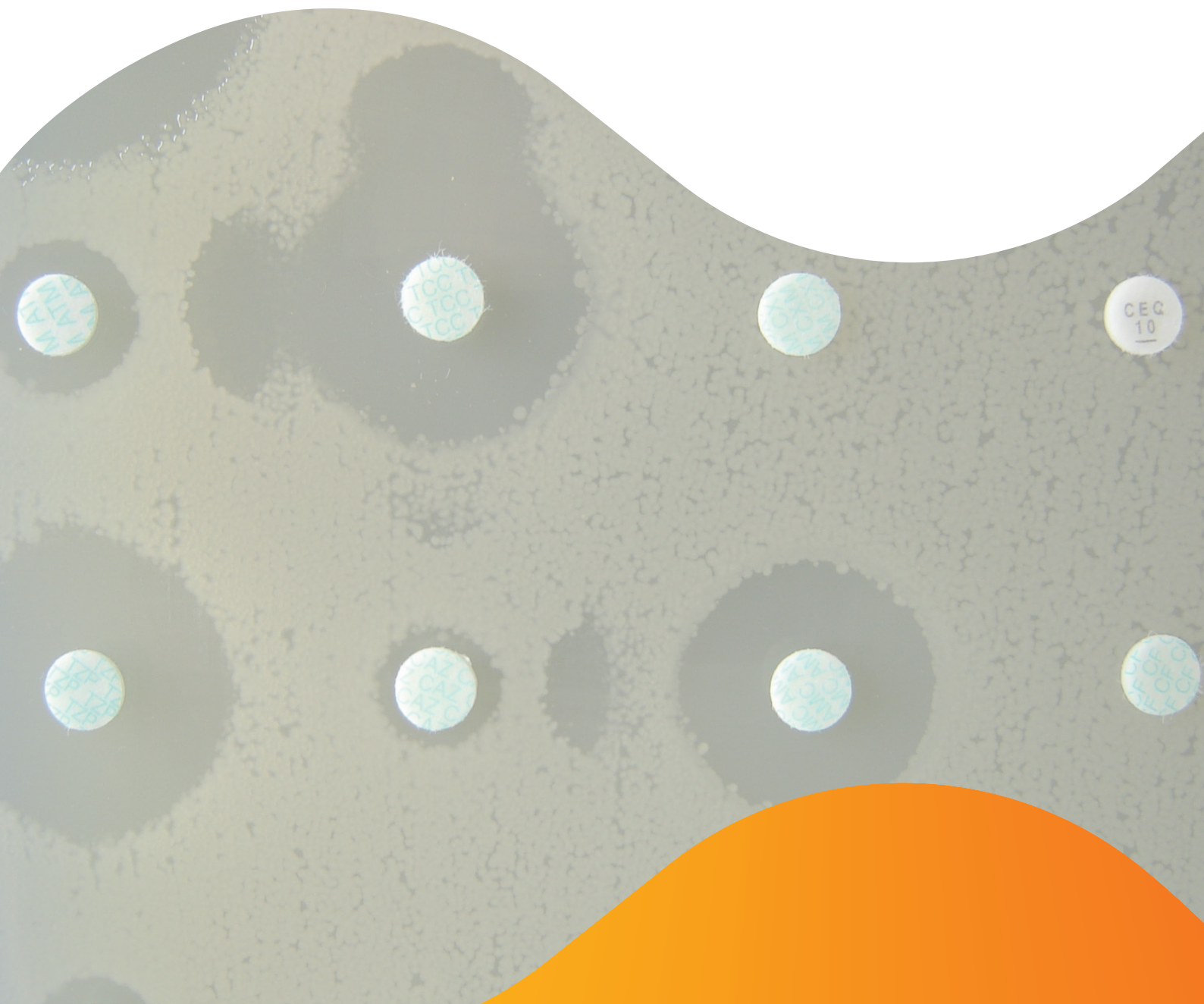
***Proteus mirabilis* isolates collecting resistance phenotypes**

Proteus mirabilis is an opportunistic pathogen, causing mostly urinary tract infections in humans. It is rarely found in veterinary medicine, unless in cats and dogs in which it is responsible for urinary tract infections as well. While veterinary isolates are usually considered as fully susceptible, human strains of *P. mirabilis* presenting the *Salmonella* Genomic Island 1 (SGI1) or acquired resistance to extended-spectrum cephalosporins (ESBL, AmpC) are increasingly reported. Two studies were thus conducted in the frame of the RESAPATH to assess whether such resistant isolates were already spreading in animals.

The first study revealed the presence of the PGI1 (*Proteus* Genomic Island 1) element and the SGI1-V variant – which additionally produced the VEB-6 ESBL enzyme – in *P. mirabilis* from dogs. The second study aimed at estimating the prevalence of such resistances in 468 clinical *Proteus* spp. collected between 2008 and 2015. A total of 17 *P. mirabilis* (3.6%) harboring the SGI1 (n=11) or PGI1 (n=6) elements were identified. Resistance to extended-spectrum cephalosporins was detected in 18 isolates (3.8%), including 10 ESBL (among which six are the SGI1 encoded VEB-6) and 8 AmpC enzymes. Interestingly, all AmpCs and 8/10 ESBLs were chromosomally-encoded. All isolates were non-clonal and originated from dogs, cats and horses. These results are breaking the myth of the susceptible *P. mirabilis* and are prompting us to survey these phenotypes in order to detect a potential rapid emergence.

Annex 1

List of RESAPATH laboratories



Laboratories members

Laboratoire Départemental d'Analyses - BOURG EN BRESSE (01)
Eurofins Laboratoire Cœur de France - MOULINS (03)
Laboratoire Départemental Vétérinaire et Hygiène Alimentaire - GAP (05)
Laboratoire Vétérinaire Départemental - SOPHIA ANTIPOLIS (06)
Laboratoire Départemental d'Analyses - HAGNICOURT (08)
Laboratoire Départemental d'Analyses - TROYES (10)
Aveyron Labo - RODEZ (12)
Laboratoire Départemental d'Analyses - MARSEILLE (13)
ANSES Laboratoire de pathologie équine de Dozulé – GOUSTRANVILLE (14)
LABEO Frank Duncombe - CAEN (14)
Laboratoire Départemental d'Analyses et de Recherches - AURILLAC (15)
Laboratoire Départemental d'Analyses de la Charente - ANGOULEME (16)
Laboratoire Départemental d'Analyses – BOURGES (18)
Laboratoire Départemental de la Côte d'Or- DIJON (21)
LABOCEA Ploufragan - PLOUFRAGAN (22)
LABOFARM - LOUDEAC (22)
Laboratoire Départemental d'Analyse - (23) AJAIN
Laboratoire Départemental d'Analyse et de Recherche - COULOUNIEUX CHAMIERES (24)
Laboratoire Vétérinaire Départemental - BESANCON (25)
LBAA - BOURG DE PEAGE (26)
ALCYON – LANDERNEAU (29)
LABOCEA Quimper - QUIMPER (29)
Laboratoire Départemental d'Analyses - NIMES (30)
Laboratoire Départemental Vétérinaire et des Eaux - AUCH (32)
BIOLAB 33 - LE HAILLAN (33)
Laboratoire Départemental Vétérinaire - MONTPELLIER (34)
Bio-Chêne Vert - CHATEAUBOURG (35)
Biovilaine - REDON (35)
LABOCEA- FOUGERES (35)
Laboratoire de Touraine - TOURS (37)
Laboratoire Vétérinaire Départemental - GRENOBLE (38)
Laboratoire Départemental d'Analyses - POLIGNY (39)
Laboratoire des Pyrénées et des Landes - MONT-DE-MARSAN (40)
Laboratoire TERANA LOIRE- MONTBRISON (42)
Bactériologie clinique ONIRIS - NANTES (44)
INOVALYS Nantes - NANTES (44)
Laboratoire Départemental d'Analyses - MENDE (48)
INOVALYS Angers - ANGERS (49)
Laboratoire HGRTS Pays de Loire – MAUGES SUR LOIRE (49)
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Laboratoire Vétérinaire et Alimentaire - MALZEVILLE (54)
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Laboratoire RESALAB-Bretagne - GUENIN (56)
Service du Laboratoire Départemental - NEVERS (58)
Laboratoire Départemental Public - VILLENEUVE D'ASCQ (59)
LABEO Orne - ALENCON (61)

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Laboratoire Vétérinaire et Biologique - LEMPDES (63)
Laboratoire Départemental d'Analyses - STRASBOURG (67)
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Laboratoire Vétérinaire Départemental - MONTAUBAN (82)
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ANI-MEDIC – LA TADIERE (85)
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Laboratoire Vétérinaire Départemental - EPINAL (88)
Laboratoire de bactériologie – Biopôle ALFORT – MAISONS-ALFORT (94)
VEBIO - ARCUEIL (94)

Annex 2

Cattle

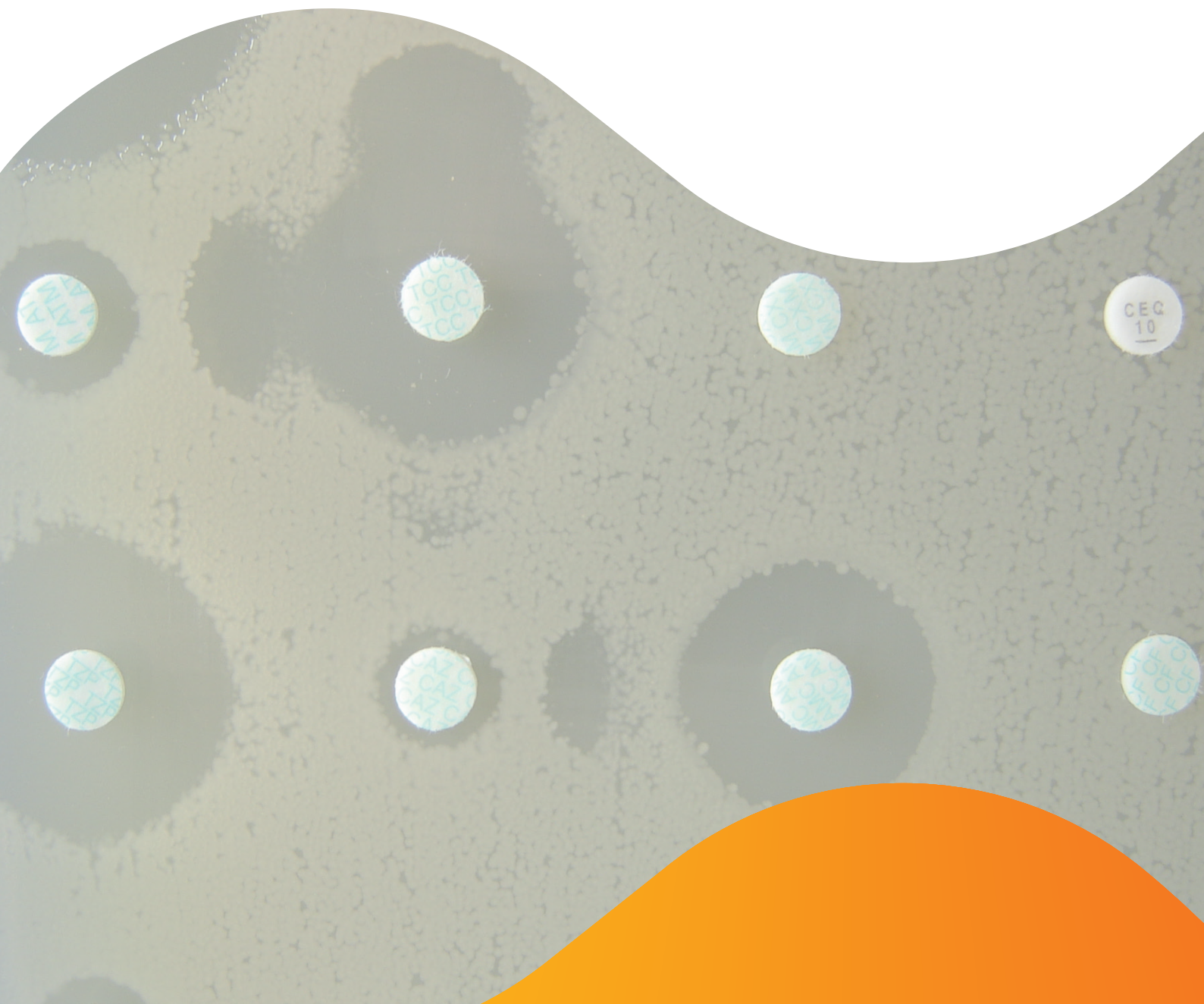
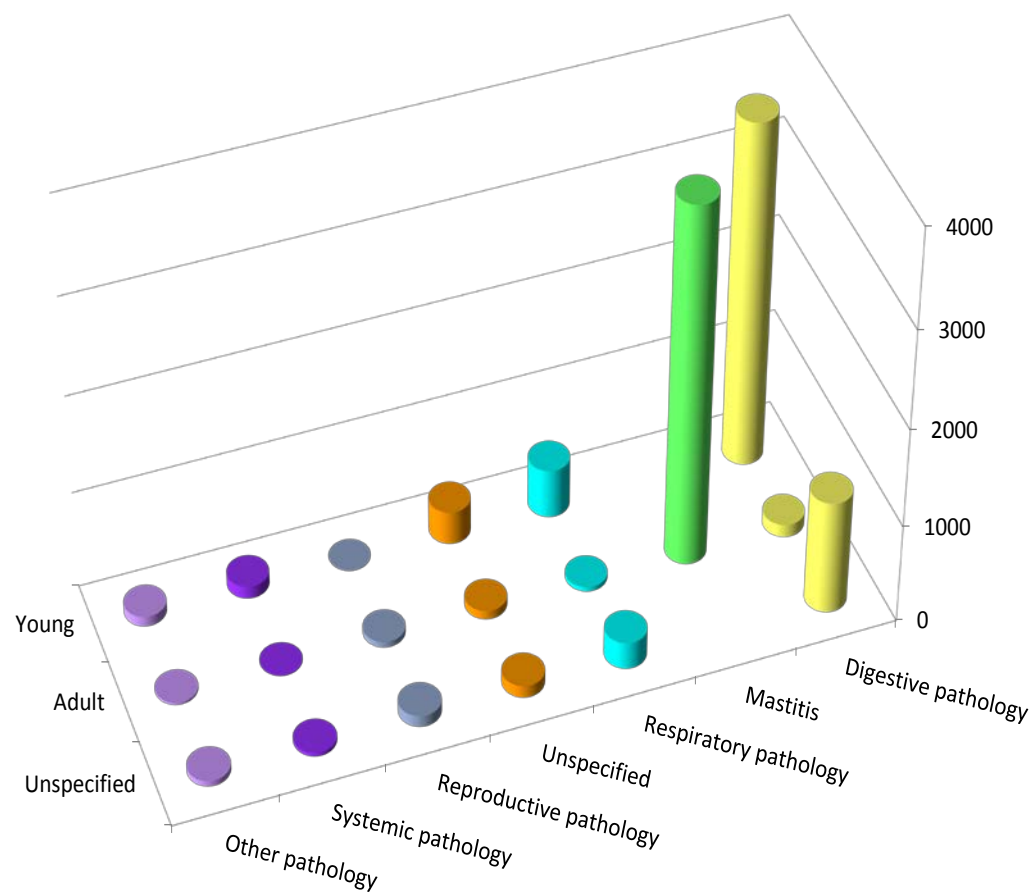


Figure 1 - Cattle 2015 – Number of antibiograms by age group and pathology

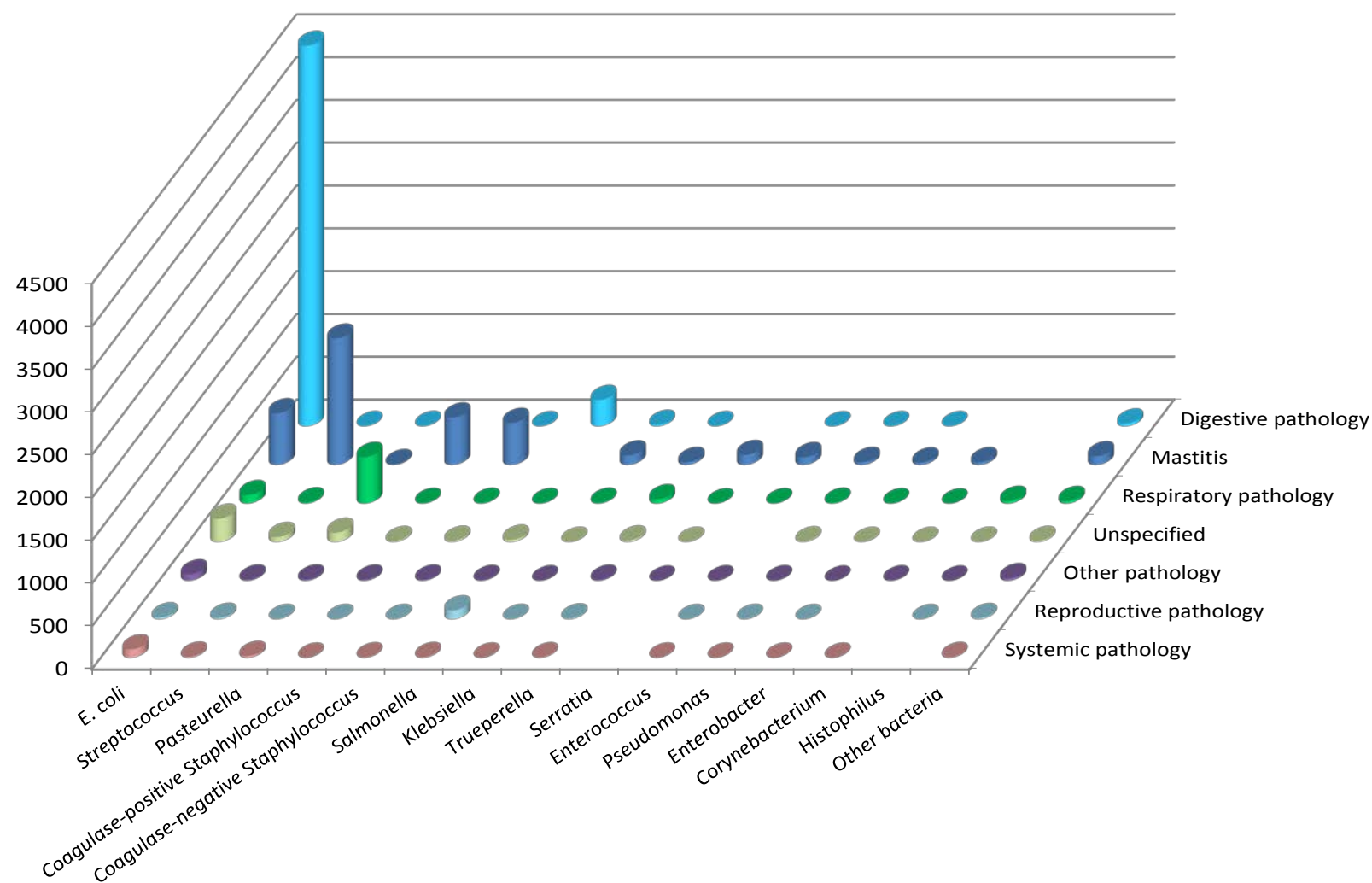


Note: all values are detailed in table 1 (including other pathologies, representing less than 1%, grouped together)

Table 1 - Cattle 2015 – Number of antibiograms by age group and pathology

Pathology N (%)	Age group N (%)			Total N (%)
	Young	Adult	Unspecified	
Digestive pathology	3,539 (34.03)	130 (1.25)	1,156 (11.12)	4,825 (46.40)
Mastitis		3,681 (35.40)		3,681 (35.40)
Respiratory pathology	496 (4.77)	46 (0.44)	275 (2.64)	817 (7.86)
Unspecified	338 (3.25)	89 (0.86)	123 (1.18)	550 (5.29)
Reproductive pathology	4 (0.04)	58 (0.56)	115 (1.11)	177 (1.70)
Systemic pathology	125 (1.20)	7 (0.07)	37 (0.36)	169 (1.63)
Nervous system pathology	23 (0.22)	2 (0.02)	8 (0.08)	33 (0.32)
Kidney and urinary tract pathology	4 (0.04)	11 (0.11)	14 (0.13)	29 (0.28)
Omphalitis	29 (0.28)			29 (0.28)
Septicemia	25 (0.24)	1 (0.01)	2 (0.02)	28 (0.27)
Arthritis	9 (0.09)	4 (0.04)	5 (0.05)	18 (0.17)
Skin and soft tissue infections	4 (0.04)	2 (0.02)	11 (0.11)	17 (0.16)
Otitis	2 (0.02)		5 (0.05)	7 (0.07)
Ocular pathology	1 (0.01)		5 (0.05)	6 (0.06)
Cardiac pathology	2 (0.02)		4 (0.04)	6 (0.06)
Cardiovascular disease	2 (0.02)		2 (0.02)	4 (0.04)
Oral pathology		2 (0.02)	1 (0.01)	3 (0.03)
Total N (%)	4,603 (44.26)	4,033 (38.78)	1,763 (16.95)	10,399 (100.00)

Figure 2 - Cattle 2015 – Number of antibiograms by bacteria and pathology (all age groups included)

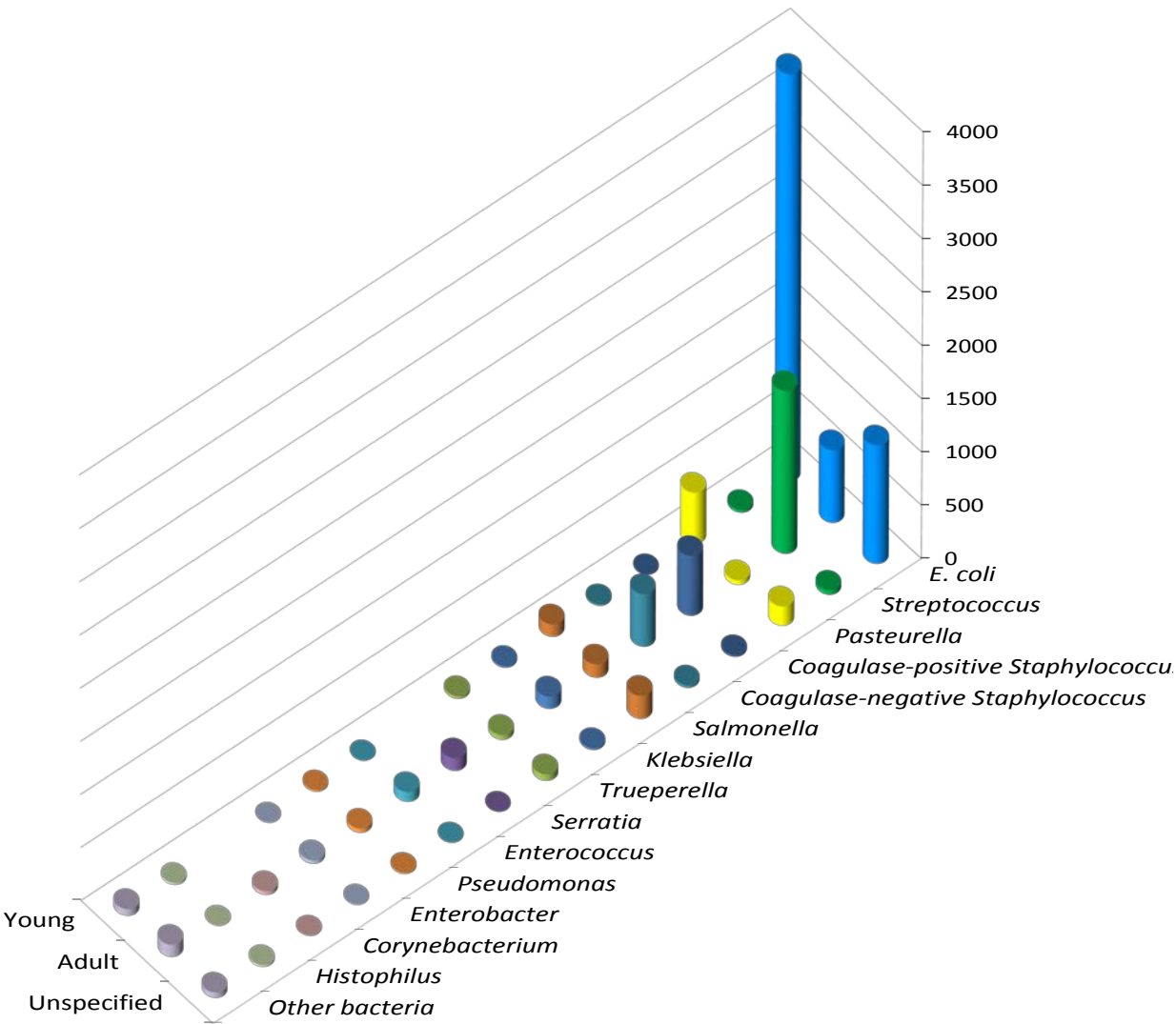


Note: only values for pathologies >1% and bacterial groups having more than 30 occurrences are represented. Detailed values are presented in table 2 below.

Table 2 - Cattle 2015 – Number of antibiograms by bacteria and pathology (all age groups included)

Bacteria N (%)	Pathology N (%)																	Total N (%)
	Digestive pathology	Mastitis	Respiratory pathology	Unspecified	Reproductive pathology	Systemic pathology	Nervous system pathology	Kidney and urinary tract pathology	Omphalitis	Septicemia	Arthritis	Skin and soft tissue infections	Otitis	Ocular pathology	Cardiac pathology	Cardiovascular disease	Oral pathology	
<i>E. coli</i>	4,445 (42.74)	604 (5.81)	99 (0.95)	273 (2.63)	21 (0.20)	98 (0.94)	15 (0.14)	15 (0.14)	14 (0.13)	20 (0.19)	3 (0.03)	1 (0.01)			3 (0.03)	3 (0.03)		5,614 (53.99)
<i>Streptococcus</i>	4 (0.04)	1,477 (14.20)	14 (0.13)	59 (0.57)	16 (0.15)	13 (0.13)	4 (0.04)	1 (0.01)	2 (0.02)	1 (0.01)	2 (0.02)	2 (0.02)						1,595 (15.34)
<i>Pasteurella</i>	5 (0.05)	9 (0.09)	543 (5.22)	109 (1.05)	2 (0.02)	22 (0.21)	1 (0.01)		1 (0.01)	4 (0.04)	1 (0.01)	2 (0.02)	2 (0.02)		1 (0.01)		1 (0.01)	703 (6.76)
<i>Coagulase-positive Staphylococcus</i>		553 (5.32)	7 (0.07)	12 (0.12)	2 (0.02)	1 (0.01)	2 (0.02)	1 (0.01)			1 (0.01)	5 (0.05)	1 (0.01)		1 (0.01)			586 (5.64)
<i>Coagulase-negative Staphylococcus</i>	2 (0.02)	490 (4.71)	8 (0.08)	15 (0.14)	2 (0.02)	5 (0.05)	1 (0.01)	4 (0.04)	2 (0.02)		1 (0.01)		2 (0.02)				1 (0.01)	533 (5.13)
<i>Salmonella</i>	308 (2.96)		5 (0.05)	27 (0.26)	103 (0.99)	8 (0.08)	7 (0.07)											458 (4.40)
<i>Klebsiella</i>	18 (0.17)	111 (1.07)	9 (0.09)	3 (0.03)	3 (0.03)	2 (0.02)			1 (0.01)	1 (0.01)	1 (0.01)							149 (1.43)
<i>Trueperella</i>	3 (0.03)	34 (0.33)	50 (0.48)	19 (0.18)	9 (0.09)	6 (0.06)			3 (0.03)		4 (0.04)	1 (0.01)			1 (0.01)	1 (0.01)		131 (1.26)
<i>Serratia</i>		116 (1.12)	2 (0.02)	3 (0.03)														121 (1.16)
<i>Enterococcus</i>	1 (0.01)	90 (0.87)	4 (0.04)		1 (0.01)	2 (0.02)		2 (0.02)				1 (0.01)						101 (0.97)
<i>Pseudomonas</i>	3 (0.03)	34 (0.33)	9 (0.09)	9 (0.09)	3 (0.03)	1 (0.01)			1 (0.01)		1 (0.01)	2 (0.02)						63 (0.61)
<i>Enterobacter</i>	3 (0.03)	29 (0.28)	4 (0.04)	2 (0.02)	1 (0.01)	1 (0.01)												40 (0.38)
<i>Corynebacterium</i>		32 (0.31)	1 (0.01)	2 (0.02)		1 (0.01)		1 (0.01)				1 (0.01)					1 (0.01)	39 (0.38)
<i>Histophilus</i>			32 (0.31)	4 (0.04)	1 (0.01)													37 (0.36)
<i>Other bacteria < 30 occurrences</i>	33 (0.32)	102 (0.98)	30 (0.29)	13 (0.13)	13 (0.13)	9 (0.09)	3 (0.03)	5 (0.05)	5 (0.05)	2 (0.02)	4 (0.04)	2 (0.02)	2 (0.02)	6 (0.06)				229 (2.20)
Total N (%)	4,825 (46.40)	3,681 (35.40)	817 (7.86)	550 (5.29)	177 (1.70)	169 (1.63)	33 (0.32)	29 (0.28)	29 (0.28)	28 (0.27)	18 (0.17)	17 (0.16)	7 (0.07)	6 (0.06)	6 (0.06)	4 (0.04)	3 (0.03)	10,399 (100.00)

Figure 3 - Cattle 2015 – Number of antibiograms by bacteria and age group



Note: only bacterial groups having more than 30 occurrences are represented. Detailed values are presented in table 3 below.

Table 3 - Cattle 2015 – Number of antibiograms by bacteria and age group

Bacteria N (%)	Age group N (%)			Total N (%)
	Young	Adult	Unspecified	
<i>E. coli</i>	3,819 (36.72)	682 (6.56)	1,113 (10.70)	5,614 (53.99)
<i>Streptococcus</i>	25 (0.24)	1,530 (14.71)	40 (0.38)	1,595 (15.34)
<i>Pasteurella</i>	479 (4.61)	42 (0.40)	182 (1.75)	703 (6.76)
<i>Coagulase-positive Staphylococcus</i>	6 (0.06)	564 (5.42)	16 (0.15)	586 (5.64)
<i>Coagulase negative Staphylococcus</i>	14 (0.13)	496 (4.77)	23 (0.22)	533 (5.13)
<i>Salmonella</i>	116 (1.12)	125 (1.20)	217 (2.09)	458 (4.40)
<i>Klebsiella</i>	17 (0.16)	115 (1.11)	17 (0.16)	149 (1.43)
<i>Trueperella</i>	24 (0.23)	46 (0.44)	61 (0.59)	131 (1.26)
<i>Serratia</i>		118 (1.13)	3 (0.03)	121 (1.16)
<i>Enterococcus</i>	6 (0.06)	91 (0.88)	4 (0.04)	101 (0.97)
<i>Pseudomonas</i>	14 (0.13)	39 (0.38)	10 (0.10)	63 (0.61)
<i>Enterobacter</i>	2 (0.02)	33 (0.32)	5 (0.05)	40 (0.38)
<i>Corynebacterium</i>		35 (0.34)	4 (0.04)	39 (0.38)
<i>Histophilus</i>	17 (0.16)	3 (0.03)	17 (0.16)	37 (0.36)
<i>Other bacteria < 30 occurrences</i>	64 (0.62)	114 (1.10)	51 (0.49)	229 (2.20)
Total N (%)	4,603 (44.26)	4,033 (38.78)	1,763 (16.95)	10,399 (100.00)

Table 4 - Cattle 2015 – Digestive pathology – Young animals – *E. coli*: susceptibility to antibiotics (proportion)
(N= 3,420)

Antibiotic	Total (N)	% S
Amoxicillin	2,983	15
Amoxicillin-Clavulanic ac.	3,319	43
Cephalexin	2,677	77
Cephalothin	808	61
Cefoxitin	2,568	90
Cefuroxime	1,756	70
Cefoperazone	1,176	87
Ceftiofur	3,409	93
Cefquinome 30 µg	3,345	87
Streptomycin 10 UI	2,094	15
Spectinomycin	851	52
Kanamycin 30 UI	1,283	44
Tobramycin	51	67
Gentamicin 10 UI	3,415	80
Neomycin	2,311	52
Netilmicin	51	82
Amikacin	51	100
Apramycin	1,347	86
Tetracycline	3,169	22
Chloramphenicol	142	44
Florfenicol	2,440	77
Nalidixic ac.	2,099	58
Oxolinic ac.	853	58
Flumequine	1,329	58
Enrofloxacin	3,206	77
Marbofloxacin	3,200	80
Danofloxacin	1,545	76
Sulfonamides	854	18
Trimethoprim	393	66
Trimethoprim-Sulfonamides	3,395	63

Table 5 - Cattle 2015 – Mastitis – Adults – *E. coli*: susceptibility to antibiotics (proportion) (N= 604)

Antibiotic	Total (N)	% S
Amoxicillin	530	72
Amoxicillin-Clavulanic ac.	603	81
Cephalexin	499	87
Cephalothin	217	88
Cefoxitin	450	99
Cefuroxime	321	92
Cefoperazone	443	98
Ceftiofur	504	98
Cefquinome 30 µg	554	98
Streptomycin 10 UI	363	82
Spectinomycin	151	95
Kanamycin 30 UI	259	92
Gentamicin 10 UI	596	98
Neomycin	431	90
Apramycin	138	97
Tetracycline	549	81
Chloramphenicol	32	78
Florfenicol	408	97
Nalidixic ac.	374	95
Oxolinic ac.	98	94
Flumequine	153	97
Enrofloxacin	533	98
Marbofloxacin	537	98
Danofloxacin	232	99
Sulfonamides	93	80
Trimethoprim	78	88
Trimethoprim-Sulfonamides	574	91

Table 6 - Cattle 2015 – All pathologies and age groups included – *Salmonella* Typhimurium: susceptibility to antibiotics (proportion) (N= 162)

Antibiotic	Total (N)	% S
Amoxicillin	128	16
Amoxicillin-Clavulanic ac.	162	36
Cephalexin	119	97
Cephalothin	56	96
Cefoxitin	132	99
Cefuroxime	65	95
Cefoperazone	68	62
Ceftiofur	162	99
Cefquinome 30 µg	152	97
Streptomycin 10 UI	99	17
Spectinomycin	63	33
Kanamycin 30 UI	56	98
Gentamicin 10 UI	162	95
Neomycin	140	98
Apramycin	80	99
Tetracycline	145	14
Chloramphenicol	31	55
Florfenicol	120	47
Nalidixic ac.	108	70
Oxolinic ac.	44	82
Flumequine	48	81
Enrofloxacin	162	94
Marbofloxacin	154	99
Danofloxacin	88	93
Sulfonamides	38	11
Trimethoprim-Sulfonamides	162	96

Table 7 - Cattle 2015 – All pathologies and age groups included – *Salmonella* Mbandaka: susceptibility to antibiotics (proportion) (N= 66)

Antibiotic	Total (N)	% S
Amoxicillin	65	100
Amoxicillin-Clavulanic ac.	63	100
Cephalexin	64	98
Cephalothin	48	100
Cefoxitin	66	100
Cefuroxime	51	100
Cefoperazone	55	100
Ceftiofur	66	100
Cefquinome 30 µg	65	97
Streptomycin 10 UI	51	98
Kanamycin 30 UI	51	100
Gentamicin 10 UI	66	100
Neomycin	65	98
Tetracycline	66	95
Florfenicol	66	100
Nalidixic ac.	48	96
Enrofloxacin	66	100
Marbofloxacin	65	100
Danofloxacin	62	100
Sulfonamides	49	88
Trimethoprim	46	100
Trimethoprim-Sulfonamides	66	98

Table 8 - Cattle 2015 – All pathologies and age groups included – *Salmonella* Montevideo: susceptibility to antibiotics (proportion) (N= 76)

Antibiotic	Total (N)	% S
Amoxicillin	72	99
Amoxicillin-Clavulanic ac.	73	99
Cephalexin	66	97
Cephalothin	42	95
Cefoxitin	73	97
Cefuroxime	47	100
Cefoperazone	55	100
Ceftiofur	76	100
Cefquinome 30 µg	74	95
Streptomycin 10 UI	50	94
Kanamycin 30 UI	50	100
Gentamicin 10 UI	76	99
Neomycin	70	100
Apramycin	33	85
Tetracycline	74	99
Florfenicol	74	100
Nalidixic ac.	47	100
Enrofloxacin	76	100
Marbofloxacin	71	100
Danofloxacin	64	100
Sulfonamides	40	100
Trimethoprim	33	100
Trimethoprim-Sulfonamides	76	100

Table 9 - Cattle 2015 – Respiratory pathology – Young animals – *Pasteurella multocida*: susceptibility to antibiotics (proportion) (N= 198)

Antibiotic	Total (N)	% S
Amoxicillin	179	96
Amoxicillin-Clavulanic ac.	181	96
Cephalexin	150	99
Cefoperazone	39	100
Ceftiofur	196	98
Cefquinome 30 µg	184	94
Streptomycin 10 UI	71	55
Spectinomycin	110	78
Kanamycin 30 UI	48	92
Gentamicin 10 UI	175	92
Neomycin	119	87
Tetracycline	193	81
Doxycycline	79	72
Florfenicol	191	99
Nalidixic ac.	77	95
Oxolinic ac.	89	85
Flumequine	112	89
Enrofloxacin	184	95
Marbofloxacin	186	98
Danofloxacin	137	96
Sulfonamides	32	9
Trimethoprim-Sulfonamides	193	90

Table 10 - Cattle 2015 – Respiratory pathology – Young animals – *Mannheimia haemolytica*: susceptibility to antibiotics (proportion) (N= 134)

Antibiotic	Total (N)	% S
Amoxicillin	114	96
Amoxicillin-Clavulanic ac.	121	98
Cephalexin	91	99
Ceftiofur	134	99
Cefquinome 30 µg	119	97
Streptomycin 10 UI	50	40
Spectinomycin	58	74
Kanamycin 30 UI	38	76
Gentamicin 10 UI	114	84
Neomycin	70	79
Tetracycline	131	84
Doxycycline	45	69
Florfenicol	130	98
Nalidixic ac.	57	93
Oxolinic ac.	41	83
Flumequine	59	85
Enrofloxacin	120	95
Marbofloxacin	131	99
Danofloxacin	92	91
Trimethoprim-Sulfonamides	131	100

Table 11 - Cattle 2015 – Mastitis – Adults – *Serratia Marcescens*: susceptibility to antibiotics (proportion) (N= 93)

Antibiotic	Total (N)	% S
Amoxicillin-Clavulanic ac.	90	22
Cefoxitin	66	77
Cefuroxime	47	13
Cefoperazone	64	100
Ceftiofur	81	99
Cefquinome 30 µg	83	100
Streptomycin 10 UI	56	61
Gentamicin 10 UI	91	99
Neomycin	64	98
Tetracycline	86	5
Florfenicol	50	90
Nalidixic ac.	52	100
Enrofloxacin	79	100
Marbofloxacin	88	100
Trimethoprim-Sulfonamides	79	99

Table 12 - Cattle 2015 – Mastitis – Adults – *Klebsiella pneumoniae*: susceptibility to antibiotics (proportion) (N= 71)

Antibiotic	Total (N)	% S
Amoxicillin-Clavulanic ac.	71	89
Cephalothin	31	100
Cefoxitin	55	96
Cefuroxime	34	97
Cefoperazone	46	98
Ceftiofur	61	100
Cefquinome 30 µg	66	100
Streptomycin 10 UI	48	94
Kanamycin 30 UI	36	100
Gentamicin 10 UI	71	99
Neomycin	44	93
Tetracycline	66	82
Florfenicol	48	98
Nalidixic ac.	44	89
Enrofloxacin	63	98
Marbofloxacin	65	98
Trimethoprim-Sulfonamides	67	97

Table 13 - Cattle 2015 – Mastitis – Adults – Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N= 553).

Antibiotic	Total (N)	% S
Penicillin	546	76
Cefoxitin	501	97
Oxacillin	83	98
Erythromycin	440	95
Tylosin	362	96
Spiramycin	550	96
Lincomycin	511	96
Pirlimycin	63	100
Streptomycin 10 UI	404	92
Kanamycin 30 UI	331	97
Gentamicin 10 UI	527	98
Neomycin	265	98
Tetracycline	526	95
Chloramphenicol	36	89
Florfenicol	191	99
Enrofloxacin	484	98
Marbofloxacin	518	99
Danofloxacin	107	97
Trimethoprim-Sulfonamides	443	99
Rifampicin	175	99

Table 14 - Cattle 2015 – Mastitis – Adults – Coagulase-negative *Staphylococcus*: susceptibility to antibiotics (proportion) (N= 490)

Antibiotic	Total (N)	% S
Penicillin	489	69
Cefoxitin	443	95
Oxacillin	104	93
Erythromycin	413	86
Tylosin	304	89
Spiramycin	489	91
Lincomycin	464	82
Pirlimycin	54	89
Streptomycin 10 UI	324	84
Kanamycin 30 UI	278	97
Gentamicin 10 UI	467	99
Neomycin	316	100
Tetracycline	476	86
Chloramphenicol	31	87
Florfenicol	163	98
Enrofloxacin	380	98
Marbofloxacin	408	99
Danofloxacin	151	98
Trimethoprim-Sulfonamides	366	99
Rifampicin	173	98

Table 15 - Cattle 2015 – Mastitis – Adults – *Streptococcus uberis*: susceptibility to antibiotics (proportion)
(N= 1,195)

Antibiotic	Total (N)	% S
Ampicillin	103	99
Oxacillin	940	80
Erythromycin	996	78
Tylosin	736	72
Spiramycin	1,180	76
Lincomycin	1,058	77
Pristinamycin	32	97
Streptomycin 500 µg	1,021	84
Kanamycin 1000 µg	822	95
Gentamicin 500 µg	1,020	97
Tetracycline	1,033	80
Doxycycline	78	90
Chloramphenicol	83	87
Florfenicol	532	89
Enrofloxacin	1,040	59
Marbofloxacin	982	78
Danofloxacin	182	47
Trimethoprim-Sulfonamides	1,100	83
Rifampicin	401	42

Table 16 - Cattle 2015 – Mastitis – Adults – *Streptococcus dysgalactiae*: susceptibility to antibiotics (proportion)
(N= 187)

Antibiotic	Total (N)	% S
Oxacillin	166	97
Erythromycin	147	76
Tylosin	124	82
Spiramycin	184	86
Lincomycin	168	86
Streptomycin 500 µg	167	94
Kanamycin 1000 µg	142	94
Gentamicin 500 µg	163	99
Tetracycline	169	14
Florfenicol	48	96
Enrofloxacin	156	56
Marbofloxacin	150	91
Trimethoprim-Sulfonamides	164	88
Rifampicin	45	67

Annex 3

Sheep

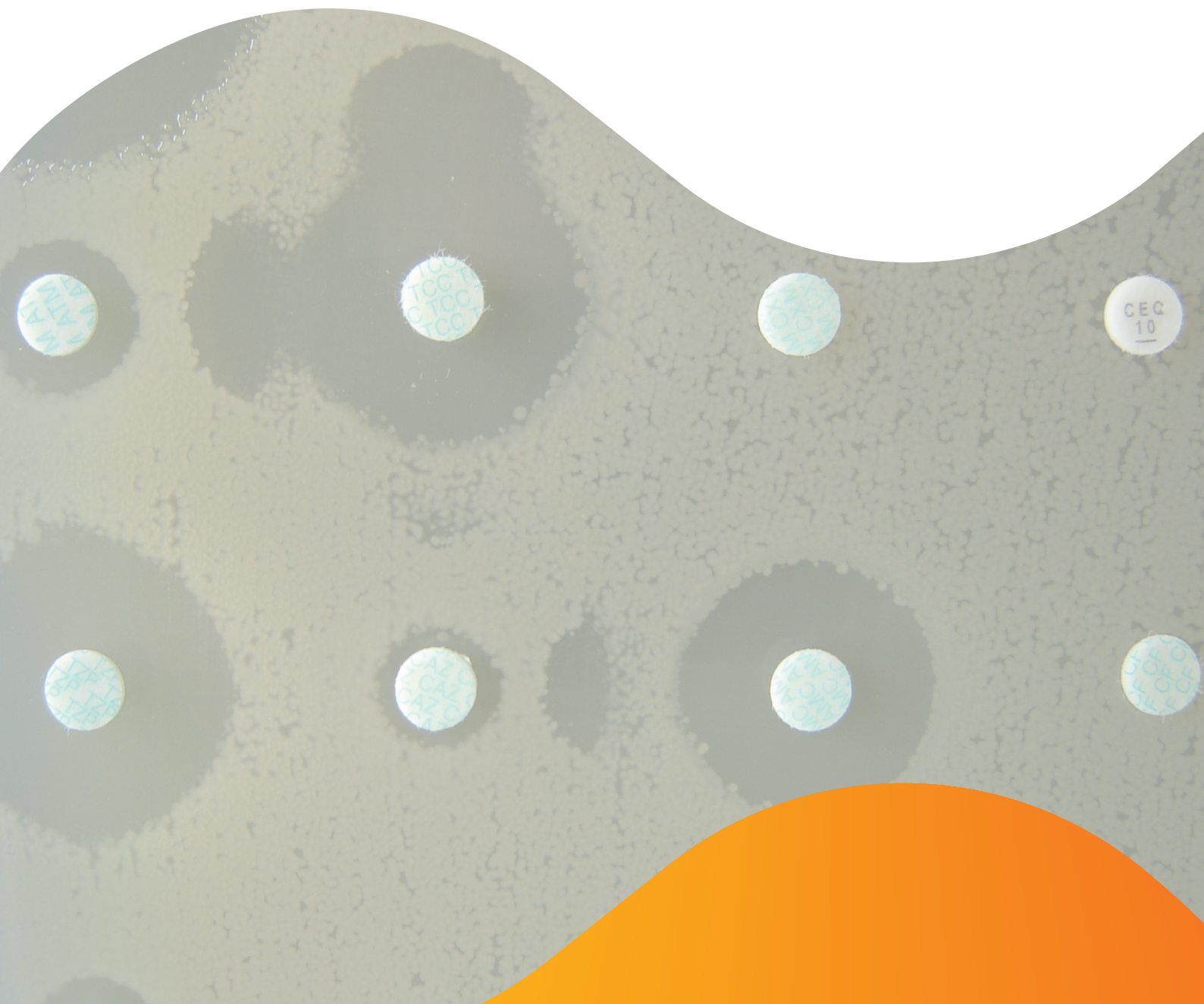
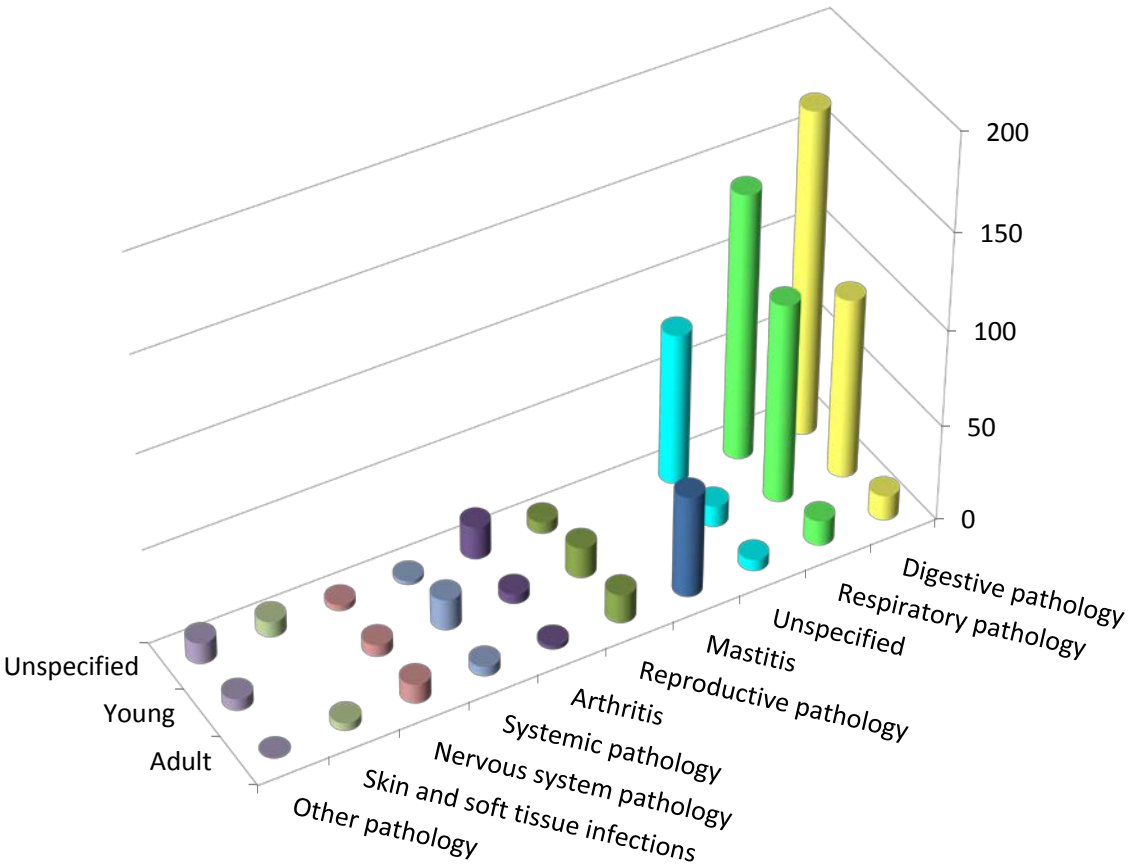


Figure 1 - Sheep 2015 – Number of antibiograms by age group and pathology

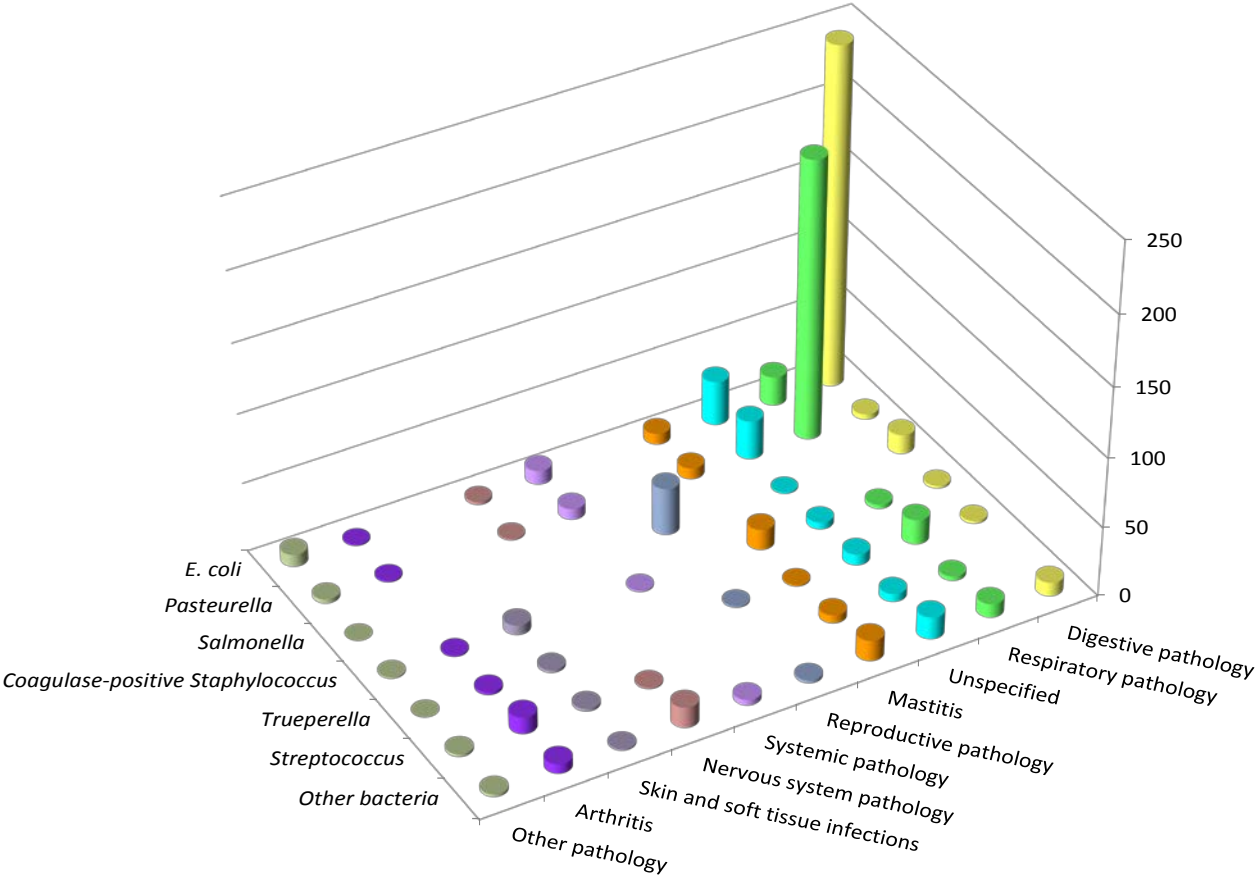


Note: all values are detailed in table 1 (including other pathologies, representing less than 1%, grouped together)

Table 1 - Sheep 2015 – Number of antibiograms by age group and pathology

Pathology N (%)	Age group N (%)			Total N (%)
	Unspecified	Young	Adult	
Digestive pathology	169 (20.8)	94 (11.6)	13 (1.6)	276 (33.9)
Respiratory pathology	139 (17.1)	104 (12.8)	13 (1.6)	256 (31.5)
Unspecified	79 (9.7)	11 (1.4)	6 (0.7)	96 (11.8)
Mastitis			53 (6.5)	53 (6.5)
Reproductive pathology	6 (0.7)	16 (2.0)	15 (1.8)	37 (4.6)
Arthritis	17 (2.1)	5 (0.6)	2 (0.2)	24 (3.0)
Systemic pathology	2 (0.2)	16 (2.0)	5 (0.6)	23 (2.8)
Nervous system pathology	3 (0.4)	6 (0.7)	10 (1.2)	19 (2.3)
Skin and soft tissue infections	8 (1.0)		4 (0.5)	12 (1.5)
Septicemia	5 (0.6)	2 (0.2)		7 (0.9)
Kidney and urinary tract pathology	4 (0.5)	1 (0.1)		5 (0.6)
Ocular pathology	2 (0.2)	2 (0.2)		4 (0.5)
Cardiac pathology		1 (0.1)		1 (0.1)
Total N (%)	434 (53.4)	258 (31.7)	121 (14.9)	813 (100.0)

Figure 2 - Sheep 2015 – Number of antibiograms by bacterial group and pathology



Note: only values for pathologies >1% and bacterial groups having more than 30 occurrences are represented. Detailed values are presented in table 2 below.

Table 2 - Sheep 2015 – Number of antibiograms by bacterial group and pathology

Bacteria N (%)	Pathology N (%)													Total N (%)
	Digestive pathology	Respiratory pathology	Unspecified	Mastitis	Reproductive pathology	Arthritis	Systemic pathology	Nervous system pathology	Skin and soft tissue infections	Septicemia	Kidney and urinary tract pathology	Ocular pathology	Cardiac pathology	
<i>E. coli</i>	244 (30.0)	21 (2.6)	32 (3.9)	8 (1.0)		1 (0.1)	10 (1.2)	2 (0.2)		2 (0.2)	5 (0.6)	1 (0.1)	1 (0.1)	327 (40.2)
<i>Pasteurella</i>	4 (0.5)	201 (24.7)	28 (3.4)	8 (1.0)		1 (0.1)	8 (1.0)	1 (0.1)		3 (0.4)				254 (31.2)
<i>Salmonella</i>	14 (1.7)		1 (0.1)		34 (4.2)									49 (6.0)
<i>Coagulase-positive Staphylococcus</i>	2 (0.2)	3 (0.4)	5 (0.6)	15 (1.8)		1 (0.1)	1 (0.1)		7 (0.9)			1 (0.1)		35 (4.3)
<i>Trueperella</i>	2 (0.2)	18 (2.2)	8 (1.0)	1 (0.1)	1 (0.1)	2 (0.2)			2 (0.2)					34 (4.2)
<i>Streptococcus</i>		3 (0.4)	6 (0.7)	6 (0.7)		12 (1.5)		1 (0.1)	2 (0.2)	1 (0.1)		1 (0.1)		32 (3.9)
<i>Other bacteria < 30 occurrences</i>	10 (1.2)	10 (1.2)	16 (2.0)	15 (1.8)	2 (0.2)	7 (0.9)	4 (0.5)	15 (1.8)	1 (0.1)	1 (0.1)		1 (0.1)		82 (10.1)
Total N (%)	276 (33.9)	256 (31.5)	96 (11.8)	53 (6.5)	37 (4.6)	24 (3.0)	23 (2.8)	19 (2.3)	12 (1.5)	7 (0.9)	5 (0.6)	4 (0.5)	1 (0.1)	813 (100.0)

Table 3 - Sheep 2015 – Digestive pathology – *E. coli*: susceptibility to antibiotics (proportion) (N= 244)

Antibiotic	Total (N)	% S
Amoxicillin	220	41
Amoxicillin-Clavulanic ac.	244	68
Cephalexin	216	91
Cefoxitin	185	99
Cefuroxime	42	98
Cefoperazone	59	98
Ceftiofur	243	98
Cefquinome 30 µg	239	98
Streptomycin 10 UI	190	32
Spectinomycin	159	78
Kanamycin 30 UI	63	89
Gentamicin 10 UI	243	93
Neomycin	217	78
Tetracycline	233	37
Florfenicol	223	90
Nalidixic ac.	216	82
Oxolinic ac.	42	93
Flumequine	108	84
Enrofloxacin	198	90
Marbofloxacin	111	94
Danofloxacin	74	88
Sulfonamides	48	65
Trimethoprim-Sulfonamides	243	56

Table 4 - Sheep 2015 – Respiratory pathology – All age groups – *Mannheimia haemolytica*: susceptibility to antibiotics (proportion) (N= 137)

Antibiotic	Total (N)	% S
Amoxicillin	131	95
Amoxicillin-Clavulanic ac.	119	98
Cephalexin	110	100
Cefoxitin	75	100
Ceftiofur	137	99
Cefquinome 30 µg	115	99
Streptomycin 10 UI	100	74
Spectinomycin	82	88
Gentamicin 10 UI	120	82
Neomycin	107	79
Tetracycline	135	87
Florfenicol	128	99
Nalidixic ac.	120	93
Flumequine	64	94
Enrofloxacin	90	92
Marbofloxacin	66	97
Danofloxacin	34	91
Trimethoprim-Sulfonamides	136	96

Annex 4

Goats

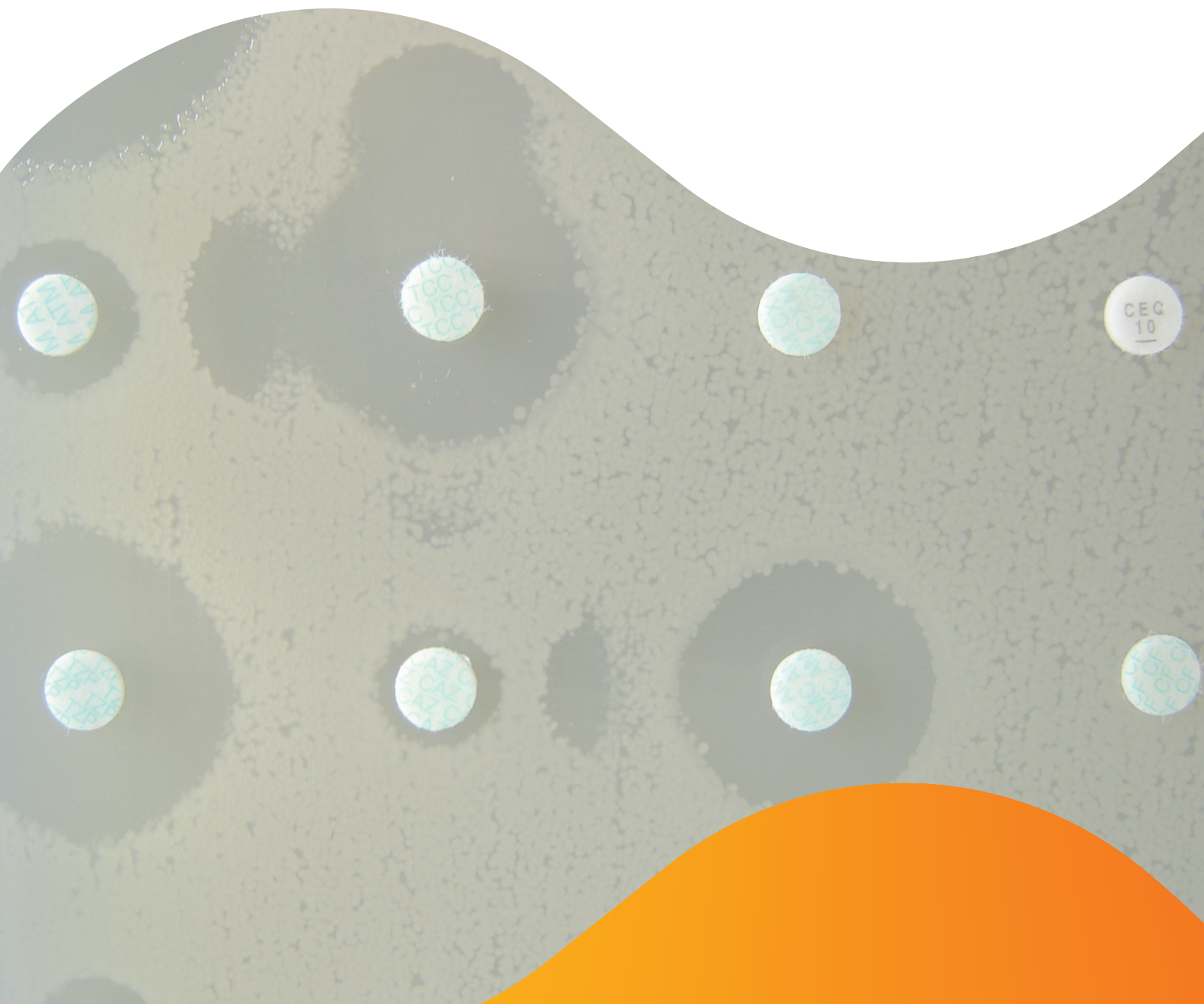
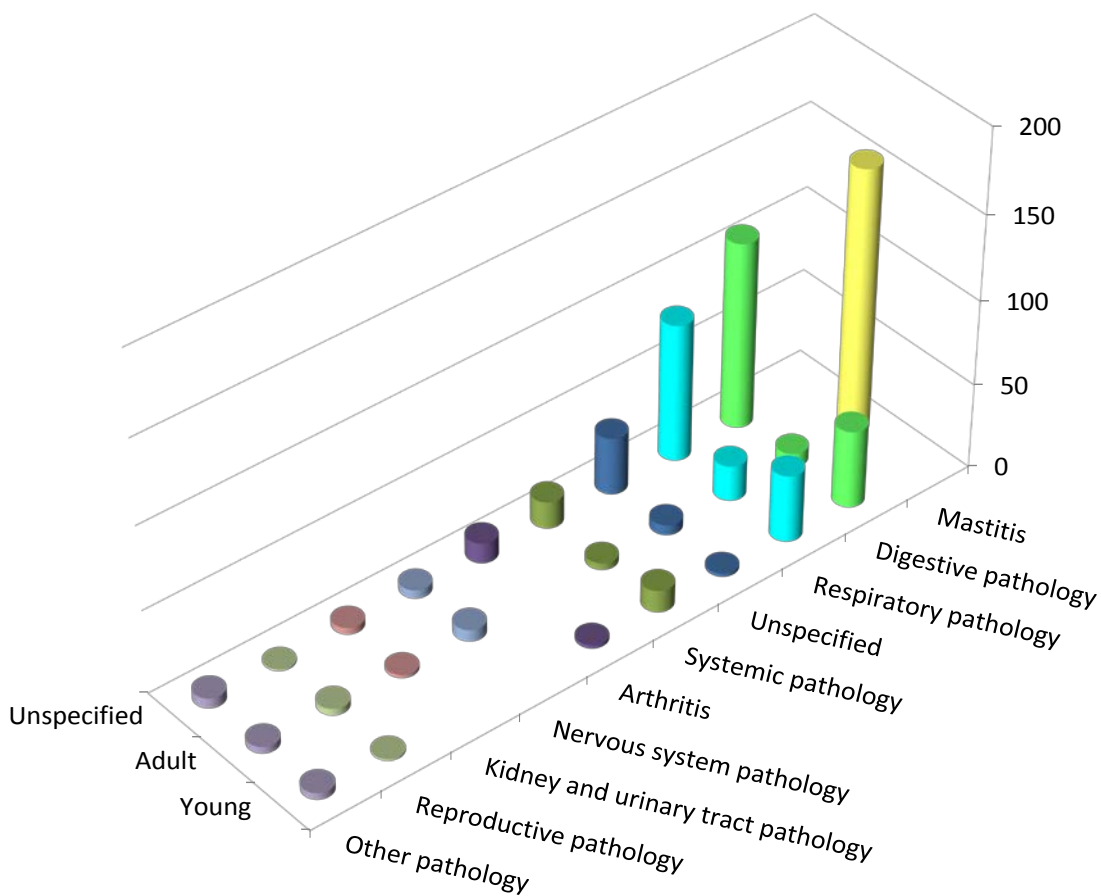


Figure 1 - Goats 2015 – Number of antibiograms by age group and pathology

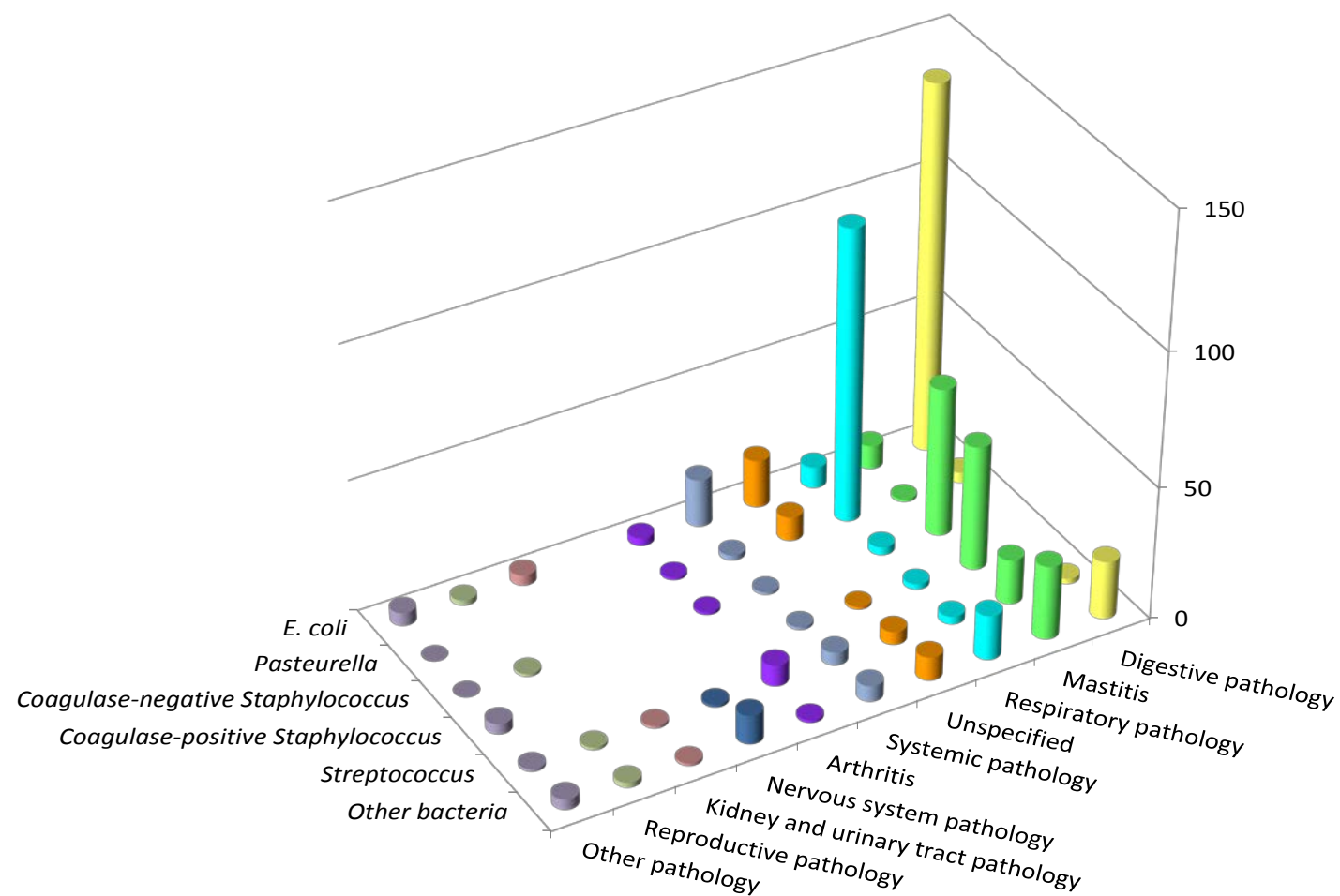


Note: all values are detailed in table 1 (including other pathologies, representing less than 1%, grouped together)

Table 1 - Goats 2015 – Number of antibiograms by age group and pathology

Pathology N (%)	Age group N (%)			Total N (%)
	Unspecified	Adult	Young	
Digestive pathology	111 (18.7)	8 (1.3)	46 (7.8)	165 (27.8)
Mastitis		158 (26.6)		158 (26.6)
Respiratory pathology	82 (13.8)	21 (3.5)	40 (6.7)	143 (24.1)
Unspecified	34 (5.7)	6 (1.0)	2 (0.3)	42 (7.1)
Systemic pathology	16 (2.7)	4 (0.7)	13 (2.2)	33 (5.6)
Arthritis	12 (2.0)		2 (0.3)	14 (2.4)
Nervous system pathology	5 (0.8)	7 (1.2)		12 (2.0)
Kidney and urinary tract pathology	4 (0.7)	2 (0.3)		6 (1.0)
Reproductive pathology	1 (0.2)	4 (0.7)	1 (0.2)	6 (1.0)
Septicemia		1 (0.2)	3 (0.5)	4 (0.7)
Skin and soft tissue infections	1 (0.2)	3 (0.5)		4 (0.7)
Otitis	2 (0.3)			2 (0.3)
Ocular pathology	2 (0.3)			2 (0.3)
Cardiac pathology	1 (0.2)		1 (0.2)	2 (0.3)
Total N (%)	271 (45.7)	214 (36.1)	108 (18.2)	593 (100.0)

Figure 2 - Goats 2015 – Number of antibiograms by bacterial group and pathology



Note: only values for pathologies >1% and bacterial groups having more than 30 occurrences are represented. Detailed values are presented in table 2 below.

Table 2 - Goats 2015 – Number of antibiograms by bacterial group and pathology

Bacteria N (%)	Pathology N (%)														Total N (%)
	Digestive pathology	Mastitis	Respiratory pathology	Unspecified	Systemic pathology	Arthritis	Nervous system pathology	Kidney and urinary tract pathology	Reproductive pathology	Septicemia	Skin and soft tissue infections	Otitis	Ocular pathology	Cardiac pathology	
<i>E. coli</i>	137 (23.1)	9 (1.5)	8 (1.3)	18 (3.0)	18 (3.0)	3 (0.5)		4 (0.7)	2 (0.3)	3 (0.5)				2 (0.3)	204 (34.4)
<i>Pasteurella</i>	4 (0.7)	1 (0.2)	110 (18.5)	9 (1.5)	2 (0.3)	1 (0.2)									127 (21.4)
<i>Coagulase-negative Staphylococcus</i>		56 (9.4)	3 (0.5)		1 (0.2)	1 (0.2)			1 (0.2)						62 (10.5)
<i>Coagulase-positive Staphylococcus</i>		47 (7.9)	2 (0.3)	1 (0.2)	1 (0.2)						3 (0.5)		1 (0.2)		55 (9.3)
<i>Streptococcus</i>	2 (0.3)	17 (2.9)	3 (0.5)	5 (0.8)	5 (0.8)	8 (1.3)	1 (0.2)	1 (0.2)	1 (0.2)		1 (0.2)				44 (7.4)
<i>Other bacteria < 30 occurrences</i>	22 (3.7)	28 (4.7)	17 (2.9)	9 (1.5)	6 (1.0)	1 (0.2)	11 (1.8)	1 (0.2)	2 (0.3)	1 (0.2)		2 (0.3)	1 (0.2)		101 (17.0)
Total N (%)	165 (27.8)	158 (26.6)	143 (24.1)	42 (7.1)	33 (5.6)	14 (2.4)	12 (2.0)	6 (1.0)	6 (1.0)	4 (0.7)	4 (0.7)	2 (0.3)	2 (0.3)	2 (0.3)	593 (100.0)

Table 3 - Goats 2015 – All pathologies and age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N= 204)

Antibiotic	Total (N)	% S
Amoxicillin	196	49
Amoxicillin-Clavulanic ac.	181	81
Cephalexin	168	89
Cephalothin	82	95
Cefoxitin	151	99
Cefuroxime	107	94
Cefoperazone	86	95
Ceftiofur	202	98
Cefquinome 30 µg	198	96
Streptomycin 10 UI	148	48
Spectinomycin	125	78
Kanamycin 30 UI	105	83
Gentamicin 10 UI	199	94
Neomycin	181	84
Apramycin	48	96
Tetracycline	189	43
Florfenicol	176	90
Nalidixic ac.	159	79
Flumequine	60	75
Enrofloxacin	190	87
Marbofloxacin	176	89
Danofloxacin	125	86
Sulfonamides	32	59
Trimethoprim	38	74
Trimethoprim-Sulfonamides	203	67

Table 4 - Goats 2015 – All pathologies and age groups included – *Pasteurella*: susceptibility to antibiotics (proportion) (N= 127)

Antibiotic	Total (N)	% S
Amoxicillin	119	89
Amoxicillin-Clavulanic ac.	97	93
Cephalexin	89	97
Cephalothin	58	98
Cefoxitin	59	98
Cefuroxime	45	100
Cefoperazone	47	94
Ceftiofur	127	100
Cefquinome 30 µg	112	94
Streptomycin 10 UI	93	44
Spectinomycin	67	76
Kanamycin 30 UI	53	55
Gentamicin 10 UI	109	93
Neomycin	79	76
Tetracycline	126	80
Florfenicol	120	98
Nalidixic ac.	83	77
Flumequine	44	91
Enrofloxacin	102	91
Marbofloxacin	110	97
Danofloxacin	73	90
Trimethoprim-Sulfonamides	126	82

Annex 5

Pigs

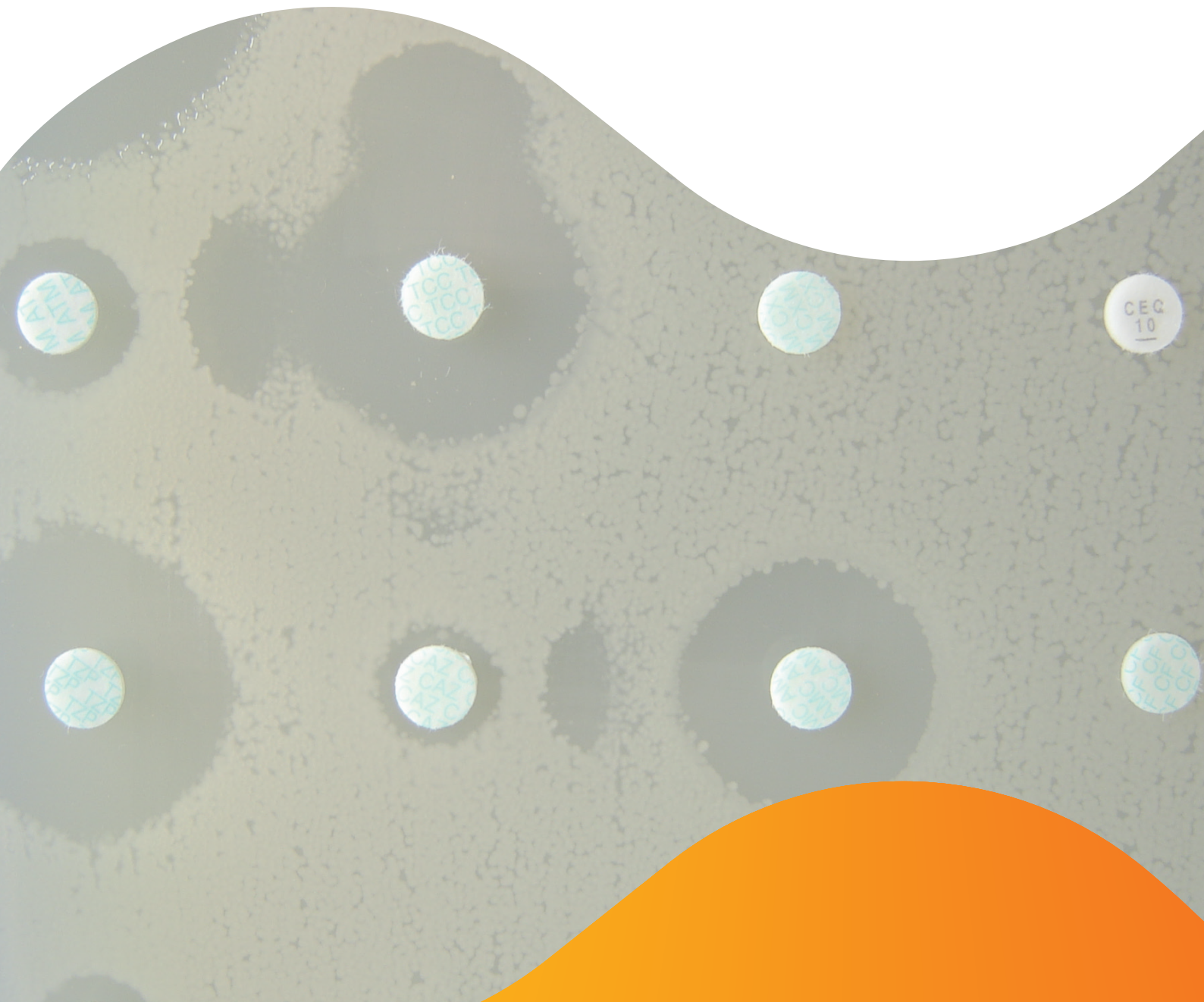


Figure 1 - Pigs 2015 – Antibigram proportions by animal category

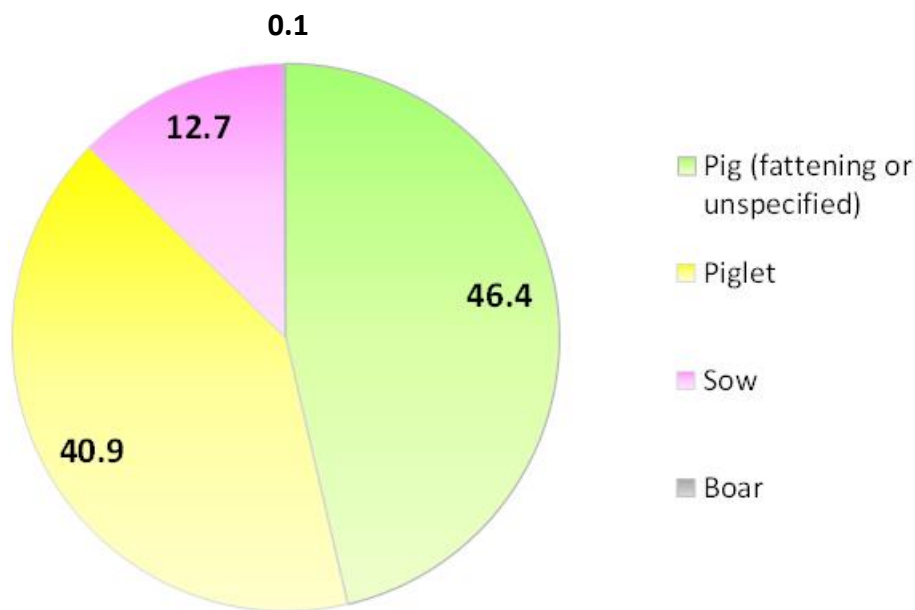


Figure 2 - Pigs 2015 – Number of antibiograms by pathology and animal category

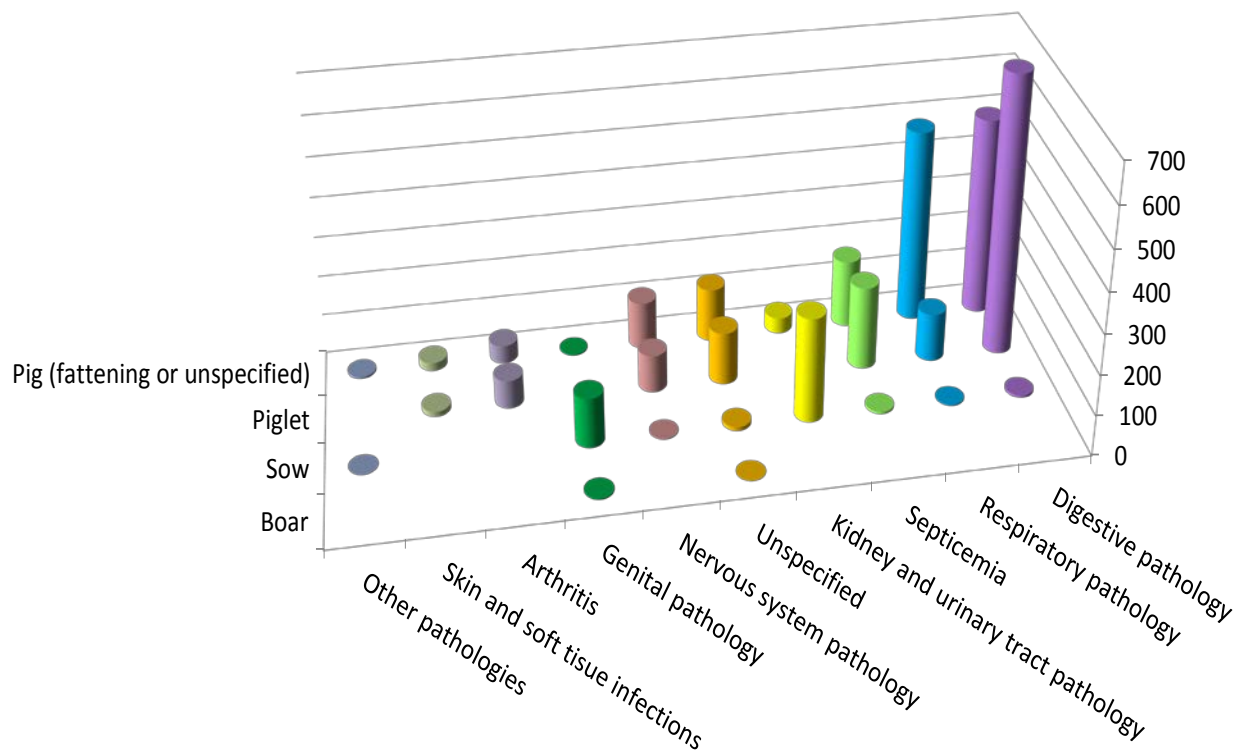


Table 1 - Pigs 2015 – Number of antibiograms by pathology and animal category

Age group or physiological stage N (%)	Pathology N (%)										Total N (%)
	Digestive pathology	Respiratory pathology	Septicemia	Kidney and urinary tract pathology	Unspecified	Nervous system pathology	Genital pathology	Arthritis	Skin and soft tissue infections	Others	
Piglet	499 (15.22)	485 (14.79)	170 (5.18)	40 (1.22)	134 (4.09)	118 (3.60)	3 (0.09)	45 (1.37)	21 (0.64)	5 (0.15)	1,520 (46.36)
Pig (fattening or unspecified)	700 (21.35)	121 (3.69)	209 (6.37)		132 (4.03)	94 (2.87)		71 (2.17)	13 (0.40)		1,340 (40.87)
Sow	6 (0.18)	3 (0.09)	6 (0.18)	262 (7.99)	10 (0.30)	2 (0.06)	125 (3.81)			1 (0.03)	415 (12.66)
Boar					1 (0.03)		3 (0.09)				4 (0.12)
Total N (%)	1,205 (36.75)	609 (18.57)	385 (11.74)	302 (9.21)	277 (8.45)	214 (6.53)	131 (4.00)	116 (3.54)	34 (1.04)	6 (0.18)	3,279 (100.00)

Figure 3 - Pigs 2015 – Number of antibiograms by bacteria and pathology

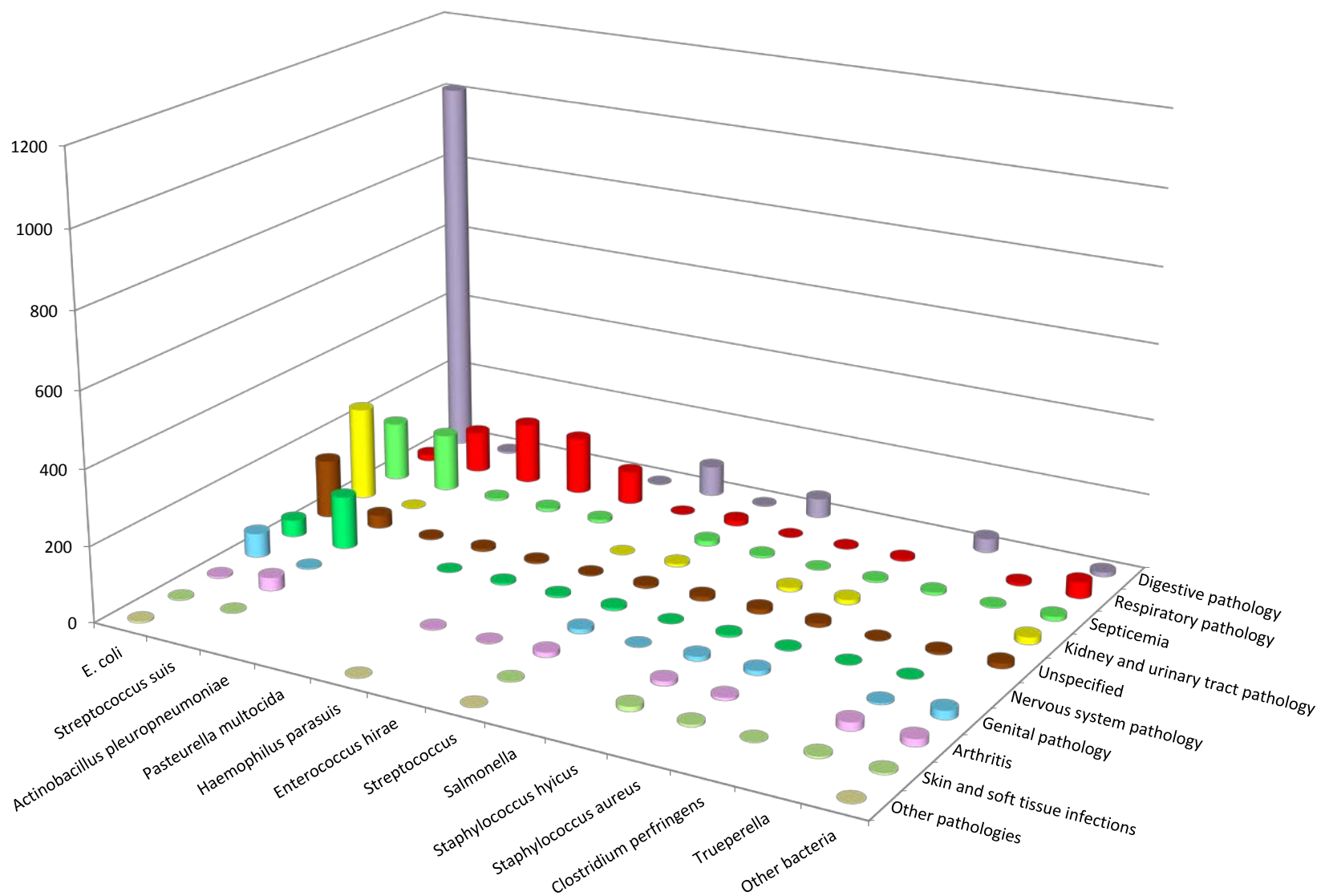


Table 2 - Pigs 2015 – Number of antibiograms by bacteria and pathology

Bacteria N (%)	Pathology N (%)										Total N (%)
	Digestive pathology	Respiratory pathology	Septicemia	Kidney and urinary tract pathology	Unspecified	Nervous system pathology	Genital pathology	Arthritis	Skin and soft tissue infections	Other pathologies	
<i>E. coli</i>	1,016 (30.99)	17 (0.52)	158 (4.82)	249 (7.59)	156 (4.76)	45 (1.37)	64 (1.95)	4 (0.12)	2 (0.06)	3 (0.09)	1,714 (52.27)
<i>Streptococcus suis</i>	4 (0.12)	111 (3.39)	154 (4.70)	1 (0.03)	35 (1.07)	141 (4.30)	3 (0.09)	34 (1.04)	1 (0.03)		484 (14.76)
<i>Actinobacillus pleuropneumoniae</i>		163 (4.97)	6 (0.18)		4 (0.12)						173 (5.28)
<i>Pasteurella multocida</i>		152 (4.64)	9 (0.27)		8 (0.24)	1 (0.03)					170 (5.18)
<i>Haemophilus parasuis</i>	1 (0.03)	89 (2.71)	9 (0.27)		5 (0.15)	5 (0.15)		2 (0.06)		1 (0.03)	112 (3.42)
<i>Enterococcus hirae</i>	81 (2.47)	1 (0.03)		1 (0.03)	3 (0.09)	5 (0.15)		1 (0.03)			92 (2.81)
<i>Streptococcus</i>	2 (0.06)	15 (0.46)	14 (0.43)	8 (0.24)	8 (0.24)	7 (0.21)	12 (0.37)	14 (0.43)	2 (0.06)	1 (0.03)	83 (2.53)
<i>Salmonella</i>	52 (1.59)	1 (0.03)	6 (0.18)		12 (0.37)	1 (0.03)	1 (0.03)				73 (2.23)
<i>Staphylococcus hyicus</i>		3 (0.09)	1 (0.03)	11 (0.34)	13 (0.40)	5 (0.15)	12 (0.37)	12 (0.37)	13 (0.40)		70 (2.13)
<i>Staphylococcus aureus</i>		6 (0.18)	5 (0.15)	13 (0.40)	11 (0.34)	2 (0.06)	12 (0.37)	8 (0.24)	6 (0.18)		63 (1.92)
<i>Clostridium perfringens</i>	37 (1.13)		8 (0.24)		2 (0.06)	1 (0.03)			1 (0.03)		49 (1.49)
<i>Trueperella</i>		7 (0.21)	3 (0.09)		6 (0.18)	1 (0.03)	4 (0.12)	22 (0.67)	5 (0.15)		48 (1.46)
<i>Other bacteria < 30 occurrences</i>	12 (0.37)	44 (1.34)	12 (0.37)	19 (0.58)	14 (0.43)		23 (0.70)	19 (0.58)	4 (0.12)	1 (0.03)	148 (4.51)
Total N (%)	1,205 (36.75)	609 (18.57)	385 (11.74)	302 (9.21)	277 (8.45)	214 (6.53)	131 (4.00)	116 (3.54)	34 (1.04)	6 (0.18)	3,279 (100.00)

Table 3 - Pigs 2015 – All pathologies and age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N= 1,714)

Antibiotic	Total (N)	% S
Amoxicillin	1,677	45
Amoxicillin-Clavulanic ac.	1,552	82
Cephalexin	942	89
Cephalothin	333	93
Cefoxitin	1,098	98
Cefuroxime	184	94
Cefoperazone	202	97
Ceftiofur	1,712	97
Cefquinome 30 µg	368	98
Streptomycin 10 UI	237	39
Spectinomycin	1,421	60
Gentamicin 10 UI	1,601	88
Neomycin	1,551	84
Apramycin	1,503	89
Tetracycline	1,326	30
Florfenicol	1,600	90
Nalidixic ac.	634	69
Oxolinic ac.	1,327	71
Flumequine	1,031	73
Enrofloxacin	1,661	90
Marbofloxacin	1,450	92
Danofloxacin	350	90
Sulfonamides	167	32
Trimethoprim	528	44
Trimethoprim-Sulfonamides	1,680	45

Table 4 - Pigs 2015 – Digestive pathology – Piglets (post-weaning included) – *E. coli*: susceptibility to antibiotics (proportion) (N= 600)

Antibiotic	Total (N)	% S
Amoxicillin	583	41
Amoxicillin-Clavulanic ac.	547	80
Cephalexin	403	90
Cefoxitin	353	97
Ceftiofur	595	97
Cefquinome 30 µg	100	97
Spectinomycin	561	55
Gentamicin 10 UI	581	82
Neomycin	595	79
Apramycin	590	86
Tetracycline	407	23
Florfenicol	544	88
Nalidixic ac.	117	65
Oxolinic ac.	540	68
Flumequine	294	67
Enrofloxacin	598	87
Marbofloxacin	567	90
Trimethoprim	121	35
Trimethoprim-Sulfonamides	567	38

Table 5 - Pigs 2015 – Kidney and urinary tract pathology – Sows – *E. coli*: susceptibility to antibiotics (proportion) (N= 214)

Antibiotic	Total (N)	% S
Amoxicillin	208	42
Amoxicillin-Clavulanic ac.	155	68
Ceftiofur	208	99
Gentamicin 10 UI	156	98
Tetracycline	200	37
Florfenicol	203	88
Nalidixic ac.	104	60
Oxolinic ac.	205	63
Enrofloxacin	160	84
Marbofloxacin	210	89
Trimethoprim-Sulfonamides	214	49

Table 6 - Pigs 2015 – All pathologies included – *Actinobacillus pleuropneumoniae*: susceptibility to antibiotics (proportion) (N= 173)

Antibiotic	Total (N)	% S
Amoxicillin	171	98
Amoxicillin-Clavulanic ac.	129	100
Ceftiofur	172	100
Tilmicosin	169	98
Tetracycline	170	84
Florfenicol	170	99
Enrofloxacin	173	99
Marbofloxacin	153	99
Trimethoprim-Sulfonamides	173	96

Table 7 - Pigs 2015 – All pathologies included – *Pasteurella multocida*: susceptibility to antibiotics (proportion) (N= 170)

Antibiotic	Total (N)	% S
Amoxicillin	165	100
Amoxicillin-Clavulanic ac.	143	100
Ceftiofur	169	100
Tilmicosin	158	97
Tetracycline	167	90
Florfenicol	167	99
Flumequine	115	94
Enrofloxacin	169	98
Marbofloxacin	139	100
Trimethoprim-Sulfonamides	170	88

Table 8 - Pigs 2015 – All pathologies included – *Streptococcus suis*: susceptibility to antibiotics (proportion) (N= 484)

Antibiotic	Total (N)	% S
Amoxicillin	465	99
Oxacillin	227	94
Erythromycin	379	31
Tylosin	473	25
Spiramycin	477	29
Lincomycin	476	27
Streptomycin 500 µg	297	94
Kanamycin 1000 µg	201	98
Gentamicin 500 µg	376	99
Tetracycline	347	13
Trimethoprim-Sulfonamides	483	85

Annex 6

Poultry

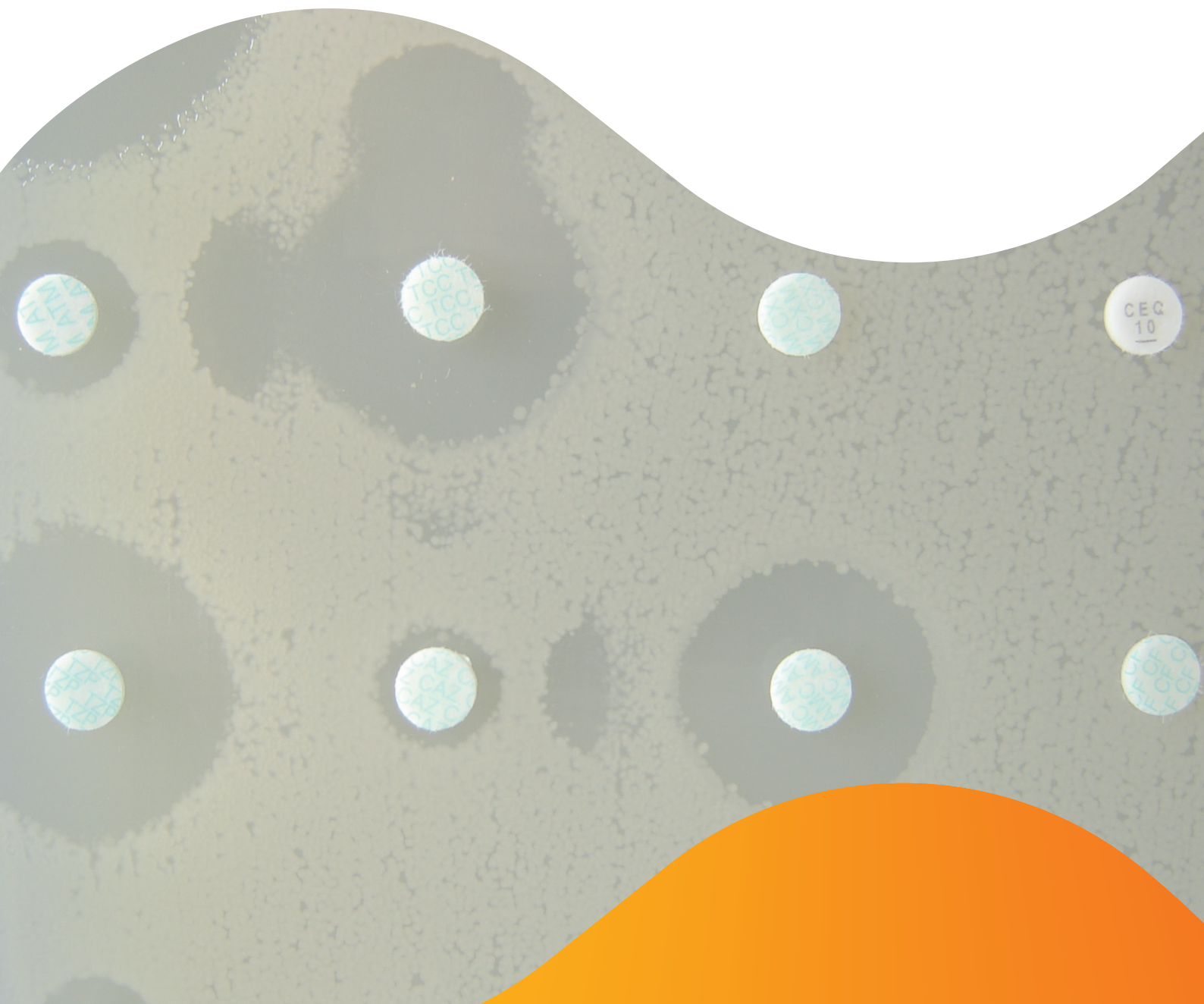


Figure 1 - Poultry 2015 – Number of antibiograms by pathology and animal

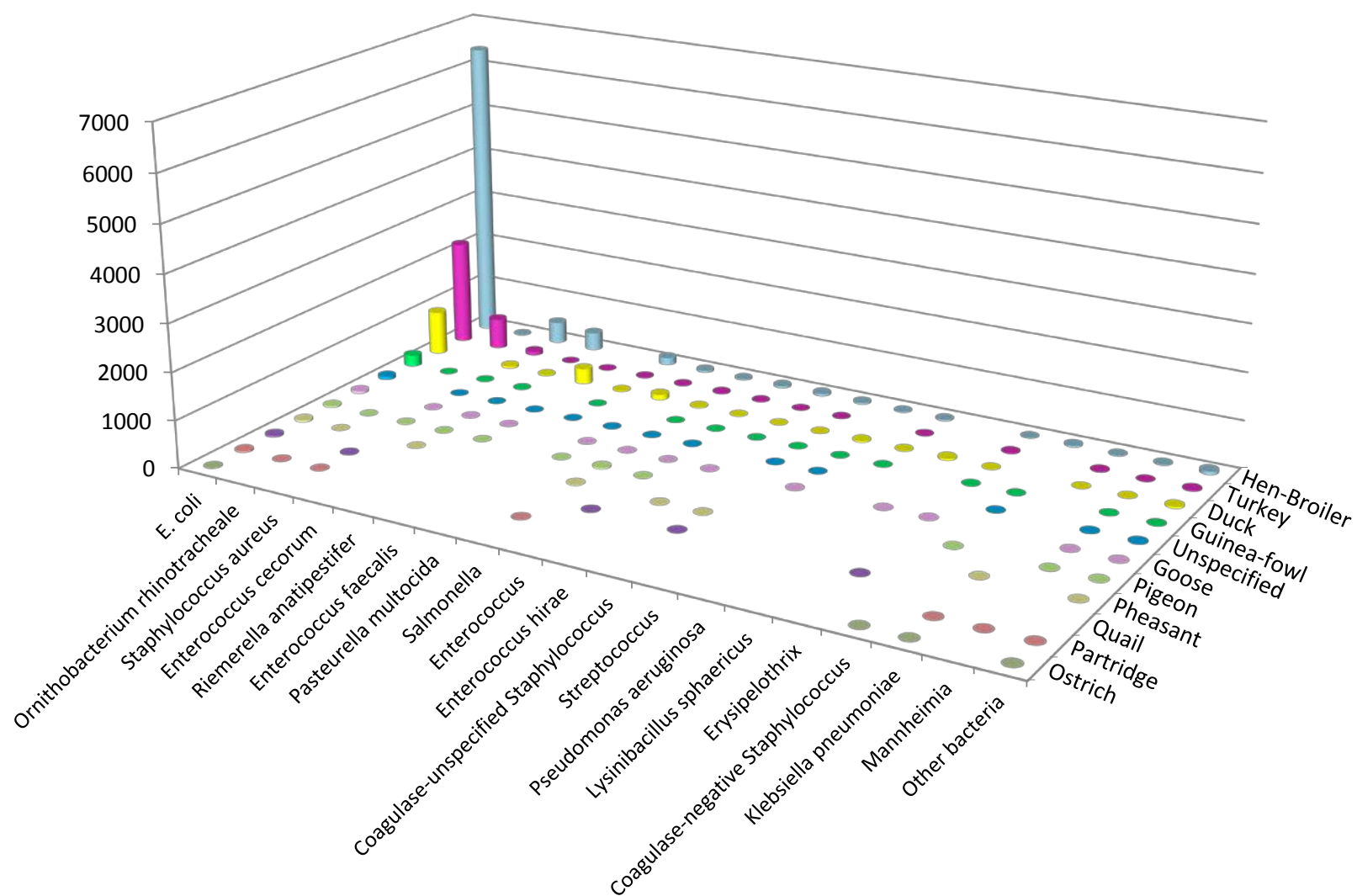


Table 1 - Poultry 2015 – Number of antibiograms by bacteria and animal

Bacteria N (%)	Animal species N (%)											Total N (%)
	Hen-chicken	Turkey	Duck	Guinea-fowl	Poultry	Goose	Pigeon	Pheasant	Quail	Partridge	Ostrich	
<i>E. coli</i>	6,397 (48.50)	2,226 (16.88)	937 (7.10)	241 (1.83)	69 (0.52)	48 (0.36)	31 (0.24)	38 (0.29)	34 (0.26)	29 (0.22)	7 (0.05)	10,057 (76.25)
<i>Ornithobacterium rhinotracheale</i>	14 (0.11)	654 (4.96)		3 (0.02)			1 (0.01)	1 (0.01)		2 (0.02)		675 (5.12)
<i>Staphylococcus aureus</i>	459 (3.48)	80 (0.61)	42 (0.32)	7 (0.05)	3 (0.02)	2 (0.02)	3 (0.02)		8 (0.06)	3 (0.02)		607 (4.60)
<i>Enterococcus cecorum</i>	383 (2.90)	2 (0.02)	18 (0.14)	7 (0.05)	2 (0.02)	5 (0.04)	1 (0.01)	1 (0.01)				419 (3.18)
<i>Riemerella anatipestifer</i>		4 (0.03)	329 (2.49)		1 (0.01)	3 (0.02)	1 (0.01)					338 (2.56)
<i>Enterococcus faecalis</i>	153 (1.16)	17 (0.13)	17 (0.13)	2 (0.02)	1 (0.01)							190 (1.44)
<i>Pasteurella multocida</i>	41 (0.31)	15 (0.11)	111 (0.84)		2 (0.02)	1 (0.01)	1 (0.01)					171 (1.30)
<i>Salmonella</i>	25 (0.19)	19 (0.14)	18 (0.14)	1 (0.01)	3 (0.02)	3 (0.02)	26 (0.20)	8 (0.06)		3 (0.02)		106 (0.80)
<i>Enterococcus</i>	45 (0.34)	13 (0.10)	6 (0.05)	2 (0.02)	3 (0.02)	1 (0.01)	1 (0.01)		3 (0.02)			74 (0.56)
<i>Enterococcus hirae</i>	55 (0.42)	3 (0.02)	1 (0.01)	1 (0.01)		1 (0.01)		1 (0.01)				62 (0.47)
<i>Coagulase-unspecified Staphylococcus</i>	34 (0.26)	7 (0.05)	5 (0.04)	3 (0.02)	2 (0.02)			2 (0.02)	1 (0.01)			54 (0.41)
<i>Streptococcus</i>	15 (0.11)		27 (0.20)	1 (0.01)	1 (0.01)	7 (0.05)						51 (0.39)
<i>Pseudomonas aeruginosa</i>	27 (0.20)	5 (0.04)	11 (0.08)	2 (0.02)								45 (0.34)
<i>Lysinibacillus sphaericus</i>			40 (0.30)			1 (0.01)						41 (0.31)
<i>Erysipelothrix</i>	11 (0.08)	19 (0.14)	4 (0.03)	3 (0.02)		3 (0.02)			1 (0.01)			41 (0.31)
<i>Coagulase-negative Staphylococcus</i>	30 (0.23)			3 (0.02)	1 (0.01)		2 (0.02)				1 (0.01)	37 (0.28)
<i>Klebsiella pneumoniae</i>	13 (0.10)	16 (0.12)	1 (0.01)					1 (0.01)		1 (0.01)	1 (0.01)	33 (0.25)
<i>Manheimia</i>	18 (0.14)	2 (0.02)	3 (0.02)	1 (0.01)	4 (0.03)	1 (0.01)	1 (0.01)			1 (0.01)		31 (0.24)
<i>Other bacteria < 30 occurrences</i>	73 (0.55)	23 (0.17)	31 (0.24)	4 (0.03)	12 (0.09)	2 (0.02)	5 (0.04)	1 (0.01)		4 (0.03)	3 (0.02)	158 (1.20)
Total N (%)	7,793 (59.08)	3,105 (23.54)	1,601 (12.14)	281 (2.13)	104 (0.79)	78 (0.59)	73 (0.55)	53 (0.40)	47 (0.36)	43 (0.33)	12 (0.09)	13,190 (100.00)

Table 2 - Hens and broilers 2015 – All pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N=6,397)

Antibiotic	Total (N)	% S
Ampicillin	649	69
Amoxicillin	6,358	65
Amoxicillin-Clavulanic ac.	4,352	90
Cephalexin	1,904	91
Cephalothin	2,229	95
Cefoxitin	3,789	98
Cefuroxime	228	94
Cefoperazone	198	97
Ceftiofur	5,878	97
Cefquinome 30 µg	1,144	98
Spectinomycin	2,066	83
Gentamicin 10 UI	4,596	93
Neomycin	2,967	97
Apramycin	2,557	99
Tetracycline	4,820	55
Florfenicol	3,759	99
Nalidixic ac.	3,717	61
Oxolinic ac.	2,401	57
Flumequine	6,053	57
Enrofloxacin	6,359	92
Marbofloxacin	639	95
Danofloxacin	198	84
Sulfonamides	501	63
Trimethoprim	2,720	77
Trimethoprim-Sulfonamides	6,367	75

Table 3 – Laying hens (table eggs and hatching eggs) 2015 – All pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N= 2,416)

Antibiotic	Total (N)	% S
Amoxicillin	2,388	71
Amoxicillin-Clavulanic ac.	1,791	91
Cephalexin	444	87
Cephalothin	1,303	95
Cefoxitin	1,727	97
Ceftiofur	2,313	97
Cefquinome 30 µg	280	97
Spectinomycin	618	82
Gentamicin 10 UI	1,863	91
Neomycin	1,376	98
Apramycin	1,314	99
Tetracycline	1,865	58
Florfenicol	1,616	99
Nalidixic ac.	1,706	63
Oxolinic ac.	494	60
Flumequine	2,347	61
Enrofloxacin	2,392	95
Trimethoprim	1,369	82
Trimethoprim-Sulfonamides	2,393	82

Table 4 – Broilers 2015 – All pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N= 3,577)

Antibiotic	Total (N)	% S
Ampicillin	519	67
Amoxicillin	3,569	61
Amoxicillin-Clavulanic ac.	2,242	89
Cephalexin	1,168	92
Cephalothin	895	97
Cefoxitin	1,779	99
Cefuroxime	110	95
Ceftiofur	3,161	98
Cefquinome 30 µg	739	98
Spectinomycin	1,198	83
Gentamicin 10 UI	2,405	94
Neomycin	1,292	97
Apramycin	989	99
Tetracycline	2,637	55
Florfenicol	1,846	99
Nalidixic ac.	1,962	58
Oxolinic ac.	1,652	56
Flumequine	3,545	56
Enrofloxacin	3,567	90
Marbofloxacin	283	95
Danofloxacin	101	79
Sulfonamides	458	62
Trimethoprim	1,340	72
Trimethoprim-Sulfonamides	3,571	70

Table 5 - Turkeys 2015 – All pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N= 2,226)

Antibiotic	Total (N)	% S
Amoxicillin	2,221	51
Amoxicillin-Clavulanic ac.	1,282	89
Cephalexin	871	89
Cephalothin	294	98
Cefoxitin	1,063	99
Ceftiofur	2,096	99
Cefquinome 30 µg	295	98
Spectinomycin	758	84
Gentamicin 10 UI	1,188	96
Neomycin	486	97
Apramycin	366	99
Tetracycline	1,401	54
Florfenicol	804	98
Nalidixic ac.	1,097	81
Oxolinic ac.	988	79
Flumequine	2,155	75
Enrofloxacin	2,225	93
Marbofloxacin	169	91
Sulfonamides	212	68
Trimethoprim	749	83
Trimethoprim-Sulfonamides	2,225	79

Table 6 - Ducks 2015 – All pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N= 937)

Antibiotic	Total (N)	% S
Amoxicillin	936	45
Amoxicillin-Clavulanic ac.	741	80
Cephalexin	452	90
Cephalothin	288	92
Cefoxitin	694	99
Ceftiofur	834	98
Cefquinome 30 µg	400	99
Spectinomycin	654	91
Gentamicin 10 UI	799	96
Neomycin	340	97
Apramycin	349	97
Tetracycline	899	30
Florfenicol	750	99
Nalidixic ac.	720	74
Oxolinic ac.	513	73
Flumequine	921	72
Enrofloxacin	935	92
Sulfonamides	106	48
Trimethoprim	381	57
Trimethoprim-Sulfonamides	937	60

Table 7 - Hens and broilers 2015 – All pathologies included - *Staphylococcus aureus*: susceptibility to antibiotics (proportion) (N= 459)

Antibiotic	Total (N)	% S
Penicillin G	280	87
Cefoxitin	299	89
Erythromycin	321	89
Tylosin	351	92
Spiramycin	228	93
Lincomycin	359	90
Gentamicin 10 UI	239	97
Neomycin	165	98
Tetracycline	364	80
Enrofloxacin	457	96
Trimethoprim-Sulfonamides	456	97

Table 8 - Hens and broilers 2015 – All pathologies included – *Enterococcus cecorum*: susceptibility to antibiotics (proportion) (N= 383)

Antibiotic	Total (N)	% S
Amoxicillin	381	98
Erythromycin	244	51
Tylosin	255	48
Spiramycin	188	53
Lincomycin	257	49
Gentamicin 500 µg	126	98
Tetracycline	269	4
Trimethoprim-Sulfonamides	382	40

Annex 7

Rabbits

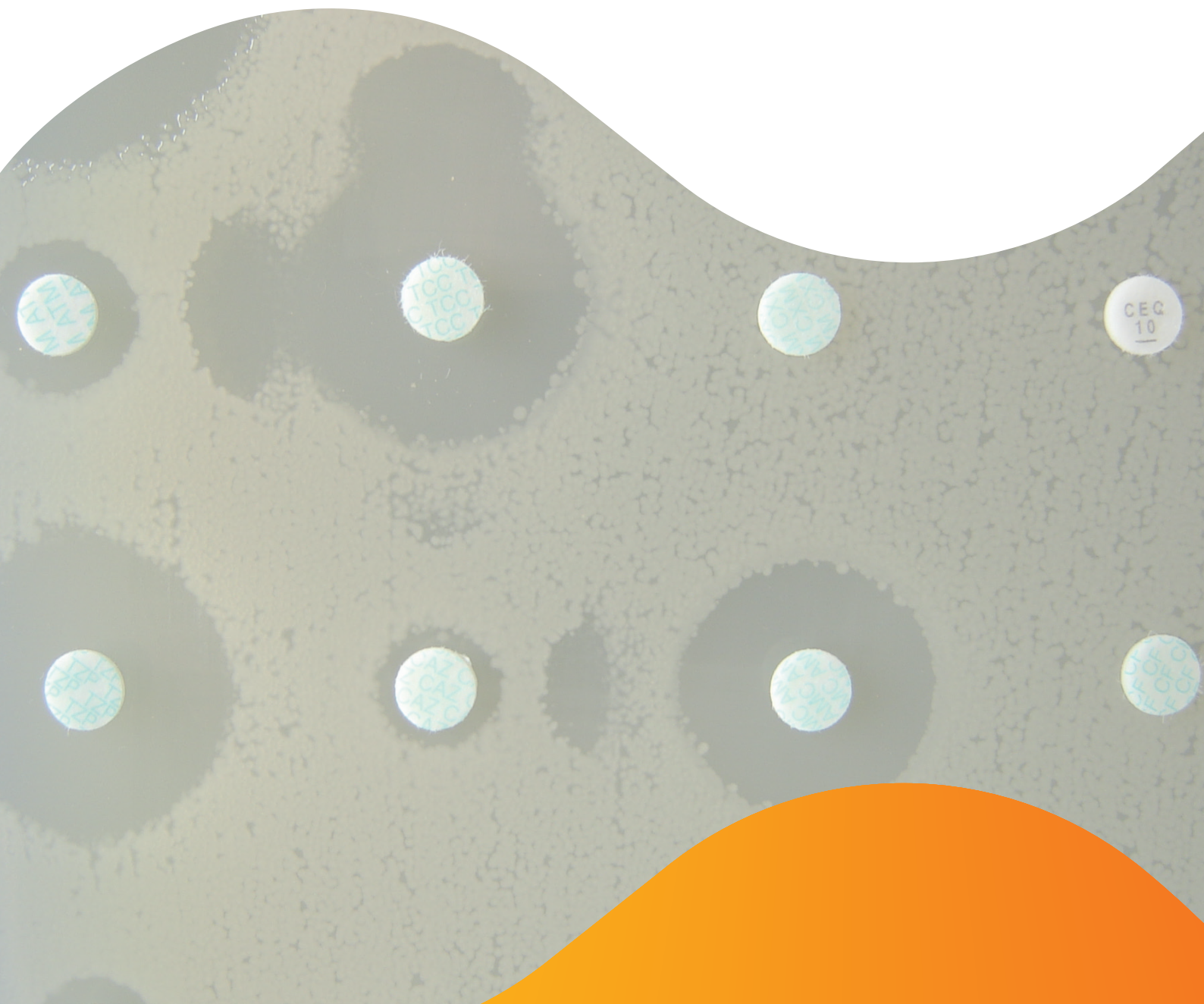
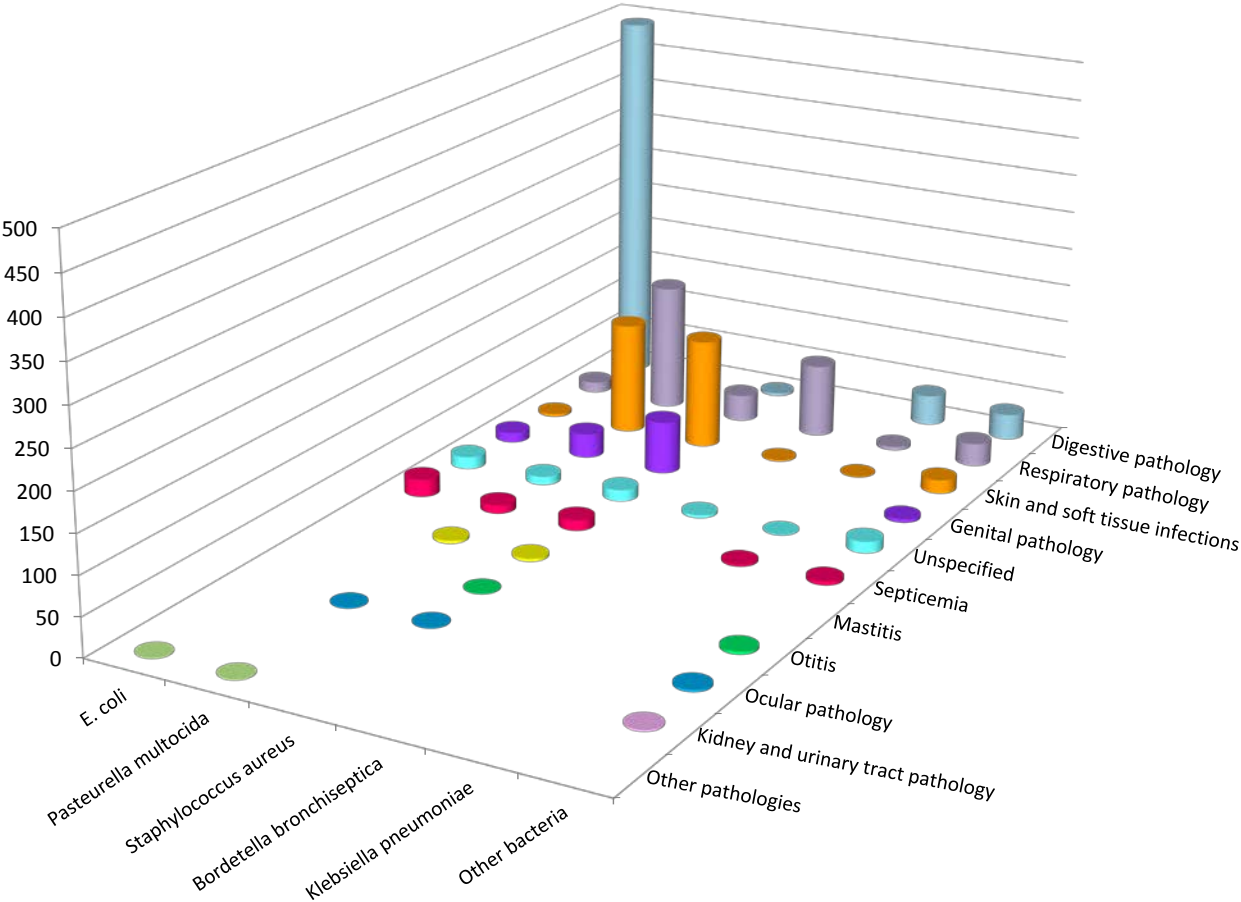


Figure 1 - Rabbits 2015 – Number of antibiograms by bacteria and pathology



Note: only values for bacterial groups having more than 30 occurrences are represented. Detailed values are presented in table 1 below.

Table 1 - Rabbits 2015 – Number of antibiograms by bacteria and pathology

Bacteria N (%)	Pathology N (%)										Total N (%)	
	Digestive pathology	Respiratory pathology	Skin and soft tissue infections	Genital pathology	Unspecified	Septicemia	Mastitis	Ocular pathology	Otitis	Kidney and urinary tract pathology		Others
<i>E. coli</i>	493	14	4	13	16	23					1	564
	(33.02)	(0.94)	(0.27)	(0.87)	(1.07)	(1.54)					(0.07)	(37.78)
<i>Pasteurella multocida</i>		167	147	32	11	11	4	1			1	374
		(11.19)	(9.85)	(2.14)	(0.74)	(0.74)	(0.27)	(0.07)			(0.07)	(25.05)
<i>Staphylococcus aureus</i>	4	35	144	69	15	14	4	1	1			287
	(0.27)	(2.34)	(9.65)	(4.62)	(1.00)	(0.94)	(0.27)	(0.07)	(0.07)			(19.22)
<i>Bordetella bronchiseptica</i>		96	2		4							102
		(6.43)	(0.13)		(0.27)							(6.83)
<i>Klebsiella pneumoniae</i>	40	5	1		1	3						50
	(2.68)	(0.33)	(0.07)		(0.07)	(0.20)						(3.35)
<i>Other bacteria</i> <i>< 30 occurrences</i>	34	30	18	5	15	5		3	4	2		116
	(2.28)	(2.01)	(1.21)	(0.33)	(1.00)	(0.33)		(0.20)	(0.27)	(0.13)		(7.77)
Total N (%)	571	347	316	119	62	56	8	5	5	2	2	1,493
	(38.25)	(23.24)	(21.17)	(7.97)	(4.15)	(3.75)	(0.54)	(0.33)	(0.33)	(0.13)	(0.13)	(100.00)

Table 2 - Rabbits 2015 - All pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N = 564)

Antibiotic	Total (N)	% S
Amoxicillin	316	43
Amoxicillin-Clavulanic ac.	321	62
Cephalexin	327	81
Cephalothin	110	85
Cefoxitin	345	98
Ceftiofur	505	99
Cefquinome 30 µg	268	99
Streptomycin 10 UI	136	44
Spectinomycin	452	83
Gentamicin 10 UI	560	86
Neomycin	550	77
Apramycin	533	85
Tetracycline	556	14
Nalidixic ac.	389	66
Flumequine	333	69
Enrofloxacin	560	89
Marbofloxacin	137	94
Danofloxacin	278	87
Trimethoprim	178	28
Trimethoprim-Sulfonamides	564	27

Table 3 - Rabbits 2015 – All pathologies included - *Pasteurella multocida*: susceptibility to antibiotics (proportion) (N= 374)

Antibiotic	Total (N)	% S
Ceftiofur	149	98
Tilmicosin	345	96
Spectinomycin	245	98
Gentamicin 10 UI	332	99
Tetracycline	370	97
Flumequine	243	96
Enrofloxacin	374	99
Danofloxacin	245	99
Trimethoprim-Sulfonamides	374	97

Table 4 - Rabbits 2015 – All pathologies included - *Staphylococcus aureus*: susceptibility to antibiotics (proportion) (N= 287)

Antibiotic	Total (N)	% S
Penicillin G	189	78
Cefoxitin	188	99
Erythromycin	236	36
Spiramycin	283	36
Gentamicin 10 UI	287	50
Tetracycline	287	32
Enrofloxacin	286	90
Trimethoprim-Sulfonamides	287	51

Annex 8

Fish

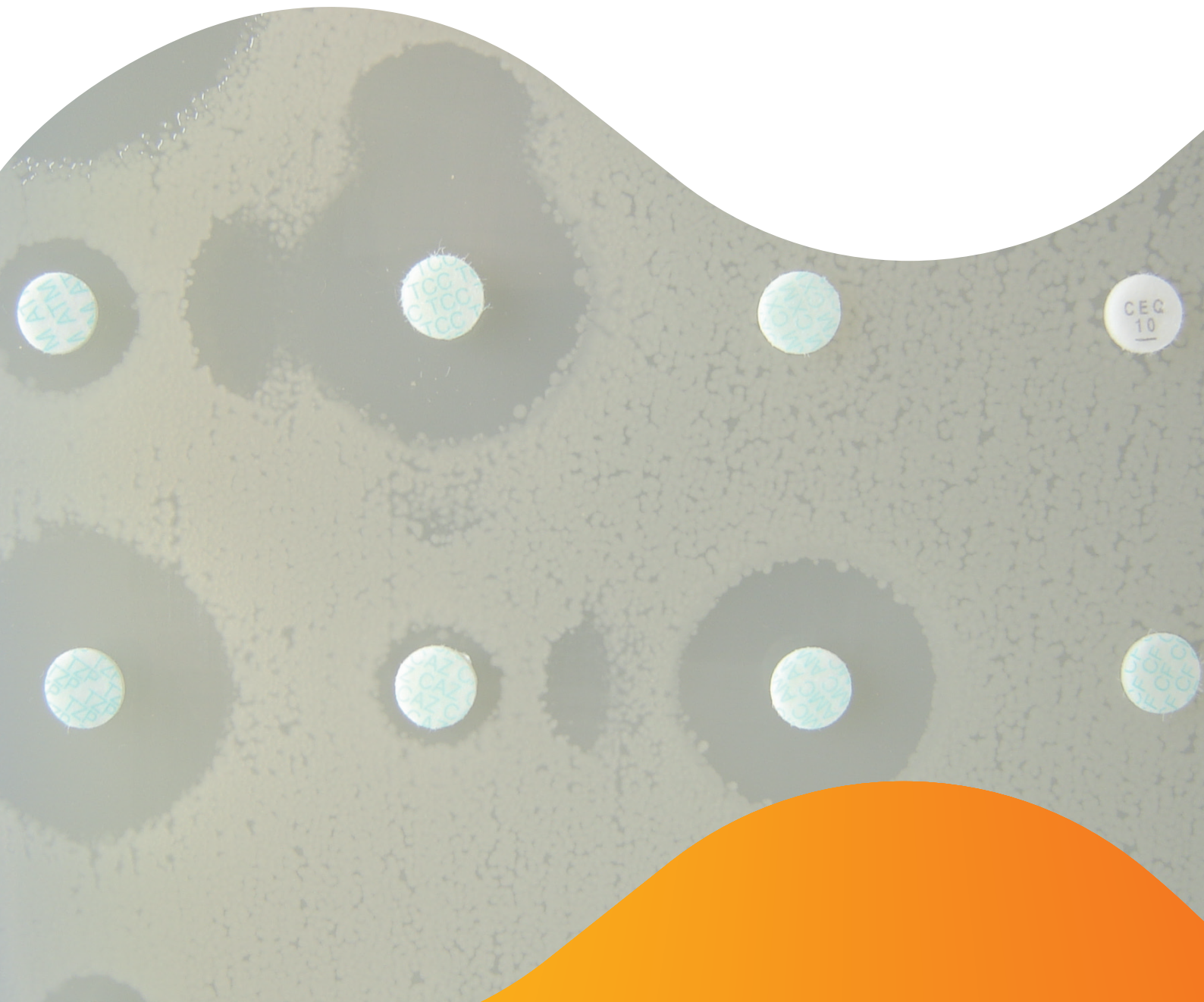


Figure 1 - Fish 2015 – Antibigram proportions by animal species

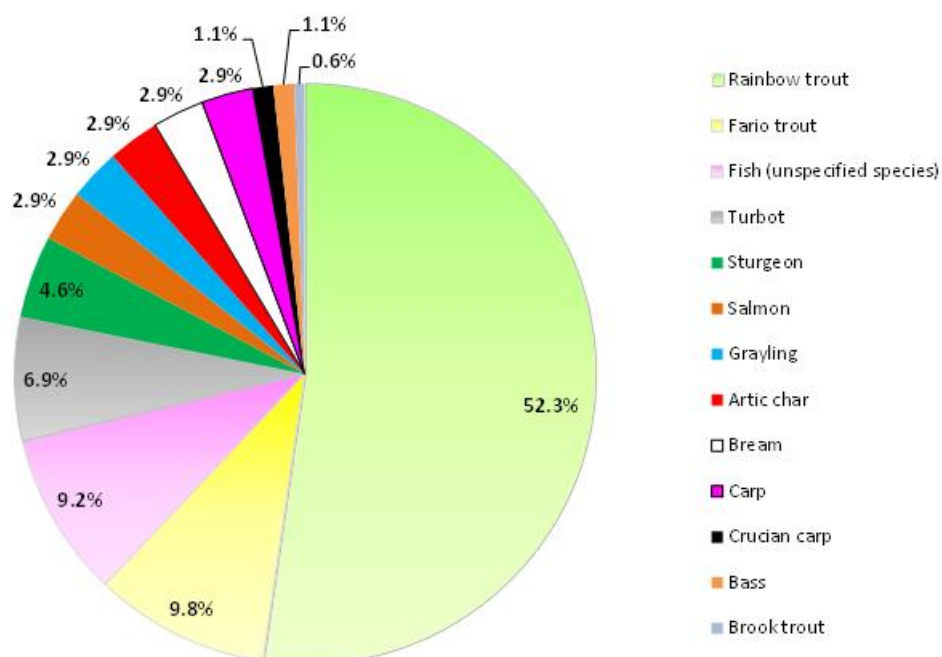


Table 1 - Fish 2015 – Number of antibiograms by bacteria and pathology

Bacteria N (%)	Pathology N (%)			Total N (%)
	Unspecified	Septicemia	Skin and soft tissue infections	
<i>Aeromonas salmonicida</i>	73 (41.95)	17 (9.77)	2 (1.15)	92 (52.87)
<i>Aeromonas</i>	11 (6.32)	7 (4.02)	5 (2.87)	23 (13.22)
<i>Yersinia ruckeri</i>	14 (8.05)	3 (1.72)		17 (9.77)
<i>Carnobacterium</i>	11 (6.32)	4 (2.30)		15 (8.62)
<i>Edwardsiella tarda</i>	7 (4.02)		1 (0.57)	8 (4.60)
<i>Vibrio</i>	4 (2.30)			4 (2.30)
<i>Lactococcus</i>	3 (1.72)			3 (1.72)
<i>Photobacterium</i>	1 (0.57)	2 (1.15)		3 (1.72)
<i>Streptococcus</i>			3 (1.72)	3 (1.72)
<i>Pseudomonas</i>	2 (1.15)			2 (1.15)
<i>Acinetobacter</i>			1 (0.57)	1 (0.57)
<i>Shewanella putrefaciens</i>			1 (0.57)	1 (0.57)
<i>Cedecea</i>	1 (0.57)			1 (0.57)
<i>Chromobacterium</i>	1 (0.57)			1 (0.57)
Total N (%)	128 (73.56)	33 (18.97)	13 (7.47)	174 (100.00)

Annex 9

Horses

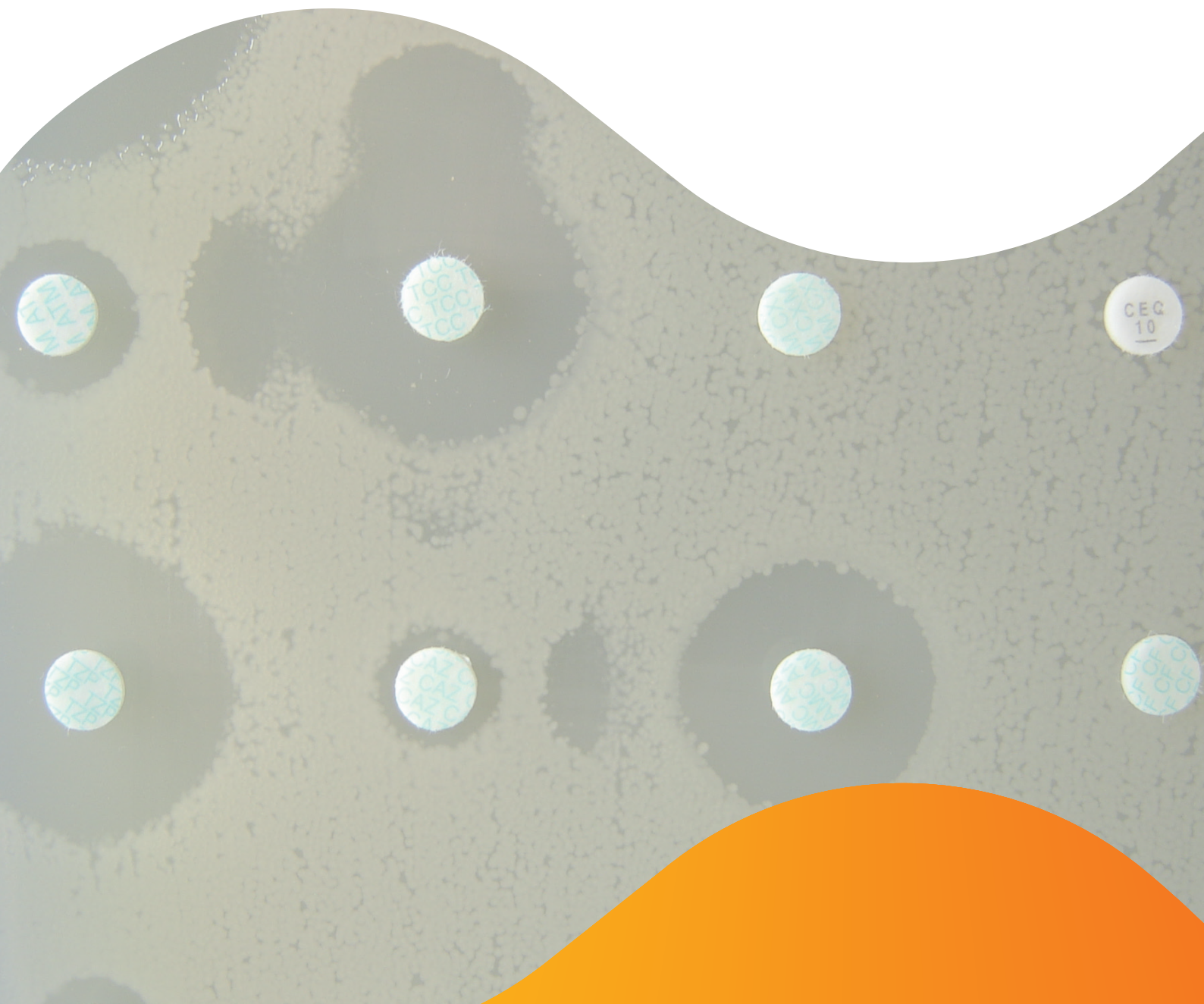
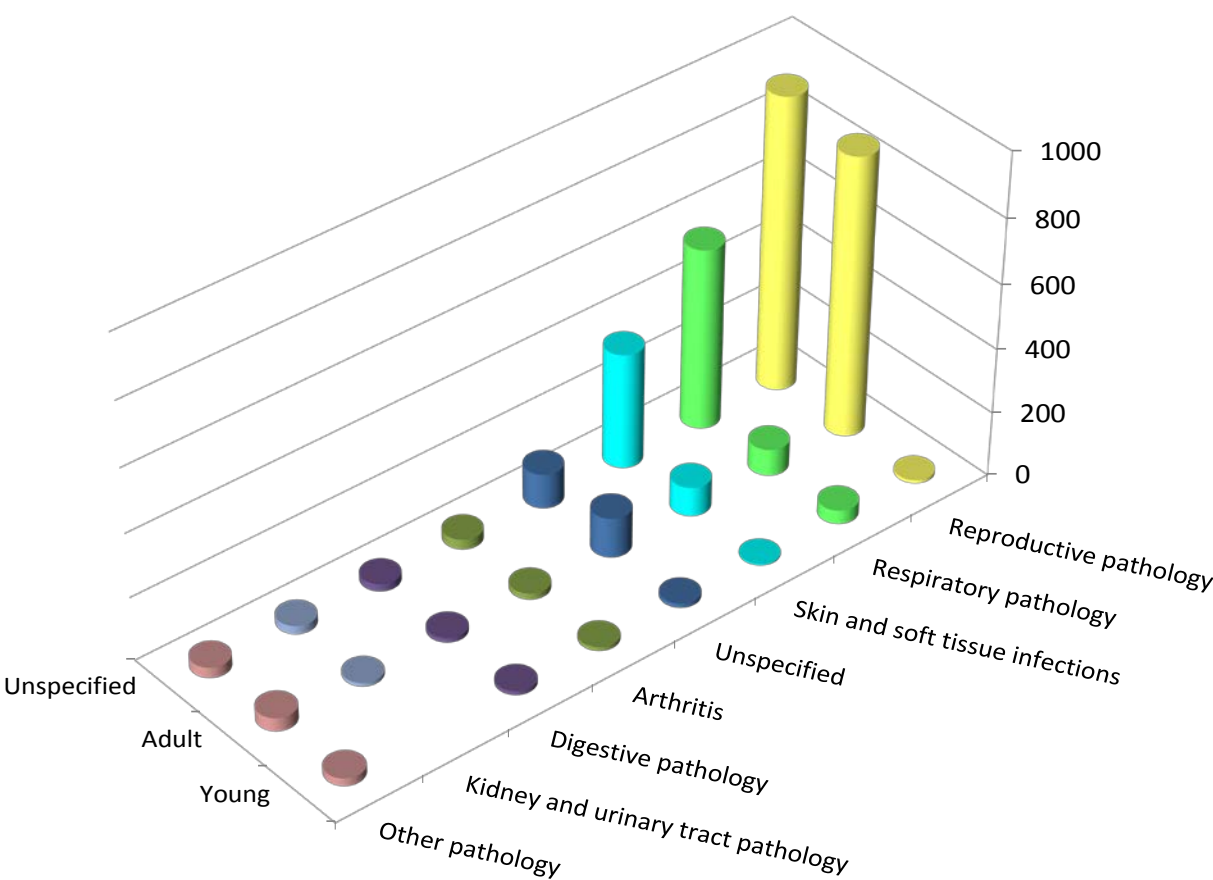


Figure 1 - Horses 2015 – Number of antibiograms by age group and pathology

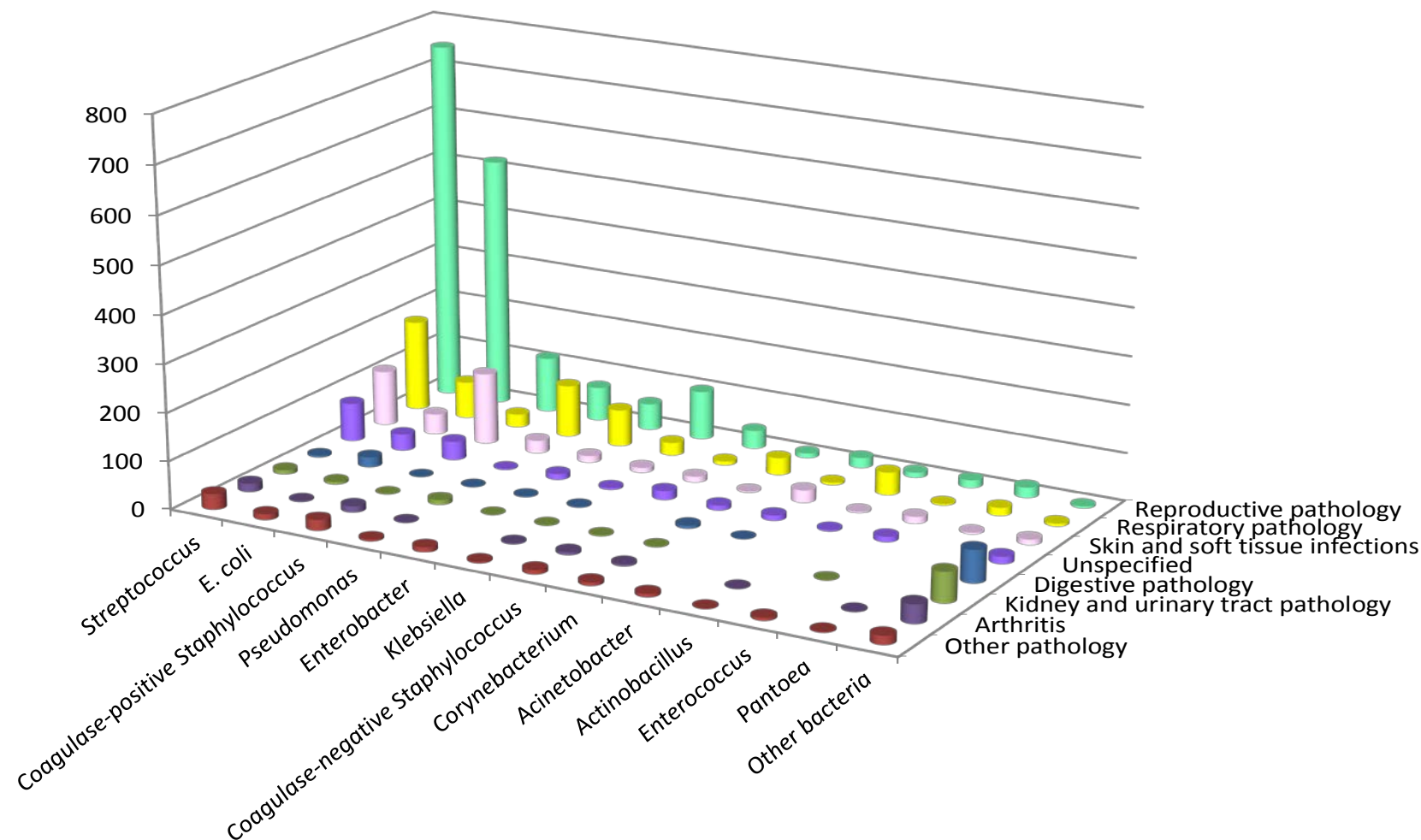


Note: all values are detailed in table 1 (including other pathologies, representing less than 1%, grouped together)

Table 1 - Horses 2015 – Number of antibiograms by age group and pathology

Pathology N (%)	Age group N (%)			Total N (%)
	Unspecified	Adult	Young	
Reproductive pathology	915 (26.38)	871 (25.12)	10 (0.29)	1,796 (51.79)
Respiratory pathology	565 (16.29)	83 (2.39)	43 (1.24)	691 (19.93)
Skin and soft tissue infections	360 (10.38)	91 (2.62)	4 (0.12)	455 (13.12)
Unspecified	108 (3.11)	124 (3.58)	13 (0.37)	245 (7.06)
Arthritis	31 (0.89)	19 (0.55)	12 (0.35)	62 (1.79)
Digestive pathology	23 (0.66)	14 (0.40)	12 (0.35)	49 (1.41)
Kidney and urinary tract pathology	26 (0.75)	11 (0.32)		37 (1.07)
Bone pathology	21 (0.61)	5 (0.14)	8 (0.23)	34 (0.98)
Mastitis		22 (0.63)		22 (0.63)
Systemic pathology	16 (0.46)	4 (0.12)	1 (0.03)	21 (0.61)
Omphalitis			19 (0.55)	19 (0.55)
Otitis	10 (0.29)	3 (0.09)		13 (0.37)
Ocular pathology	1 (0.03)	8 (0.23)	1 (0.03)	10 (0.29)
Cardiac pathology	3 (0.09)	3 (0.09)		6 (0.17)
Oral pathology	3 (0.09)	1 (0.03)		4 (0.12)
Nervous system pathology		1 (0.03)	2 (0.06)	3 (0.09)
Septicemia			1 (0.03)	1 (0.03)
Total N (%)	2,082 (60.03)	1,260 (36.33)	126 (3.63)	3,468 (100.00)

Figure 2 - Horses 2015 – Number of antibiograms by bacterial group and pathology



Note: only values for pathologies >1% and bacterial groups having more than 30 occurrences are represented. Detailed values are presented in table 2 below.

Table 2 - Horses 2015 – Number of antibiograms by bacterial group and pathology

Bacteria N (%)	Pathology N (%)																	Total N (%)
	Reproductive pathology	Respiratory pathology	Skin and soft tissue infections	Unspecified	Arthritis	Digestive pathology	Kidney and urinary tract pathology	Bone pathology	Mastitis	Systemic pathology	Omphalitis	Otitis	Ocular pathology	Cardiac pathology	Oral pathology	Nervous system pathology	Septicemia	
<i>Streptococcus</i>	750 (21.63)	189 (5.45)	115 (3.32)	80 (2.31)	17 (0.49)	4 (0.12)	9 (0.26)	10 (0.29)	8 (0.23)	3 (0.09)	4 (0.12)	2 (0.06)	2 (0.06)	2 (0.06)	1 (0.03)			1,196 (34.49)
<i>E. coli</i>	522 (15.05)	77 (2.22)	42 (1.21)	34 (0.98)	2 (0.06)	21 (0.61)	5 (0.14)	4 (0.12)	2 (0.06)	2 (0.06)	3 (0.09)	1 (0.03)						715 (20.62)
<i>Coagulase-positive Staphylococcus</i>	115 (3.32)	27 (0.78)	149 (4.30)	39 (1.12)	13 (0.37)	1 (0.03)	1 (0.03)	4 (0.12)	4 (0.12)	4 (0.12)	4 (0.12)		2 (0.06)	2 (0.06)	1 (0.03)	1 (0.03)		367 (10.58)
<i>Pseudomonas</i>	71 (2.05)	109 (3.14)	26 (0.75)	2 (0.06)	1 (0.03)	1 (0.03)	10 (0.29)			1 (0.03)	1 (0.03)	1 (0.03)	1 (0.03)					224 (6.46)
<i>Enterobacter</i>	55 (1.59)	77 (2.22)	14 (0.40)	12 (0.35)		2 (0.06)	1 (0.03)	2 (0.06)		1 (0.03)	1 (0.03)	3 (0.09)	1 (0.03)		1 (0.03)	1 (0.03)		171 (4.93)
<i>Klebsiella</i>	102 (2.94)	27 (0.78)	10 (0.29)	4 (0.12)	2 (0.06)	2 (0.06)	1 (0.03)		2 (0.06)		1 (0.03)							151 (4.35)
<i>Coagulase-negative Staphylococcus</i>	38 (1.10)	8 (0.23)	12 (0.35)	19 (0.55)	6 (0.17)		2 (0.06)	5 (0.14)	1 (0.03)			1 (0.03)	2 (0.06)					94 (2.71)
<i>Corynebacterium</i>	10 (0.29)	36 (1.04)	2 (0.06)	10 (0.29)	4 (0.12)	6 (0.17)	1 (0.03)	3 (0.09)	1 (0.03)	1 (0.03)		1 (0.03)					1 (0.03)	76 (2.19)
<i>Acinetobacter</i>	21 (0.61)	5 (0.14)	26 (0.75)	11 (0.32)		1 (0.03)		1 (0.03)		3 (0.09)		1 (0.03)	1 (0.03)		1 (0.03)			71 (2.05)
<i>Actinobacillus</i>	11 (0.32)	48 (1.38)	3 (0.09)	3 (0.09)	1 (0.03)									1 (0.03)				67 (1.93)
<i>Enterococcus</i>	16 (0.46)	3 (0.09)	14 (0.40)	11 (0.32)			1 (0.03)		1 (0.03)	1 (0.03)	4 (0.12)							51 (1.47)
<i>Pantoea</i>	22 (0.63)	17 (0.49)	3 (0.09)		1 (0.03)			1 (0.03)				1 (0.03)						45 (1.30)
<i>Other bacteria < 30 occurrences</i>	63 (1.82)	68 (1.96)	39 (1.12)	20 (0.58)	15 (0.43)	11 (0.32)	6 (0.17)	4 (0.12)	3 (0.09)	5 (0.14)	1 (0.03)	2 (0.06)	1 (0.03)	1 (0.03)		1 (0.03)		240 (6.92)
Total N (%)	1,796 (51.79)	691 (19.93)	455 (13.12)	245 (7.06)	62 (1.79)	49 (1.41)	37 (1.07)	34 (0.98)	22 (0.63)	21 (0.61)	19 (0.55)	13 (0.37)	10 (0.29)	6 (0.17)	4 (0.12)	3 (0.09)	1 (0.03)	3,468 (100.00)

Table 3 - Horses 2015 – Reproductive pathology – All ages groups included –*E. coli*: susceptibility to antibiotics (proportion) (N= 522)

Antibiotic	Total (N)	% S
Amoxicillin	520	66
Amoxicillin-Clavulanic ac.	519	69
Cephalexin	47	89
Cefoxitin	48	94
Cefuroxime	41	95
Ceftiofur	522	96
Cefquinome 30 µg	520	98
Streptomycin 10 UI	384	71
Kanamycin 30 UI	513	93
Gentamicin 10 UI	522	95
Neomycin	179	93
Amikacin	472	99
Tetracycline	387	80
Florfenicol	31	100
Nalidixic ac.	383	97
Oxolinic ac.	136	99
Flumequine	477	97
Enrofloxacin	522	98
Marbofloxacin	518	98
Danofloxacin	41	95
Trimethoprim-Sulfonamides	521	79

Table 4 - Horses 2015 – Respiratory pathology – All ages groups included –*E. coli*: susceptibility to antibiotics (proportion) (N= 77)

Antibiotic	Total (N)	% S
Amoxicillin	76	61
Amoxicillin-Clavulanic ac.	76	71
Ceftiofur	77	90
Cefquinome 30 µg	77	88
Streptomycin 10 UI	74	59
Kanamycin 30 UI	73	86
Gentamicin 10 UI	77	87
Amikacin	71	100
Tetracycline	74	73
Nalidixic ac.	76	91
Flumequine	72	93
Enrofloxacin	77	92
Marbofloxacin	74	93
Trimethoprim-Sulfonamides	77	62

Table 5 - Horses 2015 – Skin and soft tissue infections – All ages groups included – Tous *E. coli*: susceptibility to antibiotics (proportion) (N= 42)

Antibiotic	Total (N)	% S
Amoxicillin	42	55
Amoxicillin-Clavulanic ac.	42	62
Ceftiofur	42	88
Cefquinome 30 µg	42	88
Streptomycin 10 UI	42	52
Kanamycin 30 UI	42	88
Gentamicin 10 UI	42	83
Amikacin	42	100
Tetracycline	42	67
Nalidixic ac.	42	79
Flumequine	42	81
Enrofloxacin	42	83
Marbofloxacin	42	86
Trimethoprim-Sulfonamides	42	60

Table 6 - Horses 2015 – All pathologies and ages groups included – *Klebsiella* spp: susceptibility to antibiotics (proportion) (N= 151)

Antibiotic	Total (N)	% S
Amoxicillin-Clavulanic ac.	150	91
Cephalothin	48	96
Cefoxitin	75	97
Cefuroxime	54	96
Cefoperazone	43	100
Ceftiofur	151	93
Cefquinome 30 µg	150	95
Streptomycin 10 UI	112	83
Kanamycin 30 UI	136	96
Gentamicin 10 UI	151	94
Neomycin	80	96
Amikacin	90	100
Tetracycline	118	89
Florfenicol	50	96
Nalidixic ac.	110	93
Flumequine	106	93
Enrofloxacin	150	95
Marbofloxacin	142	100
Danofloxacin	44	100
Sulfonamides	32	94
Trimethoprim-Sulfonamides	151	83

Table 7 - Horses 2015 – All pathologies and ages groups included – *Enterobacter* spp: susceptibility to antibiotics (proportion) (N= 171)

Antibiotic	Total (N)	% S
Amoxicillin-Clavulanic ac.	171	51
Cefoxitin	46	24
Cefuroxime	34	56
Ceftiofur	171	88
Cefquinome 30 µg	170	94
Streptomycin 10 UI	144	84
Kanamycin 30 UI	153	89
Gentamicin 10 UI	170	90
Neomycin	35	94
Amikacin	147	97
Tetracycline	151	89
Nalidixic ac.	149	91
Flumequine	145	88
Enrofloxacin	171	90
Marbofloxacin	162	98
Trimethoprim-Sulfonamides	171	87

Table 8 - Horses 2015 – Skin and soft tissue infections – All age groups included – *Staphylococcus aureus*: susceptibility to antibiotics (proportion) (N= 107)

Antibiotic	Total (N)	% S
Penicillin	107	62
Cefoxitin	100	81
Oxacillin	96	91
Erythromycin	107	93
Spiramycin	34	94
Lincomycin	30	93
Streptomycin 10 UI	100	90
Kanamycin 30 UI	101	84
Gentamicin 10 UI	107	82
Tetracycline	103	83
Enrofloxacin	107	93
Marbofloxacin	106	95
Trimethoprim-Sulfonamides	107	99
Rifampicin	99	93

Table 9 - Horses 2015 – Reproductive pathology – All age groups included – *Streptococcus groupe C* and *Streptococcus zooepidemicus*: susceptibility to antibiotics (proportion) (N= 617)

Antibiotic	Total (N)	% S
Ampicillin	72	100
Oxacillin	587	99
Erythromycin	617	89
Tylosin	43	93
Spiramycin	158	97
Lincomycin	88	86
Streptomycin 500 µg	542	92
Kanamycin 1000 µg	533	91
Gentamicin 500 µg	545	99
Tetracycline	536	34
Florfenicol	44	100
Enrofloxacin	617	24
Marbofloxacin	601	79
Trimethoprim-Sulfonamides	614	96
Rifampicin	572	56

Table 10 - Horses 2015 – Respiratory pathology – All age groups included – *Streptococcus* spp.: susceptibility to antibiotics (proportion) (N= 189)

Antibiotic	Total (N)	% S
Oxacillin	188	98
Erythromycin	189	93
Spiramycin	32	100
Lincomycin	30	90
Streptomycin 500 µg	179	98
Kanamycin 1000 µg	172	99
Gentamicin 500 µg	182	99
Tetracycline	180	43
Enrofloxacin	188	32
Marbofloxacin	175	78
Trimethoprim-Sulfonamides	183	95
Rifampicin	173	61

Table 11 - Horses 2015 – Skin and soft tissue infections – All age groups included – *Streptococcus* spp.: susceptibility to antibiotics (proportion) (N= 115)

Antibiotic	Total (N)	% S
Oxacillin	112	98
Erythromycin	114	96
Streptomycin 500 µg	114	97
Kanamycin 1000 µg	110	98
Gentamicin 500 µg	114	99
Tetracycline	115	31
Enrofloxacin	112	36
Marbofloxacin	113	76
Trimethoprim-Sulfonamides	113	96
Rifampicin	103	52

Annex 10

Dogs

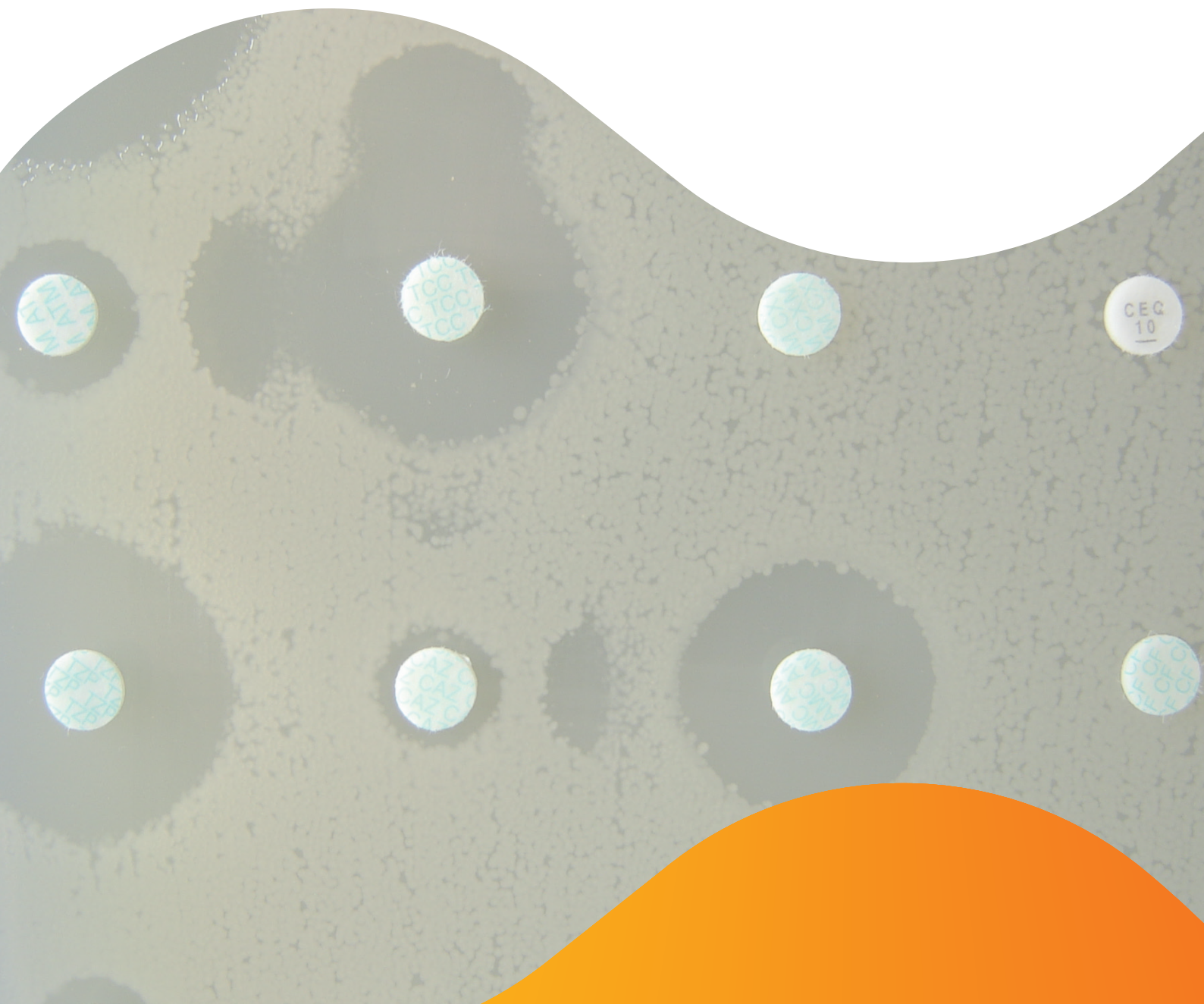
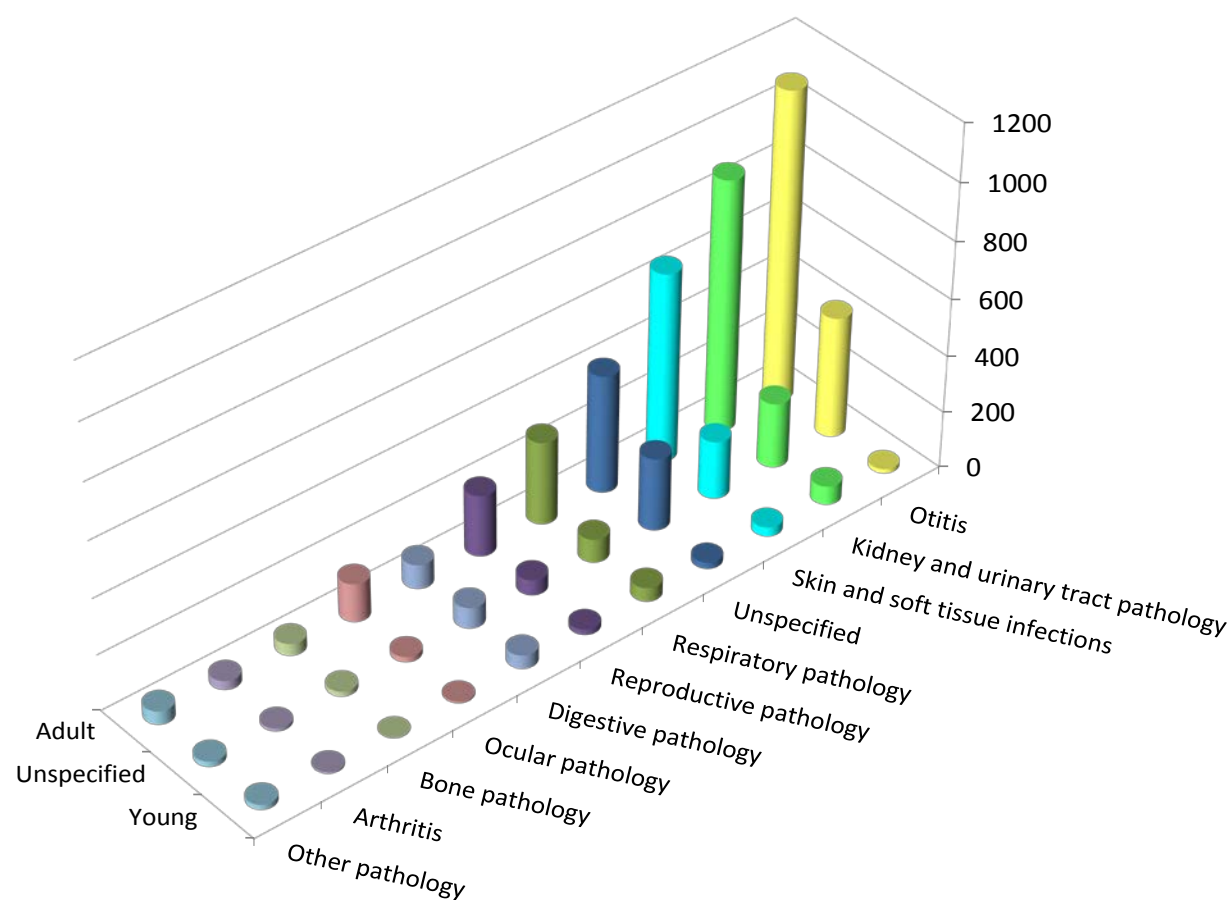


Figure 1 - Dogs 2015 – Number of antibiograms by age group and pathology

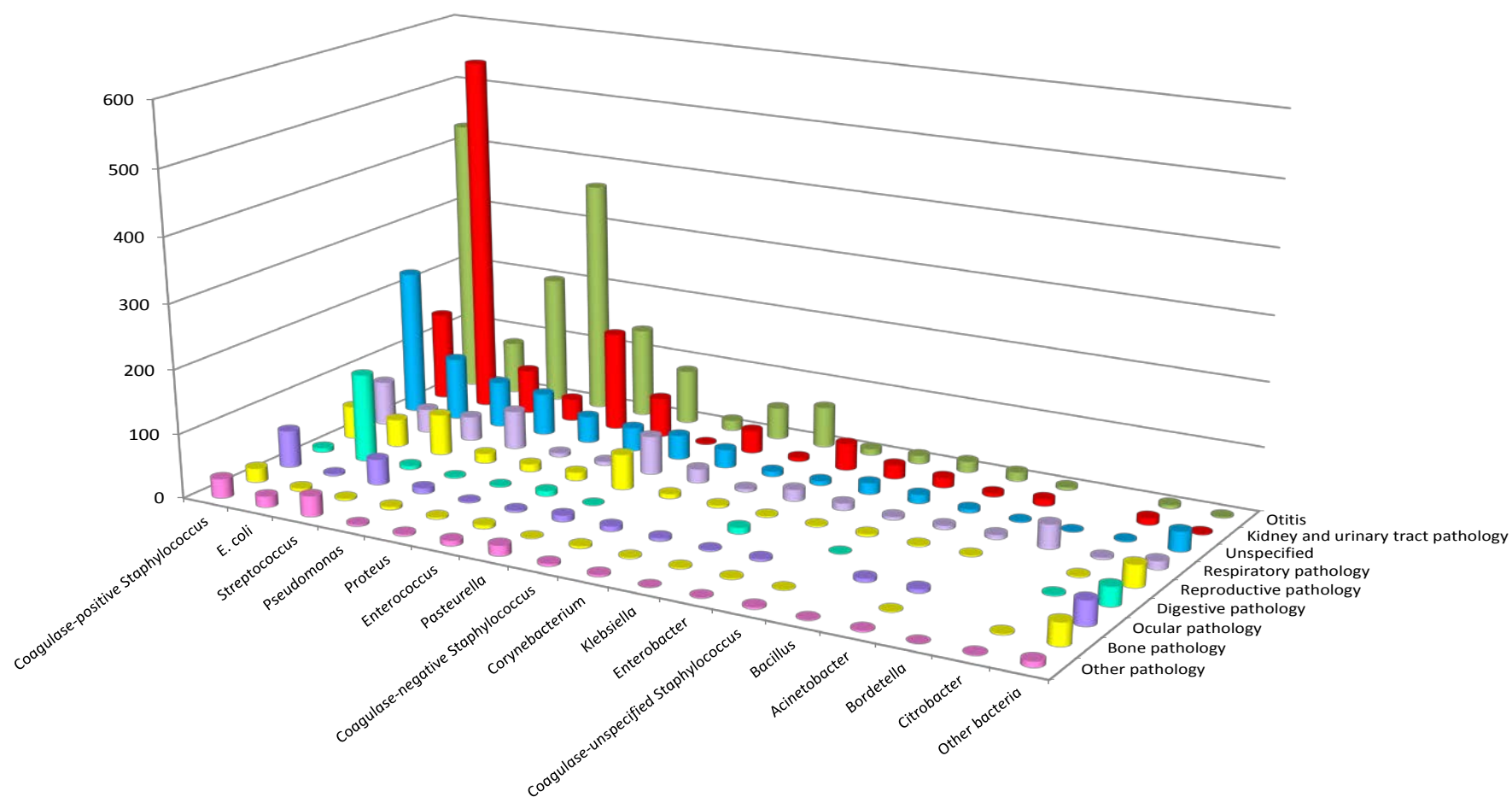


Note: all values are detailed in table 1 (including other pathologies, representing less than 1%, grouped together)

Table 1 - Dogs 2015 – Number of antibiograms by age group and pathology

Pathology N (%)	Age group N (%)			Total N (%)
	Adult	Unspecified	Young	
Otitis	1,092 (19.49)	427 (7.62)	15 (0.27)	1,534 (27.38)
Kidney and urinary tract pathology	888 (15.85)	230 (4.11)	66 (1.18)	1,184 (21.14)
Skin and soft tissue infections	669 (11.94)	205 (3.66)	33 (0.59)	907 (16.19)
Unspecified	418 (7.46)	257 (4.59)	22 (0.39)	697 (12.44)
Respiratory pathology	294 (5.25)	83 (1.48)	49 (0.87)	426 (7.60)
Reproductive pathology	218 (3.89)	54 (0.96)	19 (0.34)	291 (5.19)
Digestive pathology	86 (1.54)	74 (1.32)	48 (0.86)	208 (3.71)
Ocular pathology	137 (2.45)	19 (0.34)	5 (0.09)	161 (2.87)
Bone pathology	42 (0.75)	18 (0.32)	1 (0.02)	61 (1.09)
Arthritis	32 (0.57)	11 (0.20)	5 (0.09)	48 (0.86)
Oral pathology	25 (0.45)	13 (0.23)		38 (0.68)
Systemic pathology	8 (0.14)	4 (0.07)	13 (0.23)	25 (0.45)
Mastitis	8 (0.14)			8 (0.14)
Nervous system pathology	5 (0.09)	1 (0.02)		6 (0.11)
Septicemia			4 (0.07)	4 (0.07)
Muscle pathology	2 (0.04)			2 (0.04)
Cardiac pathology		1 (0.02)	1 (0.02)	2 (0.04)
Total N (%)	3,924 (70.05)	1,397 (24.94)	281 (5.02)	5,602 (100.00)

Figure 2 - Dogs 2015 – Number of antibiograms by bacteria and pathology



Note: only values for pathologies >1% and bacterial groups having more than 30 occurrences are represented. Detailed values are presented in table 2 below.

Table 2 - Dogs 2015 – Number of antibiograms by bacteria and pathology

Bacteria N (%)	Pathology N (%)																	Total N (%)
	Otitis	Kidney and urinary tract pathology	Skin and soft tissue infections	Unspecified	Respiratory pathology	Reproductive pathology	Digestive pathology	Ocular pathology	Bone pathology	Arthritis	Oral pathology	Systemic pathology	Mastitis	Nervous system pathology	Septicemia	Muscle pathology	Cardiac pathology	
Coagulase-positive Staphylococcus	433 (7.73)	139 (2.48)	486 (8.68)	227 (4.05)	69 (1.23)	51 (0.91)	7 (0.12)	58 (1.04)	22 (0.39)	17 (0.30)	7 (0.12)	3 (0.05)	3 (0.05)					1,522 (27.17)
E. coli	82 (1.46)	558 (9.96)	51 (0.91)	98 (1.75)	37 (0.66)	43 (0.77)	138 (2.46)	3 (0.05)	5 (0.09)	1 (0.02)	1 (0.02)	13 (0.23)			2 (0.04)			1 032 (18.42)
Streptococcus	200 (3.57)	70 (1.25)	87 (1.55)	72 (1.29)	38 (0.68)	64 (1.14)	6 (0.11)	40 (0.71)	3 (0.05)	19 (0.34)	6 (0.11)	3 (0.05)		1 (0.02)	1 (0.02)		2 (0.04)	612 (10.92)
Pseudomonas	364 (6.50)	35 (0.62)	38 (0.68)	66 (1.18)	60 (1.07)	15 (0.27)	2 (0.04)	9 (0.16)	5 (0.09)	3 (0.05)								597 (10.66)
Proteus	140 (2.50)	155 (2.77)	46 (0.82)	42 (0.75)	6 (0.11)	12 (0.21)	2 (0.04)	2 (0.04)	3 (0.05)		2 (0.04)		1 (0.02)					411 (7.34)
Enterococcus	85 (1.52)	62 (1.11)	35 (0.62)	37 (0.66)	6 (0.11)	13 (0.23)	8 (0.14)	3 (0.05)	6 (0.11)	2 (0.04)	2 (0.04)	3 (0.05)				1 (0.02)		263 (4.69)
Pasteurella	16 (0.29)	2 (0.04)	13 (0.23)	38 (0.68)	60 (1.07)	55 (0.98)	1 (0.02)	10 (0.18)	1 (0.02)	1 (0.02)	12 (0.21)	2 (0.04)		1 (0.02)				212 (3.78)
Coagulase-negative Staphylococcus	50 (0.89)	36 (0.64)	44 (0.79)	29 (0.52)	22 (0.39)	7 (0.12)		8 (0.14)	4 (0.07)	2 (0.04)			1 (0.02)	1 (0.02)				204 (3.64)
Corynebacterium	64 (1.14)	6 (0.11)	14 (0.25)	8 (0.14)	5 (0.09)	4 (0.07)		5 (0.09)	2 (0.04)		2 (0.04)			1 (0.02)				111 (1.98)
Klebsiella	10 (0.18)	42 (0.75)	10 (0.18)	7 (0.12)	18 (0.32)	2 (0.04)	10 (0.18)	2 (0.04)	2 (0.04)									103 (1.84)
Enterobacter	13 (0.23)	22 (0.39)	23 (0.41)	18 (0.32)	11 (0.20)	2 (0.04)		4 (0.07)	2 (0.04)		1 (0.02)							96 (1.71)
Coagulase-unspecified Staphylococcus	17 (0.30)	16 (0.29)	7 (0.12)	14 (0.25)	5 (0.09)	4 (0.07)	1 (0.02)		1 (0.02)				2 (0.04)	1 (0.02)				68 (1.21)
Bacillus	14 (0.25)	6 (0.11)	7 (0.12)	6 (0.11)	6 (0.11)	2 (0.04)		6 (0.11)					1 (0.02)					48 (0.86)

Bacteria N (%)	Pathology N (%)																	Total N (%)
	Otitis	Kidney and urinary tract pathology	Skin and soft tissue infections	Unspecified	Respiratory pathology	Reproductive pathology	Digestive pathology	Ocular pathology	Bone pathology	Arthritis	Oral pathology	Systemic pathology	Mastitis	Nervous system pathology	Septicemia	Muscle pathology	Cardiac pathology	
Acinetobacter	5 (0.09)	11 (0.20)	7 (0.12)	2 (0.04)	7 (0.12)	2 (0.04)		6 (0.11)	1 (0.02)	1 (0.02)	1 (0.02)							43 (0.77)
Bordetella				1 (0.02)	38 (0.68)													39 (0.70)
Citrobacter	6 (0.11)	11 (0.20)	1 (0.02)	2 (0.04)	3 (0.05)	2 (0.04)	2 (0.04)		2 (0.04)						1 (0.02)			30 (0.54)
Other bacteria < 30 occurrences	35 (0.62)	13 (0.23)	38 (0.68)	30 (0.54)	35 (0.62)	13 (0.23)	31 (0.55)	5 (0.09)	2 (0.04)	2 (0.04)	4 (0.07)	1 (0.02)		1 (0.02)		1 (0.02)		211 (3.77)
Total N (%)	1,534 (27.38)	1,184 (21.14)	907 (16.19)	697 (12.44)	426 (7.60)	291 (5.19)	208 (3.71)	161 (2.87)	61 (1.09)	48 (0.86)	38 (0.68)	25 (0.45)	8 (0.14)	6 (0.11)	4 (0.07)	2 (0.04)	2 (0.04)	5,602 (100.00)

Table 3 - Dogs 2015 – Kidney and urinary tract pathology – All age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N= 558)

Antibiotic	Total (N)	% S
Amoxicillin	488	61
Amoxicillin-Clavulanic ac.	558	77
Cephalexin	526	84
Cephalothin	75	57
Cefoxitin	336	90
Cefuroxime	60	62
Cefoperazone	67	96
Cefovecin	302	90
Ceftiofur	525	94
Cefquinome 30 µg	165	94
Streptomycin 10 UI	273	78
Kanamycin 30 UI	152	90
Tobramycin	67	97
Gentamicin 10 UI	551	96
Neomycin	208	92
Tetracycline	246	79
Doxycycline	321	59
Chloramphenicol	181	79
Florfenicol	126	94
Nalidixic ac.	301	78
Oxolinic ac.	41	95
Flumequine	130	81
Enrofloxacin	553	86
Marbofloxacin	441	91
Danofloxacin	44	100
Pradofloxacin	134	83
Sulfonamides	30	53
Trimethoprim-Sulfonamides	553	87

Table 4 - Dogs 2015 – Skin and soft tissue infections – All age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N= 51)

Antibiotic	Total (N)	% S
Amoxicillin	41	29
Amoxicillin-Clavulanic ac.	50	54
Cephalexin	49	71
Ceftiofur	46	85
Gentamicin 10 UI	50	98
Nalidixic ac.	33	67
Enrofloxacin	51	76
Marbofloxacin	41	80
Trimethoprim-Sulfonamides	51	73

Table 5 - Dogs 2015 – Otitis – All age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N= 82)

Antibiotic	Total (N)	% S
Amoxicillin	78	55
Amoxicillin-Clavulanic ac.	82	72
Cephalexin	80	76
Cefoxitin	55	85
Cefovecin	37	86
Ceftiofur	73	89
Cefquinome 30 µg	36	92
Streptomycin 10 UI	35	80
Kanamycin 30 UI	30	93
Gentamicin 10 UI	82	93
Neomycin	35	89
Tetracycline	41	71
Doxycycline	33	70
Florfenicol	35	86
Nalidixic ac.	62	69
Enrofloxacin	81	80
Marbofloxacin	57	84
Trimethoprim-Sulfonamides	73	84

Table 6 - Dogs 2015 – All pathologies and age groups included –*Pasteurella*: susceptibility to antibiotics (proportion) (N= 212)

Antibiotic	Total (N)	% S
Amoxicillin	150	91
Amoxicillin-Clavulanic ac.	209	96
Cephalexin	207	89
Cefoxitin	41	88
Cefovecin	98	90
Ceftiofur	189	95
Cefquinome 30 µg	47	89
Streptomycin 10 UI	106	71
Kanamycin 30 UI	89	83
Tobramycin	63	79
Gentamicin 10 UI	212	95
Neomycin	56	73
Tetracycline	121	93
Doxycycline	94	91
Chloramphenicol	83	95
Florfenicol	53	100
Nalidixic ac.	67	82
Flumequine	42	62
Enrofloxacin	208	94
Marbofloxacin	191	97
Trimethoprim	51	90
Trimethoprim-Sulfonamides	198	91

Table 7 - Dogs 2015 – Otitis – All age groups included – Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N= 433)

Antibiotic	Total (N)	% S
Penicillin	396	30
Cefoxitin	354	96
Oxacillin	122	95
Cefovecin	168	86
Erythromycin	394	73
Tylosin	96	78
Spiramycin	315	76
Lincomycin	384	73
Pristinamycin	33	100
Streptomycin 10 UI	252	71
Kanamycin 30 UI	206	68
Tobramycin	49	49
Gentamicin 10 UI	432	87
Neomycin	221	82
Tetracycline	335	65
Doxycycline	66	82
Chloramphenicol	175	75
Florfenicol	105	97
Enrofloxacin	411	86
Marbofloxacin	362	90
Danofloxacin	93	95
Pradofloxacin	55	89
Trimethoprim-Sulfonamides	389	89
Fusidic ac.	215	94
Rifampicin	130	99

Table 8 - Dogs 2015 – Skin and soft tissue infections – All age groups included – Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N= 486)

Antibiotic	Total (N)	% S
Penicillin	454	19
Cefoxitin	436	92
Oxacillin	119	94
Cefovecin	225	74
Erythromycin	455	58
Tylosin	117	62
Spiramycin	329	60
Lincomycin	453	59
Pristinamycin	32	100
Streptomycin 10 UI	254	56
Kanamycin 30 UI	266	55
Tobramycin	100	61
Gentamicin 10 UI	486	84
Neomycin	224	74
Tetracycline	355	56
Doxycycline	122	82
Chloramphenicol	208	69
Florfenicol	130	99
Enrofloxacin	471	81
Marbofloxacin	412	86
Danofloxacin	90	89
Pradofloxacin	56	84
Trimethoprim-Sulfonamides	436	81
Fusidic ac.	253	97
Rifampicin	105	95

Table 9 - Dogs 2015 – Kidney and urinary tract pathology – All age groups included – Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N= 139)

Antibiotic	Total (N)	% S
Penicillin	134	14
Cefoxitin	128	88
Cefovecin	59	76
Erythromycin	134	64
Spiramycin	87	68
Lincomycin	131	67
Streptomycin 10 UI	73	66
Kanamycin 30 UI	67	57
Gentamicin 10 UI	138	83
Neomycin	51	67
Tetracycline	93	56
Doxycycline	45	89
Chloramphenicol	47	81
Enrofloxacin	121	79
Marbofloxacin	113	85
Trimethoprim-Sulfonamides	134	82
Fusidic ac.	72	96
Rifampicin	40	100

Table 10 - Dogs 2015 – Otitis – All age groups included – *Streptococcus* spp.: susceptibility to antibiotics (proportion) (N= 200)

Antibiotic	Total (N)	% S
Oxacillin	169	85
Cefovecin	55	82
Erythromycin	171	74
Tylosin	52	83
Spiramycin	126	82
Lincomycin	150	79
Streptomycin 500 µg	127	90
Kanamycin 1000 µg	122	97
Gentamicin 500 µg	173	95
Tetracycline	150	25
Chloramphenicol	90	66
Florfenicol	45	89
Enrofloxacin	182	29
Marbofloxacin	166	67
Trimethoprim-Sulfonamides	174	83
Rifampicin	36	44

Table 11 - Dogs 2015 – Skin and soft tissue infections – All age groups included – *Streptococcus* spp.: susceptibility to antibiotics (proportion) (N= 87)

Antibiotic	Total (N)	% S
Oxacillin	75	91
Erythromycin	80	74
Spiramycin	37	73
Lincomycin	64	81
Streptomycin 500 µg	49	86
Kanamycin 1000 µg	41	95
Gentamicin 500 µg	73	93
Tetracycline	56	34
Chloramphenicol	36	75
Enrofloxacin	83	33
Marbofloxacin	75	73
Trimethoprim-Sulfonamides	73	86

Table 12 - Dogs 2015 – All pathologies and age groups included – *Proteus mirabilis*: susceptibility to antibiotics (proportion) (N= 390)

Antibiotic	Total (N)	% S
Amoxicillin	277	70
Amoxicillin -Ac. clavulanique	384	92
Cephalexin	370	83
Cephalothin	93	91
Cefoxitin	182	96
Cefuroxime	103	96
Cefoperazone	55	98
Cefovecin	218	95
Ceftiofur	366	97
Cefquinome 30 µg	110	99
Streptomycin 10 UI	160	64
Kanamycin 30 UI	91	81
Tobramycin	123	90
Gentamicin 10 UI	385	91
Neomycin	150	88
Chloramphenicol	194	58
Florfenicol	80	98
Nalidixic ac.	164	71
Oxolinic ac.	44	84
Flumequine	82	78
Enrofloxacin	383	84
Marbofloxacin	338	97
Danofloxacin	50	86
Pradofloxacin	58	83
Trimethoprim-Sulfonamides	372	77

Annex 11

Cats

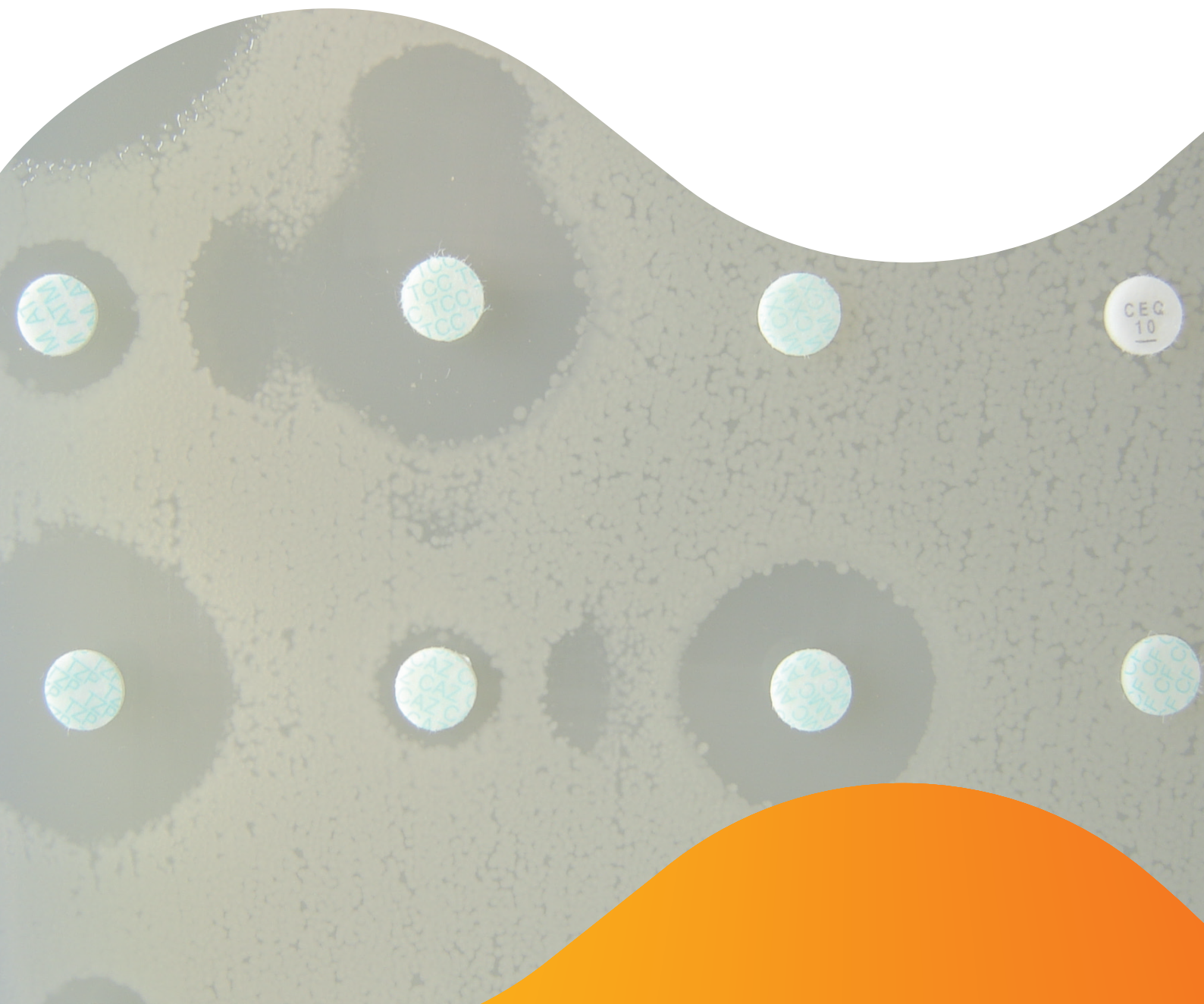
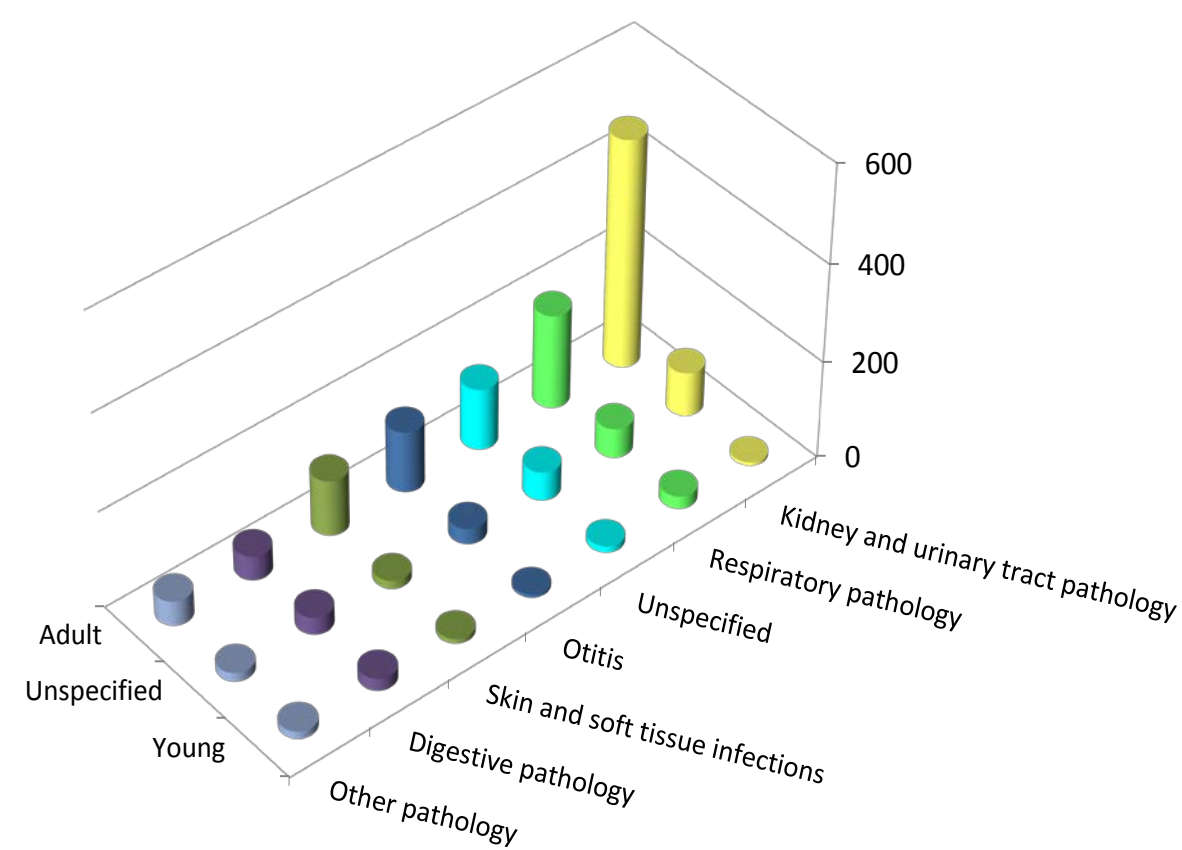


Figure 1 - Cats 2015 – Number of antibiograms by age group and pathology

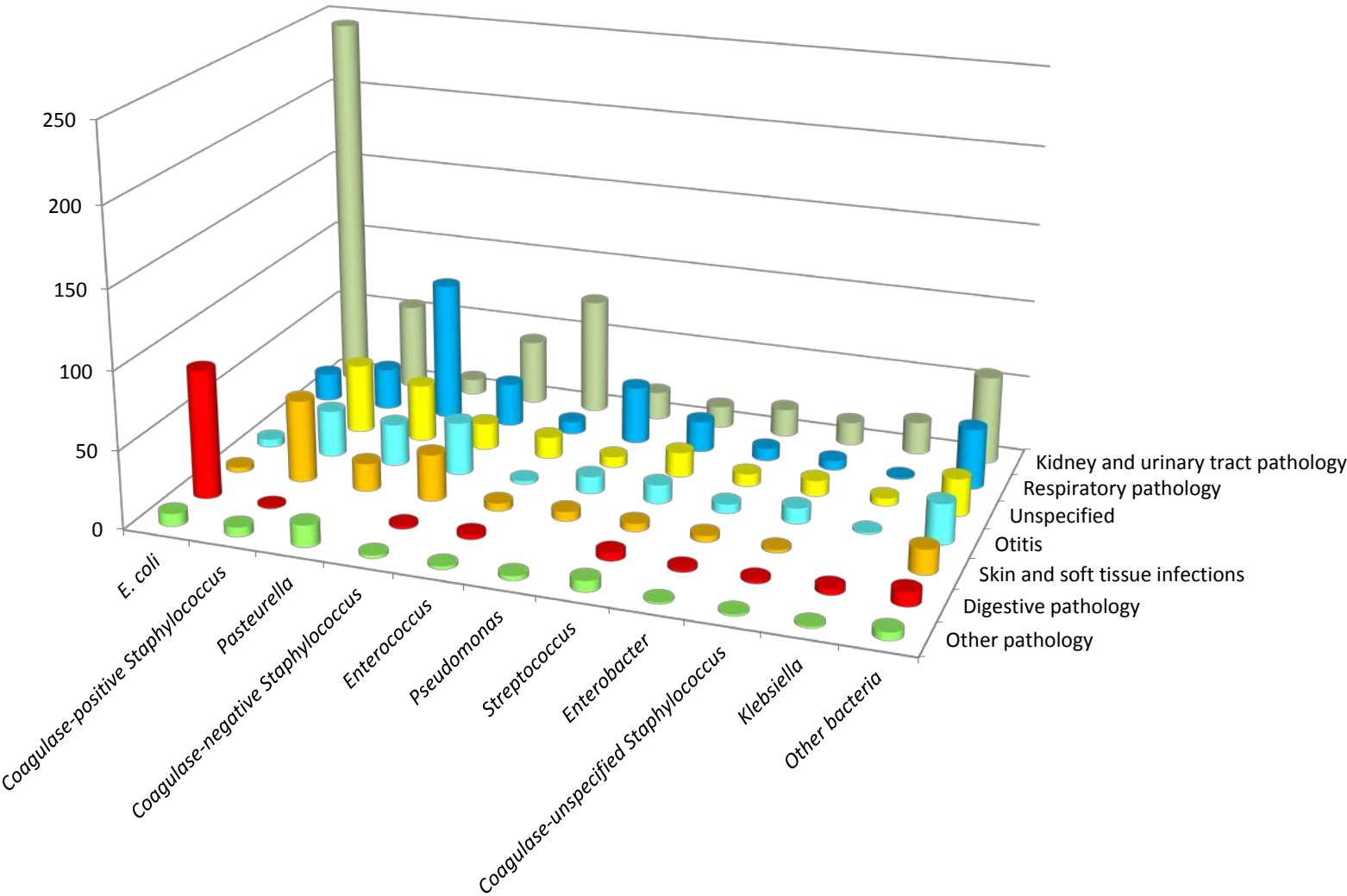


Note: all values are detailed in table 1 (including other pathologies, representing less than 1%, grouped together)

Table 1 - Cats 2015 – Number of antibiograms by age group and pathology

Pathology N (%)	Age group N (%)			Total N (%)
	Adult	Unspecified	Young	
Kidney and urinary tract pathology	473 (30.46)	91 (5.86)	7 (0.45)	571 (36.77)
Respiratory pathology	195 (12.56)	61 (3.93)	26 (1.67)	282 (18.16)
Unspecified	127 (8.18)	59 (3.8)	13 (0.84)	199 (12.81)
Otitis	126 (8.11)	32 (2.06)	6 (0.39)	164 (10.56)
Skin and soft tissue infections	115 (7.41)	17 (1.09)	10 (0.64)	142 (9.14)
Digestive pathology	50 (3.22)	36 (2.32)	25 (1.61)	111 (7.15)
Ocular pathology	22 (1.42)	6 (0.39)	6 (0.39)	34 (2.19)
Bone pathology	9 (0.58)	3 (0.19)	1 (0.06)	13 (0.84)
Arthritis	6 (0.39)	3 (0.19)	2 (0.13)	11 (0.71)
Systemic pathology	3 (0.19)		5 (0.32)	8 (0.52)
Oral pathology	5 (0.32)	2 (0.13)		7 (0.45)
Reproductive pathology	5 (0.32)	1 (0.06)	1 (0.06)	7 (0.45)
Nervous system pathology	1 (0.06)	3 (0.19)		4 (0.26)
Total N (%)	1,137 (73.21)	314 (20.22)	102 (6.57)	1,553 (100.00)

Figure 2 - Cats 2015 – Number of antibiograms by bacteria and pathology



Note: only values for pathologies >1% and bacterial groups having more than 30 occurrences are represented. Detailed values are presented in table 2 below.

Table 2 - Cats 2015 – Number of antibiograms by bacteria and pathology

Bacteria N (%)	Pathology N (%)													Total N (%)
	Kidney and urinary tract pathology	Respiratory pathology	Unspecified	Otitis	Skin and soft tissue infections	Digestive pathology	Ocular pathology	Bone pathology	Arthritis	Systemic pathology	Oral pathology	Reproductive pathology	Nervous system pathology	
<i>E. coli</i>	245 (15.78)	18 (1.16)	16 (1.03)	5 (0.32)	3 (0.19)	83 (5.34)	1 (0.06)	1 (0.06)		3 (0.19)		3 (0.19)	1 (0.06)	379 (24.40)
<i>Coagulase-positive Staphylococcus</i>	56 (3.61)	27 (1.74)	45 (2.90)	30 (1.93)	53 (3.41)	1 (0.06)	1 (0.06)	2 (0.13)		1 (0.06)	2 (0.13)		1 (0.06)	219 (14.10)
<i>Pasteurella</i>	10 (0.64)	90 (5.80)	37 (2.38)	27 (1.74)	18 (1.16)		10 (0.64)	2 (0.13)	5 (0.32)	2 (0.13)	5 (0.32)			206 (13.26)
<i>Coagulase-negative Staphylococcus</i>	42 (2.70)	28 (1.80)	17 (1.09)	34 (2.19)	30 (1.93)	2 (0.13)	10 (0.64)					1 (0.06)	1 (0.06)	165 (10.62)
<i>Enterococcus</i>	75 (4.83)	8 (0.52)	14 (0.90)	2 (0.13)	5 (0.32)	3 (0.19)		1 (0.06)				1 (0.06)		109 (7.02)
<i>Pseudomonas</i>	18 (1.16)	37 (2.38)	7 (0.45)	11 (0.71)	6 (0.39)			1 (0.06)	2 (0.13)					82 (5.28)
<i>Streptococcus</i>	14 (0.90)	20 (1.29)	16 (1.03)	12 (0.77)	5 (0.32)	5 (0.32)	2 (0.13)	3 (0.19)		2 (0.13)		2 (0.13)		81 (5.22)
<i>Enterobacter</i>	18 (1.16)	8 (0.52)	8 (0.52)	6 (0.39)	4 (0.26)	2 (0.13)	1 (0.06)	1 (0.06)						48 (3.09)
<i>Coagulase-unspecified Staphylococcus</i>	15 (0.97)	6 (0.39)	10 (0.64)	10 (0.64)	2 (0.13)	2 (0.13)	1 (0.06)						1 (0.06)	47 (3.03)
<i>Klebsiella</i>	21 (1.35)	1 (0.06)	5 (0.32)	1 (0.06)		4 (0.26)			1 (0.06)					33 (2.12)
<i>Other bacteria < 30 occurrences</i>	57 (3.67)	39 (2.51)	24 (1.55)	26 (1.67)	16 (1.03)	9 (0.58)	8 (0.52)	2 (0.13)	3 (0.19)				0	184 (11.85)
Total N (%)	571 (36.77)	282 (18.16)	199 (12.81)	164 (10.56)	142 (9.14)	111 (7.15)	34 (2.19)	13 (0.84)	11 (0.71)	8 (0.52)	7 (0.45)	7 (0.45)	4 (0.26)	1,553 (100.00)

Table 3 - Cats 2015 – All pathologies and age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N= 379)

Antibiotic	Total (N)	% S
Amoxicillin	322	60
Amoxicillin-Clavulanic ac.	372	73
Cephalexin	348	84
Cephalothin	52	60
Cefoxitin	224	91
Cefuroxime	63	75
Cefoperazone	57	93
Cefovecin	156	88
Ceftiofur	358	93
Cefquinome 30 µg	156	94
Streptomycin 10 UI	223	71
Kanamycin 30 UI	140	89
Tobramycin	44	100
Gentamicin 10 UI	372	95
Neomycin	168	90
Tetracycline	222	70
Doxycycline	159	57
Chloramphenicol	111	83
Florfenicol	120	93
Nalidixic ac.	198	87
Flumequine	91	84
Enrofloxacin	371	88
Marbofloxacin	319	90
Danofloxacin	50	98
Pradofloxacin	59	90
Trimethoprim-Sulfonamides	376	86

Table 4 - Cats 2015 – Kidney and urinary tract pathology – All age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N= 245)

Antibiotic	Total (N)	% S
Amoxicillin	208	61
Amoxicillin-Clavulanic ac.	245	75
Cephalexin	227	83
Cephalothin	38	55
Cefoxitin	136	90
Cefoperazone	34	91
Cefovecin	119	88
Ceftiofur	235	91
Cefquinome 30 µg	77	88
Streptomycin 10 UI	140	71
Kanamycin 30 UI	81	91
Tobramycin	35	100
Gentamicin 10 UI	243	95
Neomycin	98	93
Tetracycline	130	69
Doxycycline	123	55
Chloramphenicol	87	84
Florfenicol	61	95
Nalidixic ac.	125	88
Flumequine	49	88
Enrofloxacin	243	88
Marbofloxacin	208	89
Pradofloxacin	42	90
Trimethoprim-Sulfonamides	243	86

Table 5 - Cats 2015 – Respiratory pathology – All age groups included – *Pasteurella*: susceptibility to antibiotics (proportion) (N= 90)

Antibiotic	Total (N)	% S
Amoxicillin	60	97
Amoxicillin-Clavulanic ac.	90	97
Cephalexin	89	97
Cefovecin	64	95
Ceftiofur	78	100
Gentamicin 10 UI	90	89
Tetracycline	59	98
Doxycycline	37	100
Chloramphenicol	40	100
Nalidixic ac.	50	94
Enrofloxacin	89	99
Marbofloxacin	75	99
Trimethoprim-Sulfonamides	89	91

Table 6 - Cats 2015 – All pathologies and age groups included – Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N= 219)

Antibiotic	Total (N)	% S
Penicillin	211	31
Cefoxitin	189	80
Oxacillin	38	82
Cefovecin	112	62
Erythromycin	211	62
Tylosin	32	88
Spiramycin	162	68
Lincomycin	209	69
Streptomycin 10 UI	126	67
Kanamycin 30 UI	123	63
Tobramycin	66	55
Gentamicin 10 UI	219	79
Neomycin	107	80
Tetracycline	172	74
Doxycycline	52	88
Chloramphenicol	112	85
Florfenicol	72	99
Enrofloxacin	210	72
Marbofloxacin	178	79
Danofloxacin	38	92
Trimethoprim-Sulfonamides	193	82
Fusidic ac.	125	89
Rifampicin	46	98



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