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RESAPATH

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

2011 Annual Report

November 2012 Scientific publication

CONTENTS

INTRODUCTION

With the publication of its report based on data from 2011, RESAPATH celebrates thirty years of existence in 2012!

These thirty years of monitoring antimicrobial resistance in animal pathogens first began with cattle - the Résabo network was founded for this sector in 1982 - then pigs and poultry were added in 2001, and were joined more recently (2007) by a growing number of animal species, including pets, horses, sheep, goats, and even zoo animals. Obviously, these three decades of activity and the changes undergone by the network reflect the historical roots of a scheme that has been consolidated over the years, and has now become central in France at a time when the issue of animal antimicrobial resistance is receiving close political attention.

As with any network, its success is above all due to a collective effort, and the publication of the 2011 report is another opportunity to thank all the participants, first and foremost the member laboratories. ANSES also made a significant investment in order to provide the laboratories with the best possible expertise in detection of antimicrobial resistance and to ensure consistently high-quality data. This success was then secured by a constant commitment to methodological and scientific rigour, as well as the maintaining of group dynamics, cohesion and the development of skills.

It is also important to note the two aspects of RESAPATH's governance: microbiological and epidemiological. This has been a key development since 2004, providing two complementary viewpoints: laboratory expertise on bacteria and their resistance mechanisms, and an ability to put the observed trends into perspective and understand what they imply for population groups. RESAPATH is also a member of the French National Observatory for Epidemiology of Bacterial Resistance to Antimicrobials (ONERBA), which brings together several surveillance networks for human antimicrobial resistance. This integration provides a shared view of data in humans and animals, an essential point in a context where efforts to reduce levels of resistance must necessarily be combined, and where the major issues are often shared (extended-spectrum beta-lactamases – ESBLs – in *Enterobacteriaceae*, methicillin resistance in staphylococci, etc.).

As with the previous report, the 2011 edition devotes considerable space to raw data. They give the reader a detailed view of the main variables of interest (antimicrobials, diseases, bacterial species, etc.). The "Focus" part of the report addresses several subjects dealing with points of emergence or trends. Finally, the third part includes the results of performance indicators, to ensure that RESAPATH functions in accordance with the expectations of all its stakeholders.

Central to Measure 11 of EcoAntibio2017 (the national plan to reduce the risks of antimicrobial resistance in animals), but also in support of the ongoing ANSES internal request (2011-2013), the RESAPATH network will continue implementing changes in 2012, with the aim of providing as accurate a picture as possible of the current situation regarding antimicrobial resistance in animals, and thus contributing most effectively to future strategic choices regarding the use of antimicrobials in veterinary medicine. It will also play a role in the generation of new molecular data on mechanisms of resistance in animal bacteria which, by comparison with those identified in humans, will lead to a better understanding of the reality or extent of the animal-human link on this issue. This report is a key example of the output data produced by RESAPATH and we hope you enjoy reading it. Our thanks once again to everyone!

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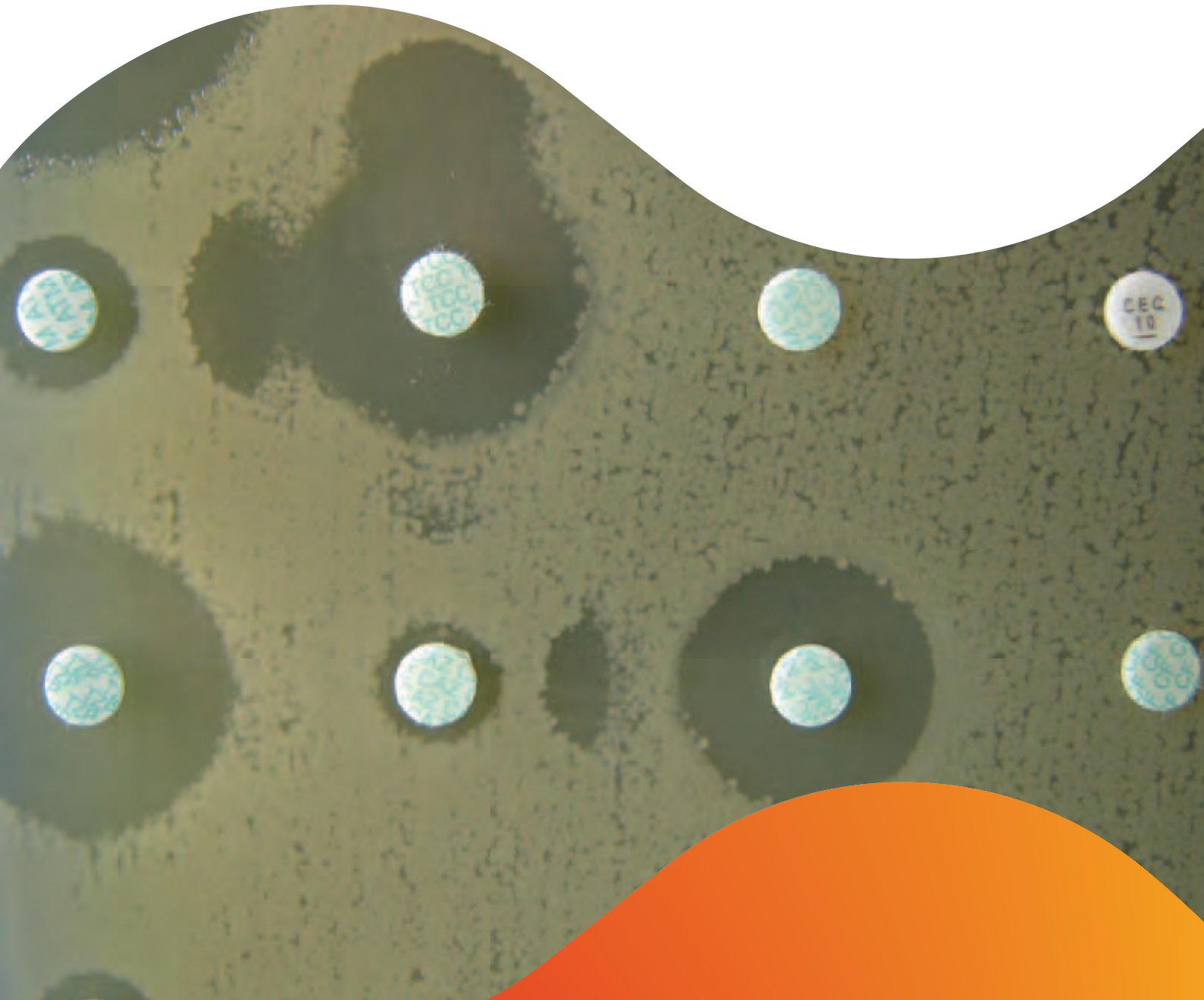
Part 1

Results by animal species



I – Source of 2011 data

Overview of how the network functions

The RESAPATH network collects data from antibiograms of pathogenic bacteria in animals in France.

Veterinary practitioners, when treating their patients, often take samples from sick animals for bacterial isolation and an antibiogram.

These antibiograms are performed in public or private veterinary testing laboratories that participate in RESAPATH on a voluntary basis. The results are then collected by the network in electronic or paper format.

These data include information about the sample and the context in which it was taken (laboratory that performed the test, sector of origin, animal age category, observed disease, sample type, *département*, etc.). They also provide information about the tested antimicrobial agents and the measured diameters of inhibition zones. The epidemiological unit monitored by RESAPATH is the antibiogram of one bacterium; therefore there are as many datasets as there are antibiograms performed by RESAPATH's laboratories.

RESAPATH recommends using the antibiogram technique listed in the AFNOR NF U47-107 Standard (antibiogram based on diffusion in an agar medium). Laboratories are also requested to follow the recommendations of the French Microbiology Society's Antibiogram Committee (CA-SFM and Veterinary CA-SFM[1]). Based on the diameters of inhibition zones reported by the laboratories, RESAPATH classifies bacteria as susceptible (S), intermediate (I) or resistant (R), using the critical values recommended by the CA-SFM (veterinary and human) or, failing that, by the laboratory that manufactures the compound.

In addition, after consulting the antibiogram results, ANSES collects certain strains whose antimicrobial resistance profile warrants molecular characterisation. These strains are the subject of in-depth studies into the antimicrobial resistance mechanisms at play, and can therefore be used to closely track trends and emerging resistance observed in the field. Other strains are collected to document the distribution of diameter values for certain bacterium/antimicrobial pairs, and to contribute to the updating of the veterinary reference guide.

The ANSES Lyon and ANSES Ploufragan-Plouzané laboratories jointly coordinate this network. Antibiogram data from the pig, poultry, rabbit and fish sectors are compiled at ANSES Ploufragan-Plouzané, while ANSES Lyon centralises results from other animal sectors (cattle, sheep, goats, dogs, cats, horses, exotic pets, etc.).

RESAPATH is a passive or 'event-based' surveillance network; its laboratories participate on a voluntary basis, and its analyses examine only samples sent on the decision of veterinary practitioners. However, bacterial isolation and antibiograms in particular are not analyses that are routinely requested in the framework of veterinary activity. They are generally reserved for the most serious cases and/or after treatment has failed. The data collected by the network will therefore tend to overestimate the antimicrobial resistance of pathogenic bacteria. Nevertheless, the significance of antimicrobial resistance monitoring lies in its ability to detect the most resistant bacteria and measure trends. In that sense, the information provided by RESAPATH is relevant and can highlight overriding trends related to the antimicrobial resistance of pathogenic bacteria in France.

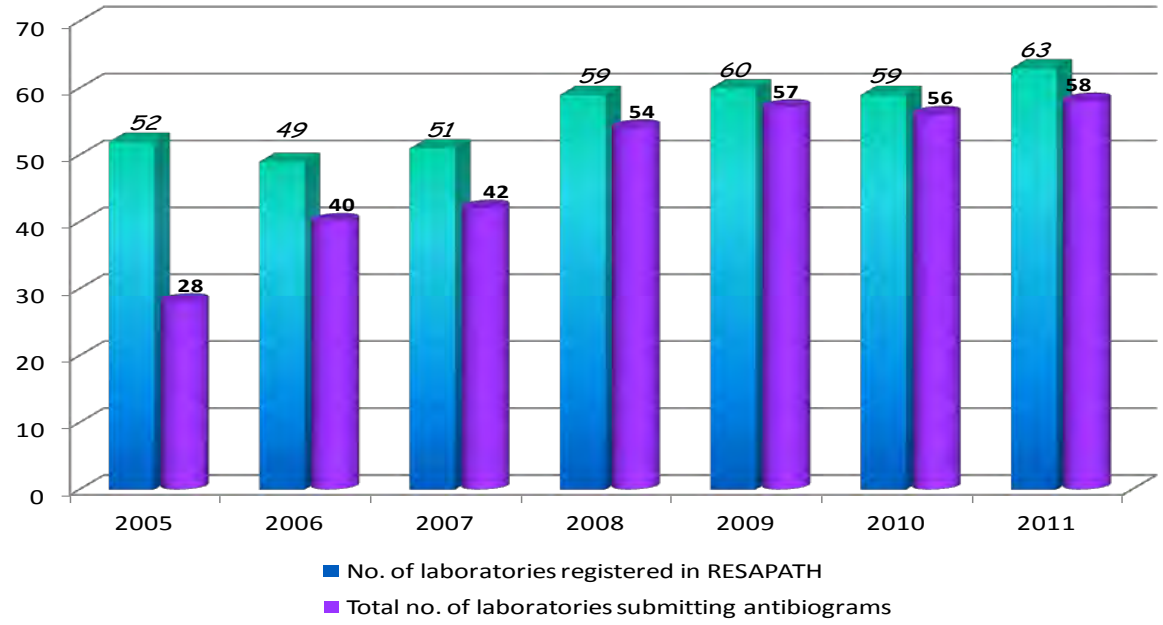
[1] French Microbiology Society's Antibiogram Committee - http://www.sfm-microbiologie.org/pages/?page=746&idl=21

Data collected in 2011

In 2011, RESAPATH had 63 member laboratories. Active participation has been stable since 2009 with 58 of the registered laboratories (or 92%) sending data in 2011 *(Figure 1).* Two laboratories registered in late 2011 and were therefore unable to send data for this report.

In 2011, the 58 laboratories *(Annex 1)* submitted a total of 26,049 antibiograms (*Figure 1 - Table 1*). The 17,816 antibiograms for which this information was available came from 96 sampling *departements*.

***Figure 1** - Growth in the number of laboratories submitting data to RESAPATH*



The number of antibiograms received by sector in 2011 is given in Table 1 below.

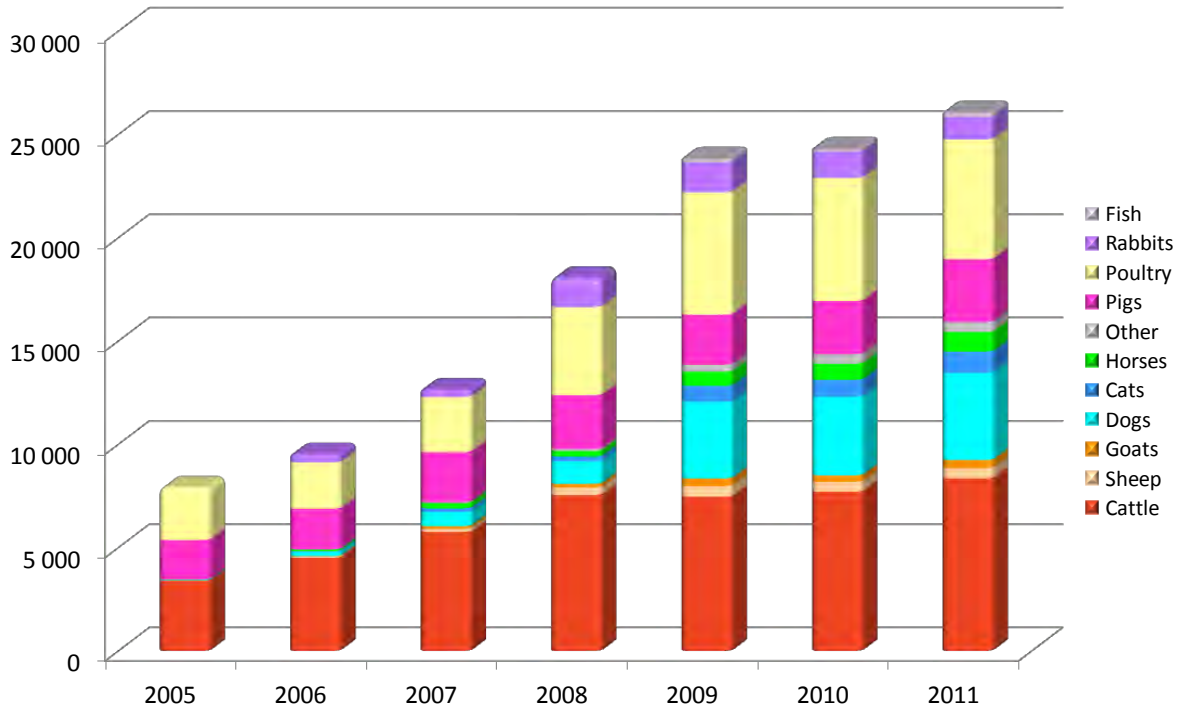
***Table 1:** Number of antibiograms received by sector in 2011*

Sector	N	%
Cattle	8354	*32.1*
Poultry	5798	*22.3*
Dogs	4221	*16.2*
Pigs	3036	*11.7*
Rabbits	1085	*4.2*
Cats	1030	*4.0*
Horses	941	*3.6*
Sheep	492	*1.9*
Goats	397	*1.5*
Other*	490	*1.9*
Fish	205	*0.8*
Total	**26,049**	

**aviary birds, pet rodents, aquarium fish, monkeys, snakes, etc.*

The amount of data collected by the network increased sharply until 2009 and has been growing at a slower rate since then (*Figure 2*). The network's positioning and the prospects for its expansion through Measure 11 of the EcoAntibio plan in 2011 should help to underpin this growth in the future.

Figure 2 *- Growth in the number of antibiograms received by animal sector*



The remainder of this report describes the main results obtained in 2011 in each of these animal sectors and expands on some specific points of interest.

The annexes present detailed data by sector concerning age group, disease, isolated bacteria and observed susceptibility percentages. These tables include only antimicrobial agents of interest with at least 30 measurements. For the pig, poultry and rabbit sectors, the minimum number of measurements is 100, in order to present results that have been collected by several laboratories.

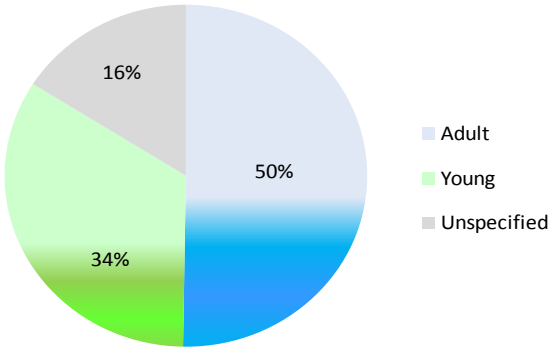
II – Ruminants

1 – Cattle

Description of the data

In 2011, more antibiograms were received from this sector than from any other, with a total of 8354, 50% of which were performed on samples taken from adult cattle and 34% from young cattle *(Figure 3).*

Figure 3 *- Cattle 2011 - Antibiograms received by age group*



As every year, virtually all of the antibiograms received concerning adult cattle were performed on isolated bacteria in cases of mastitis (n=3901, or 93% of adult antibiograms), while in young cattle the antibiograms mainly concerned cases of digestive (n=2227, or 79%) and to a lesser degree respiratory (n=286, or 10%) diseases *(Annex 2 - Figure 1, Table 1).*

The vast majority of the antibiograms received involved *Escherichia coli* (n=4029, or 48% of all antibiograms, all age groups combined). Most of them concerned digestive problems (n=2323 – 58% of *E. coli* strains), and then mastitis (n=665 – 16% of *E. coli* strains). However, in 20% of cases (n=799) the disease involved in the isolation of *E. coli* was not specified.

Streptococci were still the second most frequently isolated bacteria (n=1748 – 21%). These pathogens were often associated with mastitis (n=1693 – 20%), the primary species of which was *S. uberis* (n=1403 – 17%).

Lastly, coagulase-positive staphylococci were in third position with isolation frequencies of 8% (n=680) and were also mainly isolated from animals with mastitis (n=657 – 8%) (*Annex 2 - Figures 2, 3 - Tables 2, 3*).

Antimicrobial resistance

E. coli

Only 14% of the *E. coli* strains isolated from young cattle with digestive diseases remained susceptible to amoxicillin, while this percentage was 75% for *E. coli* strains isolated from cattle with mastitis (*Annex 2 - Tables 4 and 5*). These values are consistent with those obtained from 2008 to 2010, and thus confirm the very different levels of resistance between these two pathological entities.

Out of all of the *E. coli* antibiograms that were isolated from cattle in 2011, irrespective of the pathological context and age group, susceptibility to cephalosporins remained high. This was particularly true for the third and fourth generations (3GC and 4GC) available in veterinary medicine (cefoperazone, ceftiofur, cefquinome) (*Tables 2 and 3 below*). It can still be seen clearly that young animals (neonatal diarrhoea) are the source of ESBL-producing enterobacteria in cattle, partly by harbouring plasmids similar to those identified in humans[2] (see also the Focus part of this report).

Table 2: *Cattle from 2009 to 2011 – E. coli – All age groups combined – All diseases – Percentage of susceptible phenotypes for 3rd and 4th generation cephalosporins.*

TYPE	Antimicrobial agent	2009		2010		2011	
		Total (N)	**% S**	*Total (N)*	**% S**	*Total (N)*	**% S**
3GC	Cefoperazone	*1825*	**85**	*1875*	**85**	*1892*	**86**
3GC	Ceftiofur	*3289*	**95**	*3569*	**95**	*3834*	**93**
3GC	Cefotaxime	*142*	**88**	*136*	**91**	*199*	**68**
3GC	Ceftazidime	*162*	**85**	*368*	**91**	*435*	**91**
4GC	Cefquinome 30 µG	*2528*	**91**	*3522*	**91**	*3768*	**89**
4GC	Cefepime	*448*	**92**	*464*	**91**	*557*	**86**

Table 3: *Cattle from 2009 to 2011 – E. coli – By age group - Percentage of susceptible phenotypes for the different 3rd and 4th generation cephalosporins.*

		Adult cattle					
TYPE	Antimicrobial agent	2009		2010		20011	
		Total (N)	**% S**	*Total (N)*	**% S**	*Total (N)*	**% S**
3GC	Cefoperazone	*468*	**97**	*405*	**97**	*496*	**97**
3GC	Ceftiofur	*489*	**99**	*438*	**99**	*578*	**98**
3GC	Ceftazidime	*10*	**100**	*66*	**98**	*39*	**100**
4GC	Cefquinome 30 µG	*429*	**96**	*513*	**99**	*667*	**99**
4GC	Cefepime	*71*	**100**	*67*	**99**	*78*	**99**

NB: The values for cefotaxime are not included due to the low number of analyses performed in adult cattle.

		Young cattle					
TYPE	Antimicrobial agent	2009		2010		2011	
		Total (N)	**% S**	*Total (N)*	**% S**	*Total (N)*	**% S**
3GC	Cefoperazone	*871*	**79**	*884*	**79**	*824*	**79**
3GC	Ceftiofur	*1872*	**94**	*2126*	**94**	*2314*	**92**
3GC	Cefotaxime	*99*	**84**	*85*	**88**	*185*	**70**
3GC	Ceftazidime	*117*	**84**	*85*	**86**	*185*	**83**
4GC	Cefquinome 30 µG	*1555*	**89**	*2052*	**88**	*2210*	**86**
4GC	Cefepime	*99*	**81**	*85*	**79**	*185*	**70**

[2] Madec J.-Y., Poirel L., Saras E., Gourguechon A., Girlich D., Nordmann P., Haenni M. (2012) Non-ST131 *Escherichia coli* from cattle harbouring human-like $bla_{CTX\text{-}M\text{-}15}$-carrying plasmids. Journal of Antimicrobial Chemotherapy, 67 (3): 578-581.

The phenicol resistance of *E. coli* strains isolated from cattle is monitored for epidemiological purposes since florfenicol does not have a marketing authorisation for the treatment of *E. coli* infections, and chloramphenicol is prohibited for the treatment of livestock diseases. The rate of resistance to florfenicol of *E. coli* strains isolated from cattle has remained around 20% since 2008 and was 18% in 2011 (n=3319 – 82% of susceptible strains). Refining them by disease, strains of *E. coli* isolated from neonatal diarrhoea harboured most of this resistance (n= 1802 – 77%) *(Annex 2 - Table 4)*, while strains of *E. coli* isolated from mastitis remained highly susceptible to florfenicol (n=432 – 98%) *(Annex 2 - Table 5).* This high resistance to florfenicol should be considered with caution, firstly because this compound is not indicated for the treatment of diarrhoea in calves, and secondly because it is often associated with major resistance to other compounds, including 3GCs, with the same molecular determinants (plasmids)[3].
For fluoroquinolones, the susceptibility of *E. coli* strains in cattle with digestive diseases varied according to the tested compound, but this difference, which is in reality minor, cannot be explained for now. Overall, the same levels of resistance were observed in 2011, with around 47% of the *E. coli* strains isolated from cattle with digestive disease having resistance or intermediate resistance to quinolones and 26% to 32% to fluoroquinolones (*Annex 2 - Table 4*).

Salmonella

All age groups and diseases combined, the most frequently isolated salmonellae were, in descending order *Salmonella* Typhimurium (n=144 – 38%), *S.* Mbandaka (n=86 – 23%), then *S.* Montevideo (n=61 – 16%). However, it should be noted that in nearly 6% of all cases, the serotype of the isolated *Salmonella* strain was not specified.

Salmonella Typhimurium mainly had the typical penta-resistance profile, with the ACSSuT phenotype (amoxicillin-ampicillin, chloramphenicol-florfenicol, streptomycin-spectinomycin, sulfonamides, tetracycline), which was sometimes but not always combined with aminoglycoside resistance (*Annex 2 - Table 6*). This phenotype represented by far the overwhelming majority of resistant *Salmonella* strains in cattle.

Salmonella Mbandaka remained susceptible to the tested antimicrobials *(Annex 2 - Table 7).*

Unlike for *E. coli*, ESBL phenotypes or hyperproduced cephalosporinases had never been detected for RESAPATH's *Salmonella* isolates before 2009. In 2011, these still essentially remained susceptible to 3GC and 4GC agents. It is worth remembering that for the first time, a *Salmonella* Typhimurium strain was characterised that harboured both the island conferring penta-resistance (SGI1) and a plasmid carrying an ESBL-encoding gene (CTX-M-1)[4]. Such phenotypes will need to be monitored over time in order to determine whether or not the increasing spread of ESBL plasmids, common in *E. coli*, is tending to extend to other still largely unaffected *Enterobacteriaceae* in cattle, such as *Salmonella*. At this stage, the 2011 data still suggest a very limited circulation in *Salmonella*.

Overall, *Salmonella* Typhimurium and Mbandaka remain susceptible to fluoroquinolones.

Pasteurella

Bovine *Pasteurella* remained widely susceptible to beta-lactams, which are also the first-line treatment for human infections caused by this family of bacteria (amoxicillin).
Susceptibility to florfenicol (major indication for the treatment of bovine pasteurelloses) was almost total insofar as, in young cattle with respiratory diseases, the strains found were overwhelmingly susceptible for

[3] Meunier D, Jouy E, Lazizzera C, Doublet B, Kobish M, Cloeckaert A, Madec J-Y. (2010) Plasmid-borne florfenicol and ceftiofur resistance encoded by the floR and CMY-2 genes in Escherichia coli isolates from diseased cattle in France. *Journal of Medical Microbiology*, 59: 467-471.

4 Madec J-Y, Doublet B, Ponsin C, Cloeckaert A, Haenni M (2011) Extended-spectrum beta-lactamase $bla_{CTX\text{-}M\text{-}1}$ gene carried on an IncI1 plasmid in multidrug-resistant *Salmonella enterica* serovar Typhimurium in cattle in France. Journal of Antimicrobial Chemotherapy, 66 (4): 942-944

Pasteurella multocida (n=100 – 97% of susceptible strains) and *Mannheimia haemolytica* (n=96 – 98% of susceptible strains). Moreover, only three strains (one strain of *Pasteurella multocida* and two of *Mannheimia haemolytica)* were found to be resistant when considering only respiratory disease, independently of age (n=143 and n=139 respectively). Once again in 2011, these results confirm the completely sporadic nature of a florfenicol-resistant *Pasteurella trehalosi* strain[5] observed in France in 2006 (*Annex 2 - Tables 9 and 10*).

Staphylococcus

The most frequently detected resistance in staphylococci isolated from cattle with mastitis still involved penicillin G (35% resistant or intermediate isolates in coagulase-negative *Staphylococcus* strains and 31% in coagulase-positive *Staphylococcus* strains) (*Annex 2 - Tables 11 and 12).* Even though these percentages were significantly lower than those observed in human medicine (over 90% resistant isolates), they may raise concerns of therapeutic failure if resistant strains are treated with an antimicrobial agent from the penicillin class.

These resistance percentages also remained considerably lower than those observed in other sectors (overall from 65% to 74% resistant coagulase-positive *Staphylococcus* isolates in dogs with skin and mucous membrane disease or otitis, and 57% of coagulase-positive *Staphylococcus* isolates in cats, all diseases combined) *(Annex 10 - Tables 3 and 7, Annex 11 - Table 5*). However, comparison with other sectors is difficult given that staphylococci species may differ. For example, the coagulase-positive *Staphylococcus* isolated from cattle was almost exclusively *S. aureus*, whereas there was a majority of *S. pseudintermedius* in pets, and the epidemiology of resistance in the two species is not the same.

Methicillin resistance, which causes resistance to all beta-lactams, was the most frequently tested resistance in staphylococci. However, cefoxitin resistance, a marker of possible resistance to methicillin, was very limited, since susceptibility rates were 94% for coagulase-positive *Staphylococcus* and 95% for coagulase-negative *Staphylococcus* isolated from cattle with mastitis *(Annex 2 - Tables 11, 12*). Moreover, even in these 5-6% of cefoxitin-resistant strains, the frequency of real methicillin resistance was found to be insignificant after molecular investigation. In addition, characterisation of the rare methicillin-Resistant *Staphylococcus aureus* (MRSA) strains collected through RESAPATH suggests human-to-animal transmission, since two strains belonging to the Geraldine clone, a typically French invasive human clone, were identified[6] (see also the Focus part of this report). Finally, in 2011 RESAPATH detected two MRSA strains in cattle with the new variant (*mecC*) of the *mecA* gene[7] (see also the Focus part of this report).

Streptococcus

Resistance of streptococci isolated from cattle with mastitis was very rare. These bacteria were particularly susceptible to penicillin G whose marker is oxacillin, with 89% susceptible *S. uberis* strains (n=1 008) and 100% for *S. dysgalactiae* (n=164), both isolated from cattle with mastitis (*Annex 2 - Tables 14 and 15*).
The highest resistance concerned tetracycline in *S. dysgalactiae* with 37% susceptible strains (n=182).

[5] 5 Kehrenberg C, Meunier D, Targant H, Cloeckaert A, Schwarz S, Madec J-Y (2006) Plasmid-mediated florfenicol resistance in *Pasteurella trehalosi*. Journal of Antimicrobial Chemotherapy, 58 (1): 13-17.

[6] Haenni M, Galofaro L, Ponsin C, Bes M, Laurent F, Madec J-Y (2011) Staphylococcal bovine mastitis in France: enterotoxins, resistance and the human Geraldine methicillin-resistant *Staphylococcus aureus* clone. Journal of Antimicrobial Chemotherapy, 66 (1): 216-225.

[7] Laurent F., Chardon H., Haenni M., Bes M., Reverdy M.-E., Madec J.-Y., Lagier E., Vandenesch F. and Tristan A. (2012) MRSA Harboring *mec*A Variant Gene *mec*C, France. *Emerging Infectious Diseases*, 18 (9): 1465-1467.

Furthermore, for *S. uberis* strains isolated from cattle with mastitis, a small percentage of isolates were resistant to erythromycin (9%) and were cross-resistant to lincosamides (inducible or constitutive MLS_B resistance)[8]. There was also a difference in susceptibility between enrofloxacin (75%) and marbofloxacin, with higher susceptibility to marbofloxacin (91%). In any case, fluoroquinolones are not the most appropriate antimicrobial agents for the treatment of proven streptococcal infections.

2 – Sheep

Description of the data

Out of the 492 antibiograms received in 2011 for this sector, information about the age group was unavailable in 41% of cases, while for the rest, an equal number were performed in adult sheep, mostly with mastitis, and in young sheep with a respiratory or digestive disease *(Annex 3 - Figure 1, Table 1).*

Given the small number of available antibiograms with a specified age group and disease, the data were analysed taking into account only the disease, all age groups combined.

As in 2009, in decreasing order, antibiograms on *E. coli* strains were the most numerous (n=168 – 34%), mostly in cases of digestive diseases (n=57 – 12%) when information about the disease was available (15% of the medical histories related to *E. coli* did not have a specified disease, n=73). Next on the list were pasteurellae (n=154 – 31%) mainly in respiratory diseases (n=91 – 18%) then coagulase-positive *Staphylococcus* (n=44 – 9%), mainly isolated from sheep with mastitis. Lastly, salmonellae were in fourth position (n=36 – 7%), 27 of which were isolated during abortions (5%) *(Annex 3 - Figure 2, Table 2).*

Antimicrobial resistance

The *E. coli* strains isolated from sheep with digestive diseases remained susceptible to 3GCs and 4GCs (for ceftiofur: n=53 – 98%), unlike what was observed in the *E. coli* strains isolated from young cattle. However, as in the cattle sector, the *E. coli* strains had a relatively high level of resistance to florfenicol (n=51 – R+I=14%) *(Annex 3 - Table 3).*

3 – Goats

Description of the data

The 397 antibiograms from goats lacked information about the age group in 25% of cases (n=99) and about the disease in 12% of cases (n=49) *(Annex 4 - Figure 1, Table 1).*

E. coli and pasteurellae strains were equally represented in 2011 (23% of antibiograms received for each). Pasteurellae (n=91) were mainly isolated in respiratory disease (n=63). *E. coli* strains (n=90) came mainly from digestive diseases (n=32), where the information was specified *(Annex 4 - Figure 2, Table 2).*

Given the small number of antibiograms performed per bacterial group, the analysis was unable to take age and/or disease into consideration. Consequently, the results on the antimicrobial resistance of pathogens in this sector include all age groups and diseases combined.

[8] Haenni M., Saras E., Chaussière S., Treilles M. and Madec J.-Y. (2011). *ermB*-mediated erythromycin resistance in *Streptococcus uberis* from bovine mastitis in France. *The Veterinary Journal*, 189 (3): 356-358.

Antimicrobial resistance

As in the sheep sector, the *E. coli* strains isolated from goats, all diseases and age groups combined, were susceptible overall to 3GCs and 4GCs *(Annex 8 - Table 3).* However, an ESBL was characterised for the first time in the goat sector in 2011 in *E. coli*[9] (see also the Focus part of this report). This result therefore underlines the fact that such strains could be described in other animal production sectors as well as the major ones (cattle, pigs, poultry). In addition, the gene responsible ($bla_{CTX\text{-}M\text{-}1}$) was carried by a plasmid that is widespread in animals (IncI1/ST3) and that has been described in poultry, cattle, domestic carnivores and horses in France[10]. The issue is therefore raised of the spread of the same highly epidemiologically successful plasmid between animal sectors.
The rate of resistance to florfenicol in *E. coli* (n=76, R+I=16%) was higher than in 2010 (10%). Despite the limitations of the small amount of data, this seems to present the same problem as in cattle and sheep.

The data on isolated pasteurellae, all diseases combined, do not indicate any particular resistance to the few antimicrobial agents that can be interpreted given the small amount of available data (n=91) (*Annex 4* - Table 4).

9 Dahmen S., Haenni M., Madec J.-Y (2011). Animal ESBLs: first description in a goat. RICAI Convention, 1-2 December, Paris, France.

10 Dahmen S., Haenni M., Madec J.-Y (2012). IncI1/ST3 plasmids contribute to the dissemination of the $bla_{CTX\text{-}M\text{-}1}$ gene in *Escherichia coli* from several animal species in France. *Journal of Antimicrobial Chemotherapy,* in press.

III – Pigs

Description of the data

In 2011, ANSES Ploufragan-Plouzané received 3036 antibiogram results for bacteria isolated from diseased pigs. These antibiograms were performed by 38 laboratories, three of which accounted for 65% of the data. Almost 93% of the antibiograms came from nine laboratories, all located in the Brittany and Pays de la Loire regions, which contain the majority of France's pig farms.

These antibiograms were performed on samples from piglets (45%) until the post-weaning stage and from sows (17%). The 'pig' category, which accounted for 37% of all antibiograms, remains vague as the term on the antibiogram does not have the same level of precision in all the laboratories. In the majority of cases, the term 'pig' refers to grower-finisher pigs but it may also include piglets, sows and breeding boars. The antibiograms performed for bacteria isolated from breeding boars and wild boars respectively accounted for 0.2% and 0.1% of all the antibiograms collected in 2011 for the pig sector (*Annex 5 - Figure 1*).

Most of the antibiograms (44%) were performed for bacteria isolated during a digestive disease. The other three diseases that each accounted for more than 10% of the antibiograms performed were respiratory (14%), urinary (13%) and septicaemic (10%) (*Annex 5 - Figure 2, Table 1*) diseases.

All diseases combined, antibiograms involving *E. coli* were the most frequent (62%) followed by *Streptococcus suis* (8%), *Actinobacillus pleuropneumoniae* (5%) and *Pasteurella multocida* (4%). These four bacterial species accounted for 80% of the antibiograms collected by RESAPATH in 2011 (*Annex 5 - Figure 3, Table 2*).

Antimicrobial resistance

E. coli

In the class of beta-lactams, 42% of *E. coli* were susceptible to amoxicillin (*Annex 5 - Table 3*). This percentage was significantly higher with cephalosporins, even first-generation cephalosporins such as cefalexin (87%). Present in 99% of the *E. coli* antibiograms, ceftiofur was the most frequently tested cephalosporin. The percentage of *E. coli* strains susceptible to this compound in 2011 was 95%.

The percentage of *E. coli* strains susceptible to quinolones and fluoroquinolones varied according to the tested compound. Oxolinic acid and enrofloxacin, the main compounds that were represented, respectively gave susceptibility levels of 66% and 85%.

E. coli strains were less frequently susceptible to tetracycline, trimethoprim, sulfonamides and the latter two antimicrobial agents combined: 21% to 36%.

A comparison between the proportions of *E. coli* susceptible to different antimicrobials depending on the category of animals (piglets versus sows) is presented in Tables 4 and 5 of Annex 5. The proportions of *E. coli* susceptible to amoxicillin, ceftiofur, aminoglycosides, tetracycline and trimethoprim-sulfonamide combined were lower in piglets than in sows (Chi-2 test, $p<0.05$). There was no difference between these two groups of animals with respect to quinolones and fluoroquinolones.

Actinobacillus pleuropneumoniae

More than 95% of the *A. pleuropneumoniae* isolates were susceptible to the majority of antimicrobial agents, with the exception of tetracycline and the combination of trimethoprim-sulfonamide (*Annex 5 - Table 6).*
No *A. pleuropneumoniae* isolates were found to be resistant to amoxicillin-clavulanic acid combined, to ceftiofur or to florfenicol. One isolate had reduced susceptibility to enrofloxacin.

Pasteurella multocida

Most of the *P. multocida* isolates in the pig sector were susceptible to the most frequently tested antimicrobial agents (*Annex 5 - Table 7*). No antibiograms showed resistance to ceftiofur, florfenicol or fluoroquinolones.

Streptococcus suis

In 2002, the CA-SFM stopped issuing critical diameters for amoxicillin against streptococci. Nevertheless, this antimicrobial agent is still frequently tested by analytical laboratories since it is used to control infections caused by this bacterium. The critical diameters used are those that were published in 2001 (14 and 21 mm). In 2011, no *S. suis* isolates were found to be amoxicillin-resistant (*Annex 5 - Table 8*). A study is in progress in order to determine whether amoxicillin is the best indicator of resistance to beta-lactams in *S. suis*.

More than 90% of the *S. suis* isolates were susceptible to aminoglycosides (high disk loads).

Few *S. suis* isolates were susceptible to cyclins and macrolides-lincosamides. For the latter group of antimicrobial agents, the most common phenotype was constitutive MLS_B.

IV – Poultry

Description of the data

A total of 5798 antibiograms of poultry origin conducted by 44 laboratories were submitted to ANSES Ploufragan-Plouzané in 2011. As in 2010, two laboratories accounted for 50% of the data. The 90% threshold was reached with nine laboratories. As in the pig sector, this reflects the fact that farms are concentrated in the Brittany and Pays de la Loire regions.

Most antibiograms were conducted for bacteria isolated in hens/chickens (53%), followed by turkeys (21%), ducks (17%) and guineafowl (2%). For these four animal species, *E. coli* was the subject of 68% of the antibiograms (respectively 42%, 16%, 8% and 2%), followed by *S. aureus* (3%) and *Enterococcus cecorum* (2%) for hens/chickens, *Ornithobacterium rhinotracheale* (3%) for turkeys and *Riemerella anatipestifer* (4%) for ducks *(Annex 6 - Figure 1, Table 1).*

All poultry and bacteria combined, 90% of the antibiograms were performed for bacteria isolated during cases of septicaemia (73%), respiratory disease (6%) or arthritis (9%).

Antimicrobial resistance

E. coli

In turkeys, hens/chickens, ducks and guineafowl, between 40 and 47% of *E. coli* strains were susceptible to amoxicillin. A lack of susceptibility (resistant or intermediate bacteria) to ceftiofur was found in 5% of the *E. coli* isolates in turkeys, 21% in hens/chickens, 1% in ducks and 9% in guineafowl (*Annex 6 - Tables 2 to 5*). In 2009 and 2010, respectively 12% and 22% of *E. coli* isolates from hens/chickens were not susceptible to ceftiofur (see also the Focus part of this report).

For these four animal species in the poultry sector:

- the majority of *E. coli* isolates were susceptible to aminoglycosides, and particularly gentamicin, for which percentages were greater than or equal to 97%;
- less than 28% of *E. coli* isolates were susceptible to tetracycline;
- from 74 to 76% of the antibiograms showed susceptibility to trimethoprim and trimethoprim-sulfonamide combined, in turkeys and hens/chickens. These percentages were lower in ducks and guineafowl (47 to 56%);
- percentages of *E. coli* susceptible to enrofloxacin (the most frequently tested fluoroquinolone) varied from 90% to 95% and were therefore similar among the four poultry species.

Ornithobacterium rhinotracheale and Riemerella anatipestifer

O. rhinotracheale and *R. anatipestifer* are bacteria with similar phenotypes that belong to the *Flavobacteriaceae* family. In terms of the number of antibiograms collected by RESAPATH, they were in second position after *E. coli* for turkeys (*O. rhinotracheale*) and ducks (*R. anatipestifer*).
There are currently no specific critical diameters in the French guidelines for these bacteria.
The accumulation of data through RESAPATH will make it possible to analyse diameter distributions for the most frequently tested antimicrobial agents and assess the possibility of assigning specific critical diameters.

Staphylococcus aureus (hens/chickens)

Over 98% of *S. aureus* isolates from hens/chickens were susceptible to neomycin, gentamicin or trimethoprim-sulfonamide.
More than 80% of *S. aureus* were susceptible to antimicrobials of the macrolide-lincosamide class *(Annex 6 - Table 6)* and a majority (61%) remained susceptible to penicillin G.
Cefoxitin does not appear in the table because it is rarely tested. There is therefore no relevant information on the percentage of *S. aureus* strains with the *mecA* gene conferring resistance to all beta-lactams.

Enterococcus cecorum (hens/chickens)

Almost all *E. cecorum* strains were susceptible to amoxicillin *(Annex 6 - Table 7)*. However, the class of macrolides-lincosamides was less frequently active with 44% to 49% of isolates susceptible, while for tetracycline only 7% of *E. cecorum* strains were susceptible.

V – Rabbits

Description of the data

In 2011, 32 laboratories sent to ANSES Ploufragan-Plouzané 1085 antibiograms performed on bacteria isolated from rabbits. As in the pig and poultry sectors, the data were highly concentrated in the Brittany and Pays de la Loire regions, with 71% of the collected results coming from three laboratories in these two regions.

For this animal species, three bacteria accounted for 83% of the antibiograms: *E. coli* (37%) isolated primarily from the intestines, *Pasteurella multocida* (26%) isolated mainly from the respiratory tract and *Staphylococcus aureus* (20%), mostly isolated from rabbits with skin infections *(Annex 7 - Figure 1, Table 1).*

Antimicrobial resistance

E. coli

There are no data on the susceptibility of *E. coli* to penicillin A drugs (amoxicillin, ampicillin) because administering these antimicrobial agents to rabbits would cause fatal dysenteric enterocolitis. These medically contraindicated antimicrobial agents are therefore not tested by analytical laboratories.

The highest susceptibility levels were obtained with ceftiofur (99%) and enrofloxacin (89%) (*Annex 7 - Table 2*).

Concerning aminoglycosides, the percentages of susceptible *E. coli* strains were above 70%.

Very few *E. coli* were susceptible to trimethoprim-sulfonamide combined (21%) or to cyclines (9 to 14%).

Pasteurella multocida

No antibiograms showed resistance to ceftiofur and more than 96% of the *P. multocida* isolates from rabbits were susceptible to several antimicrobial agents: gentamicin, cyclines, tilmicosin, flumequine and fluoroquinolones *(Annex 7 - Table 3).*

Staphylococcus aureus

Concerning beta-lactams, the vast majority of the *Staphylococcus aureus* strains (86%) isolated from rabbits were susceptible to penicillin G *(Annex 7 - Table 4).*
Cefoxitin does not appear in the table because it is rarely tested. There is therefore no relevant information on the percentage of *S. aureus* strains with the *mecA* gene conferring resistance to all beta-lactams.

More than 87% of the *S. aureus* isolates were susceptible to tiamulin or enrofloxacin.

The lowest susceptibility levels were obtained with macrolides and tetracycline (39 to 44%).

VI – Fish

Description of the data

RESAPATH received 205 antibiograms related to farmed fish in 2011, an increase of 93% compared to 2010 due to the contribution of data by a new laboratory joining the network. All the antibiograms came from nine laboratories, three of which accounted for 94% of the data.

The animal species was not specified in 69% of the antibiograms. In the remaining cases, bacteria were essentially isolated from trout (18%) and turbot (7%) *(Annex 8 – Figure 1)*.

The disease or nature of the sample was not indicated for 91% of the antibiograms *(Annex 8 – Figure 2)*.

As in the previous two years, *Aeromonas* and *Yersinia ruckeri* accounted for the majority of antibiograms, with 38% and 20% respectively. In contrast, the genus *Vibrio,* which was previously in third position, was replaced in 2011 by the genus *Vagococcus* (13%) *(Annex 8 – Table 1)*.

Antimicrobial resistance

No results of antimicrobial resistance can be inferred from the data collected due to the low number of isolates at the level of a given bacterial species.

VII – Horses

Description of the data

In 2011, RESAPATH compiled data from 941 antibiograms taken from horses and donkeys. The vast majority of the antibiograms used samples taken from adults (n=802 – 85%), although this information was not available in 13% of cases (n=126) *(Annex 9 - Figure 1, Table 1).*

When the disease was specified, it was most often a reproductive disease (n=615 - 65%) or a skin and mucous membrane disease (n=71 - 7%). Information about the disease was not available in 16% of cases (n=152) *(Annex 9 - Figure 2).*

The main bacterial groups involved were *Streptococcus* (n=400 – 42%) mainly in contexts of reproductive diseases (n=270 – 29%), *E. coli* (n=231 – 24%) in the same disease context for 21% (n=202) and coagulase-positive *Staphylococcus* (n=62 – 7%) *(Annex 9 - Figure 2, Table 2).*

Antimicrobial resistance

Streptococcus strains were susceptible overall to penicillin G whose marker is oxacillin (n=201 – 98% susceptibility). The lowest observed susceptibility was to tetracycline with 52% of susceptible strains (n=130). This rate was 29% in 2010, and the reality of this significant increase in susceptibility to this antimicrobial should be monitored in 2012.
Although a slight decrease was observed, a very large proportion of isolates remained susceptible to macrolides. In fact, 88% of strains were susceptible to erythromycin (n=267), and 91% to spiramycin (n=266) (respectively 92% and 97% in 2010) *(Annex 9 - Table 3).*

For *E. coli* strains, a 4% rate of resistance was observed for ceftiofur, which is a significant warning threshold, despite the low number of strains collected (n=202), in view of similar proportions observed in larger groups in livestock sectors *(Annex 9 - Table 4).*

Strains of coagulase-positive *Staphylococcus* isolated from horses (n=60) had a susceptibility of 67% to penicillin G, all age groups and diseases combined *(Annex 9 - Table 5).* These strains remained highly susceptible to cefoxitin (80%, n=49), a marker of resistance to methicillin. However, these data, obtained from a persistently small number of strains, should be refined in future years. In particular, this should include systematically detecting the presence of the *mecA* gene for strains resistant or intermediate to cefoxitin, to accurately determine the prevalence of methicillin resistance in this sector.

VIII – Pets

1 – Dogs

Description of the data

En 2011, RESAPATH compiled data from 4221 antibiograms taken from dogs, provided by 43 laboratories, with one of them providing a majority of the data (53%). Note however that the location of a given laboratory does not necessarily determine the geographical origin of the animals, since many dogs with severe diseases are treated in specialised veterinary clinics that are sometimes far from their homes. The age was not available in 23% of cases (n=978).

The disease was specified for 75% of the antibiograms (n=3162). When it was specified, it was most often an otitis (25% – n=1049) or a skin and mucous membrane disease (19% – n=811) *(Annex 10 - Figures 1 and 2, Table 1).*

Thirty-four percent of the antibiograms involved coagulase-positive *Staphylococcus* strains (n=1431), mainly in samples taken from dogs with skin and mucous membrane diseases (n=439 – 10%) and otitis (n=415 – 10%) *(Annex 10 - Figure 2, Table 2).*
E. coli strains were in second position with 18% of the antibiograms (n=760), the majority of which involved urinary and renal diseases, when they were specified (n=287 – 7%).
Streptococcus strains were in third position in terms of the number of antibiograms from dogs (n=482 – 11%), and were mainly isolated from dogs with otitis (n=163 – 4%).
Pseudomonas strains were also isolated (n=391 – 9%), mainly from dogs with otitis (n=203 – 5%).

Antimicrobial resistance

Staphylococcus

Susceptibility to penicillin G was relatively low among strains of coagulase-positive *Staphylococcus* isolated from skin and mucous membrane diseases and otitis, respectively 26% (n=383) and 35% (n=399) *(Annex 10 - Tables 3 and 7).*

In dogs, the species distribution of coagulase-positive *Staphylococci* was different from that observed in cattle. In fact, *Staphylococcus pseudintermedius* was vastly over-represented compared to *S. aureus* (approximately 9:1 according to our data). *S. pseudintermedius* can also show methicillin resistance (MRSP – methicillin-resistant *S. pseudintermedius*) conferred by the *mecA* gene; this resistance is more frequent that that found for *S. aureus* in cattle. However, as it is not accurately detected with cefoxitin, an unreliable indicator, it may be significantly underestimated. MRSP can either be detected with an oxacillin disk (in adequate conditions) or suspected due to penicillin G resistance in contact with the disk combined with co-resistance to several agents, and particularly to macrolides, aminoglycosides and fluoroquinolones. A study undertaken in the context of RESAPATH in around 200 strains isolated from dogs suggests a level of around 10% MRSP out of the total identified *S. pseudintermedius* strains[11]. It should be remembered, however, that MRSA strains are sometimes isolated from canine infections, and these strains are probably most often of human origin[12,13] (Geraldine clone, Lyon clone) (see also the Focus part of this report).

[11] Haenni, M., N. Alves de Moraes, C. Médaille, A. Moodley and J.-Y. Madec (2012). Characteristics of methicillin-susceptible and methicillin-resistant *S. pseudintermedius* stains isolated from French dogs. In International Symposium on Staphylococci and Staphylococcal infections, 26-30 August, Lyon, France

[12] Haenni M., Saras E., Châtre P., Médaille C., Bes M., Madec J.-Y. and Laurent F. (2012). A USA300 variant and other human-related methicillin-resistant *Staphylococcus aureus* strains infecting cats and dogs in France. Journal of Antimicrobial Chemotherapy, 67 (2): 326-329.

[13] Haenni M., Médaille C., Laurent F. and Madec J.-Y. (2012). Des staphylocoques dorés résistants à la méticilline d'origine humaine chez les animaux de compagnie [Methicillin-resistant *Staphylococcus aureus* of human origin in pets]. *Le Point vétérinaire* N°328: 8-9.

E. coli

In dogs with skin and mucous membrane diseases, resistance to amoxicillin and amoxicillin-clavulanic acid combined was high (amoxicillin: 55%; clavulanic acid: 39%). Resistance to these two antimicrobial agents was highest with these diseases. Approximately one in five strains was also resistant to cefalexin and fluoroquinolones (enrofloxacin, marbofloxacin).

In dogs with urinary and renal diseases, resistance to amoxicillin was less frequent than for the aforementioned diseases (amoxicillin: 39%). Approximately one in six strains was also resistant to cefalexin (17%), fluoroquinolones (enrofloxacin (15%), marbofloxacin (14%)) and sulfonamides-trimethoprim combined (15%) *(Annex 10 - Tables 4, 8 and 10)*.

Regarding 3GC/4GC resistance, several points need to be considered:

(i) The drug most commonly used in canine veterinary practice is cefovecin, which is also tested in the antibiograms, but for which the CA-SFM does not yet have independent threshold values derived from an analysis of the diameter distributions in a large strain population. This work is ongoing and is the reason for the lack of SIR data for this antimicrobial.

(ii) Data are, however, presented for ceftiofur, whose consistency with those of cefovecin will moreover be studied as a consequence of the previous point. These data show susceptibility rates in dogs of the same order of magnitude as those observed in certain production livestock sectors (otitis: 95%; diseases of the skin and mucous membranes: 83%; urinary tract and renal diseases: 95%). The presence of ESBL-producing *Enterobacteriaceae* in infections in dogs is also confirmed at the molecular level[14,15].

(iii) The epidemiological meaning of these levels of resistance to 3GC must be considered in terms of the structure of the canine population, which is not an economic production sector. Firstly, the canine population is more akin to the human community population, and secondly, its members establish individual relationships with members of the human community, leading to very specific exposure of humans from dogs, and vice versa. This point should be given special attention in the future, to obtain as precise an estimate as possible of the levels of resistance in pets, including an approach that is more segmented by risk factors, similar to the one followed for humans.

Streptococcus

Susceptibility of *Streptococcus* isolates was high overall except for tetracycline, with only 33% susceptibility for *Streptococcus* isolates in cases of otitis for which this antimicrobial agent was tested in a sufficiently large number of dogs (n=79) (*Annex 10 - Table 5*).
Regarding macrolides, susceptibility to erythromycin was lower in 2011 (n=123 – 57%) relative to 2010 (n=60 – 75%) for *Streptococcus* isolated from dogs with otitis. Susceptibility remained relatively high for spiramycin (n=78 – 78%).

Lastly, despite the relative unsuitability of using fluoroquinolones in the treatment of streptococcal infections, these compounds were frequently tested with, in cases of otitis, susceptibility to enrofloxacin of 45% (n=148) and susceptibility to marbofloxacin of 69% (n=150). These susceptibility levels were slightly higher in cases of skin and mucous membrane disease with susceptibility to enrofloxacin of 53% (n=78) and susceptibility to marbofloxacin of 76% (n=84), and even higher in urinary and renal disease *(Annex 10 - Tables 5, 9 and 12).*

[14] Dahmen S., Haenni M., Madec J.-Y (2012). IncI1/ST3 plasmids contribute to the dissemination of the $bla_{CTX\text{-}M\text{-}1}$ gene in *Escherichia coli* from several animal species in France. *Journal of Antimicrobial Chemotherapy,* in press.

[15] Haenni M., Ponsin C., Métayer V., Médaille C. and Madec J.-Y. (2012). Veterinary hospital-acquired infections in pets with a ciprofloxacin-resistant CTX-M-15-producing *Klebsiella pneumoniae* ST15 clone. Journal of Antimicrobial Chemotherapy, 67 (3): 770-771.

Pseudomonas

The most frequently documented disease remained otitis, with nearly 20% resistance to gentamicin *(Annex 10 - Table 6).* Resistance to veterinary fluoroquinolones (enrofloxacin, marbofloxacin) was relatively high (62% and 36%, respectively), bearing in mind our limited knowledge of the intrinsic efficacy of these fluoroquinolones against this bacterium. More generally, interpretation of the data obtained is difficult due to a lack of any benchmark on the levels of natural susceptibility/resistance of this bacterium to veterinary antimicrobials. This should be addressed in future work related to collection of these data.

2 – Cats

Description of the data

In 2011, 1030 antibiograms were collected from cats. In 65% of cases (n=674), the antibiograms were taken from adult cats; however, the age group was unknown in 24% of cases (n=248). For the majority of antibiograms, the disease was not specified (n=338 – 33%). When the disease was specified, it was most frequently a urinary or renal disease (n=270 – 26%) *(Annex 11 - Figure 1, Table 1)*.

The antibiograms were divided up among several bacterial groups and diseases. Therefore, the number available for each bacterial group/disease pair is relatively low *(Annex 11 - Figure 3, Table 2).*

The most frequently isolated bacterial group or species was *E. coli* (n=257 – 25%), primarily involving urinary and renal diseases (n=111 – 11%). Next came coagulase-positive *Staphylococcus* (n=161 – 16%) for urinary and renal diseases (n=35 – 3%) and skin and mucous membrane diseases (n=34 – 3%). Coagulase-negative *Staphylococcus* (n=131 – 12%) was in third position. Most often the condition was not specified (n=38 – 4%). When it was, it was most often a urinary or renal disease (n=25 – 2%). Finally, *Pasteurella* (n=108 – 10%) came most often from cases of respiratory disease (n=44 – 4%).

Antimicrobial resistance

In *E. coli* strains isolated from cats with urinary and renal diseases (111/257), the rates of resistance to amoxicillin in combination with clavulanic acid, and to cephalexin were lower than in 2010 (amoxicillin: 35% versus 46%; combined with clavulanic acid: 29% versus 42%; cephalexin: 8% versus 23%, in 2011 and 2010 respectively). Rates of 11% to 14% were noted for fluoroquinolones and trimethoprim-sulfonamides combined *(Annex 11 - Tables 3 and 4).* Regarding 3GC resistance, the comments made for dogs (see previous section) also fully apply to cats.

Strains of coagulase-positive *Staphylococcus*, all diseases and age groups combined, showed frequent resistance to penicillin G (43% of susceptible strains – n=157). Resistance to cefoxitin, a marker of resistance to methicillin, was in contrast low for these same staphylococci (84% of susceptible strains – n=145) *(Annex 11 - Table 5).* However, this point will need to be clarified in the coming years, as the comment about the prevalence of *S. pseudintermedius* in dogs also applies to cats, even though isolation of *S. aureus* is more common in cats than in dogs.

IX – Other species

Apart from the species already mentioned in the previous sections, RESAPATH also collects antibiograms from samples taken from other animal species.

In total, in 2011, 490 antibiograms from other species were collected.

This was mainly samples from mammals (pet rabbits, monkeys, dwarf rabbits, guinea pigs, etc.) (n=302 – 62%), birds (n= 119 – 24%), reptiles (n=37 – 8%), fish (n=30 – 6%) and amphibians (n=2 – 0%).

Because of the low numbers of antibiograms collected for each animal species and the variety of diseases and bacterial species, detailed results of resistance for these animal species are not included in the RESAPATH report at this stage.

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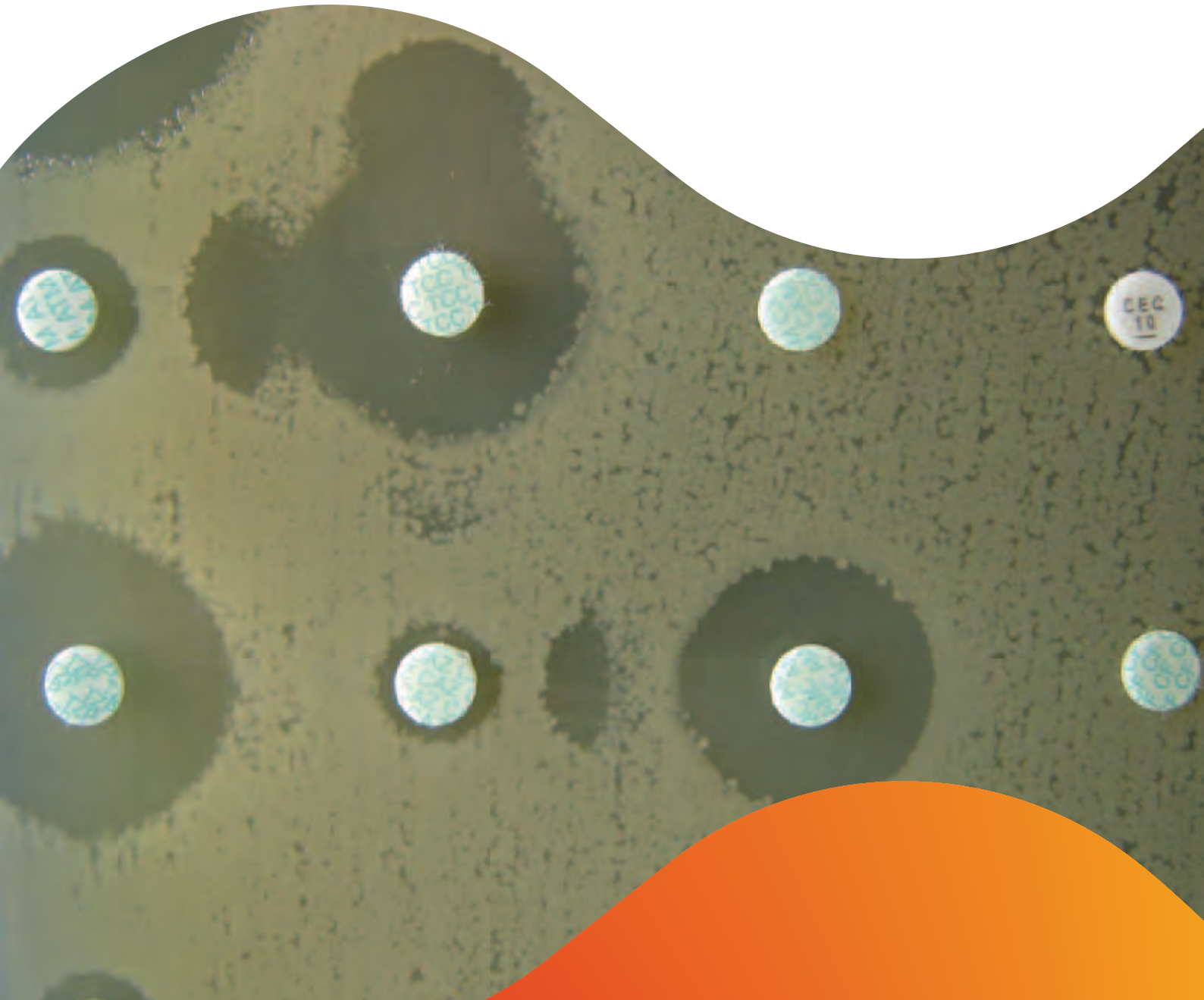
Part 2

Focus



I – *E. coli* – Trends between 2006 and 2011: 3GCs/4GCs and fluoroquinolones

Evolution of resistance to 3GCs/4GCs in *E. coli*

The increased prevalence of *Enterobacteriaceae* that are resistant to third- and fourth-generation cephalosporins (3GCs/4GCs) is one of the most alarming trends in human medicine. The situation in veterinary medicine appears to be moving in the same direction with regard to the three major compounds from this group used in therapy: ceftiofur, cefquinome and cefovecin.

RESAPATH has therefore presented an analysis of trends in levels of resistance to 3GCs/4GCs every year since 2006, on the basis of data on ceftiofur and in *E. coli*, the most affected bacterial species in France to date. Until 2009, a significant increase in resistance to 3GCs/4GCs was observed in cattle, pigs and poultry (chi-square test for trend $p<10^{-3}$), confirming the steady development of an animal reservoir of extended-spectrum beta-lactamase-producing bacteria (ESBLs) capable of inactivating these compounds.

The 2010 data were characterised by a major contrast between the trend observed in hens/chickens and that observed in other sectors. The percentage of *E. coli* strains not susceptible to ceftiofur in hens/chickens in 2010 was considerable (22.5%), accounting for nearly one in four strains analysed. This percentage had already doubled in 2009 (2008: 6%; 2009: 12.2%), and the doubling observed again in 2010 led to the recognition of a very alarming increase in this resistance in the poultry industry.

The 2011 data show a continuing increase in the percentage of this resistance in cattle (around 6-7% of *E. coli* strains isolated) and a high level maintained in hens/chickens (nearly 21%) (*Figures 4 and 5*). It therefore seems clear that production animals, all sectors combined, are a stable reservoir for these enzymes.

The results obtained for the species *Gallus gallus* nevertheless raise questions, because of (i) firstly, the lack of marketing authorisation for these compounds in poultry production, and (ii) secondly, the many recent scientific publications in Europe that all emphasise the major contribution of this sector to the rates of resistance to 3GCs/4GCs observed in livestock[16, 17, 18 ,19].

It should be noted that, as in the cattle sector where calves constitute the reservoir of ESBL-producing *E. coli,* the poultry sector does not contribute uniformly to the spread of 3GC/4GC resistance. The hen/chicken production industry is clearly the most affected, although at this stage it is not possible to distinguish the contributions made by each of the two constituent sectors: laying hens and broilers. This more detailed level of analysis should be an objective for the future, alongside other approaches on this issue (ongoing ANSES internal request, for example).

16 Dierikx C, van Essen-Zandbergen A, Veldman K, Smith H, Mevius D (2010) Increased detection of extended spectrum beta-lactamase producing Salmonella enterica and Escherichia coli isolates from poultry. Veterinary Microbiology. 145(3-4): 273-278.

17 Leverstein-van Hall M A, Dierikx C M, Cohen Stuart J, Voets G M, van den Munckhof M P, van Essen-Zandbergen A, Platteel T, Fluit A C, van de Sande-Bruinsma N, Scharinga J, Bonten M J, Mevius D J (2011). Dutch patients, retail chicken meat and poultry share the same ESBL genes, plasmids and strains. Clinical Microbiology and infection. 17(6): 873-880.

18 Kola A, Kohler C, Pfeifer Y, Schwab F, Kühn K, Schulz K, Balau V, Breitbach K, Bast A, Witte W, Gastmeier P and Steinmetz I (2012) High prevalence of extended-spectrum-b-lactamase-producing Enterobacteriaceae in organic and conventional retail chicken meat, Germany. Journal of Antimicrobial Chemotherapy, in press

19 Stuart J C, van den Munckhof T, Voets G, Scharring J, Fluit A, Leverstein-Van Hall M (2012) Comparison of ESBL contamination in organic and conventional retail chicken meat. International Journal of Food Microbiology 154 (3): 212-4.

Finally, the recent extension of RESAPATH's scope to include pets means that for the first time trend data can be provided on resistance to 3GC/4GC in dogs and cats *(Figure 6).* These data estimate the percentage of 3GC/4GC resistance to be between 6 and 8% for *E. coli* in these species. Other *Enterobacteriaceae* are sometimes involved, which are not reported here (see Focus No. IV). Note that more than 80% of the data collected by RESAPATH concern four animal groups, including dogs, for which the number of antibiograms collected is even higher than that obtained in pigs. However, although quite enough canine data are available to produce robust statistical conclusions, the structure of this population must also be taken into account, being more comparable to the non-hospitalised human population (a city or community population) than to livestock animal populations, which are relatively homogeneous since they are organised either into herds or, for some of them, into industrial sectors. It will therefore be necessary in the future to refine these data according to interpretation grids that specifically include other risk factors (life context, diseases, etc.).

Figure 4*: Changes in percentages of E. coli strains not susceptible to ceftiofur (I+R) in cattle (2006-2011).*

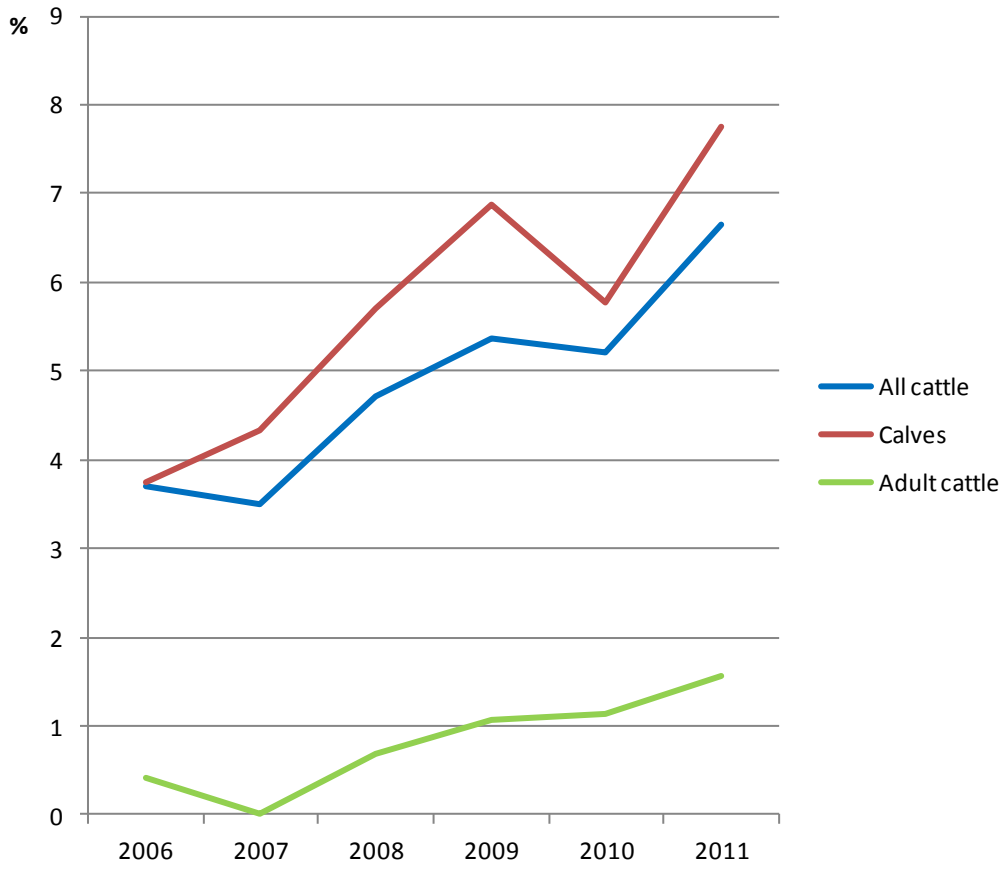


***Figure 5**: Changes in percentages of E. coli strains not susceptible to ceftiofur (I+R) in pigs, hens/chickens and turkeys (2006-2011).*

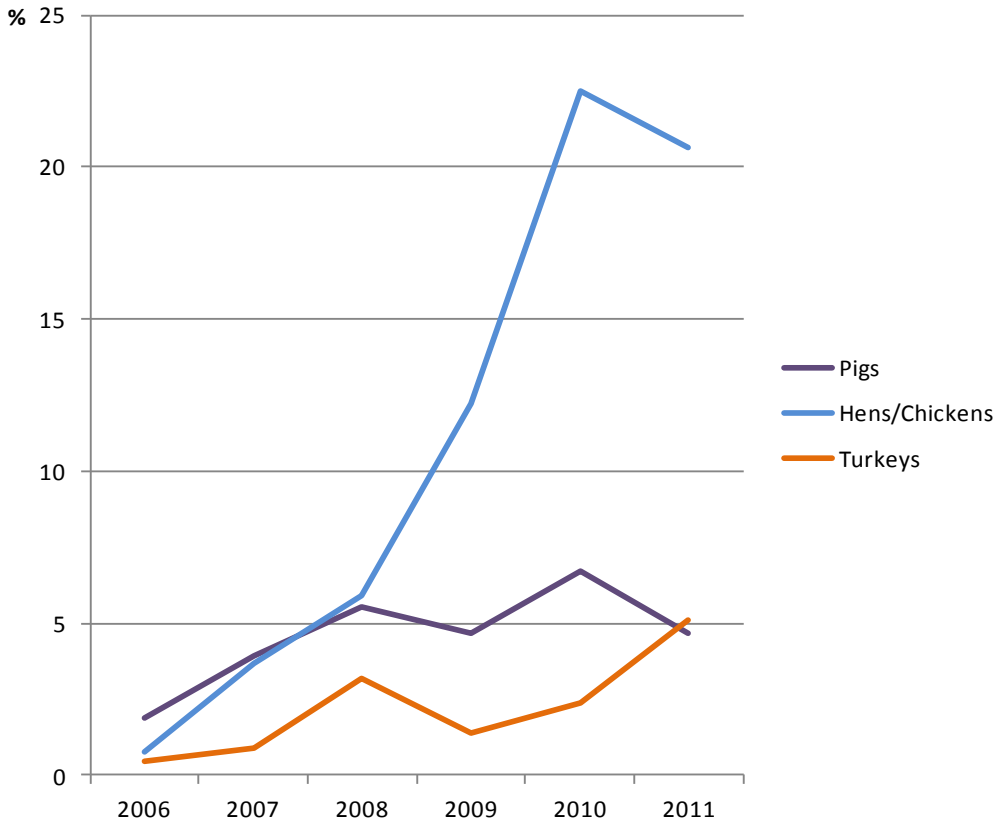
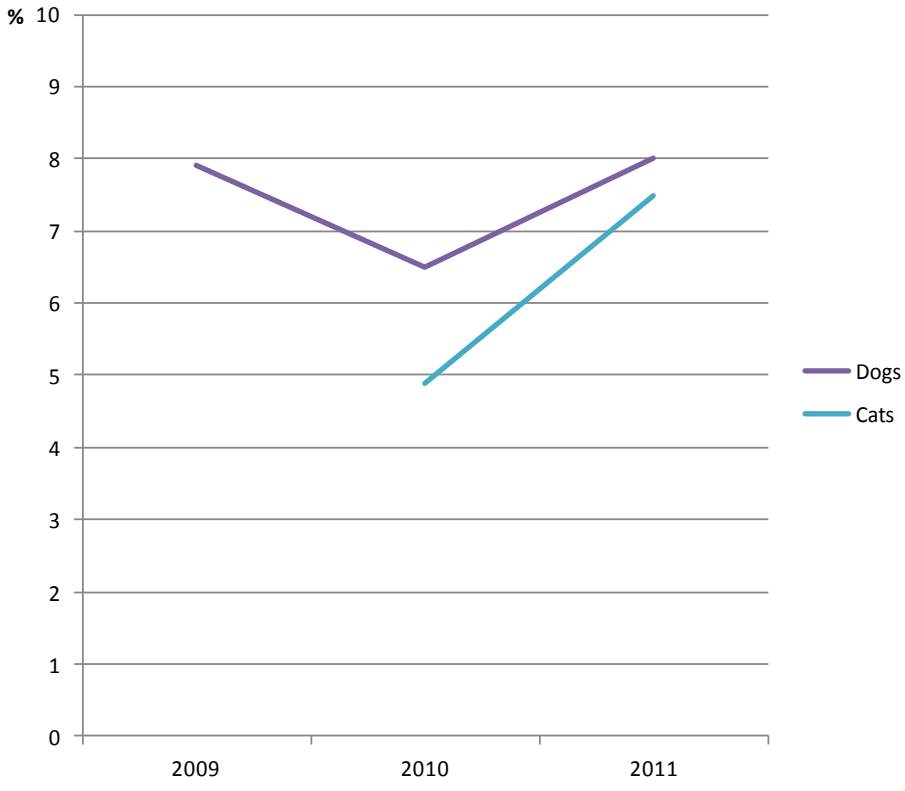


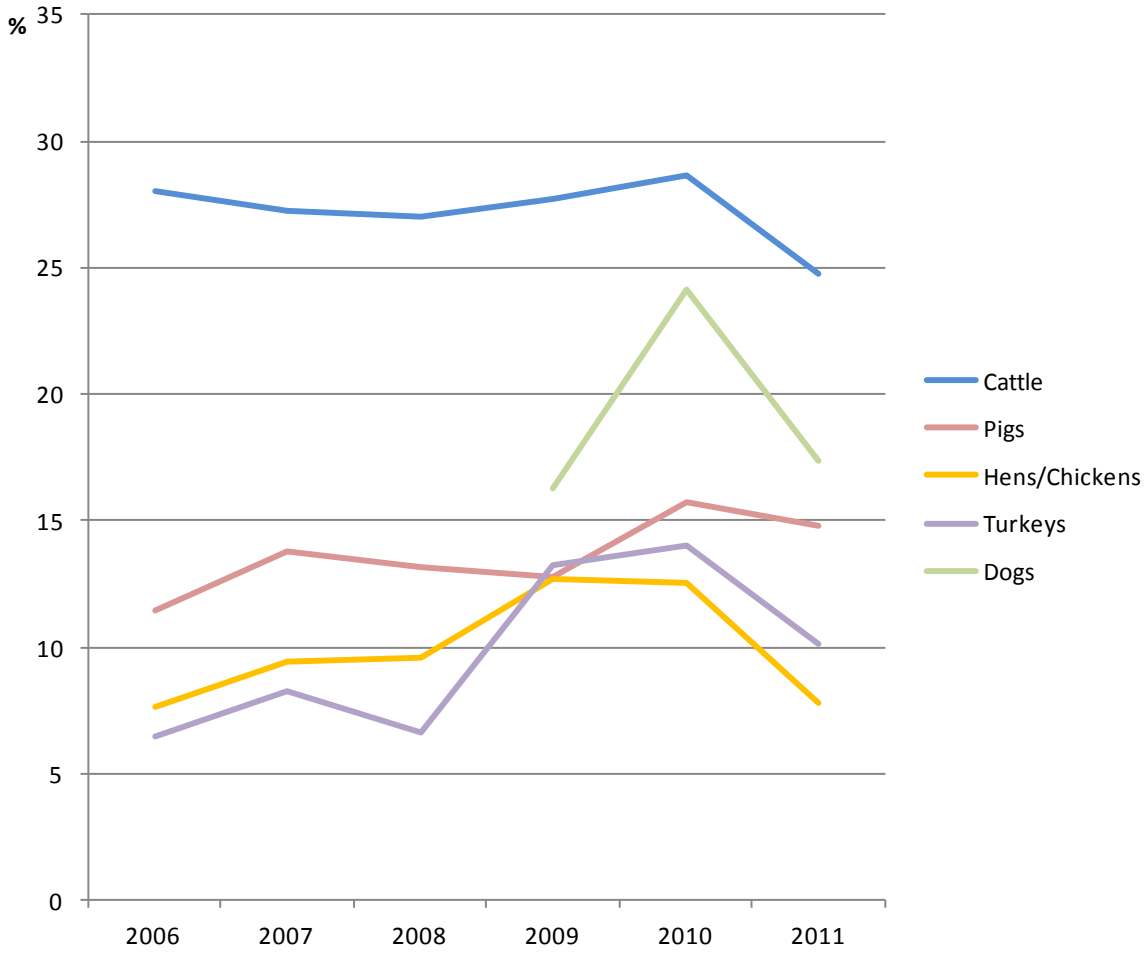
***Figure 6**: Changes in percentages of E. coli strains not susceptible to ceftiofur (I+R) in domestic carnivores (2009-2011).*



Evolution of resistance to fluoroquinolones in *E. coli*

Of the various fluoroquinolones, enrofloxacin is the marker that has been chosen to monitor evolution of resistance to this class of compounds, due to the large number of antibiograms collected for all the animal species. Other fluoroquinolones are also used by veterinarians (marbofloxacin, in particular), for which an analysis of the data, independently or combined with those on enrofloxacin, does not modify the general trend. These data suggest that the cattle sector still has the highest rate of resistance to fluoroquinolones (around 25%) *(Figure 7)*. For the first time in 2011, apart from the overall stability observed for the rates of resistance to these compounds, a downward inflection in the percentage of *E. coli* resistant (R + I) to enrofloxacin could nevertheless be noted in all animal species, whose importance should be measured objectively with 2012 data when they become available.

***Figure 7**: Changes in percentages of E. coli strains not susceptible to enrofloxacin (I+R) in cattle, pigs, poultry and dogs (2006-2011).*



II – Analysis of multi-resistance in *Escherichia coli*

Although considering resistance phenomena one by one is very informative, taking multi-drug resistance into account is of particular importance, especially at the population level, in an attempt to reduce the overall resistance burden. It is not always enough to promote the use of "older" compounds in order to preserve the effectiveness of the newest generation of antimicrobials, because multidrug resistance—and in particular co-resistance—makes the situation a little more complex. Several resistance genes are often carried by the same plasmid within a single bacterium, and are then spread together from one strain to another[20]. These phenomena therefore need to be observed and monitored over time.

We examined multi-drug resistance in *E. coli,* the bacterial species most represented in the RESAPATH data and the one that currently constitutes the most serious threat, with the increase in recent years in the proportion of ESBL-producing strains.

In many reference sources (including EFSA), multi-drug resistance is considered to relate to resistance with respect to three classes of antimicrobials. However, it also depends on the nature of the antimicrobials considered. In contrast, rather than just considering the notion of threshold (> 3 classes of antimicrobials), we chose to address multi-resistance in terms of the number of resistances against a given list of antimicrobials, and also and especially in terms of combinations of resistances to antimicrobials.

For *E. coli*, this list of antimicrobials was determined by the compounds most often tested by RESAPATH laboratories, by the representativeness and significance of these antimicrobials in human and veterinary medicine, and by a wish to consider a single compound per class (in fact, the mechanisms of resistance to different compounds in a single class are rarely independent). Five antimicrobials were considered, namely:

- ceftiofur,
- gentamicin,
- tetracycline,
- trimethoprim-sulfonamide combined,
- either enrofloxacin or marbofloxacin (depending on the compound tested by the different laboratories) to represent the fluoroquinolone class.

Within each species, more than 20% of the strains collected by RESAPATH had no resistance to the antimicrobials considered, except in pigs in which this percentage was lower (12.5%) (*Table 1*). The majority of strains had one or two resistances, and few strains had more than three resistances except in cattle (10.8%) and to a lesser extent in pigs (4.7%).

Table 1: *Number and percentage of resistant strains (R+I) from a list of five antimicrobials in E. coli in the different animal species*

Number of resistant strains (R+I)	Cattle		Pigs		Hens/chickens		Turkeys	
	n	%	n	%	n	%	n	%
0	753	**22.8**	149	**12.5**	383	**23.8**	147	**25.3**
1	1158	**35.0**	296	**24.9**	632	**39.2**	235	**40.4**
2	624	**18.9**	488	**41.0**	421	**26.1**	149	**25.6**
3	411	**12.4**	201	**16.9**	163	**10.1**	48	**8.2**
4	285	**8.6**	51	**4.3**	13	**0.8**	1	**0.2**
5	73	**2.2**	5	**0.4**	0	**0**	2	**0.3**
Total	3304	**100**	1190	**100**	1612	**100**	582	**100**

The number of resistances with regard to the antimicrobials on this list varies according to the species, but also according to the disease. In cattle and pigs, in which the number of strains allows differentiation according to

[20] 3 Meunier D, Jouy E, Lazizzera C, Doublet B, Kobish M, Cloeckaert A, Madec J-Y. (2010) Plasmid-borne florfenicol and ceftiofur resistance encoded by the floR and CMY-2 genes in Escherichia coli isolates from diseased cattle in France. *Journal of Medical Microbiology* 59: 467-471.

disease, resistance of *E. coli* to several antimicrobials was significantly higher in strains from digestive diseases. If we consider the percentage of strains fully susceptible to these five antimicrobials and the percentage of those resistant to at least three antimicrobials, they were respectively 12% and 25% in pig digestive diseases, 13% and 27% in cattle digestive diseases, and 83% and 2% for bovine mastitis.

In terms of combined resistance in cattle (all diseases included), and among ceftiofur-resistant strains, 95% were also resistant to tetracycline (versus 73% tetracycline resistance for all strains), and 57% were also resistant to fluoroquinolones (versus 26% for all strains). In addition, 74% of strains resistant to ceftiofur and tetracycline were also resistant to trimethoprim-sulfonamide combined (versus 33% resistance to the combination for all strains).

These phenomena were much less pronounced in other animal species. In pigs, in strains resistant to ceftiofur, there was neither over-representation of resistance to tetracycline (72% vs. 80% for all strains), nor excessive over-representation of resistance to fluoroquinolones (22% vs. 15%). In hens/chickens, ceftiofur-resistant strains more frequently exhibited resistance associated with tetracycline (92% vs. 72% for all strains), but not with fluoroquinolones (6% vs. 7% for all strains). It would therefore seem that strains of ESBL-producing *E. coli* (representing almost all strains resistant to ceftiofur in these animals) have numerous other resistances in cattle, but this is less true in the pig and poultry sectors.

In strains resistant to fluoroquinolones, tetracycline resistance was over-represented in all species (94% vs. 73% for all strains in cattle, 91% vs. 80% for pigs, 77 % vs. 72% in hens/chickens, and 95% vs. 73% in turkeys).

This analysis of multi-drug resistance, which deliberately focused on the critical antimicrobials (3rd and 4th generation cephalosporins and fluoroquinolones), again illustrates how the maintenance of a reservoir of strains resistant to these compounds is not only a consequence of their use, and that the use of "older" compounds (such as tetracyclines, for example) may also contribute. All these elements ultimately show the complexity of the possible routes by which resistance is selected, and with this in mind, care is needed to avoid identifying *a priori* predictive impact scenarios that are too exaggerated.

III – Methicillin-resistant *Staphylococcus aureus* (MRSA) of human origin in pets

In humans, methicillin-resistant *S. aureus* (MRSA) is one of the most widespread nosocomial bacteria. Like all staphylococci, MRSA is transmitted clonally, with these clones often being grouped into clonal complexes (CC), each of which may have more or less stringent host-specific features. In human medicine, MRSA is also classified according to the context of its isolation, in order to distinguish hospital clones, community clones and clones associated with livestock (such as clonal complex CC398).

Between 2006 and 2010, of 1250 strains of coagulase-positive staphylococci analysed by RESAPATH laboratories, 23 strains were confirmed as being MRSA, in 16 dogs and 7 cats that were epidemiologically unrelated [21,22]. Molecular characterisation of these 23 strains showed that 20 of them corresponded to "human" clones. Sixteen MRSA isolates (69.6%) belonged to the Lyon clone, which is mainly implicated in human hospital infections in France. The owner of one of the dogs also worked in a hospital environment, supporting the hypothesis that the source of animal contamination could have been a healthcare facility. Three other isolates (13%) belonged to the Geraldine clone, which is also a "human" clone that has hitherto been described exclusively on French territory.

While it was hardly surprising to note the presence in dogs or cats of human clones that are highly prevalent in France, the detection of human clones that are rarely reported in this country was more unexpected. For example, the Barnim clone (mainly associated with nosocomial infections in Germany and the United Kingdom) and the USA300 community clone (endemic to the United States but rare in France) were also identified.

The USA300 clone was isolated from a dog with post-operative complications following orthopaedic surgery. This infection was treated with targeted antimicrobial therapy because this clone, although highly virulent due to the presence of the Panton-Valentine toxin, is generally still susceptible to antimicrobials, with the exception of those of the class of beta-lactams. During the period around surgery, the veterinarian had welcomed his sister in his home. She was recovering from acute peritonitis, which had required a lengthy hospital stay near New York, where she lived. The dog owners had never left their immediate geographic environment. The assumption that the USA300 clone was transmitted to the veterinary practitioner by his still colonised sister and then to the dog during the surgical procedure therefore seems very plausible.

This study indicates that the prevalence of MRSA infections in domestic carnivores is probably low in France (less than 2% in this collection of strains). As such, the other isolated staphylococci was *Staphylococcus pseudintermedius,* which confirms that the main coagulase-positive *Staphylococcus* responsible for infections in dogs and cats is not *S. aureus* (see Focus below). However, when the presence of MRSA is proven, there is a high probability that it is a clone of human origin. Indeed, the distribution of clones identified in domestic carnivores in France appears very similar to that of human hospital and community clones, with a large majority of strains of the Lyon clone and, to a lesser extent, the Geraldine clone. In addition, the detection of two atypical clones (Barnim and USA300) shows that dogs and cats can also be carriers and vectors of isolates that occur rarely in France. Thus, these animals, which occupy a central role in families, can be victims of human MRSA strains, but can also act as reservoirs, and are therefore a potential source of dissemination or human re-contamination.

21 Haenni M., Saras E., Châtre P., Médaille C., Bes M., Madec J.-Y. and Laurent F. (2012). A USA300 variant and other human-related methicillin-resistant *Staphylococcus aureus* strains infecting cats and dogs in France. Journal of Antimicrobial Chemotherapy, 67 (2): 326-329.

22 Haenni M., Médaille C., Laurent F. and Madec J.-Y. (2012). Des staphylocoques dorés résistants à la méticilline d'origine humaine chez les animaux de compagnie (Methicillin-resistant *Staphylococcus aureus* (MRSA) of human origin in pets). *Le Point vétérinaire* N°328: 8-9.

IV – A veterinary nosocomial infection with ESBL-producing *Klebsiella pneumoniae*

Selection and transmission of pathogenic bacteria in healthcare facilities are well known in humans, but are less frequently described in the veterinary field. However, the same causes have the same effects: veterinary clinics are favoured places for selection and circulation of multi-resistant bacteria responsible for nosocomial infections, i.e., those acquired at the hospital by an animal that was not infected when admitted.

Between 2008 and 2010, 24 strains of *Klebsiella pneumoniae* were isolated by RESAPATH laboratories from urine samples collected by the attending veterinarian from dogs (18) and cats (6) with chronic cystitis. Molecular analysis of these strains showed that 17 of the 24 animals were infected with the same clone of *K. pneumoniae*.

This ST15 clone was a producer of CTX-M-15 type ESBL, and had multiple associated resistances (aminoglycosides, including tobramycin and gentamicin, sulfonamides, trimethoprim, tetracyclines and fluoroquinolones). The $bla_{\text{CTX-M-15}}$ gene was carried by a 40-70 kb plasmid from the incompatibility group IncR.

After a detailed investigation, these 17 animals were found to have been previously hospitalised in the same clinic in the weeks before their consultation with their attending veterinarian[23]. These 17 animals had been admitted for urinary surgery (cystotomy, perineal urethrostomy) to treat severe urethral obstructions related to the abundant presence of urate crystals in otherwise uninfected animals.

This case study shows the strong similarity between human and veterinary hospital situations. In all likelihood, the strain of *K. pneumoniae* was resident at the veterinary clinic, the site of infection in these animals. These results also raise the question of the origin of this strain (this clone has already been described in humans) and its dissemination outside the clinic, in particular its transmission from dogs to humans.

23 Haenni M., Ponsin C., Métayer V., Médaille C. and Madec J.-Y. (2012). Veterinary hospital-acquired infections in pets with a ciprofloxacin-resistant CTX-M-15-producing *Klebsiella pneumoniae* ST15 clone. Journal of Antimicrobial Chemotherapy, 67 (3): 770-771.

V – Methicillin resistance in *Staphylococcus pseudintermedius*, a dog pathogen

Staphylococcus pseudintermedius was first described in 2005 following the redefinition of species of coagulase-positive staphylococci (CPS), and corresponds mainly to the former species *S. intermedius*[24]. Although it does not generally colonise or infect humans, it is a close relative of *S. aureus,* and moreover these two species are difficult to distinguish using conventional laboratory methods. *S. pseudintermedius* is a commensal of the skin and mucous membrane of domestic carnivores, in which it is frequently found in healthy carriage[25]. But it is also an opportunistic pathogen responsible for severe primary infections (pyoderma, otitis), as well as postoperative infections.

Until 2006, strains of *S. pseudintermedius* were on the whole susceptible to most antimicrobials available in veterinary medicine. However, from this date, strains resistant to methicillin (called MRSP) began to emerge and spread rapidly in Europe and worldwide. Moreover, these MRSP strains have multiple associated resistances and cause serious problems for veterinarians, who have increasingly limited therapeutic options.

In 2010, through RESAPATH, 263 strains of *S. pseudintermedius* isolated from dogs without any known epidemiological relationship were collected at the Lyon laboratory. Characterisation of these strains showed that 41 of them, or 16.9%, were MRSP. In addition, methicillin-susceptible strains also showed disturbing resistance profiles, including 70% resistance to penicillin G, 52% to tetracycline, 43% to kanamycin, and 38% to macrolides[26]. Molecular typing of these isolates also revealed that the increase in MRSP prevalence in the dog population was mainly due to the spread of a predominant clone, whereas susceptible strains belong to many unrelated clones.

The emergence and spread of MRSP in France must imperatively be monitored, firstly because of treatment difficulties caused by these bacteria, and secondly to detect the potential emergence of genetic recombinations between *S. aureus* and *S. pseudintermedius* that could lead to the emergence of more resistant and/or more virulent strains in both animals and humans.

Unfortunately, two characteristics make monitoring of this bacterium difficult. Firstly, only a molecular method can distinguish them with certainty from other CPS. They are therefore sometimes misidentified as *S. aureus,* or identified less precisely as coagulase-positive staphylococci. Secondly, cefoxitin is a very poor marker of resistance to methicillin. Despite this, this compound is often used in testing laboratories, for its ease of use (under standard conditions) and reliability (ideal marker for the detection of this phenotype in *S. aureus)*. For these two reasons, it is currently still difficult to determine prevalence of *S. pseudintermedius* and MRSP in France from the raw RESAPATH data. However, by comparing the medical histories associated with the strains (the vast majority of canine CPS are *S. pseudintermedius)* and their antimicrobial resistance profile (multi-resistance and growth in contact with the penicillin G disk are good markers of MRSP), it is possible to identify trends, to target strains to be collected for specific studies, and to achieve reliable active surveillance. To date, the percentage of MRSP among pathogenic strains of *S. pseudintermedius* can be estimated at 15%.

[24] Devriese, L.A., Vancanneyt, M., Baele, M., Vaneechoutte, M., De Graef, E., Snauwaert, C., Cleenwerck, I., Dawyndt, P., Swings, J., Decostere, A., Haesebrouck, F., 2005, *Staphylococcus pseudintermedius* sp. nov., a coagulase-positive species from animals. Int J Syst Evol Microbiol 55, 1569-1573.

[25] Weese, J.S., van Duijkeren, E., 2010, Methicillin-resistant *Staphylococcus aureus* and *Staphylococcus pseudintermedius* in veterinary medicine. Vet Microbiology 140, 418-429.

[26] Haenni, M., N. Alves de Moraes, C. Médaille, A. Moodley and J.-Y. Madec (2012). Characteristics of methicillin-susceptible and methicillin-resistant *S. pseudintermedius* stains isolated from French dogs. In International Symposium on Staphylococci and Staphylococcal infections, 26-30 August, Lyon, France.

VI – Emerging resistance phenotypes

Methicillin resistance: detection of a new variant *(mecC)* of the *mecA* gene in strains of *Staphylococcus aureus* isolated from cattle

Methicillin resistance in *Staphylococcus aureus* is conferred by the acquisition of a SCC*mec* chromosomal cassette carrying the *mecA* gene, which encodes a membrane protein (PBP2A) with very low affinity for beta-lactams, making the strains with this gene resistant to all antimicrobials in this class. While the majority of clones of methicillin-resistant *S. aureus* (MRSA) are associated with hospital environments, some human staphylococcal infections have been linked to occupational exposure to production animals. These infections are mainly caused by MRSA strains belonging to clonal complex (CC) 398, which are frequently isolated in healthy carriage from pigs and other livestock species.

Very recently (June 2011), a study described MRSA strains of bovine and human origin in the United Kingdom and Denmark with a new variant of the *mecA* gene (known at that time as $mecA_{LGA251}$), located within a new type XI SSC*mec* cassette. These strains are unique in having phenotypic resistance to methicillin that cannot be confirmed by specific amplification of the *mecA* gene. Moreover, multi-susceptible to other classes of antimicrobials, these strains may be wrongly regarded as not being MRSA, and therefore treated with beta-lactams, potentially leading to therapeutic failure.

The discovery of this variant of the *mecA* gene (now officially called *mecC)* constitutes a major scientific revelation, 50 years after the characterisation of this gene. In France, retrospective studies to determine whether this clone is also present in our territory were quickly undertaken. Thirteen human strains have been identified in recent months, from various hospital collections. In veterinary medicine, two bovine strains from the same *département* were identified by RESAPATH[27]. Today, prospective studies in human and veterinary medicine have begun, in order to document the distribution of this gene in France, and to estimate the levels and types of exposure of human and animal populations to these strains, in a similar way to what is known about clone CC398.

First description of an ESBL in a goat

Resistance to third- (3GC) and fourth-generation (4GC) cephalosporins (ceftiofur, cefquinome, cefovecin) in animal enterobacteria is often associated with the presence of a CTX-M-type extended spectrum β-lactamase (ESBL). In France, CTX-M enzymes, particularly the enzyme CTX-M-1, are frequently isolated from *E. coli* strains in cattle, pigs and poultry.

In 2010, RESAPATH identified the first strain of ESBL-producing E. *coli* in a goat with diarrhoea[28]. This result shows that such strains, resistant to all beta-lactams, are now present in all animal sectors, including those that may have seemed less exposed to 3GC/4GC (small ruminants) than others (poultry). The ESBL phenotype was conferred by the enzyme CTX-M-1, and the corresponding gene ($bla_{CTX\text{-}M\text{-}1}$), carried by a large (112 kb) conjugative plasmid belonging to incompatibility group IncI1[29]. In addition, this strain had a phenotype of resistance to tetracyclines and sulfonamides.

[27] Laurent F., Chardon H., Haenni M., Bes M., Reverdy M.-E., Madec J.-Y., Lagier E., Vandenesch F. and Tristan A. (2012) MRSA Harboring *mec*A Variant Gene *mec*C, France. *Emerging Infectious Diseases*, 18 (9): 1465-1467.

[28] Dahmen S., Haenni M., Madec J.-Y (2011). BLSE animales: première description chez une chèvre (Animal ESBLs: first description in a goat). RICAI Convention, December, 1-2, Paris, France.

[29] Dahmen S., Haenni M., Madec J.-Y (2012). IncI1/ST3 plasmids contribute to the dissemination of the $bla_{CTX\text{-}M\text{-}1}$ gene in *Escherichia coli* from several animal species in France. *Journal of Antimicrobial Chemotherapy,* in press.

The plasmid identified, which belongs to subtype ST3, was recently described in France in avian strains of *E. coli* and in bovine and avian, and even human strains of *Salmonella enterica* Typhimurium. These results suggest a very high prevalence of the plasmid $bla_{CTX\text{-}M\text{-}1}$/IncI1/ST3 in animals in France, including in different production sectors (poultry, goats, cattle), and with the possibility of transmission to humans.

Antimicrobial resistance and virulence: detection of an ESBL in a strain of bovine Shiga toxin-producing *Escherichia coli*

Shiga toxin-producing *Escherichia coli* (STEC) are pathogens whose serotypes O157, O26, O103, O111 and O145 are most often involved in human foodborne infections. Ruminants are the main reservoir of STEC, and transmission occurs most often through the consumption of contaminated products, and by direct contact with infected animals or people.

Several studies have described resistance phenotypes among STEC strains, but few have shown the presence of extended-spectrum β-lactamase (ESBL). This association was, however, largely revealed during the major outbreak occurring in Germany and France in the spring of 2011, related to the spread of a clone of *E. coli* serotype O104:H4 that was hypervirulent and a producer of CTX-M-15-type ESBL, whose corresponding gene was carried by a plasmid of the type IncI1/ST31.

This outbreak, whose origin was for a long time controversial, led us to investigate the presence of STEC in a collection of 204 bovine strains of ESBL-producing *E. coli* isolated through RESAPATH. We were able to identify an isolate of serotype O111:H8 producing the enzyme CTX-M-15, whose corresponding gene was carried by a non-typeable plasmid[30]. This strain had many virulence factors, including Shiga toxin Stx1, the gene encoding intimin *(eae),* and the loci encoding the type III secretion system (T3SS) and the attaching and effacing factor (locus of enterocyte effacement - LEE).

This study showed that strains of *E. coli* combining major virulence and resistance properties (ESBL) are present in bovine flora, although their prevalence is likely to be low[31]. Nevertheless, in view of the accelerating increase in ESBL in the animal reservoir (including ruminants), and the fact that ruminants are also the main reservoir of STEC, isolation of this type of strain may become more frequent in the future. Understanding selection pressures that could lead to such a combination of virulence factors and resistance determinants is clearly a challenge for the future with regard to control of these health risks.

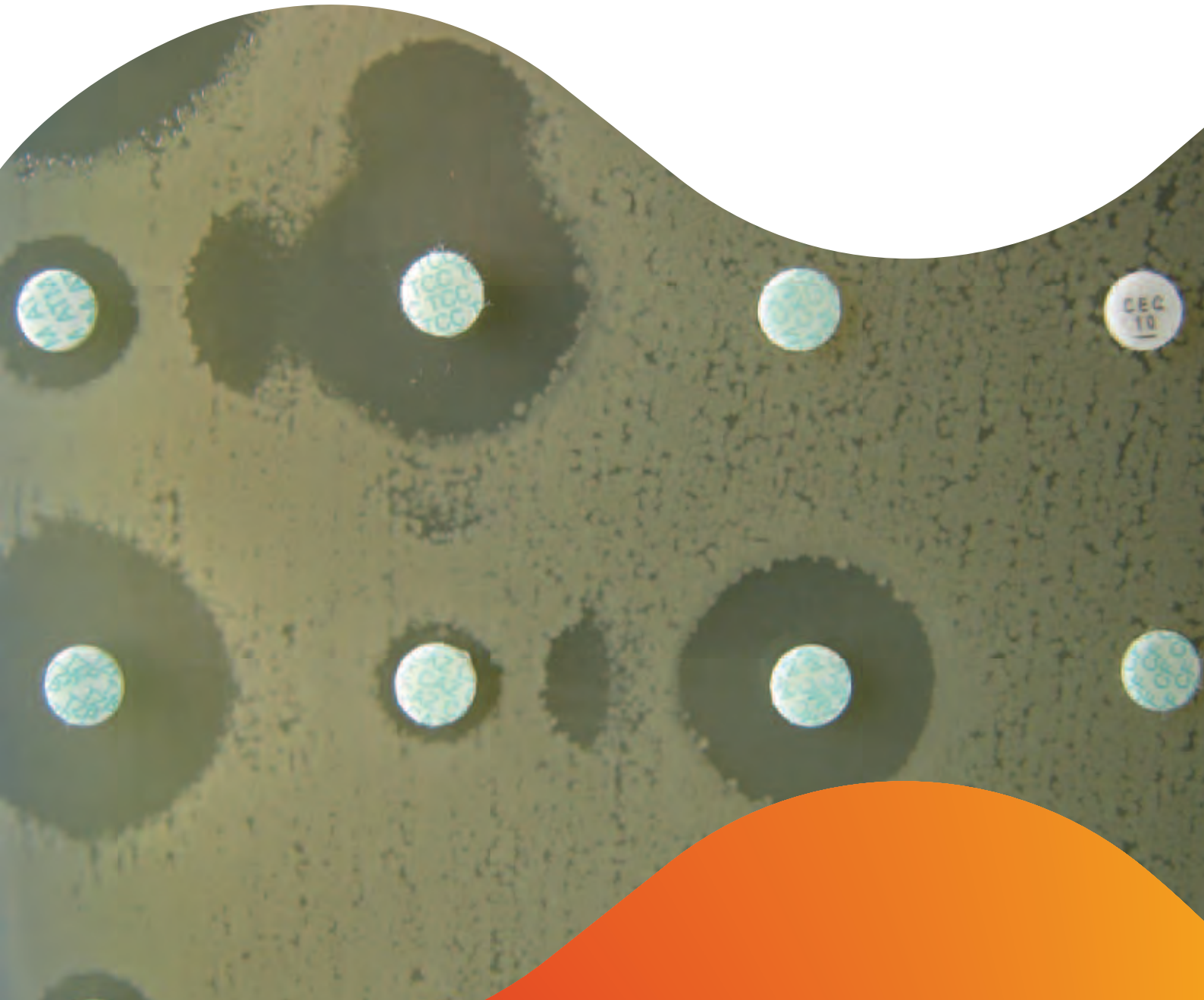
[30] Valat, C., M. Haenni, E. Saras, F. Auvray, K. Forest, E. Oswald and J.-Y. Madec (2012). CTX-M-15 extended-spectrum beta-lactamase in a shiga toxin-producing *Escherichia coli* isolate of serotype O111:H8. *Applied Environmental Microbiology*, 78 (4) 1308-1309.

[31] Valat, C., F. Auvray, K. Forest, V. Métayer, E. Gay, C. Peytavin, J.-Y. Madec and M. Haenni (2012). Phylogenetic grouping and virulence potential of Extended-Spectrum β-Lactamase producing *Escherichia coli* in cattle. *Applied Environmental Microbiology* 78 (13): 4677-4682.

anses
French agency for food, environmental and occupational health & safety

Part 3

Performance indicators



Indicateurs de performance du Résapath

Description of the network's performance indicators

RESAPATH has defined performance indicators (PIs) for its network since 2009.

Performance indicators are quantitative oversight tools used to verify the operational efficiency of an epidemiological surveillance network, as the quality of information produced closely depends on the quality of the network's operations. Performance indicators are essential tools to identify an activity's weaknesses in order to adopt optimal corrective measures.

A total of 14 indicators were selected and have been calculated retrospectively since 2006, when the information was available. These 14 indicators can be grouped into four categories.

One group of indicators monitors the network's operations and ensures that data collection is increasingly exhaustive. These indicators are very important as they testify to the reliability of the network's information with respect to the current situation. This group of indicators is used to ensure the optimum fulfilment of the network's main objective, which is to monitor the antimicrobial resistance of pathogenic bacteria in animals. In this context, the following are measured:

- the number of antibiograms collected yearly (PI1a) which should remain constant or increase versus the previous year,
- the number of laboratories registered in the network (PI1b) and their actual participation rate (submission of data) (PI1c) which should remain constant or increase versus the previous year.

One group of indicators monitors the recovery of strains of interest requested from laboratories by RESAPATH. Indeed, RESAPATH has another objective which is to collect and store a panel of strains that could be needed to conduct in-depth studies into the mechanisms of antimicrobial resistance in bacteria.
In order to do this, the following PIs are calculated:

- the rate of antibiogram sheets received and entered in the RESAPATH database within 4 months of the laboratory analysis (PI3). This rate is used to ensure the continuity and regularity of data reception, in order to be able to request strains of interest before they are destroyed in the laboratory.
- the rate of strains requested by ANSES and actually received (PI2), to be sure to receive the largest possible number of strains that attracted the RESAPATH team's attention due to their antibiogram profile.
- the rate of strains received within 31 days of their request (PI4), an indicator that pursues the same objectives as PI2.

One group of indicators monitors the network's coordination and reporting to partners. In order to motivate member laboratories to actively participate in the network, the network needs to have efficient coordination.
In order to assess coordination and reporting, several indicators are monitored:

- the RESAPATH annual report's rate of publication (PI5), to ensure that the information compiled by the network is shared with its partners,
- the frequencies at which the website is updated (PI7b) and newsletters are sent (PI7a). These indicators cannot yet be calculated since the website did not go online until December 2010. Their objective will be to ensure continuous activity on the site to keep partners interested.
- the rate at which network Steering Committee meetings are held (PI9). Steering Committee meetings should be held at least once per year.

One group of indicators monitors the scientific and technical support given to partner laboratories, which is one of the network's objectives.
The PIs that measure this aspect are as follows:

- the rate at which training days are held (PI6a); their target frequency has been yearly since their implementation.

- the participation of laboratories in these days (PI6b), which measures the importance of the training days for partners, to ensure that they continue meeting the expectations of the network's laboratories.
- the rate of responses to technical questions asked by the network's laboratories that are given within 15 days (PI8). This indicator measures responsiveness in answering questions.
- participation of laboratories in inter-laboratory trials (PI10). This indicator also improves the reliability of collected data.

In tandem with these performance indicators that are calculated annually, the team defined so-called 'network life indicators' with the aim of monitoring certain aspects of the network's life, but with no target values (e.g. annual number of technical questions asked by laboratories, number of collaborative projects between the RESAPATH team and its partners, etc.). These indicators are not presented here.

Moreover, some points could not be assigned an indicator since the data needed to calculate them are not easily accessible. These indicators are however of interest when monitoring the network's operations, and have been maintained as occasional indicators that will be calculated further to dedicated studies with partner laboratories (e.g. overall satisfaction of laboratories with the answers given to their technical questions, etc.). The results of these indicators are not yet available and are therefore not presented below.
L'équipe du Résapath a mis en place depuis 2009 des indicateurs de performance (IP) pour son réseau.

RESAPATH performance indicators

Performance indicators results from 2007 to 2011

The RESAPATH network continues to expand its scope, both in number of member laboratories and amount of data collected. This wide coverage allows reliable interpretation of trends observed, while remaining on a scale that guarantees a good level of operation and allow close interactions with each member laboratory. Development of these indicators should be looked at closely in the context of implementation of Measure 11 of the EcoAntibio2017 plan, which considers increasing the number of laboratories participating to RESAPATH in the medium term.

Strain recovery rates and times are still poor. However, the calculation method for these indicators is possibly no longer fully suited to the network's operation. Several laboratories, especially among the new members, reported logistical constraints regarding storage of strains. The list of strains of interest is then often defined with the laboratories in advance, to enable them to store them prior to any request. This development should lead to the procedure for recording receipt of strains being revised, together with the method of calculating the performance indicator.

Indicators related to coordination (the annual RESAPATH Day, the website), technical support (EQAS's, frequently asked technical questions) and feedback (the RESAPATH report, the steering committee meeting) generally achieved the desired objectives. Participation in the RESAPATH Day did not necessarily reach the ambitious target set, but continued to attract excellent attendance and very positive feedback from participants. Responses to questions were still rather slow, despite some improvement. In contrast, coordination of the website has improved, and the RESAPATH team is working on setting up a better internal organisation for coordination, which is essential for keeping the site attractive (response times, nature and organisation of updates, etc.).

Finally, the indicators show that the network is operating efficiently, with constant interaction between the RESAPATH team and its increasingly numerous partner laboratories. The reliability of the collected data is ensured by the growing expertise of the laboratories, supported by the RESAPATH Coordination Day and the annual organisation of EQAS's. As mentioned above, these indicators will help to ensure that we continue to progress in the same way, despite the possible forthcoming changes to RESAPATH (Measure 11 of the EcoAntibio2017 plan).

Tableau 1 – RESAPATH performance indicators, 2006 to 2011

Key:
Equal to or greater than the expected value
Lower than the expected value

Indicator			*Expected value*	2007	2008	2009	2010	2011	Comments
IP1a	number of antibiograms collected	Number of antibiograms received	*Steady or increasing*	**12 643**	**18 058**	**24 274**	**24 274**	**26 049**	Amount of data collected in 2011 increased again compared to 2010. Laboratory participation remained stable (two laboratories joined the network in late 2011, and therefore did not report data in 2011).
IP1b	number of registered laboratories	Number of member laboratories	*Steady or increasing*	**51**	**59**	**59**	**59**	**63**	
IP1c	percentage of laboratories submitting data	Number of laboratories having submitted data during the year / Number of registered laboratories	*90%*	**82%** *(42/51)*	**92%** *(54/59)*	**95%** *(56/59)*	**95%** *(56/59)*	**92%** *(58/63)*	
IP2	rate of strains requested by ANSES that were actually received (outside of project mode)	Number of strains received by ANSES outside of 'project' mode / Number of strains requested by ANSES outside of 'project' mode	*80%*	**61%** *(870/ 1 423)*	**50%** *(795/1 599)*	**35%** *(532/1 517)*	**57%** *(793/1 391)*	**50%** *(629/1268)*	The number of strains received decreased slightly compared to 2010
IP3	rate of sheets received at ANSES* and entered or integrated in the database within 4 months of sample analysis	Number of sheets received and entered within 4 months of the analysis / Total number of sheets received and entered	*70%*	**45%** *(3 278/7 207)*	**50%** *(4 898/9 786)*	**43%** *(5 925/13 735)*	**58%** *(8 361/ 14 356)*	**60%** *(9 637/ 15 948)*	The speed of data transmission by the laboratories after analysis further increased in 2011, reflecting more regular transmission over the year and faster data entry. Transmission by electronic means, constantly increasing, has improved this indicator both for the part associated with the member laboratory and for the ANSES processing part.
IP4	rate of strains received within 31 days of the ANSES request	Number of strains received within 31 days of the request / Total number of strains received	*90%*	**64%** *(553/870)*	**67 %** *(531/795)*	**78%** *(415/532)*	**72%** *(568/793)*	**54%** *(337/629)*	This indicator was lower in 2011
IP5	the network annual report's rate of publication (number of reports expected per year = 1)	Number of annual reports published / Number of annual reports expected (=1)	*100%*	**100%** *(1/1)*	**100%** *(1/1)*	**100%** *(1/1)*	**100%** *(1/1)*	**100%** *(1/1)*	Regular dissemination of network data is ensured annually.
IP6a	the rate at which days for reporting, training and exchanges are held (number of sessions expected per year = 1)	Number of 'RESAPATH day' sessions organised / Number of 'day' sessions expected (=1 per year)	*100%*	**100%** *(1/1)*	**100%** *(1/1)*	**100%** *(1/1)*	**100%** *(1/1)*	**100%** *(1/1)*	Technical support to network partners is systematically provided annually.

IP6b	laboratory participation in reporting, training and exchange days	Number of registered laboratories having 1 or more members who participated in the year's RESAPATH days Number of laboratories registered this year	*67%*	**67%** *(34/51)*	**68%** *(40/59)*	**58%** *(35/60)*	**59%** *(35/59)*	**59%** *(37/63)*	The rate of participation in the RESAPATH Day is stable but below the ambitious target set. However, nearly 60% of the laboratories are represented each year, reflecting their interest and the need to continue organising such events.
IP7a	frequency at which website newsletters are sent	Number of newsletters actually sent Number of expected newsletters	*To be defined*	*Indicators not applicable – Site online in late 2010*				*No newsletter yet in service*	Newsletters will only be sent out once the site is regularly updated.
IP7b	frequency at which the website is updated (maximum 3 months between two website updates)	Average time between 2 website updates Expected time (3 months)	*100%*	*Indicators not applicable – Site online in late 2010*				*No regular updates*	Information on the life of the network is updated in real time, but the rest of the information present is not renewed. A procedure on the frequency and nature of updates still remains to be established.
IP8	rate of responses to questions in the FAQ section asked by data-collecting laboratories that are given within 15 days	Number of answers given within 15 days after the question arrives in the FAQ section Total number of questions in the FAQ section	*90%*	**78%** *(42/54)*	**74%** *(37/50)*	**71%** *(24/34)*	**39%** *(11/28)*	**45%** *(15/33)*	This indicator measures the responsiveness of the RESAPATH team to technical questions submitted by the laboratories. It should be noted that the 15-day limit is not always achievable depending on the nature of the questions, which have become increasingly specific over time (in fact, a consequence of this is the addition of a FAQ available to all members, which lists all the questions and answers dealt with over the years). The expected value of this indicator has therefore possibly become slightly ambitious. A significant improvement occurred in 2011 compared to 2010, but the coordination team is still doing its utmost to reduce response times.
IP9	rate at which steering committee meetings are held (number of meetings expected per year = 1)	Number of steering committee meetings held Number of expected steering committee meetings (=1 per year)	*100%*	**0%** *(0/1)*	**100%** *(1/1)*	**100%** *(1/1)*	**100%** *(1/1)*	**100%** *(1/1)*	In order for the network to be regularly monitored by its Steering Committee, at least one meeting should be held every year. There has been one meeting of the Steering Committee every year except for 2007.
IP10	laboratory participation in External Quality Assurance System on antimicrobial susceptibility testing	Number of laboratories participating in External Quality Assurance System	*90%*	**100%** *(51/51)*	**97%** *(57/59)*	**97%** *(58/60)*	**100%** *(59/59)*	**98%** (58/59)	The goal of this indicator has been reached. It is important to monitor the participation of laboratories in EQAS's to ensure the reliability of the results obtained and to provide laboratories with technical support in line with their expectations.

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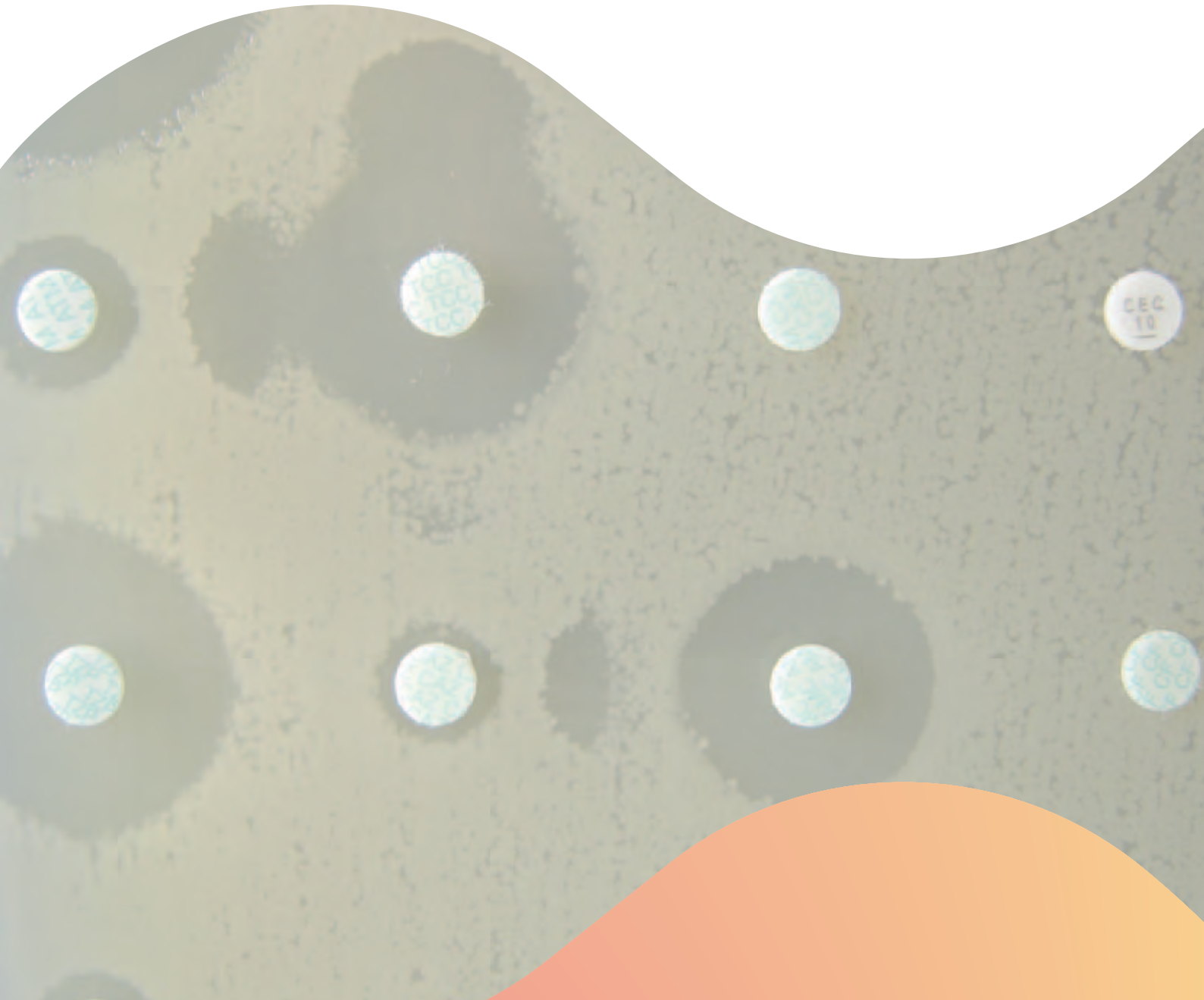
Annex 1

List of RESAPATH laboratories



RESAPATH team (alphabetical order)

Anses Lyon

Antimicrobial resistance and bacterial virulence unit

Pierre CHATRE
Karine FOREST
Marisa HAENNI
Jean-Yves MADEC
Véronique METAYER
Cécile PONSIN
Estelle SARAS
Charlotte VALAT

Epidemiology unit

Géraldine CAZEAU
Emilie GAY
Nathalie JARRIGE
Christelle PHILIPPON

The resapath team thanks Myriam Chazel for her contribution to this report in previous years.

Anses Ploufragan-Plouzané

Mycoplasmology – Bacteriology unit

Odile BALAN
Eric JOUY
Isabelle KEMPF
Aurélie LE ROUX

Epidemiology and pig well-being unit

Claire CHAUVIN

Reporting laboratories for 2011

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Chemin de la Miche Cénord
01012 BOURG EN BRESSE Cedex

IPL Laboratoire d'Analyses de l'Allier
Zone de l'Etoile
Boulevard de Nomazy
BP 1707
03017 MOULINS Cedex

Laboratoire Départemental Vétérinaire et Hygiène Alimentaire
5 rue des Silos
BP 63
05002 GAP Cedex

Laboratoire Vétérinaire Départemental
105 route des Chappes
Quartier des templiers
BP 107
06902 SOPHIA ANTIPOLIS Cedex

Laboratoire Départemental d'Analyses
BP 2
08430 HAGNICOURT

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10006 TROYES Cedex

Aveyron Labo
ZA Bel Air - rue des Artisans
BP 3118
12031 RODEZ Cedex 9

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29 rue Joliot Curie
Technopole de Château-Gombert
13013 MARSEILLE

Laboratoire Départemental d'Analyses et de Recherches
100 rue de l'Egalité
15013 AURILLAC Cedex

Laboratoire Départemental d'Analyses de la Charente
496 route de Bordeaux
16021 ANGOULEME Cedex

Laboratoire Départemental d'Analyses Vétérinaires agricoles et des eaux
22 rue François Pietri
BP 60969
20700 AJACCIO Cedex 09

Laboratoire de Développement et d'Analyses des Côtes-d'Armor
5 – 7 Rue du Sabot
BP 54
22440 PLOUFRAGAN

Labofarm
4 rue Théodore Botrel
BP 351
22603 LOUDEAC Cedex

Laboratoire Départemental d'Analyse et de Recherche
161 avenue Winston Churchill
24660 COULOUNIEIX CHAMIERS

Laboratoire Vétérinaire Départemental
13 rue Gay Lussac
BP 1981
25020 BESANCON Cedex

Lbaa
ZI allée du Lyonnais
26300 BOURG DE PEAGE

IDHESA Bretagne Océane
22 avenue de la plage des Gueux
ZA de Créach Gwen
29334 QUIMPER Cedex

Alcyon
ZI de Kériel-Plouédern
BP 109
29411 LANDERNEAU Cedex

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970 route de St Gilles
Sc 28201
30942 NIMES Cedex 9

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chemin de Naréous
32020 AUCH Cedex 09

Biolab 33
12 avenue Pasteur
33185 LE HAILLAN

Laboratoire Départemental Vétérinaire
306 rue de Croix Las Cazes
CS 69013
34967 MONTPELLIER Cedex 2

Institut en Santé Agro Environnement
24 rue Antoine Joly
BP 3163
35031 RENNES Cedex

Bio-Chêne Vert
ZI Bellevue II
Rue Blaise Pascal
BP 82101
35221 CHATEAUBOURG Cedex

Deltavit
Parc d'activités Nord-est du Bois de Teillay
35150 JANZE

Laboratoire des Sources
Boulevard de la Cote du Nord
35133 LECOUSSE

Laboratoire de Touraine
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37073 TOURS Cedex 2

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20 avenue Saint-Roch
38000 GRENOBLE

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39802 POLIGNY Cedex 2

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40004 MONT-DE-MARSAN Cedex

Laboratoire Vétérinaire Départemental
ZI de Vaure
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Institut Départemental d'Analyse et Conseil IDAC
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50008 SAINT LO Cedex

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224 rue du Bas des Bois
BP 1427
53014 LAVAL Cedex

Laboratoire Vétérinaire et Alimentaire
Domaine de Pixérécourt
BP 60029
54220 MALZEVILLE

Anibio
19 rue de la Ferrière
56930 PLUMELIAU

Service du Laboratoire Départemental
rue de la Fosse aux Loups
BP 25
58028 NEVERS Cedex

Laboratoire Départemental de l'Orne
19 Rue Candie
BP 7
61001 ALENCON Cedex

Laboratoire Départemental d'Analyses
Parc de haute technologie des Bonnettes
2 rue du Génevrier
62022 ARRAS Cedex

Laboratoire Vétérinaire et Biologique
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63370 LEMPDES

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67200 STRASBOURG

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71000 MACON

Laboratoire Départemental de la Sarthe
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Laboratoire Départemental d'Analyses Vétérinaires
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73024 CHAMBERY Cedex

Lidal - Laboratoire Vétérinaire Départemental
22 rue du Pré Fornet
BP 42
74602 SEYNOD Cedex

Laboratoire Agro Vétérinaire Départemental
Avenue du Grand Cours
BP 1140
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Laboratoire d'Analyses Sèvres Atlantique – Site de Niort
210 avenue de la Venise Verte
79000 NIORT

Laboratoire Vétérinaire Départemental
60 avenue Marcel Unal
BP 747
82013 MONTAUBAN Cedex

Laboratoire Départemental d'Analyses
285 rue Raoul Follereau
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Rond point Georges Duval
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87005 LIMOGES

Laboratoire Vétérinaire Départemental
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88050 EPINAL Cedex 09

Institut Départemental de l'Environnement et d'Analyses IDEA
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41 bis avenue Aristide Briand
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Annex 2

Cattle

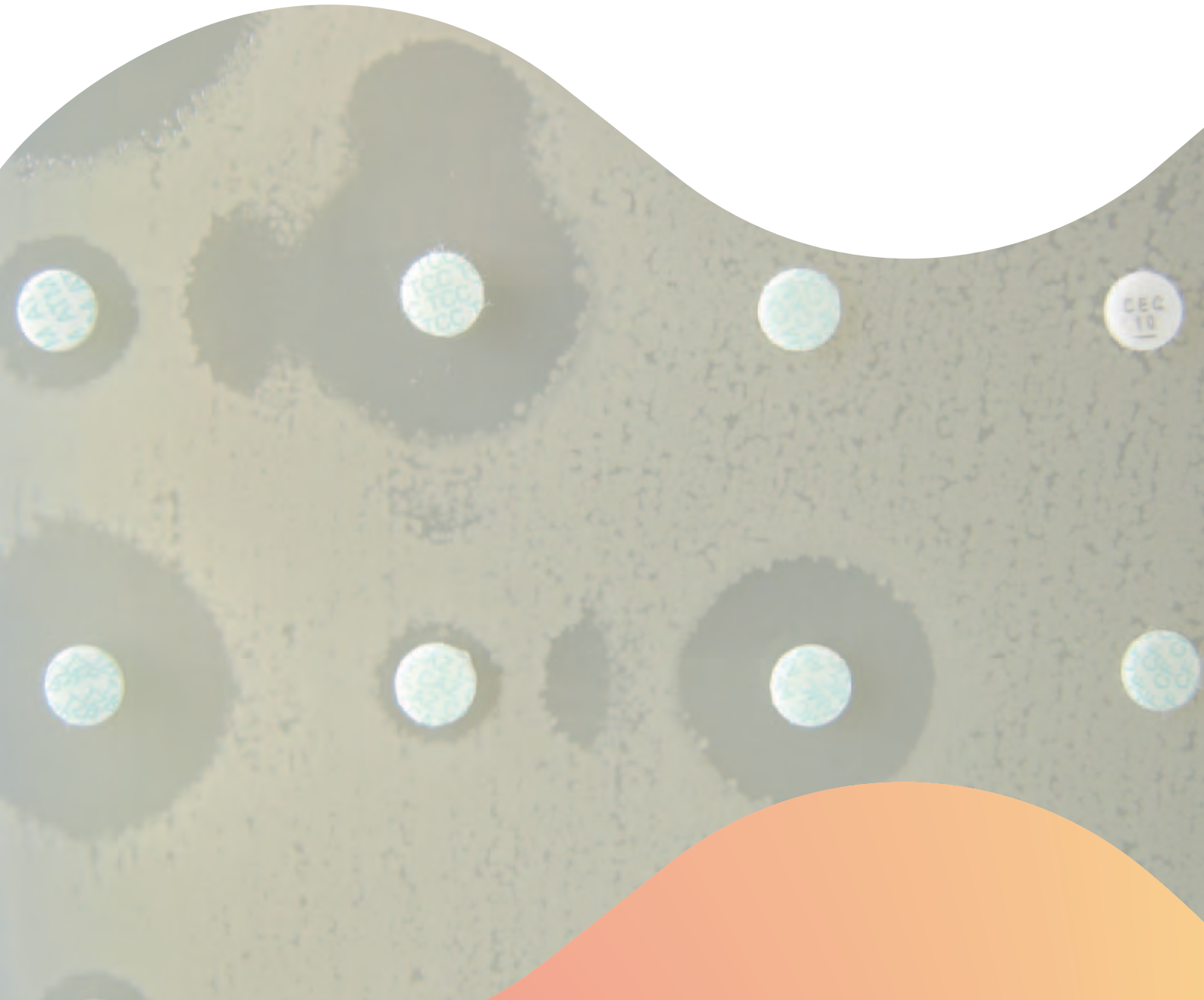
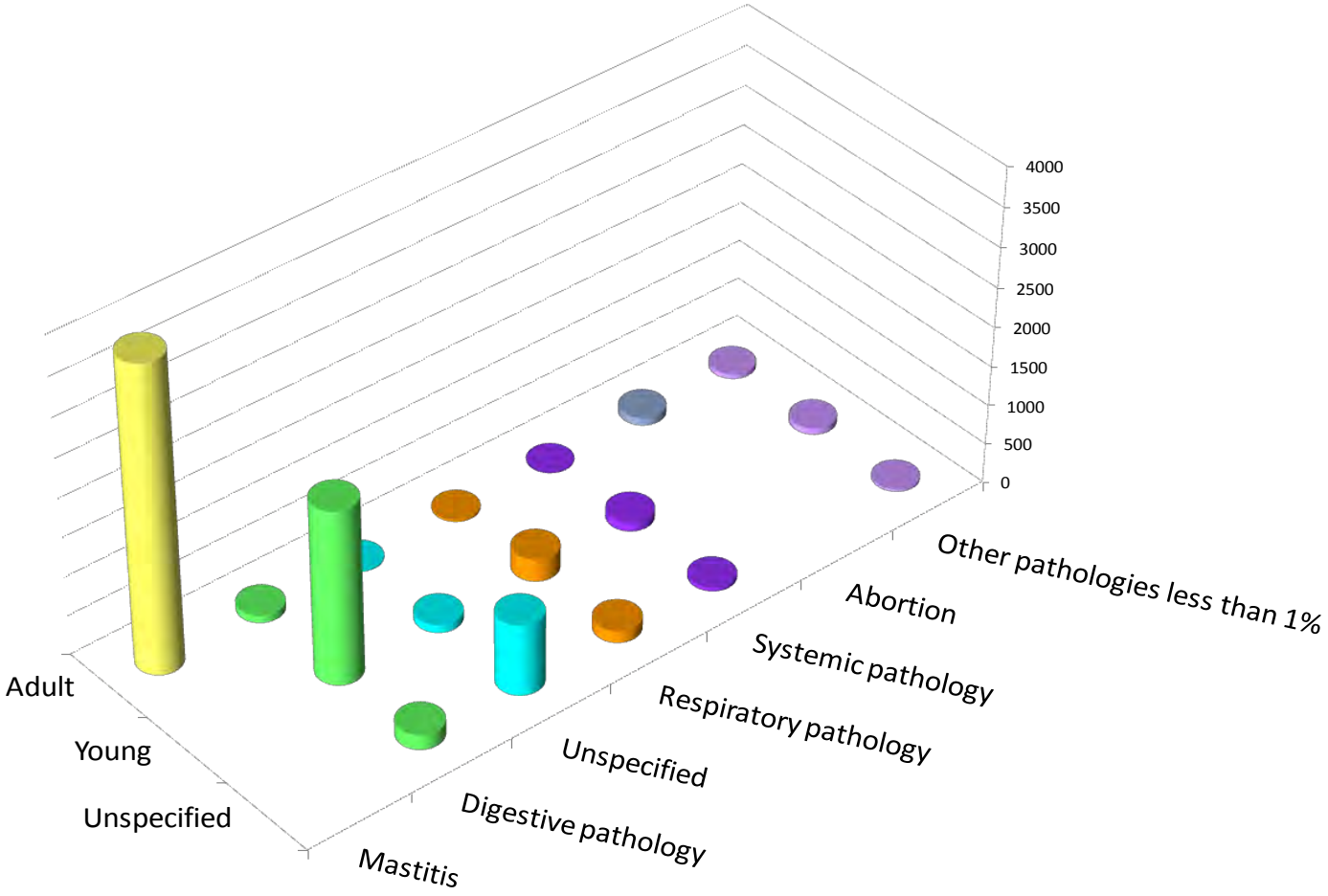


Figure 1 - Cattle 2011 – Number of antibiograms by age group and pathology

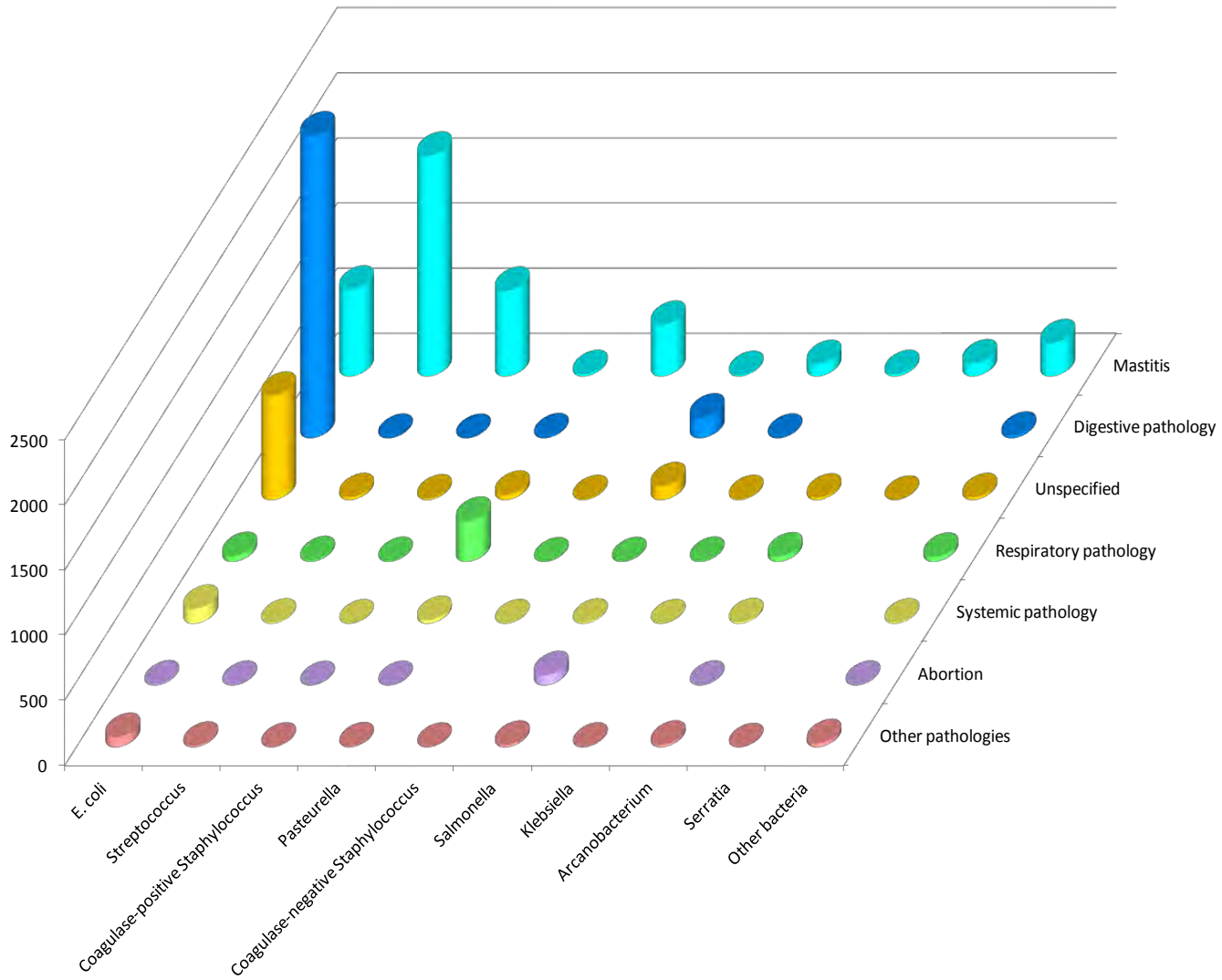


Note: *All values are detailed in table 1 (including Other pathologies, representing less than 1% grouped together)*

Table 1 - Cattle 2011 – Number of antibiograms by age group and pathology

Age group (%)	Pathology N *(%)*																		
	Mastisis	Digestive pathology	Unspecified	Respiratory pathology	Systemic pathology	Abortion	Septicemia	Reproductive pathology	Skin and mucous membrane pathology	Nervous system pathology	Omphalitis	Arthritis	Kidney and urinary tract pathology	Ocular pathology	Otitis	Oral pathology	Cardiac pathology	**Total N *(%)***
Adult	*3,901 (46.7)*	*91 (1.09)*	*16 (0.19)*	*25 (0.3)*	*5 (0.06)*	*99 (1.19)*	*3 (0.04)*	*27 (0.32)*	*20 (0.24)*	*2 (0.02)*		*4 (0.05)*	*3 (0.04)*	*1 (0.01)*			*1 (0.01)*	***4,198 (50.25)***
Young		*2,227 (26.66)*	*102 (1.22)*	*286 (3.42)*	*123 (1.47)*		*50 (0.6)*		*2 (0.02)*	*8 (0.1)*	*13 (0.16)*	*5 (0.06)*		*2 (0.02)*	*2 (0.02)*			***2,820 (33.76)***
Unspecified		*193 (2.31)*	*909 (10.88)*	*155 (1.86)*	*48 (0.57)*		*6 (0.07)*		*1 (0.01)*	*9 (0.11)*	*1 (0.01)*	*4 (0.05)*	*5 (0.06)*	*4 (0.05)*		*1 (0.01)*		***1,336 (15.99)***
Total N (%)	***3,901 (46.7)***	***2,511 (30.06)***	***1,027 (12.29)***	***466 (5.58)***	***176 (2.11)***	***99 (1.19)***	***59 (0.71)***	***27 (0.32)***	***23 (0.28)***	***19 (0.23)***	***14 (0.17)***	***13 (0.16)***	***8 (0.1)***	***7 (0.08)***	***2 (0.02)***	***1 (0.01)***	***1 (0.01)***	***8,354 (100)***

Figure 2 - Cattle 2011 – Number of antibiograms by bacteria and pathology (both representing more than 1%) (all age groups included)



Note: *only values higher than 1% are represented. Detailed values are presented in table 2 below.*

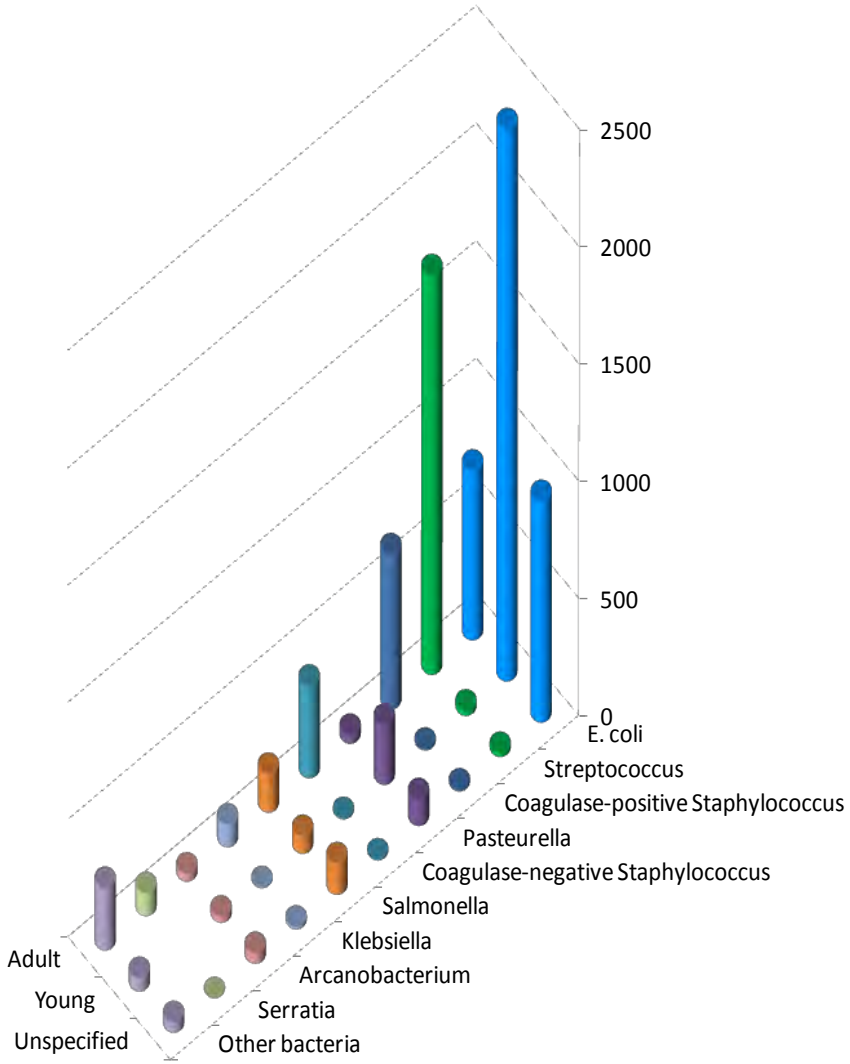
Table 2 - Cattle 2011 – Number of antibiograms by bacteria group and pathology (all age groups included)

	Pathology N *(%)*																		
Bacteria N *(%)*	Mastisis	Digestive pathology	Unspecified	Respiratory pathology	Systemic pathology	Abortion	Septicemia	Reproductive pathology	Skin and mucous membrane pathology	Nervous system pathology	Omphalitis	Arthritis	Kidney and urinary tract pathology	Ocular pathology	Otitis	Oral pathology	Cardiac pathology	**Total N *(%)***
E. coli	665 *(7.96)*	2,323 *(27.81)*	799 *(9.56)*	44 *(0.53)*	113 *(1.35)*	7 *(0.08)*	45 *(0.54)*	9 *(0.11)*	6 *(0.07)*	7 *(0.08)*	3 *(0.04)*	5 *(0.06)*	2 *(0.02)*		1 *(0.01)*			**4,029 *(48.23)***
Streptococcus	1,693 *(20.27)*	2 *(0.02)*	21 *(0.25)*	11 *(0.13)*	7 *(0.08)*	3 *(0.04)*	1 *(0.01)*	4 *(0.05)*		3 *(0.04)*	2 *(0.02)*	1 *(0.01)*						**1,748 *(20.92)***
Coagulase-positive Staphylococcus à	657 *(7.86)*	1 *(0.01)*	11 *(0.13)*	5 *(0.06)*	1 *(0.01)*	1 *(0.01)*	1 *(0.01)*	1 *(0.01)*		1 *(0.01)*		1 *(0.01)*						**680 *(8.14)***
Pasteurella	17 *(0.2)*	6 *(0.07)*	39 *(0.47)*	315 *(3.77)*	27 *(0.32)*	2 *(0.02)*	3 *(0.04)*			1 *(0.01)*		1 *(0.01)*		1 *(0.01)*				**412 *(4.93)***
Coagulase-negative Staphylococcus	395 *(4.73)*		6 *(0.07)*	2 *(0.02)*	2 *(0.02)*				1 *(0.01)*					1 *(0.01)*	1 *(0.01)*			**408 *(4.88)***
Salmonella	10 *(0.12)*	158 *(1.89)*	105 *(1.26)*	4 *(0.05)*	7 *(0.08)*	78 *(0.93)*	2 *(0.02)*	1 *(0.01)*	14 *(0.17)*	1 *(0.01)*								**380 *(4.55)***
Klebsiella	94 *(1.13)*	3 *(0.04)*	6 *(0.07)*	6 *(0.07)*	1 *(0.01)*		2 *(0.02)*	1 *(0.01)*		1 *(0.01)*								**114 *(1.36)***
Arcanobacterium	17 *(0.2)*		18 *(0.22)*	41 *(0.49)*	10 *(0.12)*	4 *(0.05)*	1 *(0.01)*	8 *(0.1)*	1 *(0.01)*		4 *(0.05)*	3 *(0.04)*				1 *(0.01)*	1 *(0.01)*	**109 *(1.3)***
Serratia	99 *(1.19)*		1 *(0.01)*															**100 *(1.2)***
Enterococcus	67 *(0.8)*	2 *(0.02)*	1 *(0.01)*	1 *(0.01)*		1 *(0.01)*	1 *(0.01)*											**73 *(0.87)***
Pseudomonas	46 *(0.55)*	1 *(0.01)*	2 *(0.02)*	10 *(0.12)*	3 *(0.04)*	1 *(0.01)*												**63 *(0.75)***
Corynebacterium	32 *(0.38)*		1 *(0.01)*	1 *(0.01)*	1 *(0.01)*								4 *(0.05)*					**39 *(0.47)***
Histophilus			2 *(0.02)*	22 *(0.26)*	2 *(0.02)*			1 *(0.01)*										**27 *(0.32)***
Aerococcus	15 *(0.18)*		1 *(0.01)*		1 *(0.01)*	1 *(0.01)*		1 *(0.01)*			1 *(0.01)*	1 *(0.01)*	1 *(0.01)*					**22 *(0.26)***
Coagulase-unspecified Staphylococcus	20 *(0.24)*		2 *(0.02)*															**22 *(0.26)***

Bacteria N *(%)*	Pathology N *(%)*																			Total N *(%)*
	Mastisis	Digestive pathology	Unspecified	Respiratory pathology	Systemic pathology	Abortion	Septicemia	Reproductive pathology	Skin and mucous membrane pathology	Nervous system pathology	Omphalitis	Arthritis	Kidney and urinary tract pathology	Ocular pathology	Otitis	Oral pathology	Cardiac pathology			
Enterobacter	16 *(0.19)*	1 *(0.01)*																		**17** ***(0.2)***
Citrobacter	15 *(0.18)*																			**15** ***(0.18)***
Bacillus	10 *(0.12)*		1 *(0.01)*					1 *(0.01)*				1 *(0.01)*								**13** ***(0.16)***
Proteus	1 *(0.01)*	4 *(0.05)*	2 *(0.02)*		1 *(0.01)*		1 *(0.01)*				1 *(0.01)*		1 *(0.01)*							**11** ***(0.13)***
Listeria	2 *(0.02)*					1 *(0.01)*				5 *(0.06)*				2 *(0.02)*						**10** ***(0.12)***
Acinetobacter	4 *(0.05)*			1 *(0.01)*							1 *(0.01)*			1 *(0.01)*						**7** ***(0.08)***
Campylobacter		5 *(0.06)*	1 *(0.01)*	1 *(0.01)*																**7** ***(0.08)***
Pantoea	6 *(0.07)*													1 *(0.01)*						**7** ***(0.08)***
Moraxella	2 *(0.02)*			1 *(0.01)*					1 *(0.01)*		1 *(0.01)*			1 *(0.01)*						**6** ***(0.07)***
Hafnia	5 *(0.06)*																			**5** ***(0.06)***
Leuconostoc	5 *(0.06)*																			**5** ***(0.06)***
Aeromonas	2 *(0.02)*		2 *(0.02)*								1 *(0.01)*									**5** ***(0.06)***
Morganella	1 *(0.01)*		1 *(0.01)*	1 *(0.01)*																**3** ***(0.04)***
Providencia		2 *(0.02)*	1 *(0.01)*																	**3** ***(0.04)***
Actinomyces			3 *(0.04)*																	**3** ***(0.04)***
Vibrio	1 *(0.01)*	1 *(0.01)*																		**2** ***(0.02)***

	Pathology N *(%)*																	
Bacteria N *(%)*	Mastisis	Digestive pathology	Unspecified	Respiratory pathology	Systemic pathology	Abortion	Septicemia	Reproductive pathology	Skin and mucous membrane pathology	Nervous system pathology	Omphalitis	Arthritis	Kidney and urinary tract pathology	Ocular pathology	Otitis	Oral pathology	Cardiac pathology	**Total N *(%)***
Clostridium		2 *(0.02)*																**2 *(0.02)***
Alcaligenes							2 *(0.02)*											**2 *(0.02)***
Haemophilus			1 *(0.01)*															**1 *(0.01)***
Mycobacterium	1 *(0.01)*																	**1 *(0.01)***
Arthrobacter	1 *(0.01)*																	**1 *(0.01)***
Kocuria	1 *(0.01)*																	**1 *(0.01)***
Lactococcus	1 *(0.01)*																	**1 *(0.01)***
Total N (%)	**3,901 *(46.7)***	**2,511 *(30.06)***	**1,027 *(12.29)***	**466 *(5.58)***	**176 *(2.11)***	**99 *(1.19)***	**59 *(0.71)***	**27 *(0.32)***	**23 *(0.28)***	**19 *(0.23)***	**14 *(0.17)***	**13 *(0.16)***	**8 *(0.1)***	**7 *(0.08)***	**2 *(0.02)***	**1 *(0.01)***	**1 *(0.01)***	**8,354**

Figure 3 - Cattle 2011 – Number of antibiograms by bacteria and age group



Note: *Only values higher than 1% are represented. Detailed values are presented in table 3 below.*

Table 3 - Cattle 2011 – Number of antibiograms by bacteria and age group

Bacteria N ***(%)***	**Age group N** ***(%)***			
	Adult	Young	Unspecified	**Total N** ***(%)***
E. coli	726 *(8.69)*	2,356 *(28.2)*	947 *(11.34)*	**4,029** ***(48.23)***
Streptococcus	1,706 *(20.42)*	24 *(0.29)*	18 *(0.22)*	**1,748** ***(20.92)***
Coagulase-positive Staphylococcus	663 *(7.94)*	8 *(0.1)*	9 *(0.11)*	**680** ***(8.14)***
Pasteurella	39 *(0.47)*	258 *(3.09)*	115 *(1.38)*	**412** ***(4.93)***
Coagulase-negative Staphylococcus	397 *(4.75)*	6 *(0.07)*	5 *(0.06)*	**408** ***(4.88)***
Salmonella	167 *(2)*	77 *(0.92)*	136 *(1.63)*	**380** ***(4.55)***
Klebsiella	97 *(1.16)*	5 *(0.06)*	12 *(0.14)*	**114** ***(1.36)***
Arcanobacterium	35 *(0.42)*	27 *(0.32)*	47 *(0.56)*	**109** ***(1.30)***
Serratia	99 *(1.19)*		1 *(0.01)*	**100** ***(1.20)***
Enterococcus	68 *(0.81)*	4 *(0.05)*	1 *(0.01)*	**73** ***(0.87)***
Pseudomonas	48 *(0.57)*	5 *(0.06)*	10 *(0.12)*	**63** ***(0.75)***
Corynebacterium	33 *(0.4)*		6 *(0.07)*	**39** ***(0.47)***
Histophilus	3 *(0.04)*	14 *(0.17)*	10 *(0.12)*	**27** ***(0.32)***
Coagulase-unspecified Staphylococcus	20 *(0.24)*	1 *(0.01)*	1 *(0.01)*	**22** ***(0.26)***
Aerococcus	18 *(0.22)*	2 *(0.02)*	2 *(0.02)*	**22** ***(0.26)***
Enterobacter	16 *(0.19)*	1 *(0.01)*		**17** ***(0.20)***
Citrobacter	15 *(0.18)*			**15** ***(0.18)***

Bacteria N *(%)*	**Age group N *(%)***			**Total N *(%)***
	Adult	Young	Unspecified	
Bacillus	11 *(0.13)*		2 *(0.02)*	**13** ***(0.16)***
Proteus	2 *(0.02)*	7 *(0.08)*	2 *(0.02)*	**11** ***(0.13)***
Listeria	3 *(0.04)*	1 *(0.01)*	6 *(0.07)*	**10** ***(0.12)***
Pantoea	6 *(0.07)*	1 *(0.01)*		**7** ***(0.08)***
Acinetobacter	4 *(0.05)*	2 *(0.02)*	1 *(0.01)*	**7** ***(0.08)***
Campylobacter	1 *(0.01)*	5 *(0.06)*	1 *(0.01)*	**7** ***(0.08)***
Moraxella	3 *(0.04)*	1 *(0.01)*	2 *(0.02)*	**6** ***(0.07)***
Hafnia	5 *(0.06)*			**5** ***(0.06)***
Aeromonas	2 *(0.02)*	2 *(0.02)*	1 *(0.01)*	**5** ***(0.06)***
Leuconostoc	5 *(0.06)*			**5** ***(0.06)***
Morganella	1 *(0.01)*	1 *(0.01)*	1 *(0.01)*	**3** ***(0.04)***
Actinomyces		3 *(0.04)*		**3** ***(0.04)***
Providencia		3 *(0.04)*		**3** ***(0.04)***
Alcaligenes		2 *(0.02)*		**2** ***(0.02)***
Clostridium		2 *(0.02)*		**2** ***(0.02)***
Vibrio	1 *(0.01)*	1 *(0.01)*		**2** ***(0.02)***
Kocuria	1 *(0.01)*			**1** ***(0.01)***
Arthrobacter	1 *(0.01)*			**1** ***(0.01)***

	Age group N *(%)*			
Bacteria N *(%)*	Adult	Young	Unspecified	**Total N *(%)***
Mycobacterium	1 *(0.01)*			**1 *(0.01)***
Lactococcus	1 *(0.01)*			**1 *(0.01)***
Haemophilus		1 *(0.01)*		**1 *(0.01)***
Total N *(%)*	**4,198 *(50.25)***	**2,820 *(33.76)***	**1,336 *(15.99)***	**8,354**

Table 4 - Cattle 2011 – Digestive pathology – Youngs - *E. coli*: susceptibility to antibiotics (proportion) (N =2,135)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*1,910*	**14**
Amoxicillin-Clavulanic ac.	*2,118*	**45**
Cephalexin	*1,571*	**73**
Cefalothin	*525*	**71**
Cefuroxime	*732*	**75**
Cefoxitin	*1,442*	**91**
Cefoperazone	*753*	**79**
Ceftiofur	*2,094*	**92**
Cefquinome 30 µg	*2,000*	**86**
Streptomycin 10 UI	*1,007*	**13**
Kanamycin 30 UI	*918*	**47**
Gentamicin 10 UI	*2,128*	**79**
Spectinomycin	*713*	**45**
Neomycin	*1,297*	**44**
Apramycin	*908*	**89**
Tetracycline	*1,918*	**16**
Florfenicol	*1,802*	**77**
Oxolinic ac.	*727*	**48**
Nalidixic ac.	*958*	**58**
Flumequine	*1,175*	**54**
Enrofloxacin	*1,846*	**70**
Marbofloxacin	*1,917*	**74**
Danofloxacin	*1,192*	**68**
Sulfonamides	*367*	**14**
Trimethoprim	*89*	**79**
Trimethoprim-Sulfonamides	*1,978*	**63**

Table 5 - Cattle 2011 – Mastitis – Adults - *E. coli*: susceptibility to antibiotics (proportion) (N = 665)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*588*	**75**
Amoxicillin-Clavulanic ac.	*662*	**84**
Cephalexin	*471*	**87**
Cefalothin	*215*	**83**
Cefuroxime	*339*	**94**
Cefoxitin	*489*	**97**
Cefoperazone	*475*	**97**
Ceftiofur	*520*	**99**
Cefquinome 30 µg	*609*	**99**
Streptomycin 10 UI	*352*	**76**
Kanamycin 30 UI	*233*	**94**
Gentamicin 10 UI	*660*	**99**
Spectinomycin	*150*	**86**
Neomycin	*498*	**89**
Apramycin	*154*	**97**
Tetracycline	*601*	**82**
Florfenicol	*432*	**98**
Oxolinic ac.	*153*	**92**
Nalidixic ac.	*265*	**96**
Flumequine	*209*	**96**
Enrofloxacin	*544*	**98**
Marbofloxacin	*598*	**98**
Danofloxacin	*254*	**97**
Sulfonamides	*99*	**87**
Trimethoprim	*81*	**98**
Trimethoprim-Sulfonamides	*574*	**93**

Table 6 - Cattle 2011 – all pathologies and age groups included – *Salmonella* Typhimurium: susceptibility to antibiotics (proportion) (N =144)

Antibiotic	*Total(N)*	**% S**
Amoxicillin	*129*	**20**
Amoxicillin-Clavulanic ac.	*140*	**42**
Cephalexin	*115*	**98**
Cefalothin	*38*	**100**
Cefuroxime	*64*	**98**
Cefoxitin	*129*	**99**
Cefoperazone	*73*	**34**
Ceftiofur	*143*	**99**
Cefquinome 30 µg	*134*	**99**
Streptomycin 10 UI	*51*	**12**
Gentamicin 10 UI	*143*	**99**
Kanamycin 30 UI	*43*	**100**
Spectinomycin	*64*	**39**
Neomycin	*111*	**99**
Apramycin	*75*	**97**
Tetracycline	*124*	**16**
Florfenicol	*133*	**38**
Oxolinic ac.	*52*	**98**
Nalidixic ac.	*68*	**99**
Flumequine	*82*	**99**
Enrofloxacin	*141*	**100**
Marbofloxacin	*124*	**100**
Danofloxacin	*69*	**99**
Trimethoprim-Sulfonamides	*141*	**95**

Table 7 - Cattle 2011 – all pathologies and age groups included – *Salmonella* Mbandaka: susceptibility to antibiotics (proportion) (N = 86)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*86*	**100**
Amoxicillin-Clavulanic ac.	*86*	**100**
Cephalexin	*85*	**100**
Cefalothin	*45*	**100**
Cefuroxime	*62*	**100**
Cefoxitin	*85*	**100**
Cefoperazone	*62*	**100**
Ceftiofur	*86*	**100**
Cefquinome 30 µg	*85*	**100**
Streptomycin 10 UI	*46*	**78**
Kanamycin 30 UI	*46*	**100**
Gentamicin 10 UI	*86*	**100**
Neomycin	*86*	**100**
Apramycin	*40*	**100**
Spectinomycin	*40*	**93**
Tetracycline	*85*	**99**
Florfenicol	*86*	**100**
Nalidixic ac.	*45*	**100**
Oxolinic ac.	*39*	**100**
Flumequine	*37*	**100**
Enrofloxacin	*83*	**100**
Marbofloxacin	*86*	**100**
Danofloxacin	*82*	**100**
Trimethoprim-Sulfonamides	*86*	**100**
Trimethoprim	*46*	**100**
Sulfonamides	*46*	**87**

Table 8 - Cattle 2011 – all pathologies and age groups included – *Salmonella* Montevideo: susceptibility to antibiotics (proportion) (N = 61)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*54*	**100**
Amoxicillin-Clavulanic ac.	*61*	**100**
Cephalexin	*54*	**100**
Cefoxitin	*61*	**100**
Cefquinome 30 µg	*60*	**100**
Ceftiofur	*61*	**100**
Spectinomycin	*43*	**93**
Gentamicin 10 UI	*61*	**100**
Neomycin	*59*	**100**
Apramycin	*44*	**100**
Florfenicol	*56*	**98**
Tetracycline	*60*	**98**
Oxolinic ac.	*39*	**100**
Flumequine	*46*	**100**
Enrofloxacin	*56*	**100**
Marbofloxacin	*57*	**100**
Danofloxacin	*42*	**100**
Trimethoprim-Sulfonamides	*61*	**100**

Table 9 - Cattle 2011 – Respiratory pathology – Youngs – *Pasteurella Multocida*: susceptibility to antibiotics (proportion) (N =103)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*97*	**95**
Amoxicillin-Clavulanic ac.	*103*	**100**
Cephalexin	*80*	**95**
Ceftiofur	*103*	**100**
Cefquinome 30 µg	*98*	**97**
Gentamicin 10 UI	*82*	**96**
Neomycin	*72*	**86**
Spectinomycin	*65*	**85**
Florfenicol	*100*	**97**
Tetracycline	*101*	**78**
Tilmicosin	*69*	**96**
Tulathromycin	*55*	**82**
Oxolinic ac.	*67*	**94**
Flumequine	*78*	**95**
Enrofloxacin	*101*	**97**
Marbofloxacin	*95*	**98**
Danofloxacin	*69*	**96**
Trimethoprim-Sulfonamides	*102*	**90**
Lincomycin	*51*	**16**

Table 10 - Cattle 2011 – Respiratory pathology – Youngs – *Mannheimia Haemolytica*: susceptibility to antibiotics (proportion) (N =101)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*87*	**80**
Amoxicillin-Clavulanic ac.	*100*	**97**
Cephalexin	*77*	**94**
Ceftiofur	*101*	**96**
Cefquinome 30 µg	*99*	**96**
Gentamicin 10 UI	*87*	**94**
Spectinomycin	*60*	**75**
Neomycin	*65*	**77**
Streptomycin 10 UI	*31*	**13**
Florfenicol	*96*	**98**
Tetracycline	*96*	**64**
Tilmicosin	*69*	**87**
Nalidixic ac.	*30*	**80**
Oxolinic ac.	*63*	**68**
Flumequine	*71*	**76**
Enrofloxacin	*96*	**93**
Marbofloxacin	*90*	**98**
Danofloxacin	*73*	**97**
Trimethoprim-Sulfonamides	*97*	**85**
Tulathromycin	*52*	**88**

Table 11 - Cattle 2011 – Mastitis – Adults – Coagulase-positive *Staphyloccus*: susceptibility to antibiotics (proportion) (N =657) , including 454 identified S. *aureus* strains.

Antibiotic	*Total (N)*	**% S**
Penicillin	*631*	**65**
Oxacillin	*97*	**96**
Cefoxitin	*547*	**94**
Streptomycin 10 UI	*429*	**89**
Kanamycin 30 UI	*369*	**98**
Gentamicin 10 UI	*640*	**98**
Neomycin	*353*	**98**
Florfenicol	*207*	**99**
Tetracycline	*630*	**94**
Erythromycin	*611*	**94**
Spiramycin	*652*	**96**
Tylosin	*424*	**99**
Lincomycin	*618*	**96**
Pirlimycin	*110*	**100**
Enrofloxacin	*496*	**99**
Marbofloxacin	*586*	**100**
Danofloxacin	*152*	**98**
Rifampicin	*233*	**95**
Trimethoprim-Sulfonamides	*527*	**99**
Sulfonamides	*42*	**90**

Table 12 - Cattle 2011 – Mastitis – Adults – Coagulase-negative *Staphycoccus*: susceptibility to antibiotics (proportion) (N =395)

Antibiotic	*Total (N)*	**% S**
Penicillin	*383*	**69**
Cefoxitin	*331*	**95**
Oxacillin	*109*	**97**
Streptomycin 10 UI	*239*	**90**
Kanamycin 30 UI	*191*	**99**
Gentamicin 10 UI	*391*	**99**
Neomycin	*257*	**98**
Florfenicol	*142*	**99**
Tetracycline	*383*	**85**
Erythromycin	*384*	**83**
Spiramycin	*395*	**89**
Tylosin	*258*	**90**
Lincomycin	*387*	**82**
Pirlimycin	*100*	**92**
Enrofloxacin	*283*	**98**
Marbofloxacin	*305*	**99**
Danofloxacin	*132*	**94**
Rifampicin	*108*	**95**
Trimethoprim-Sulfonamides	*307*	**98**

Table 13 - Cattle 2011 – Mastitis – Adults – *Serratia Marcescens*: susceptibility to antibiotics (proportion) (N =81)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*73*	**21**
Amoxicillin-Clavulanic ac.	*79*	**15**
Cefuroxime	*48*	**15**
Ceftiofur	*72*	**99**
Cefoperazone	*64*	**100**
Cefquinome 30 µg	*71*	**100**
Gentamicin 10 UI	*80*	**100**
Neomycin	*46*	**98**
Streptomycin 10 UI	*47*	**51**
Nalidixic ac.	*42*	**100**
Enrofloxacin	*65*	**98**
Marbofloxacin	*75*	**100**
Florfenicol	*35*	**80**
Tetracycline	*69*	**4**
Trimethoprim-Sulfonamides	*56*	**98**

Table 14 - Cattle 2011 – Mastitis – Adults – *Streptococcus uberis*: susceptibility to antibiotics (proportion) (N = 1,403)

Antibiotic	*Total (N)*	**% S**
Oxacillin	*1,008*	**89**
Streptomycin 500 µg	*1,252*	**88**
Kanamycin 1000 µg	*1,102*	**94**
Gentamicin 500 µg	*1,285*	**98**
Florfenicol	*595*	**95**
Tetracycline	*1,200*	**83**
Erythromycin	*1,332*	**81**
Spiramycin	*1,392*	**83**
Tylosin	*936*	**84**
Lincomycin	*1,344*	**84**
Pirlimycin	*119*	**92**
Enrofloxacin	*1,117*	**75**
Marbofloxacin	*1,037*	**91**
Danofloxacin	*234*	**57**
Rifampicin	*377*	**69**
Trimethoprim-Sulfonamides	*1,284*	**93**

Table 15 - Cattle 2010 – Mastitis – Adults - *Streptococcus dysgalactiae*: susceptibility to antibiotics (proportion) (N = 205)

Antibiotic	*Total (N)*	**% S**
Oxacillin	*164*	**100**
Streptomycin 500 µg	*176*	**95**
Kanamycin 1000 µg	*147*	**93**
Gentamicin 500 µg	*185*	**99**
Florfenicol	*62*	**97**
Tetracycline	*182*	**37**
Erythromycin	*185*	**84**
Spiramycin	*198*	**91**
Tylosin	*154*	**93**
Lincomycin	*186*	**94**
Enrofloxacin	*139*	**73**
Marbofloxacin	*161*	**97**
Rifampicin	*38*	**47**
Trimethoprim-Sulfonamides	*173*	**97**

Table 16 - Cattle 2011 – Mastitis – Adults - *Klebsiella pneumoniae*: susceptibility to antibiotics (proportion) (N =56)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*48*	**8**
Amoxicillin-Clavulanic ac.	*56*	**86**
Cephalexin	*37*	**97**
Cefoxitin	*32*	**97**
Cefoperazone	*42*	**98**
Ceftiofur	*35*	**97**
Cefquinome 30 µg	*54*	**98**
Streptomycin 10 UI	*37*	**84**
Neomycin	*34*	**100**
Gentamicin 10 UI	*55*	**98**
Tetracycline	*52*	**96**
Enrofloxacin	*41*	**100**
Marbofloxacin	*51*	**100**
Trimethoprim-Sulfonamides	*43*	**98**

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Annex 3

Sheep

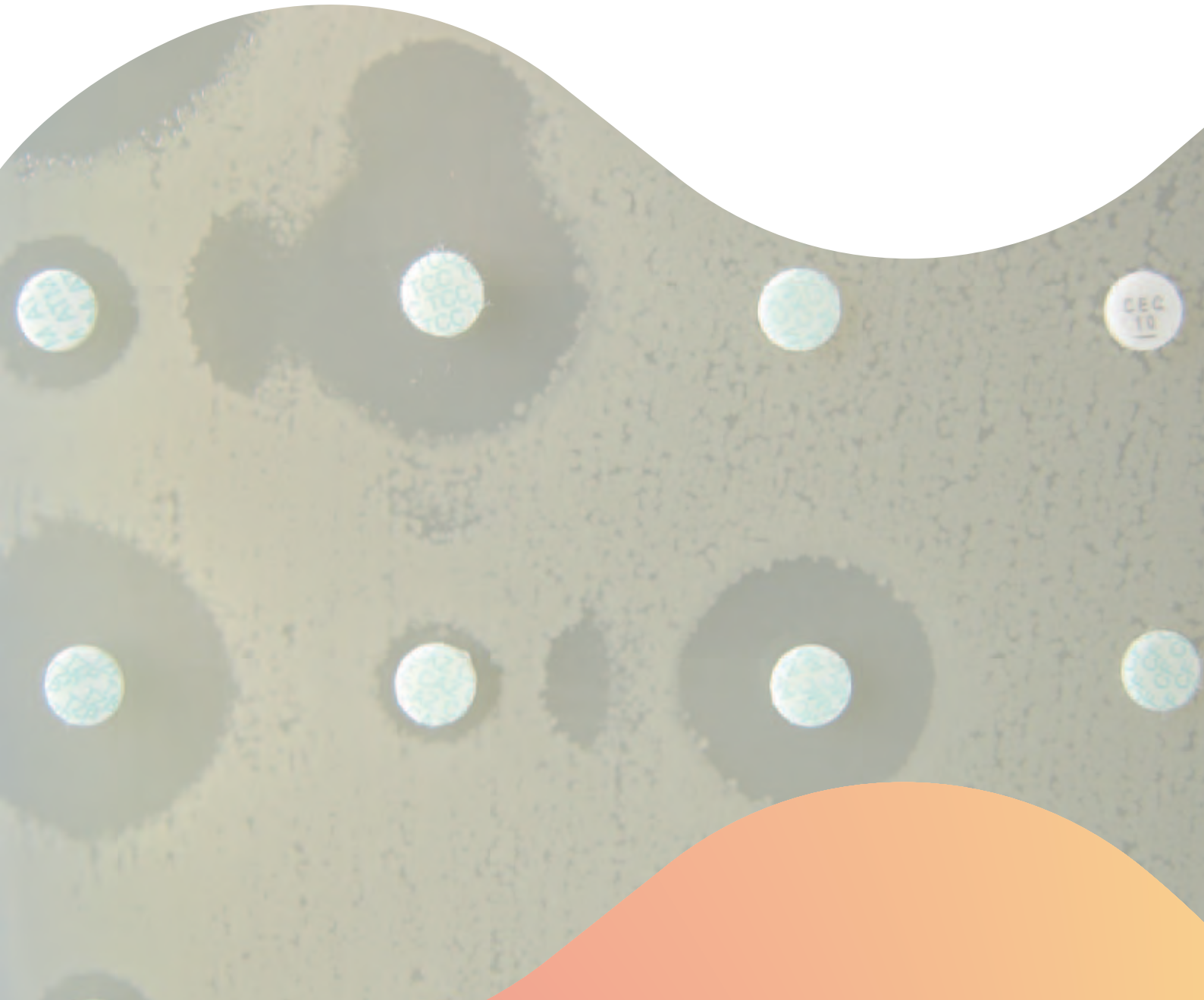


Figure 1 - Sheep 2011 – Number of antibiograms by age group and pathology

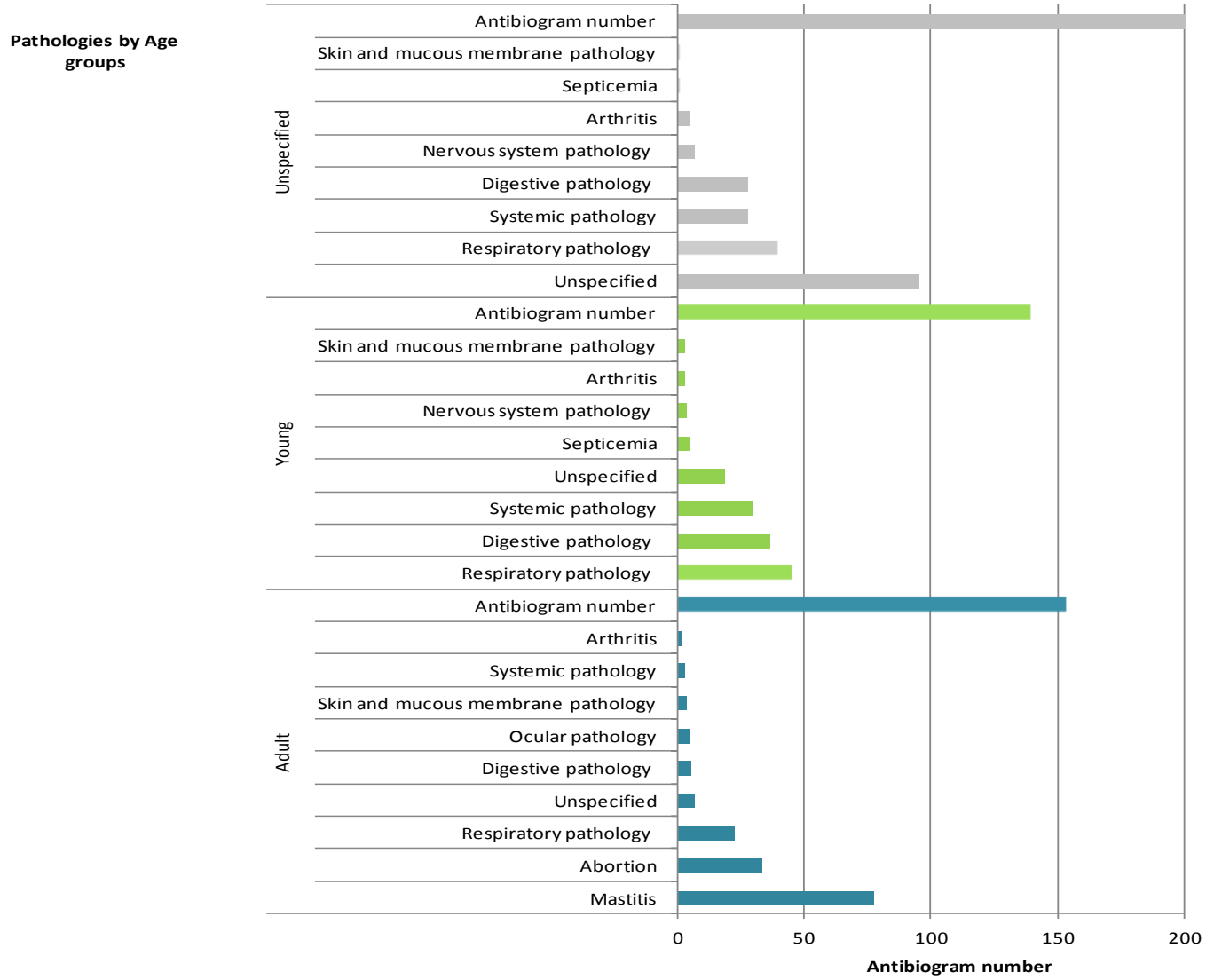
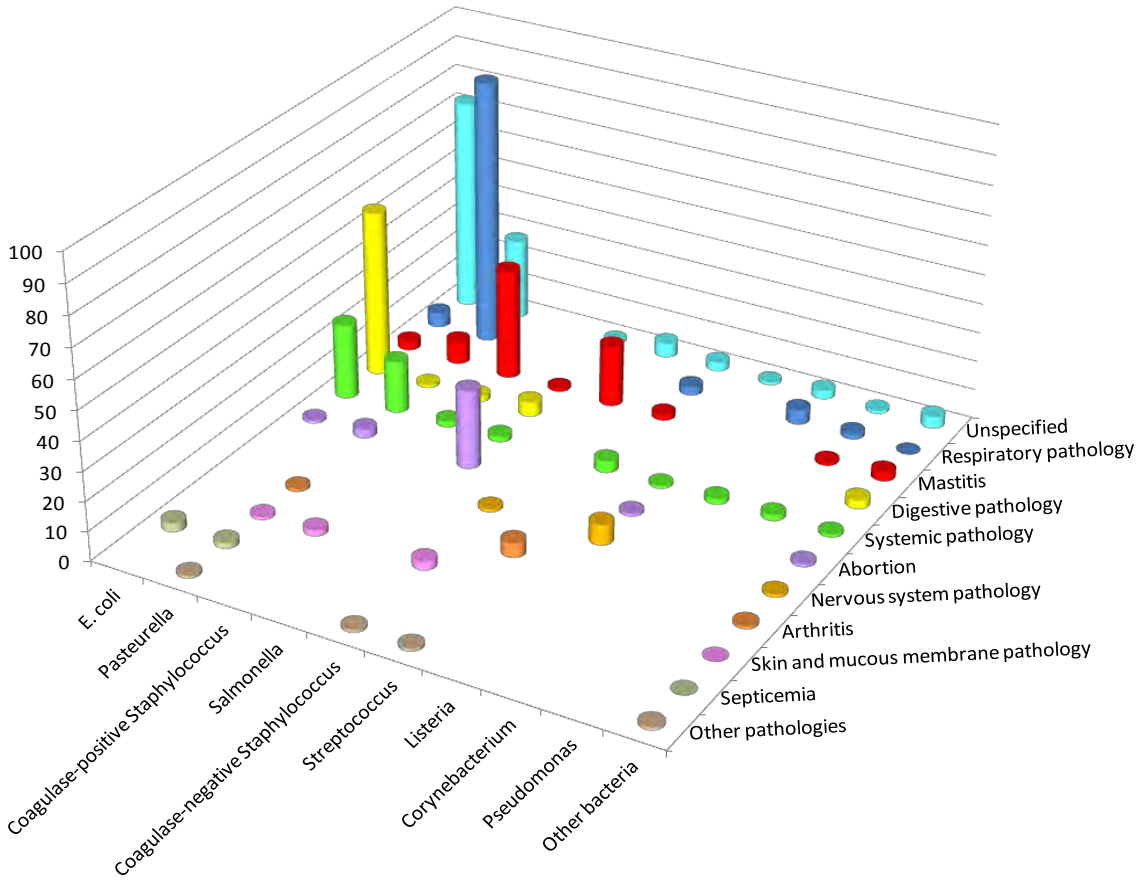


Table 1 - Sheep 2011 – Number of antibiograms by age group and pathology

	Pathology N *(%)*											
Age group N *(%)*	Unspecified	Respiratory pathology	Mastitis	Digestive pathology	Systemic pathology	Abortion	Nervous system pathology	Arthritis	Skin and mucous membrane	Septicemia	Ocular pathology	**Total N *(%)***
Unspecified	95 *(19.3)*	39 *(7.9)*		27 *(5.5)*	27 *(5.5)*		6 *(1.2)*	4 *(0.8)*	1 *(0.2)*	1 *(0.2)*		**200** ***(40.7)***
Young	18 *(3.7)*	45 *(9.1)*		36 *(7.3)*	29 *(5.9)*		3 *(0.6)*	2 *(0.4)*	2 *(0.4)*	4 *(0.8)*		**139** ***(28.3)***
Adult	6 *(1.2)*	22 *(4.5)*	77 *(15.7)*	5 *(1.0)*	2 *(0.4)*	33 *(6.7)*		1 *(0.2)*	3 *(0.6)*		4 *(0.8)*	**153** ***(31.1)***
Total N *(%)*	**119** ***(24.2)***	**106** ***(21.5)***	**77** ***(15.7)***	**68** ***(13.8)***	**58** ***(11.8)***	**33** ***(6.7)***	**9** ***(1.8)***	**7** ***(1.4)***	**6** ***(1.2)***	**5** ***(1.0)***	**4** ***(0.8)***	**492**

Figure 2 - Sheep 2011 – Number of antibiograms by bacteria group and pathology



Note: *only values higher than 1% for bacteria groups and pathologies. Detailed values are presented in table 2 below.*

Table 2 - Sheep 2011 – Number of antibiograms by bacteria group and pathology

Bacteria N *(%)*	**Pathology N *(%)***											**Total N *(%)***
	Unspecified	Respiratory pathology	Mastitis	Digestive pathology	Systemic pathology	Abortion	Nervous system pathology	Arthritis	Skin and mucous membrane	Septicemia	Ocular pathology	
E. coli	73 *(14.8)*	5 *(1)*	3 *(0.6)*	57 *(11.6)*	26 *(5.3)*	1 *(0.2)*				3 *(0.6)*		**168 *(34.1)***
Pasteurella	28 *(5.7)*	91 *(18.5)*	8 *(1.6)*	1 *(0.2)*	18 *(3.7)*	3 *(0.6)*		1 *(0.2)*	1 *(0.2)*	2 *(0.4)*	1 *(0.2)*	**154 *(31.3)***
Coagulase-negative Staphylococcus			38 *(7.7)*	2 *(0.4)*	2 *(0.4)*				2 *(0.4)*			**44 *(8.9)***
Salmonella	1 *(0.2)*		1 *(0.2)*	5 *(1)*	2 *(0.4)*	27 *(5.5)*						**36 *(7.3)***
Coagulase-positive Staphylococcus	5 *(1)*		21 *(4.3)*				1 *(0.2)*		3 *(0.6)*		1 *(0.2)*	**31 *(6.3)***
Streptococcus	3 *(0.6)*	3 *(0.6)*	2 *(0.4)*		4 *(0.8)*			5 *(1)*			1 *(0.2)*	**18 *(3.7)***
Listeria	1 *(0.2)*				1 *(0.2)*	1 *(0.2)*	7 *(1.4)*					**10 *(2)***
Corynebacterium	3 *(0.6)*	5 *(1)*			2 *(0.4)*							**10 *(2)***
Pseudomonas	1 *(0.2)*	2 *(0.4)*	1 *(0.2)*		2 *(0.4)*							**6 *(1.2)***
Arcanobacterium	1 *(0.2)*		1 *(0.2)*				1 *(0.2)*	1 *(0.2)*				**4 *(0.8)***
Enterococcus	1 *(0.2)*			2 *(0.4)*								**3 *(0.6)***
Moraxella	1 *(0.2)*										1 *(0.2)*	**2 *(0.4)***
Coagulase-unspecified Staphylococcus			2 *(0.4)*									**2 *(0.4)***
Aeromonas	1 *(0.2)*											**1 *(0.2)***
Erysipelothrix				1 *(0.2)*								**1 *(0.2)***
Serratia					1 *(0.2)*							**1 *(0.2)***
Yersinia						1 *(0.2)*						**1 *(0.2)***
Total N *(%)*	**119 *(24.2)***	**106 *(21.5)***	**77 *(15.7)***	**68 *(13.8)***	**58 *(11.8)***	**33 *(6.7)***	**9 *(1.8)***	**7 *(1.4)***	**6 *(1.2)***	**5 *(1.0)***	**4 *(0.8)***	**492**

Table 3 - Ovins 2011 – Digestive pathology – tous *E. coli* : proportion de sensibilite pour les Antibiotics testes (N =57)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*55*	**51**
Amoxicillin Ac. Clavulanique	*57*	**79**
Cephalexin	*49*	**82**
Ceftiofur	*53*	**98**
Cefquinome 30 µg	*52*	**94**
Tetracycline	*56*	**34**
Gentamicin 10 UI	*55*	**95**
Neomycin	*48*	**85**
Florfenicol	*51*	**86**
Flumequine	*42*	**95**
Enrofloxacin	*49*	**98**
Marbofloxacin	*43*	**98**
Trimethoprim-Sulfonamides	*52*	**75**
Ac. Nalidixique	*43*	**91**

Table 4 - Ovins 2011 – Respiratory pathology – quelle que soit la Age group –*Mannheimia haemolytica* : proportion de sensibilite pour les Antibiotics testes (N =60)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*59*	**93**
Amoxicillin Ac. Clavulanique	*59*	**98**
Cephalexin	*53*	**100**
Ceftiofur	*56*	**98**
Cefquinome 30 µg	*55*	**100**
Tetracycline	*52*	**92**
Streptomycin 10 UI	*33*	**42**
Neomycin	*46*	**78**
Gentamicin 10 UI	*57*	**96**
Florfenicol	*49*	**100**
Tilmicosin	*31*	**94**
Flumequine	*49*	**96**
Enrofloxacin	*48*	**98**
Marbofloxacin	*36*	**100**
Trimethoprim-Sulfonamides	*52*	**92**
Ac. Nalidixique	*38*	**97**

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Annex 4

Goats

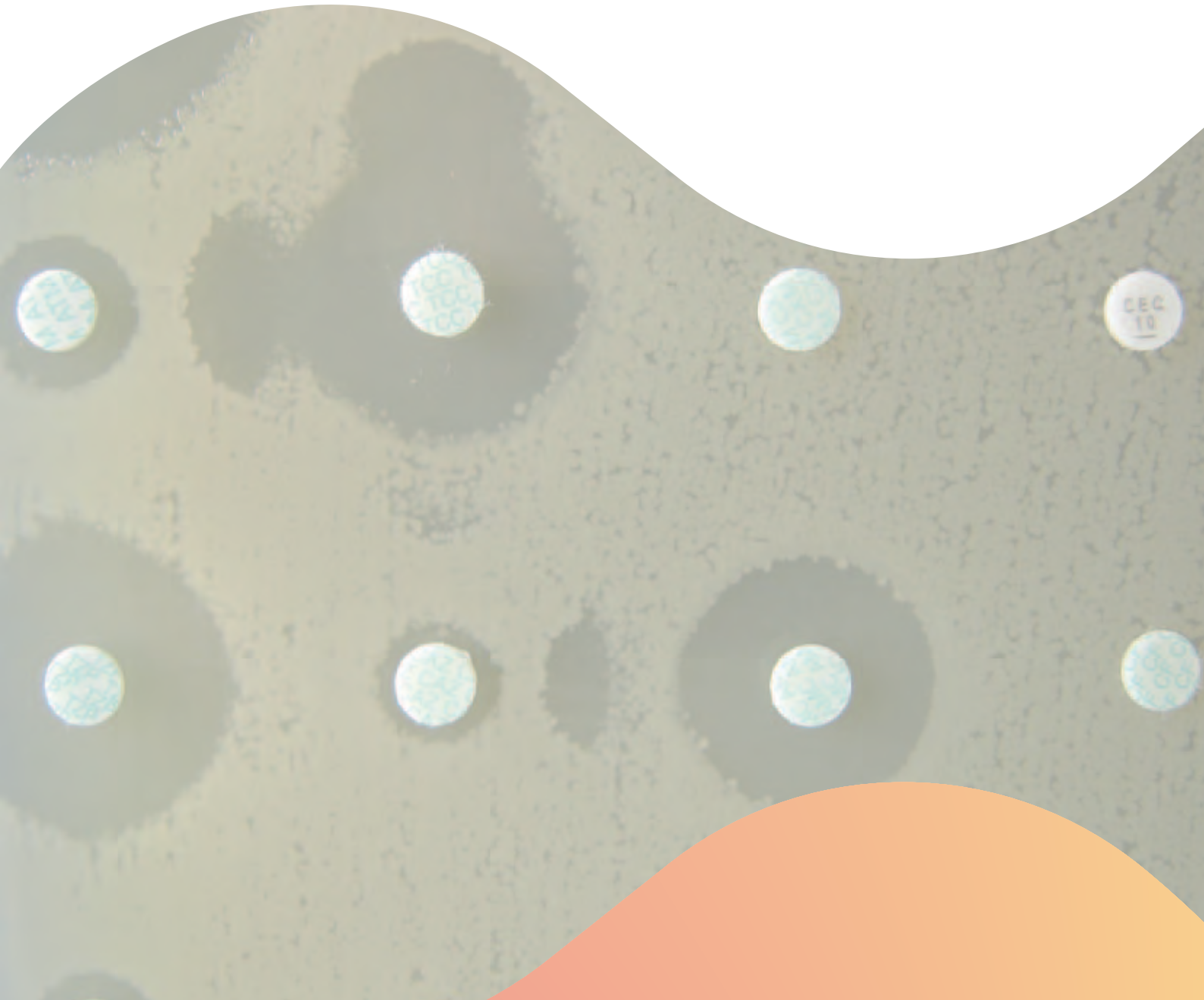


Figure 1 - Goats 2011 – Number of antibiograms by age group and pathology

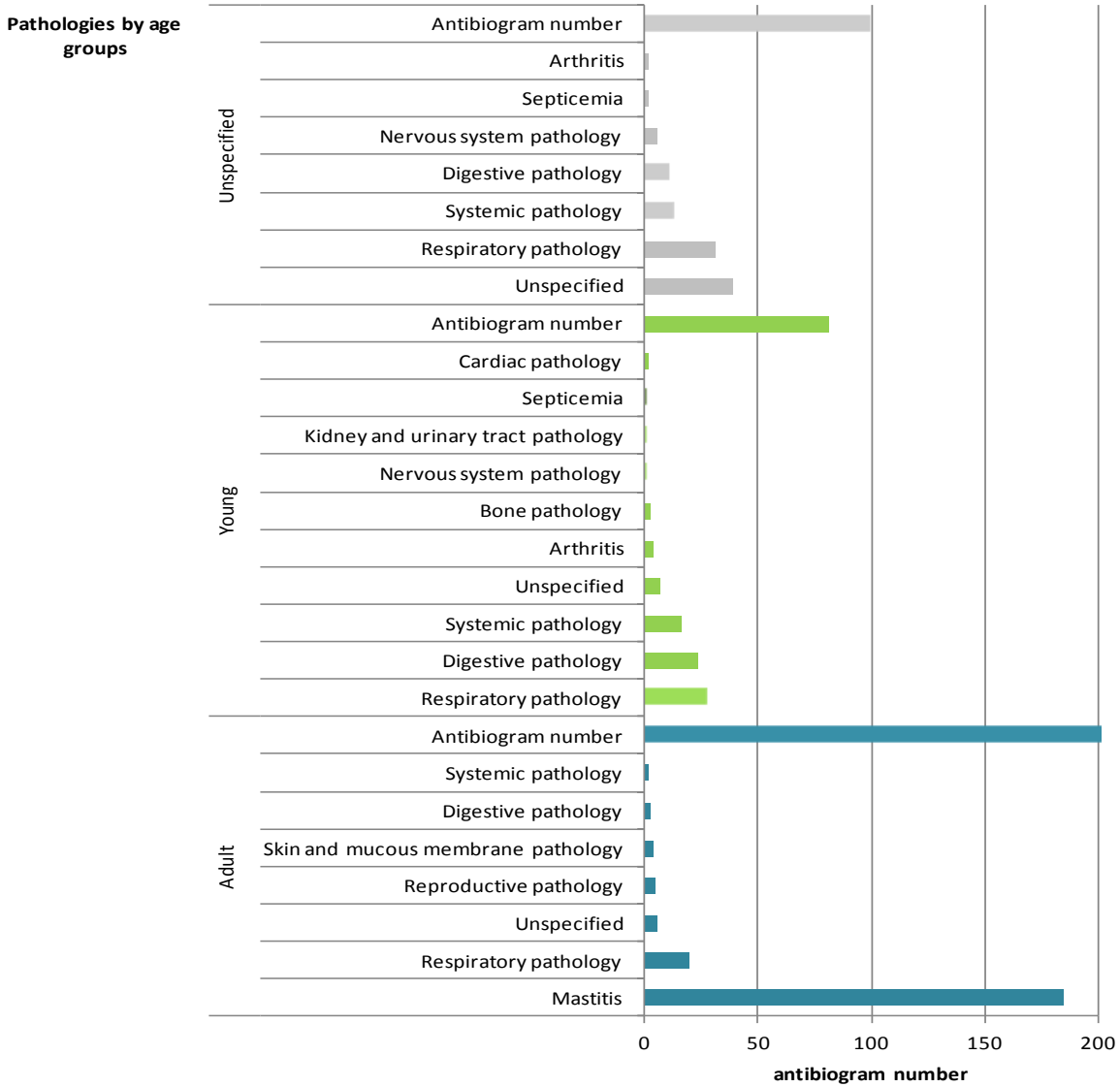
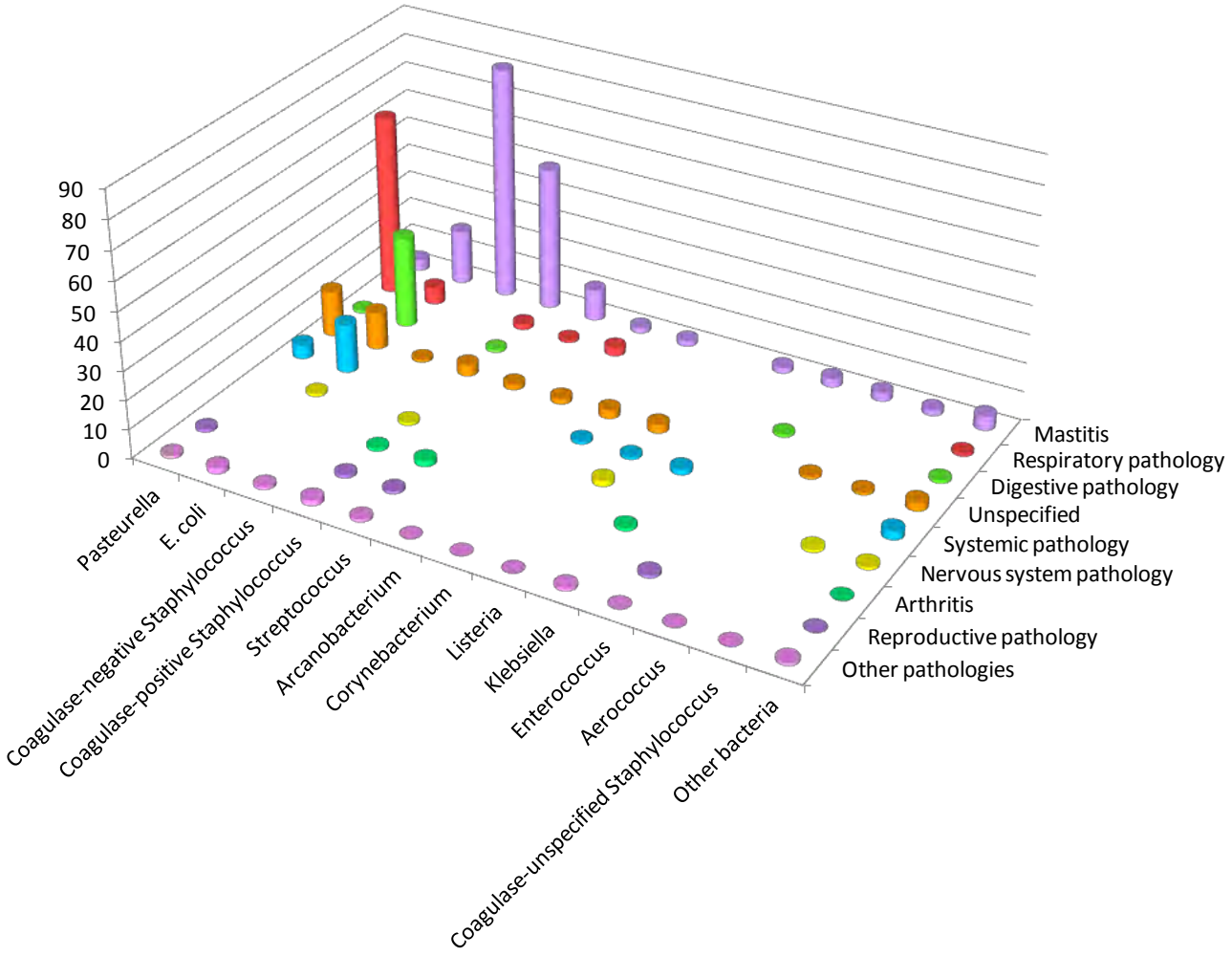


Table 1 - Goats 2011 – Number of antibiograms by age group and pathology

	Pathology N *(%)*													
Age group N *(%)*	Mastitis	Respiratory pathology	Unspecified	Digestive pathology	Systemic pathology	Nervous system pathology	Arthritis	Reproductive pathology	Skin and mucous membrane pathology	Septicemia	Bone pathology	Kidney and urinary tract pathology	Cardiac pathology	**Total N *(%)***
Adult	*184 (46.3)*	*19 (4.8)*	*5 (1.3)*	*2 (0.5)*	*1 (0.3)*	*0*		*4 (1)*	*3 (0.8)*	*0*				***218 (54.9)***
Unspecified		*27 (6.8)*	*6 (1.5)*	*23 (5.8)*	*15 (3.8)*	*1 (0.3)*	*3 (0.8)*	*0*	*0*	*1 (0.3)*	*2 (0.5)*	*1 (0.3)*	*1 (0.3)*	***80 (20.2)***
Young		*30 (7.6)*	*38 (9.6)*	*11 (2.8)*	*13 (3.3)*	*5 (1.3)*	*1 (0.3)*	*0*	*0*	*1 (0.3)*				***99 (24.9)***
Total N *(%)*	***184 (46.3)***	***76 (19.1)***	***49 (12.3)***	***36 (9.1)***	***29 (7.3)***	***6 (1.5)***	***4 (1)***	***4 (1)***	***3 (0.8)***	***2 (0.5)***	***2 (0.5)***	***1 (0.3)***	***1 (0.3)***	***397 (100)***

Figure 2 - Goats 2011 – Number of antibiograms by bacteria group and pathology



***Note**: only values higher than 1% for the bacteria group and pathology. Detailed values are presented in table 2 below.*

Table 2 - Goats 2011 – Number of antibiograms by bacteria and pathology

Bacteria N ***(%)***	**Pathology N** ***(%)***													**Total N** ***(%)***
	Mastitis	Respiratory pathology	Unspecified	Digestive pathology	Systemic pathology	Nervous system pathology	Arthritis	Reproductive pathology	Skin and mucous membrane pathology	Bone pathology	Septicemia	Kidney and urinary tract pathology	Cardiac pathology	
Pasteurella	4 *(1.0)*	63 *(15.9)*	16 *(4.0)*	1 *(0.3)*	5 *(1.3)*			1 *(0.3)*		1 *(0.3)*				**91** ***(22.9)***
E. coli	19 *(4.8)*	6 *(1.5)*	13 *(3.3)*	32 *(8.1)*	17 *(4.3)*	1 *(0.3)*					1 *(0.3)*	1 *(0.3)*		**90** ***(22.7)***
Coagulase-negative Staphylococcus	81 *(20.4)*		1 *(0.3)*						1 *(0.3)*					**83** ***(20.9)***
Coagulase-positive Staphylococcus	50 *(12.6)*	2 *(0.5)*	4 *(1)*	1 *(0.3)*		1 *(0.3)*	1 *(0.3)*	1 *(0.3)*	2 *(0.5)*					**62** ***(15.6)***
Streptococcus	11 *(2.8)*	1 *(0.3)*	2 *(0.5)*				2 *(0.5)*	1 *(0.3)*		1 *(0.3)*				**18** ***(4.5)***
Arcanobacterium	2 *(0.5)*	3 *(0.8)*	2 *(0.5)*											**7** ***(1.8)***
Corynebacterium	2 *(0.5)*		3 *(0.8)*		1 *(0.3)*									**6** ***(1.5)***
Listeria			3 *(0.8)*		1 *(0.3)*	2 *(0.5)*								**6** ***(1.5)***
Klebsiella	2 *(0.5)*				2 *(0.5)*		1 *(0.3)*				1 *(0.3)*			**6** ***(1.5)***
Enterococcus	3 *(0.8)*			1 *(0.3)*				1 *(0.3)*						**5** ***(1.3)***
Aerococcus	3 *(0.8)*		1 *(0.3)*											**4** ***(1.0)***
Coagulase-unspecified Staphylococcus	2 *(0.5)*		1 *(0.3)*			1 *(0.3)*								**4** ***(1.0)***
Salmonella			1 *(0.3)*		1 *(0.3)*									**2** ***(0.5)***
Enterobacter	1 *(0.3)*				1 *(0.3)*									**2** ***(0.5)***
E. fergusonii				1 *(0.3)*									1 *(0.3)*	**2** ***(0.5)***
Proteus					1 *(0.3)*	1 *(0.3)*								**2** ***(0.5)***

Bacteria N *(%)*	**Pathology N *(%)***													**Total N *(%)***
	Mastitis	Respiratory pathology	Unspecified	Digestive pathology	Systemic pathology	Nervous system pathology	Arthritis	Reproductive pathology	Skin and mucous membrane pathology	Bone pathology	Septicemia	Kidney and urinary tract pathology	Cardiac pathology	
Providencia	1 *(0.3)*													**1 *(0.3)***
Bibersteinia			1 *(0.3)*											**1 *(0.3)***
Pantoea	1 *(0.3)*													**1 *(0.3)***
Bacillus	1 *(0.3)*													**1 *(0.3)***
E. hermanii			1 *(0.3)*											**1 *(0.3)***
Serratia	1 *(0.3)*													**1 *(0.3)***
Yersinia		1 *(0.3)*												**1 *(0.3)***
Total N *(%)*	**184 *(46.3)***	**76 *(19.1)***	**49 *(12.3)***	**36 *(9.1)***	**29 *(7.3)***	**6 *(1.5)***	**4 *(1.0)***	**4 *(1.0)***	**3 *(0.8)***	**2 *(0.5)***	**2 *(0.5)***	**1 *(0.3)***	**1 *(0.3)***	**397**

Table 3 - Goats 2011 –all pathologies and age groups included – All *E. coli*: susceptibility to antibiotics (proportion) (N =90)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*74*	**42**
Amoxicillin Ac. Clavulanique	*89*	**61**
Cephalexin	*64*	**67**
Cefoxitin	*66*	**92**
Cefoperazone	*43*	**86**
Ceftiofur	*79*	**97**
Cefquinome 30 µg	*85*	**99**
Streptomycin 10 UI	*49*	**41**
Neomycin	*53*	**68**
Gentamicin 10 UI	*87*	**93**
Tetracycline	*83*	**45**
Florfenicol	*76*	**84**
Nalidixic ac.	*43*	**84**
Flumequine	*32*	**78**
Enrofloxacin	*56*	**93**
Marbofloxacin	*56*	**96**
Trimethoprim-Sulfonamides	*65*	**75**

Table 4 - Goats 2011 – all pathologies and age groups included – all *Pasteurella*: susceptibility to antibiotics (proportion) (N =91)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*83*	**95**
Amoxicillin Ac. Clavulanique	*87*	**98**
Cephalexin	*72*	**97**
Ceftiofur	*86*	**99**
Cefquinome 30 µg	*83*	**90**
Streptomycin 10 UI	*79*	**35**
Neomycin	*34*	**85**
Gentamicin 10 UI	*87*	**93**
Tilmicosin	*66*	**85**
Tetracycline	*49*	**86**
Florfenicol	*51*	**98**
Nalidixic ac.	*32*	**78**
Flumequine	*34*	**97**
Enrofloxacin	*47*	**96**
Marbofloxacin	*45*	**100**
Trimethoprim-Sulfonamides	*56*	**93**

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Annex 5

Pigs

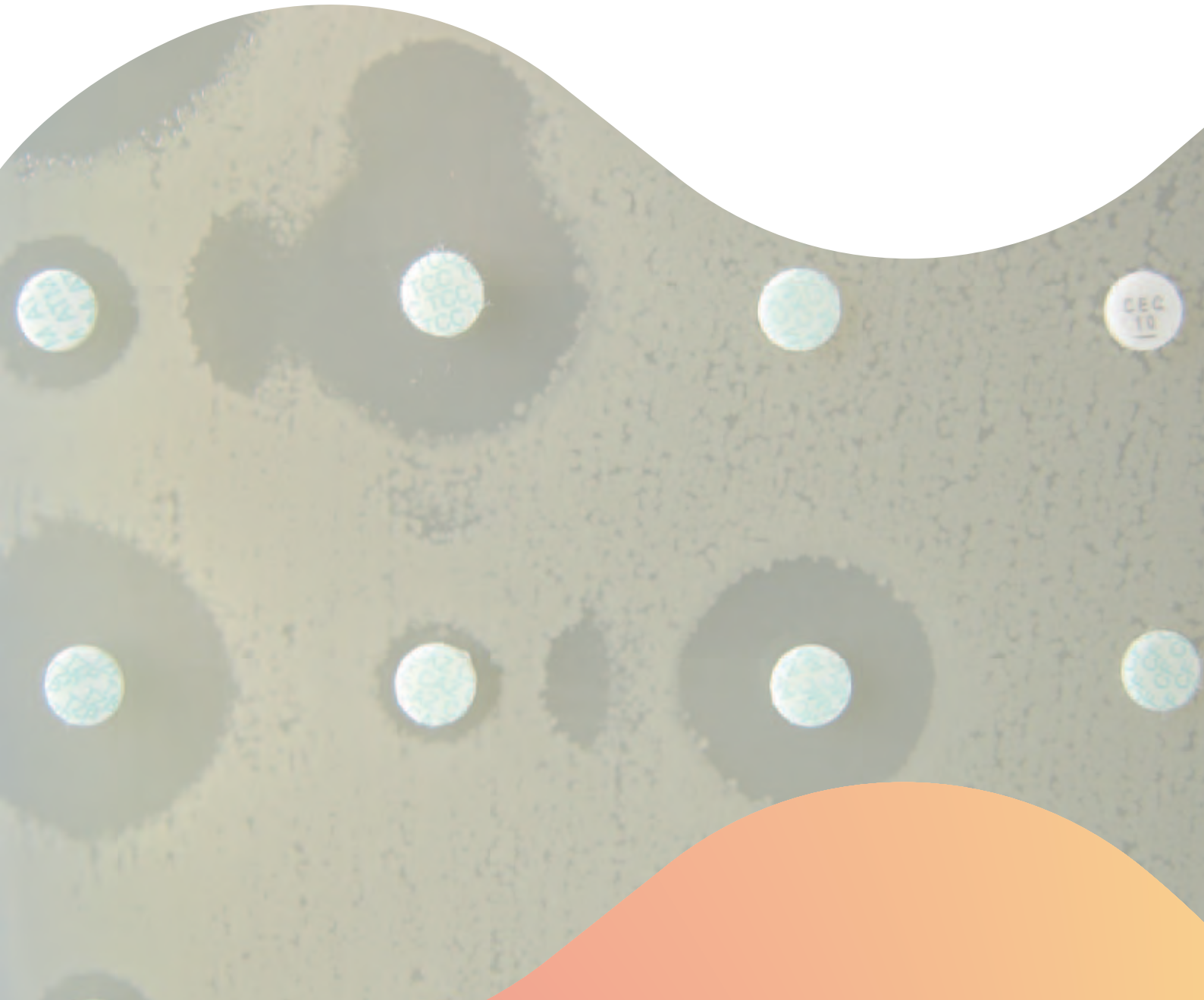


Figure 1 - Pigs 2011 – Antibiogram proportions by animal category

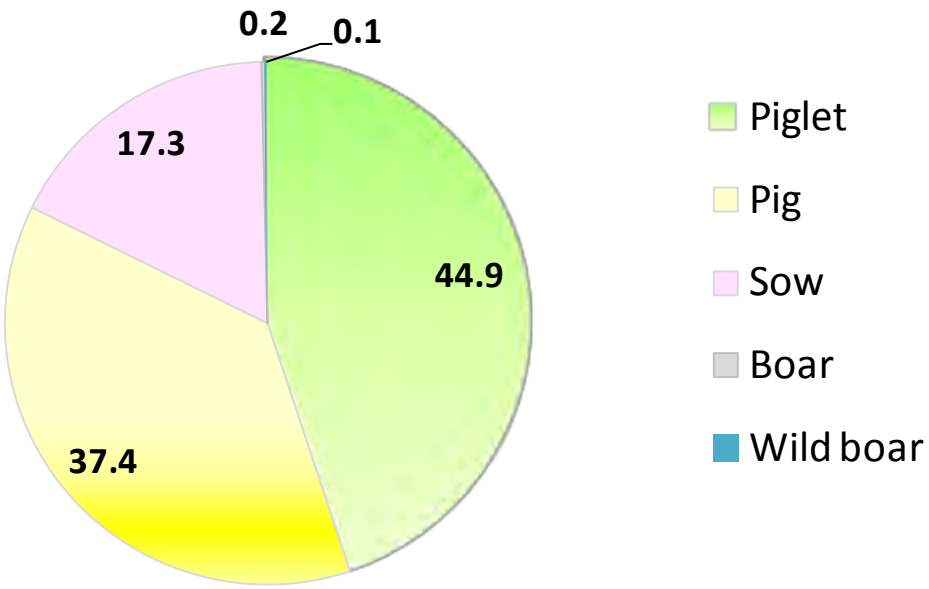


Figure 2 - Pigs 2011 – Number of antibiograms by pathology and animal category

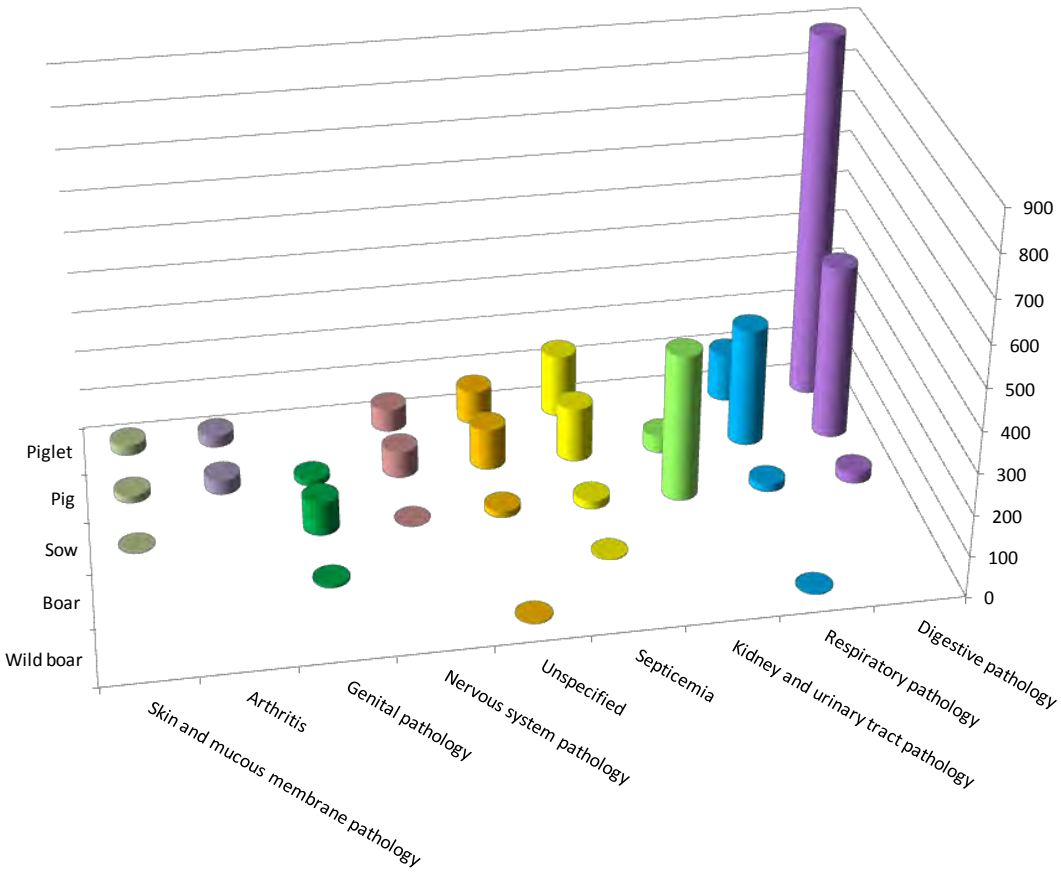
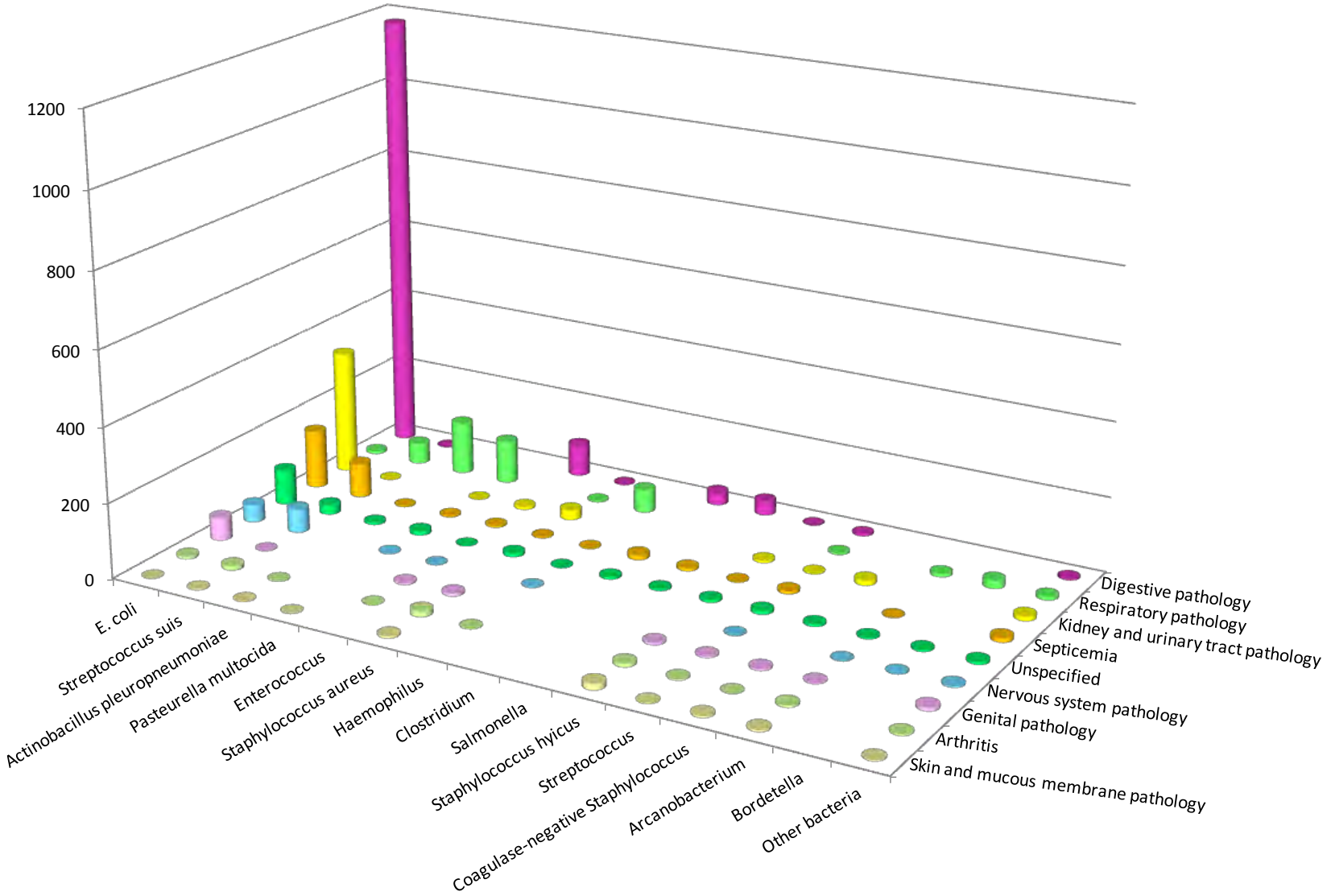


Table 1 - Pigs 2011 – Number of antibiograms by pathology and animal category

Age group or animal species N (%)	**Pathology N *(%)***									
	Digestive pathology	Respiratory pathology	Kidney and urinary tract pathology	Septicemia	Unspecified	Nervous system pathology	Genital pathology	Arthritis	Skin and mucous membrane pathology	**Total N** *(%)*
Piglet	895	120		155	83	56		29	25	**1,363**
	(29.48)	*(3.95)*		*(5.11)*	*(2.73)*	*(1.84)*		*(0.96)*	*(0.82)*	*(44.89)*
Pig	430	293	42	134	101	66	15	36	18	**1,135**
	(14.16)	*(9.65)*	*(1.38)*	*(4.41)*	*(3.33)*	*(2.17)*	*(0.49)*	*(1.19)*	*(0.59)*	*(37.38)*
Sow	26	19	362	20	16	1	82		1	**527**
	(0.86)	*(0.63)*	*(11.92)*	*(0.66)*	*(0.53)*	*(0.03)*	*(2.70)*		*(0.03)*	*(17.36)*
Boar				2			5			**7**
				(0.07)			*(0.16)*			*(0.23)*
Wild boar		2			2					**4**
		(0.07)			*(0.07)*					*(0.13)*
Total N (*%*)	**1,351**	**434**	**404**	**311**	**202**	**123**	**102**	**65**	**44**	**3,036**
	(44.50)	*(14.30)*	*(13.31)*	*(10.24)*	*(6.65)*	*(4.05)*	*(3.36)*	*(2.14)*	*(1.45)*	

Figure 3 - Pigs 2011 – Number of antibiograms by bacteria and pathology



Note: *only values higher than 1% are represented. Detailed values are presented in table 2 below.*

Table 2 - Pigs 2011 – Number of antibiograms by bacteria and pathology

Bacteria N ***(%)***	**Pathology N** ***(%)***									
	Digestive pathology	Respiratory pathology	Kidney and urinary tract pathology	Septicemia	Unspecified	Nervous system pathology	Genital pathology	Arthritis	Skin and mucous membrane pathology	**Total N** *(%)*
E. coli	1,177 *(38.77)*	8 *(0.26)*	332 *(10.94)*	157 *(5.17)*	95 *(3.13)*	47 *(1.55)*	61 *(2.01)*	8 *(0.26)*	1 *(0.03)*	**1,886** ***(62.12)***
Streptococcus suis	1 *(0.03)*	57 *(1.88)*	1 *(0.03)*	93 *(3.06)*	26 *(0.86)*	64 *(2.11)*	1 *(0.03)*	12 *(0.40)*	2 *(0.07)*	**257** ***(8.47)***
Actinobacillus pleuropneumoniae		142 *(4.68)*		2 *(0.07)*	6 *(0.20)*			2 *(0.07)*	2 *(0.07)*	**154** ***(5.07)***
Pasteurella multocida		116 *(3.82)*	1 *(0.03)*	4 *(0.13)*	12 *(0.40)*	2 *(0.07)*			1 *(0.03)*	**136** ***(4.48)***
Enterococcus	87 *(2.87)*		8 *(0.26)*	5 *(0.16)*	1 *(0.03)*	1 *(0.03)*	5 *(0.16)*	1 *(0.03)*		**108** ***(3.56)***
Staphylococcus aureus	2 *(0.07)*	3 *(0.10)*	27 *(0.89)*	3 *(0.10)*	10 *(0.33)*		8 *(0.26)*	16 *(0.53)*	6 *(0.20)*	**75** ***(2.47)***
Haemophilus		63 *(2.08)*		2 *(0.07)*	2 *(0.07)*	2 *(0.07)*		2 *(0.07)*		**71** ***(2.34)***
Clostridium	35 *(1.15)*			14 *(0.46)*	6 *(0.20)*					**55** ***(1.81)***
Salmonella	39 *(1.28)*			8 *(0.26)*	5 *(0.16)*					**52** ***(1.71)***
Staphylococcus hyicus	1 *(0.03)*		6 *(0.20)*	2 *(0.07)*	7 *(0.23)*		6 *(0.20)*	10 *(0.33)*	17 *(0.56)*	**49** ***(1.61)***
Streptococcus	5 *(0.16)*	4 *(0.13)*	2 *(0.07)*	8 *(0.26)*	10 *(0.33)*	1 *(0.03)*	4 *(0.13)*	3 *(0.10)*	2 *(0.07)*	**39** ***(1.28)***
Coagulase-negative Staphylococcus			14 *(0.46)*		6 *(0.20)*		5 *(0.16)*	1 *(0.03)*	5 *(0.16)*	**31** ***(1.02)***
Arcanobacterium		9 *(0.30)*		1 *(0.03)*	4 *(0.13)*	1 *(0.03)*	3 *(0.10)*	6 *(0.20)*	5 *(0.16)*	**29** ***(0.96)***
Bordetella		22 *(0.72)*			5 *(0.16)*	1 *(0.03)*				**28** ***(0.92)***
Actinobacillus		4 *(0.13)*	1 *(0.03)*	3 *(0.10)*	1 *(0.03)*	1 *(0.03)*	1 *(0.03)*	2 *(0.07)*		**13** ***(0.43)***
Pasteurella		3 *(0.10)*	1 *(0.03)*	1 *(0.03)*	1 *(0.03)*	1 *(0.03)*	1 *(0.03)*			**8** ***(0.26)***
Coagulase-unspecified Staphylococcus			2 *(0.07)*	1 *(0.03)*			2 *(0.07)*	1 *(0.03)*	1 *(0.03)*	**7** ***(0.23)***
Erysipelothrix rhusiopathiae				2 *(0.07)*	1 *(0.03)*	2 *(0.07)*		1 *(0.03)*		**6** ***(0.20)***
Klebsiella			2 *(0.07)*	2 *(0.07)*	1 *(0.03)*					**5** ***(0.16)***
Mannheimia		3 *(0.10)*			1 *(0.03)*					**4** ***(0.13)***

Bacteria N ***(%)***	**Pathology N** ***(%)***									**Total N** *(%)*
	Digestive pathology	Respiratory pathology	Kidney and urinary tract pathology	Septicemia	Unspecified	Nervous system pathology	Genital pathology	Arthritis	Skin and mucous membrane pathology	
Coagulase-positive Staphylococcus			3 *(0.10)*	1 *(0.03)*						**4** ***(0.13)***
Corynebacterium							1 *(0.03)*		2 *(0.07)*	**3** ***(0.10)***
Campylobacter	2 *(0.07)*				1 *(0.03)*					**3** ***(0.10)***
Serratia							2 *(0.07)*			**2** ***(0.07)***
Proteus			2 *(0.07)*							**2** ***(0.07)***
Eubacterium				1 *(0.03)*						**1** ***(0.03)***
Arthrobacter	1 *(0.03)*									**1** ***(0.03)***
Actinomyces							1 *(0.03)*			**1** ***(0.03)***
Aerococcus			1 *(0.03)*							**1** ***(0.03)***
Citrobacter				1 *(0.03)*						**1** ***(0.03)***
Yersinia	1 *(0.03)*									**1** ***(0.03)***
Pantoea					1 *(0.03)*					**1** ***(0.03)***
Actinobaculum suis							1 *(0.03)*			**1** ***(0.03)***
Pseudomonas			1 *(0.03)*							**1** ***(0.03)***
Total N (%)	**1,351** *(44.50)*	**434** *(14.30)*	**404** *(13.31)*	**311** *(10.24)*	**202** *(6.65)*	**123** *(4.05)*	**102** *(3.36)*	**65** *(2.14)*	**44** *(1.45)*	**3,036**

Table 3 - Pigs 2011 – all pathologies included – *E. coli*: susceptibility to antibiotics (proportion) (N = 1,886)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*1,857*	**42**
Amoxicillin-Clavulanic ac.	*1,250*	**86**
Cephalexin	*878*	**87**
Cefuroxime	*383*	**96**
Cefoperazone	*345*	**96**
Ceftiofur	*1,880*	**95**
Cefquinome 30 µG	*516*	**97**
Cefoxitin	*939*	**98**
Neomycin	*1,642*	**79**
Apramycin	*1,543*	**83**
Gentamicin 10 UI	*1,687*	**83**
Tetracycline	*1,314*	**21**
Nalidixic ac.	*311*	**68**
Flumequine	*1,242*	**69**
Oxolinic ac.	*1,401*	**66**
Enrofloxacin	*1,766*	**85**
Marbofloxacin	*1,523*	**89**
Danofloxacin	*446*	**86**
Difloxacin	*232*	**76**
Sulfonamides	*100*	**27**
Trimethoprim	*703*	**30**
Trimethoprim-Sulfonamides	*1,861*	**36**

Table 4 - Pigs 2011 – all pathologies included – piglets (post-weaning included) – *E. coli*: susceptibility to antibiotics (proportion) (N = 935)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*917*	**39**
Ceftiofur	*932*	**94**
Neomycin	*854*	**76**
Apramycin	*836*	**78**
Gentamicin 10 UI	*871*	**77**
Tetracycline	*444*	**18**
Flumequine	*617*	**64**
Oxolinic ac.	*816*	**65**
Enrofloxacin	*933*	**85**
Marbofloxacin	*857*	**89**
Trimethoprim-Sulfonamides	*923*	**31**

Table 5 - Pigs 2011 – all pathologies included – sow – *E. coli*: susceptibility to antibiotics (proportion) (N = 388)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*385*	**46**
Ceftiofur	*388*	**98**
Neomycin	*279*	**90**
Apramycin	*241*	**94**
Gentamicin 10 UI	*297*	**93**
Tetracycline	*343*	**27**
Flumequine	*155*	**69**
Oxolinic ac.	*299*	**60**
Enrofloxacin	*299*	**81**
Marbofloxacin	*356*	**87**
Trimethoprim-Sulfonamides	*385*	**43**

Table 6 - Pigs 2011 – all pathologies included – *Actinobacillus pleuropneumoniae*: susceptibility to antibiotics (N = 154)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*151*	**95**
Amoxicillin-Clavulanic ac.	*128*	**100**
Ceftiofur	*150*	**100**
Florfenicol	*151*	**100**
Tetracycline	*150*	**88**
Tilmicosin	*153*	**99**
Enrofloxacin	*149*	**99**
Marbofloxacin	*135*	**100**
Trimethoprim-Sulfonamides	*153*	**89**

Table 7 - Pigs 2011 – all pathologies included – *Pasteurella multocida*: susceptibility to antibiotics (N = 136)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*129*	**97**
Amoxicillin-Clavulanic ac.	*112*	**100**
Ceftiofur	*133*	**100**
Florfenicol	*126*	**100**
Tetracycline	*127*	**87**
Tilmicosin	*126*	**100**
Enrofloxacin	*134*	**100**
Marbofloxacin	*111*	**100**
Trimethoprim-Sulfonamides	*134*	**89**

Table 8 - Pigs 2011 – all pathologies included – *Streptococcus suis*: susceptibility to antibiotics *(*N = 257)

Antibiotic	*Total (N)*	**% S**
Amoxicillin*	*208*	**100**
Streptomycin 500 µG	*173*	**93**
Kanamycin 1000 µG	*143*	**95**
Gentamicin 500 µG	*174*	**99**
Tetracycline	*172*	**27**
Doxycycline	*123*	**32**
Erythromycine	*211*	**33**
Spiramycine	*242*	**31**
Lincomycin	*250*	**34**
Tylosin	*237*	**37**
Trimethoprim-Sulfonamides	*254*	**88**

** With critical values of CA-SFM 2001*

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Annex 6

Poultry

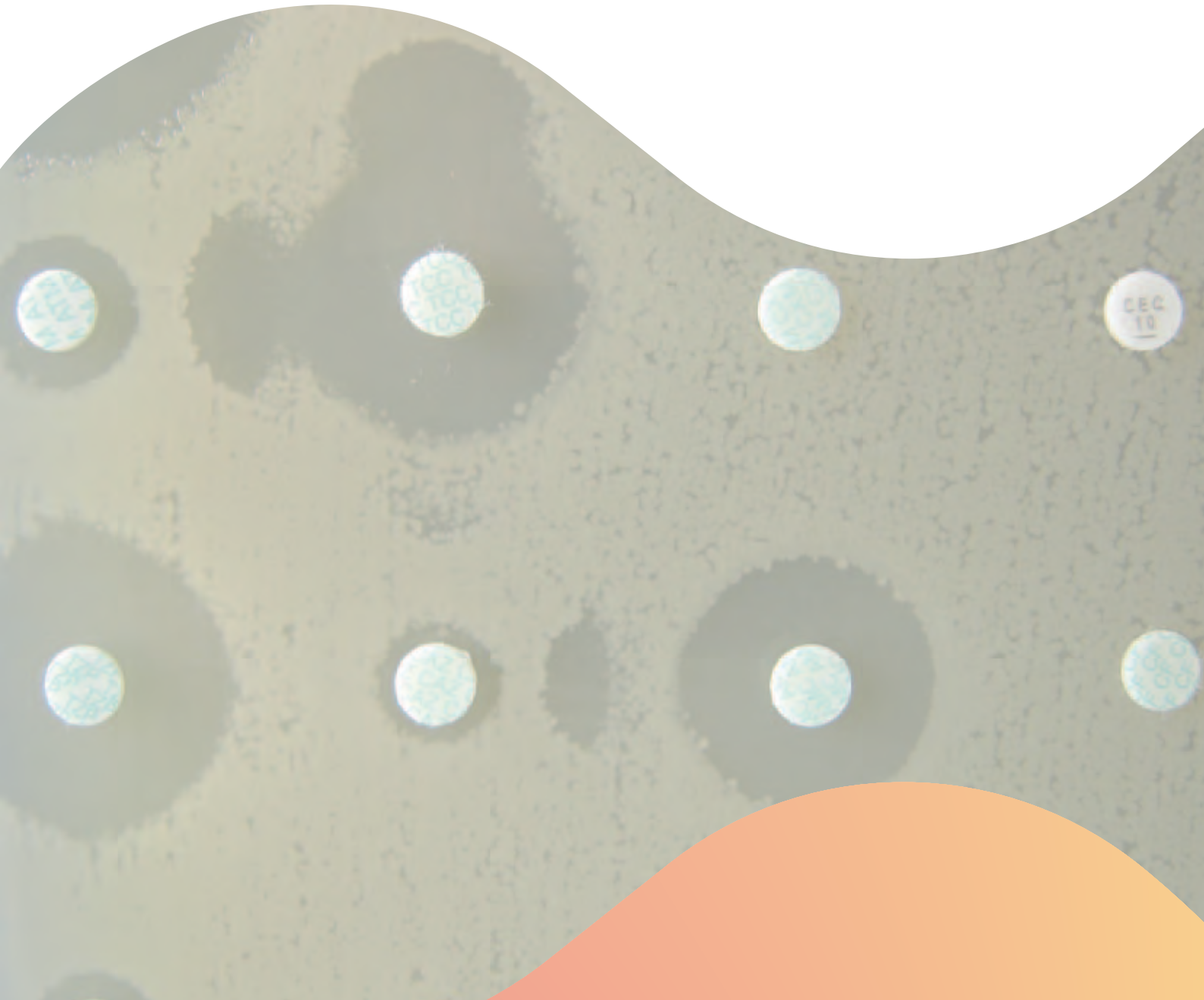
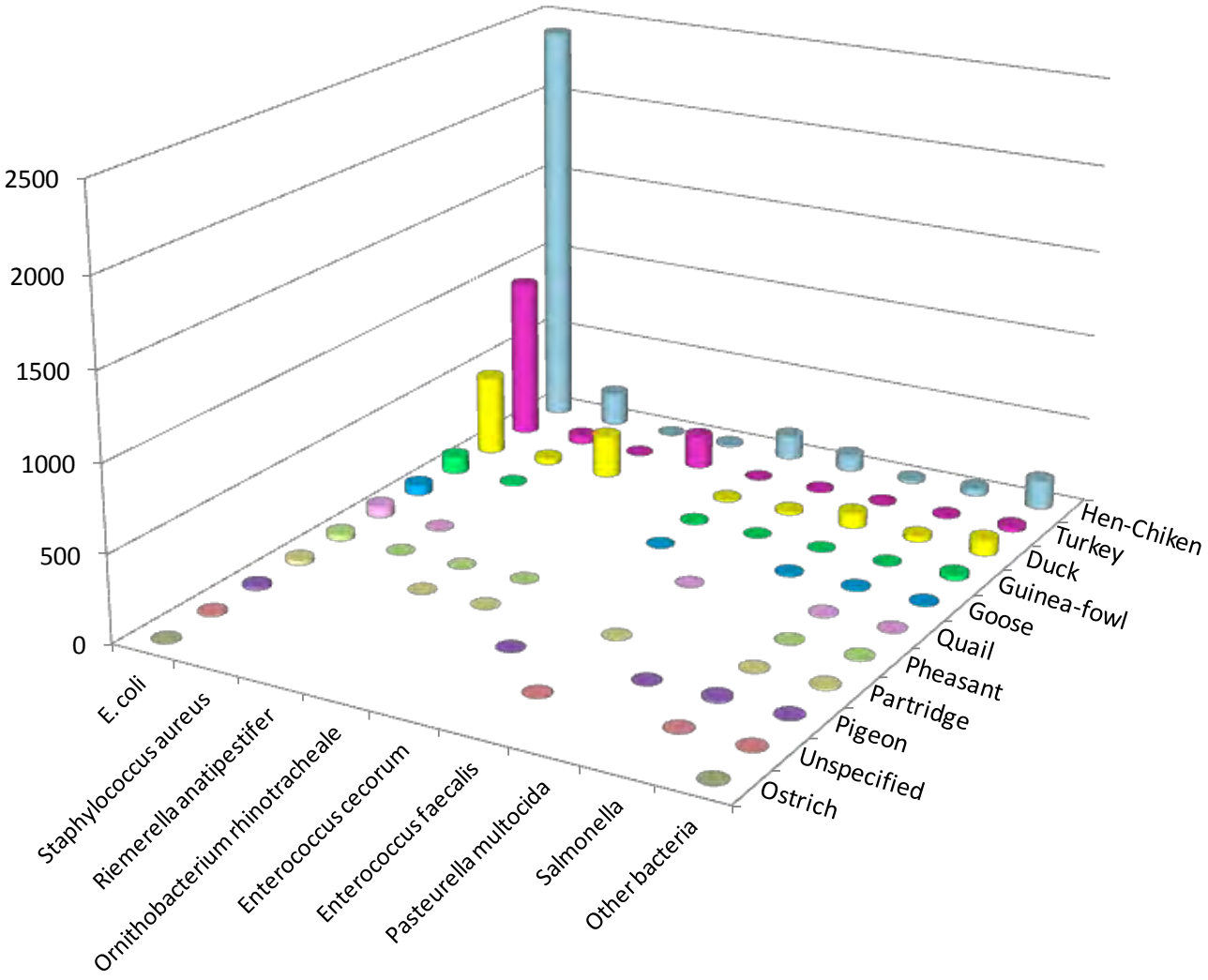


Figure 1 - Poultry 2011 – Number of antibiograms by bacteria and animal



Note: *only values higher than 1% for bacteria. Detailed values are presented in table 1 below.*

Table 1 - Poultry 2011 – Number of antibiograms by bacteria and animal

Bacteria N ***(%)***	**Animal species N** ***(%)***											**Total N** ***(%)***
	Hen-Chicken	Turkey	Duck	Guinea-fowl	Goose	Quail	Pheasant	Partridge	Pigeon	Unspecified	Ostrich	
E. coli	2,410 *(41.57)*	942 *(16.25)*	472 *(8.14)*	102 *(1.76)*	59 *(1.02)*	65 *(1.12)*	38 *(0.66)*	26 *(0.45)*	17 *(0.29)*	10 *(0.17)*	4 *(0.07)*	**4,145** ***(71.49)***
Staphylococcus aureus	195 *(3.36)*	48 *(0.83)*	35 *(0.60)*	8 *(0.14)*		5 *(0.09)*	1 *(0.02)*					**292** ***(5.04)***
Riemerella anatipestifer	1 *(0.02)*	5 *(0.09)*	251 *(4.33)*				1 *(0.02)*	1 *(0.02)*				**259** ***(4.47)***
Ornithobacterium rhinotracheale	12 *(0.21)*	194 *(3.35)*					1 *(0.02)*	2 *(0.03)*				**209** ***(3.60)***
Enterococcus cecorum	142 *(2.45)*	2 *(0.03)*	12 *(0.21)*	9 *(0.16)*	4 *(0.07)*				1 *(0.02)*			**170** ***(2.93)***
Enterococcus faecalis	95 *(1.64)*	8 *(0.14)*	18 *(0.31)*	2 *(0.03)*		1 *(0.02)*		2 *(0.03)*		2 *(0.03)*		**128** ***(2.21)***
Pasteurella multocida	20 *(0.34)*	7 *(0.12)*	88 *(1.52)*	1 *(0.02)*	7 *(0.12)*				1 *(0.02)*			**124** ***(2.14)***
Salmonella	43 *(0.74)*	9 *(0.16)*	30 *(0.52)*	4 *(0.07)*	7 *(0.12)*	7 *(0.12)*	2 *(0.03)*	3 *(0.05)*	14 *(0.24)*	2 *(0.03)*		**121** ***(2.09)***
Pseudomonas	23 *(0.40)*	5 *(0.09)*	4 *(0.07)*	11 *(0.19)*	2 *(0.03)*		2 *(0.03)*	1 *(0.02)*		1 *(0.02)*		**49** ***(0.85)***
Enterococcus	39 *(0.67)*	2 *(0.03)*	5 *(0.09)*	1 *(0.02)*			1 *(0.02)*					**48** ***(0.83)***
Bacillus			40 *(0.69)*									**40** ***(0.69)***
Coagulase-negative Staphylococcus	29 *(0.50)*		1 *(0.02)*			1 *(0.02)*						**31** ***(0.53)***
Klebsiella	10 *(0.17)*	10 *(0.17)*	1 *(0.02)*	3 *(0.05)*		1 *(0.02)*	2 *(0.03)*	1 *(0.02)*		1 *(0.02)*		**29** ***(0.50)***
Mannheimia	19 *(0.33)*		4 *(0.07)*	1 *(0.02)*					3 *(0.05)*		1 *(0.02)*	**28** ***(0.48)***
Erysipelothrix rhusiopathiae	5 *(0.09)*	4 *(0.07)*	9 *(0.16)*	4 *(0.07)*	2 *(0.03)*							**24** ***(0.41)***
Streptococcus	3 *(0.05)*		11 *(0.19)*	1 *(0.02)*	3 *(0.05)*	1 *(0.02)*		1 *(0.02)*		1 *(0.02)*		**21** ***(0.36)***
Clostridium	10 *(0.17)*	2 *(0.03)*		3 *(0.05)*					1 *(0.02)*			**16** ***(0.28)***
Coagulase-positive Staphylococcus	7 *(0.12)*	3 *(0.05)*						3 *(0.05)*				**13** ***(0.22)***
Pasteurella	6 *(0.10)*		2 *(0.03)*						1 *(0.02)*			**9** ***(0.16)***
Staphylococcus hyicus	4 *(0.07)*		2 *(0.03)*	1 *(0.02)*								**7** ***(0.12)***

Bacteria N *(%)*	**Animal species N *(%)***											**Total N *(%)***
	Hen-Chicken	Turkey	Duck	Guinea-fowl	Goose	Quail	Pheasant	Partridge	Pigeon	Unspecified	Ostrich	
Coagulase-unspecified Staphylococcus	4 *(0.07)*		1 *(0.02)*									**5 *(0.09)***
Citrobacter			1 *(0.02)*				1 *(0.02)*	2 *(0.03)*				**4 *(0.07)***
Bordetella	1 *(0.02)*		2 *(0.03)*	1 *(0.02)*								**4 *(0.07)***
Gallibacterium	3 *(0.05)*											**3 *(0.05)***
Campylobacter	1 *(0.02)*			2 *(0.03)*								**3 *(0.05)***
Escherichia fergusonii	1 *(0.02)*		2 *(0.03)*									**3 *(0.05)***
Aeromonas		1 *(0.02)*	1 *(0.02)*	1 *(0.02)*								**3 *(0.05)***
Avibacterium	2 *(0.03)*											**2 *(0.03)***
Yersinia			2 *(0.03)*									**2 *(0.03)***
Riemerella			1 *(0.02)*									**1 *(0.02)***
Sphingomonas			1 *(0.02)*									**1 *(0.02)***
Acinetobacter			1 *(0.02)*									**1 *(0.02)***
Haemophilus	1 *(0.02)*											**1 *(0.02)***
Enterobacter	1 *(0.02)*											**1 *(0.02)***
Moraxella			1 *(0.02)*									**1 *(0.02)***
Total N *(%)*	**3,087 *(53.24)***	**1,242 *(21.42)***	**998 *(17.21)***	**155 *(2.67)***	**84 *(1.45)***	**81 *(1.40)***	**49 *(0.85)***	**42 *(0.72)***	**38 *(0.66)***	**17 *(0.29)***	**5 *(0.09)***	**5,798**

Table 2 - Turkeys 2011 – all pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N = 942)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*935*	**42**
Amoxicillin-Clavulanic ac.	*479*	**79**
Cephalexin	*235*	**80**
Ceftiofur	*903*	**95**
Cefoxitin	*133*	**98**
Neomycin	*543*	**92**
Gentamicin 10 UI	*686*	**97**
Tetracycline	*609*	**26**
Nalidixic ac.	*228*	**71**
Flumequine	*887*	**71**
Oxolinic ac.	*316*	**68**
Enrofloxacin	*940*	**90**
Marbofloxacin	*123*	**91**
Danofloxacin	*162*	**86**
Sulfonamides	*192*	**49**
Trimethoprim	*508*	**76**
Trimethoprim-Sulfonamides	*941*	**74**

Table 3 - Hens and chickens 2011 – all pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N = 2,410)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*2,381*	**47**
Amoxicillin-Clavulanic ac.	*1,555*	**87**
Cefalothin	*1,064*	**78**
Cefoxitin	*346*	**92**
Cefuroxime	*186*	**72**
Ceftiofur	*2,205*	**79**
Cefoperazone	*131*	**69**
Cefquinome 30 µG	*216*	**80**
Neomycin	*1,628*	**97**
Apramycin	*1,199*	**98**
Gentamicin 10 UI	*1,938*	**97**
Tetracycline	*1,850*	**27**
Doxycycline	*294*	**12**
Oxytetracycline	*427*	**28**
Nalidixic ac.	*1,119*	**64**
Flumequine	*2,237*	**65**
Oxolinic ac.	*757*	**63**
Enrofloxacin	*2,400*	**92**
Marbofloxacin	*313*	**98**
Danofloxacin	*232*	**91**
Difloxacin	*128*	**61**
Sulfonamides	*275*	**53**
Trimethoprim	*1,266*	**76**
Trimethoprim-Sulfonamides	*2,402*	**76**

Table 4 - Ducks 2011 – all pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N = 472)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*472*	**41**
Amoxicillin-Ac. clavulanique	*244*	**71**
Cefalothin	*146*	**89**
Ceftiofur	*459*	**99**
Neomycin	*250*	**98**
Gentamicin 10 UI	*433*	**97**
Tetracycline	*436*	**13**
Nalidixic ac.	*216*	**87**
Flumequine	*458*	**79**
Oxolinic ac.	*261*	**79**
Enrofloxacin	*469*	**94**
Danofloxacin	*205*	**91**
Trimethoprim	*306*	**56**
Trimethoprim-Sulfonamides	*471*	**54**

Table 5 - Guineafowl 2011 – all pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N = 102)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*102*	**40**
Ceftiofur	*91*	**91**
Gentamicin 10 UI	*72*	**99**
Tetracycline	*91*	**23**
Flumequine	*96*	**63**
Enrofloxacin	*100*	**95**
Trimethoprim-Sulfonamides	*101*	**47**

Table 6 - Hens and chickens 2011 – all pathologies included - *Staphylococcus aureus*: susceptibility to antibiotics (proportion) (N = 195)

Antibiotic	*Total (N)*	**% S**
Penicilline G	*98*	**61**
Neomycin	*100*	**100**
Gentamicin 10 UI	*111*	**98**
Tetracycline	*138*	**45**
Erythromycin	*133*	**83**
Spiramycin	*119*	**86**
Lincomycin	*138*	**81**
Tylosin	*102*	**91**
Tilmicosin	*111*	**88**
Tiamulin	*124*	**97**
Enrofloxacin	*195*	**89**
Trimethoprim-Sulfonamides	*171*	**99**

Table 7 - Hens and chickens 2011 – all pathologies included – *Enterococcus cecorum:* susceptibility to antibiotics (proportion) (N = 142)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*141*	**99**
Tetracycline	*100*	**7**
Erythromycin	*100*	**44**
Lincomycin	*101*	**49**
Trimethoprim-Sulfonamides	*142*	**57**

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Annex 7

Rabbits

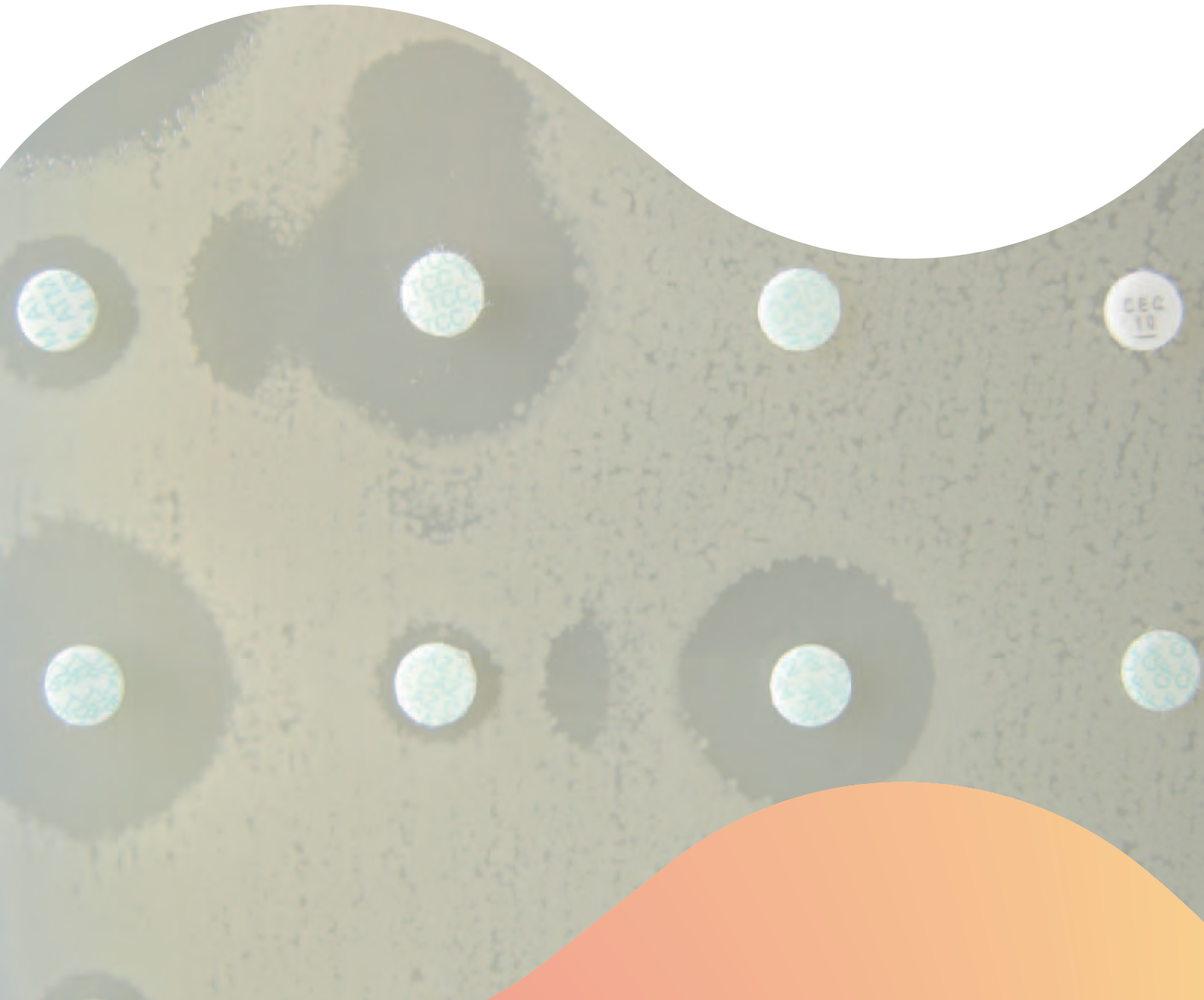
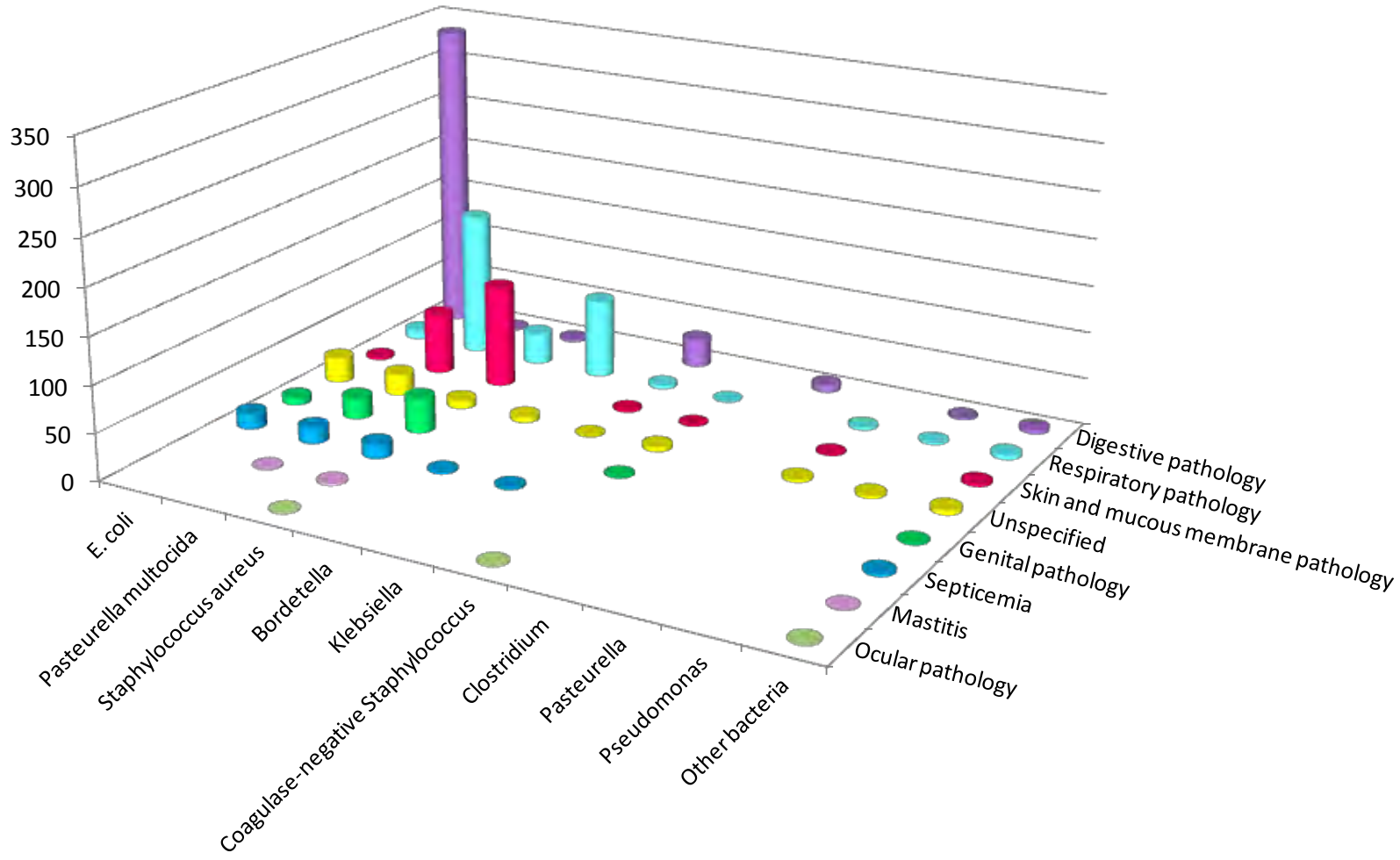


Figure 1 - Rabbits 2011 – Number of antibiograms by bacteria and pathology



Note: *only values higher than 1% for bacteria. Detailed values are presented in table 1 below.*

Table 1 - Rabbits 2011 – Number of antibiograms by bacteria and pathology

Bacteria N *(%)*	**Pathology N *(%)***								**Total N *(%)***
	Digestive pathology	Respiratory pathology	Skin and mucous membrane pathology	Unspecified	Genital pathology	Septicemia	Mastitis	Ocular pathology	
E. coli	335 *(30.88)*	10 *(0.92)*	3 *(0.28)*	27 *(2.49)*	8 *(0.74)*	17 *1.57)*			**400 *(36.87)***
Pasteurella multocida	2 *(0.18)*	154 *(14.19)*	66 *(6.08)*	23 *(2.12)*	23 *(2.12)*	17 *(1.57)*	1 *(0.09)*		**286 *(26.36)***
Staphylococcus aureus	3 *(0.28)*	34 *(3.13)*	110 *(10.14)*	9 *(0.83)*	38 *(3.50)*	15 *(1.38)*	2 *(0.18)*	1 *(0.09)*	**212 *(19.54)***
Bordetella		85 *(7.83)*		6 *(0.55)*		2 *(0.18)*			**93 *(8.57)***
Klebsiella	31 *(2.86)*	4 *(0.37)*	2 *(0.18)*	1 *(0.09)*		2 *(0.18)*			**40 *(3.69)***
Coagulase-negative Staphylococcus		1 *(0.09)*	1 *(0.09)*	5 *(0.46)*	1 *(0.09)*			1 *(0.09)*	**9 *(0.83)***
Clostridium	8 *(0.74)*								**8 *(0.74)***
Pasteurella		3 *(0.28)*	1 *(0.09)*	3 *(0.28)*					**7 *(0.65)***
Pseudomonas	2 *(0.18)*	2 *(0.18)*		3 *(0.28)*					**7 *(0.65)***
Enterobacter	2 *(0.18)*	1 *(0.09)*							**3 *(0.28)***
Salmonella						3 *(0.28)*			**3 *(0.28)***
Streptococcus			1 *(0.09)*	1 *(0.09)*					**2 *(0.18)***
Enterococcus	2 *(0.18)*								**2 *(0.18)***
Coagulase-unspecified Staphylococcus		1 *(0.09)*	1 *(0.09)*						**2 *(0.18)***
Mannheimia		2 *(0.18)*							**2 *(0.18)***
Escherichia fergusonii				1 *(0.09)*					**1 *(0.09)***
Citrobacter				1 *(0.09)*					**1 *(0.09)***
Coagulase-positive Staphylococcus				1 *(0.09)*					**1 *(0.09)***

Bacteria N *(%)*	**Pathology N *(%)***								**Total N *(%)***
	Digestive pathology	Respiratory pathology	Skin and mucous membrane pathology	Unspecified	Genital pathology	Septicemia	Mastitis	Ocular pathology	
Achromobacter								1 *(0.09)*	**1 *(0.09)***
Raoultella	1 *(0.09)*								**1 *(0.09)***
Staphylococcus hyicus			1 *(0.09)*						**1 *(0.09)***
Moraxella		1 *(0.09)*							**1 *(0.09)***
Bacillus				1 *(0.09)*					**1 *(0.09)***
Arcanobacterium					1 *(0.09)*				**1 *(0.09)***
Total N (%)	***386 (35.58)***	***298 (27.47)***	***186 (17.14)***	***82 (7.56)***	***71 (6.54)***	***56 (5.16)***	***3 (0.28)***	***3 (0.28)***	**1,085**

Table 2 - Rabbits 2011 - all pathologies included - *E. coli*: susceptibility to antibiotics (proportion) (N = 400)

Antibiotic	*Total (N)*	**% S**
Ceftiofur	*207*	**99**
Streptomycin 10 UI	*212*	**36**
Neomycin	*384*	**73**
Apramycin	*356*	**81**
Gentamicin 10 UI	*398*	**84**
Tetracycline	*390*	**14**
Doxycycline	*282*	**9**
Flumequine	*198*	**68**
Ac. oxolinique	*230*	**57**
Enrofloxacin	*395*	**89**
Danofloxacin	*153*	**84**
Trimethoprim-Sulfonamides	*392*	**21**

Table 3 - Rabbits 2011 – all pathologies included - *Pasteurella multocida*: susceptibility to antibiotics (proportion (N = 286)

Antibiotic	*Total (N)*	**% S**
Ceftiofur	*152*	**100**
Streptomycin 10 UI	*148*	**73**
Gentamicin 10 UI	*237*	**98**
Tetracycline	*271*	**99**
Doxycycline	*252*	**96**
Tilmicosin	*271*	**99**
Tiamulin	*256*	**67**
Trimethoprim-Sulfonamides	*280*	**93**
Flumequine	*126*	**99**
Enrofloxacin	*282*	**99**
Danofloxacin	*121*	**100**

Table 4 - Rabbits 2011 – all pathologies included - *Staphylococcus aureus*: susceptibility to antibiotics (proportion) (N = 212)

Antibiotic	*Total (N)*	**% S**
Penicilline G	*118*	**86**
Gentamicin 10 UI	*212*	**46**
Tetracycline	*209*	**39**
Doxycycline	*192*	**54**
Erythromycine	*140*	**44**
Spiramycine	*211*	**43**
Tilmicosin	*202*	**53**
Tiamulin	*208*	**95**
Enrofloxacin	*211*	**88**
Trimethoprim-Sulfonamides	*209*	**51**

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Annex 8

Fish

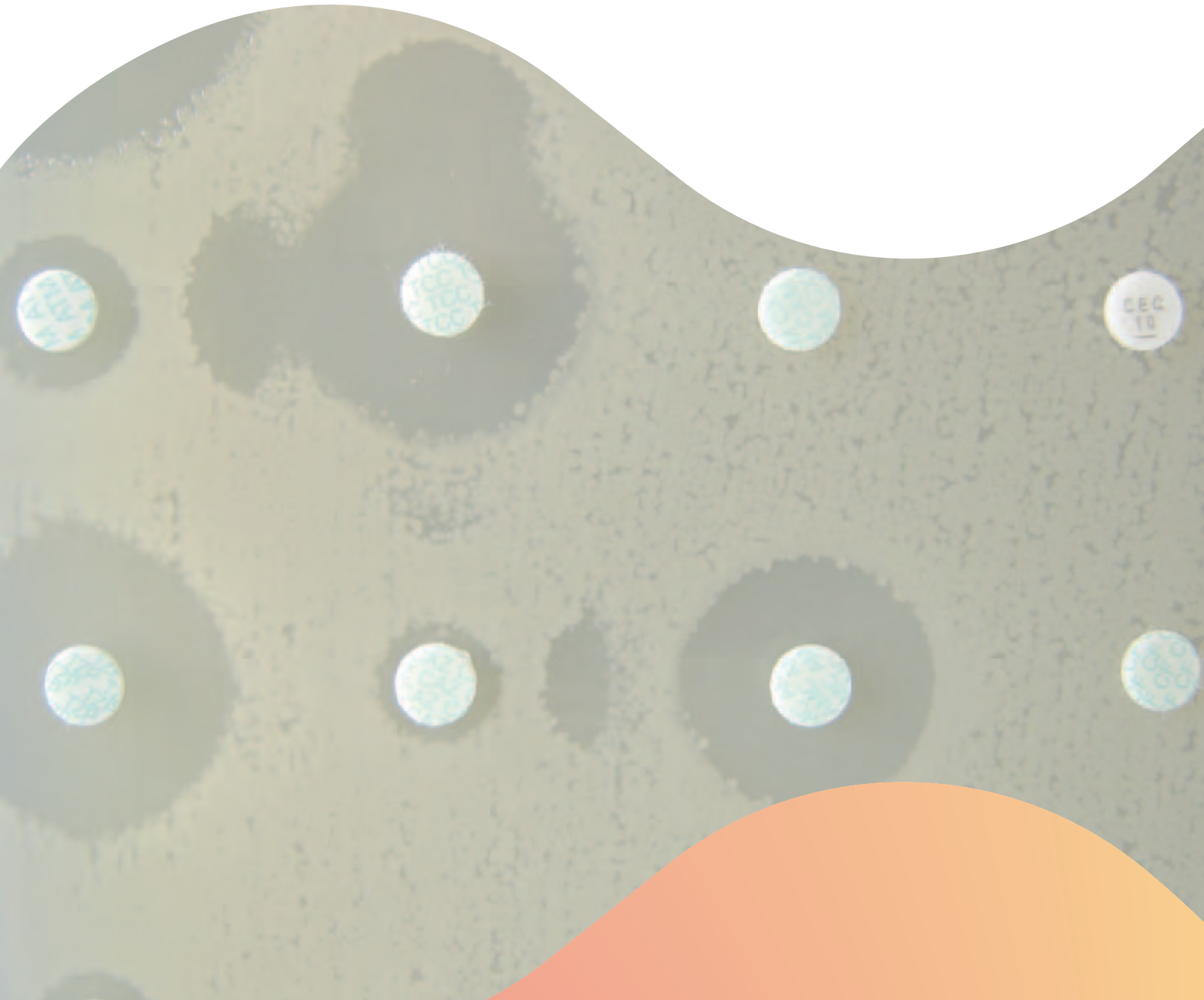

Figure 1- Fish 2011 – Antibiogram proportions by animal species

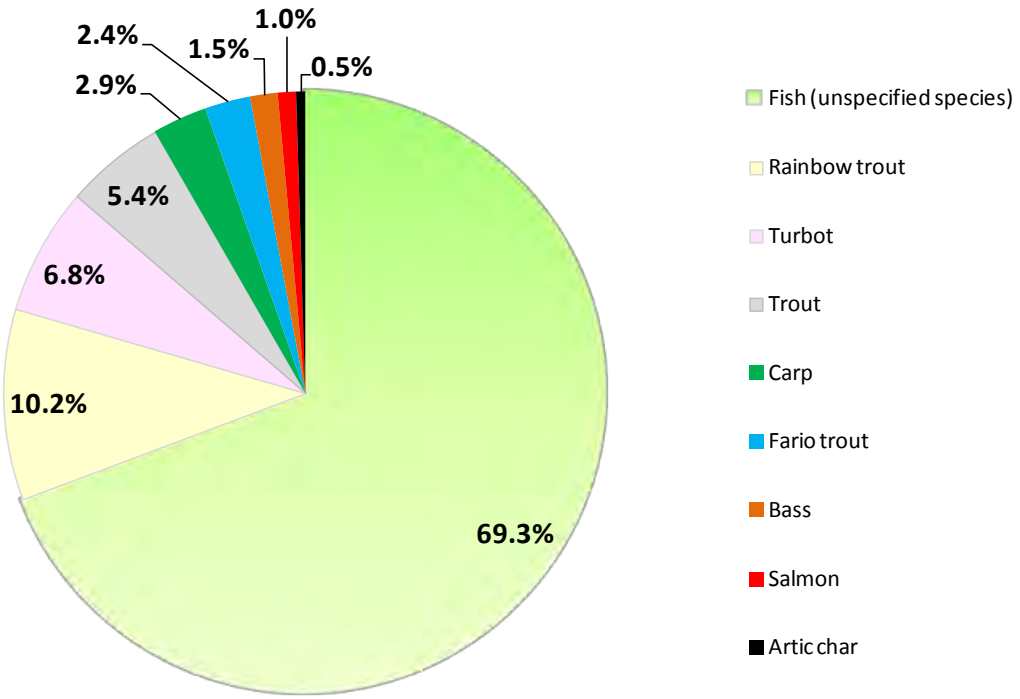

Table 1- Fish 2011 – Number of antibiograms by bacteria and pathology

Bacteria N *(%)*	**Pathology N *(%)***			**Total N *(%)***
	Unspecified	Septicemia	Skin and mucous membrane pathology	
Aeromonas	66 *(32.20)*	12 *(5.85)*		**78** ***(38.05)***
Yersinia ruckeri	42 *(20.49)*			**42** ***(20.49)***
Vagococcus	26 *(12.68)*			**26** ***(12.68)***
Carnobacterium	11 *(5.37)*			**11** ***(5.37)***
Pseudomonas	8 *(3.90)*	1 *(0.49)*	1 *(0.49)*	**10** ***(4.88)***
Vibrio	5 *(2.44)*	2 *(0.98)*		**7** ***(3.41)***
Flavobacterium	6 *(2.93)*			**6** ***(2.93)***
Edwardsiella tarda	4 *(1.95)*	2 *(0.98)*		**6** ***(2.93)***
Lactococcus	3 *(1.46)*			**3** ***(1.46)***
Serratia	3 *(1.46)*			**3** ***(1.46)***

Bacteria N *(%)*	Pathology N *(%)*			Total N *(%)*
	Unspecified	Septicemia	Skin and mucous membrane pathology	
Plesiomonas shigelloides	3 *(1.46)*			**3** ***(1.46)***
Streptococcus	2 *(0.98)*			**2** ***(0.98)***
Shewanella putrefaciens	2 *(0.98)*			**2** ***(0.98)***
Enterococcus	1 *(0.49)*			**1** ***(0.49)***
Citrobacter	1 *(0.49)*			**1** ***(0.49)***
Hafnia alvei	1 *(0.49)*			**1** ***(0.49)***
Photobacterium	1 *(0.49)*			**1** ***(0.49)***
Chryseobacterium	1 *(0.49)*			**1** ***(0.49)***
Enterobacter	1 *(0.49)*			**1** ***(0.49)***
Total N (%)	**187** ***(91.22)***	**17** ***(8.29)***	**1** ***(0.49)***	**205**

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Annex 9

Horses

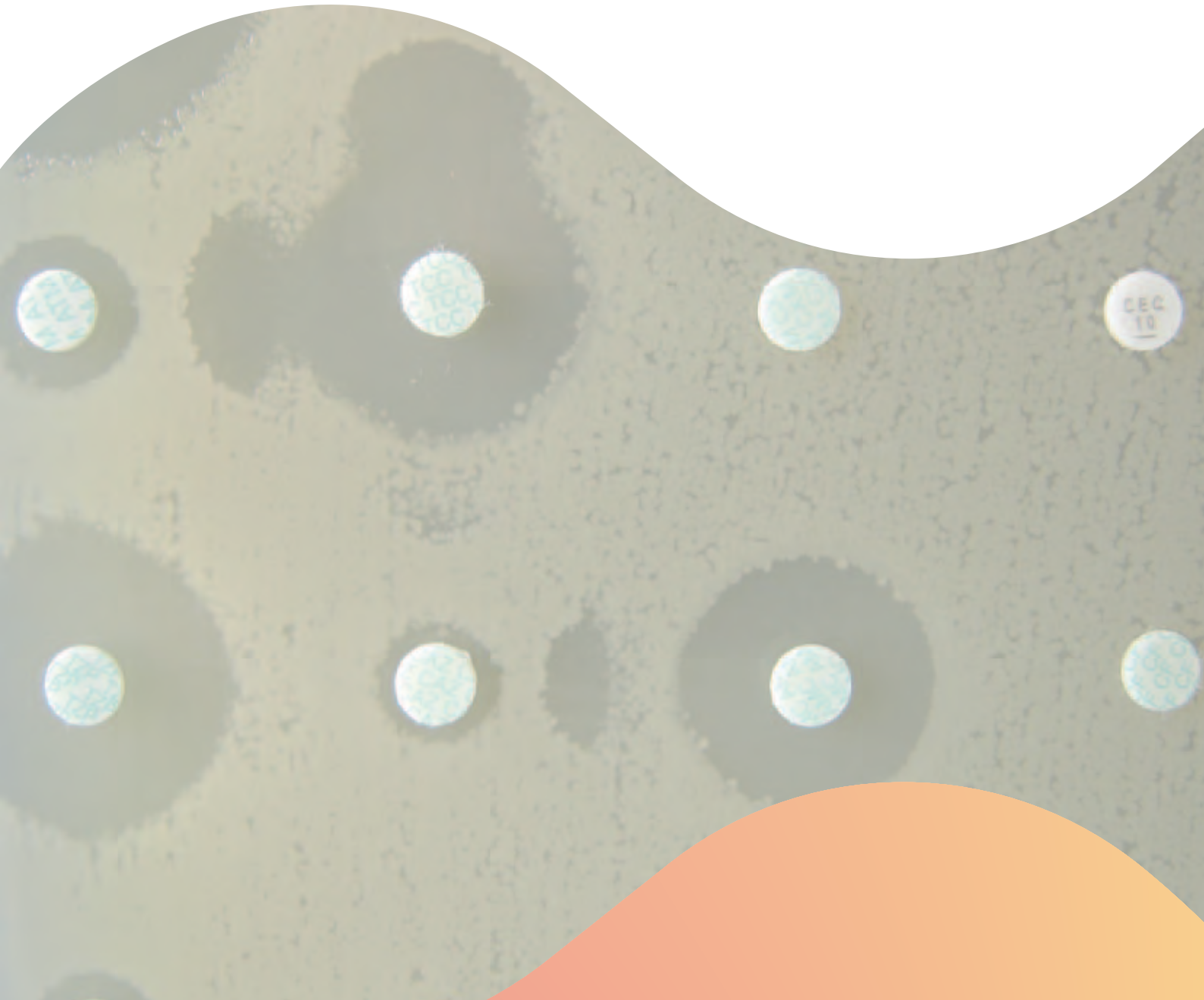


Figure 1- Horses 2011 – Number of antibiograms by age group and pathology

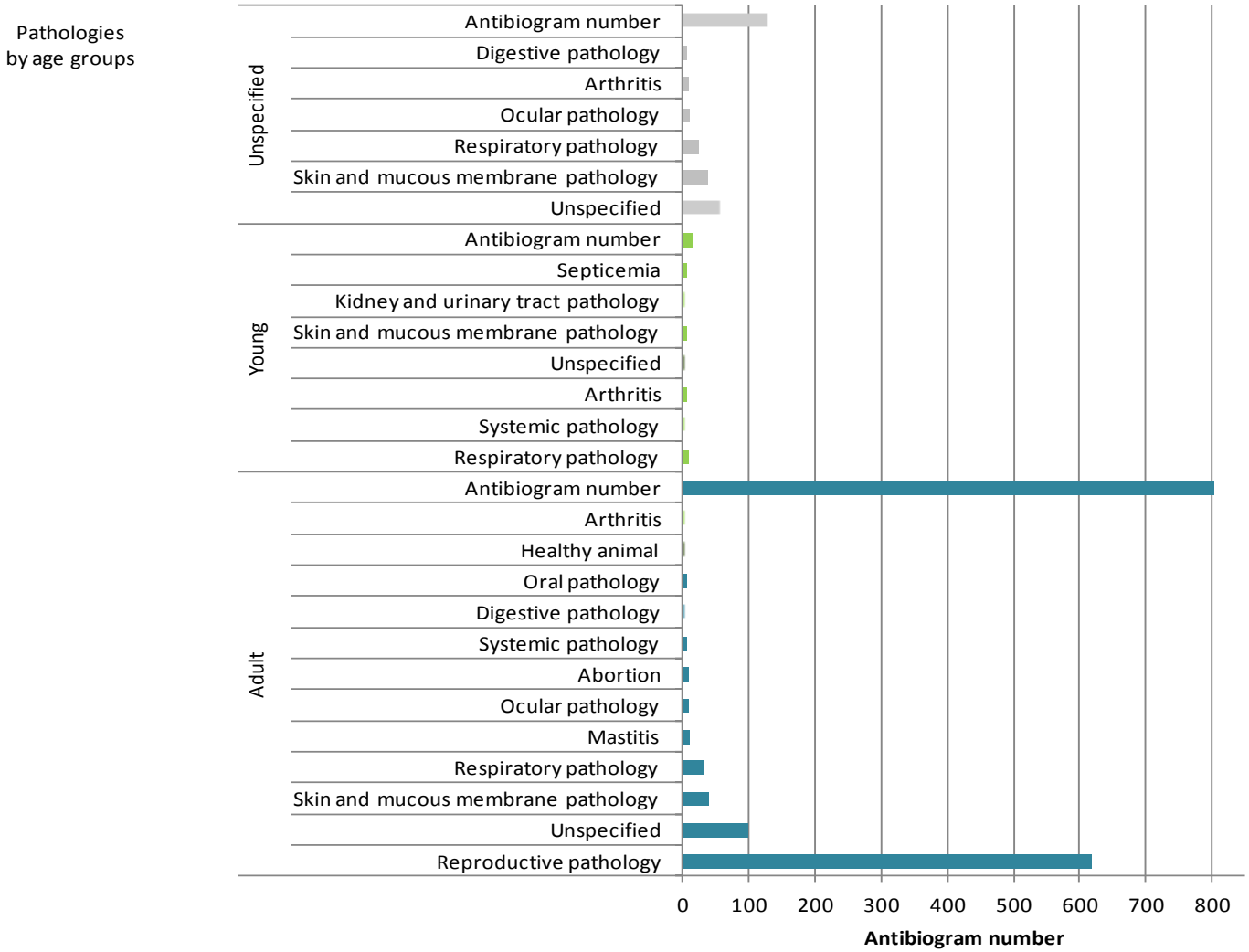
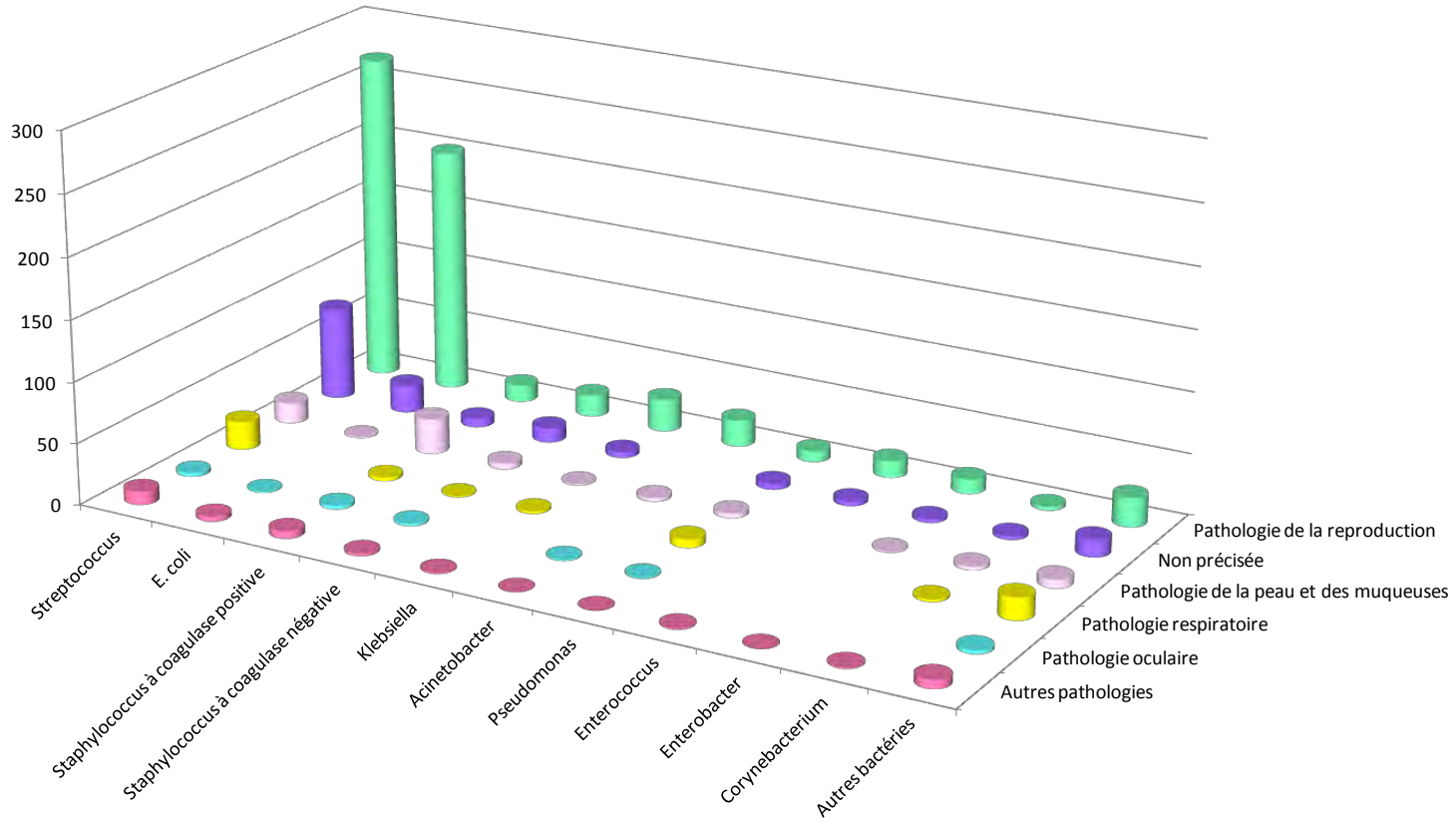


Table 1- Horses 2011 – Number of antibiograms by age group and pathology

Age group N *(%)*	**Pathology N *(%)***														
	Reproductive pathology	Unspecified	Skin and mucous membrane pathology	Respiratory pathology	Ocular pathology	Mastitis	Arthritis	Digestive pathology	Abortion	Systemic pathology	Bone pathology	Kidney and urinary tract pathology	Healthy carriage	Septicemia	**Total N *(%)***
Adult	615 *(65.4)*	96 *(10.2)*	36 *(3.8)*	29 *(3.1)*	6 *(0.6)*	7 *(0.7)*	1 *(0.1)*	2 *(0.2)*	5 *(0.5)*	2 *(0.2)*	2 *(0.2)*		1 *(0.1)*		**802** ***(85.2)***
Young		1 *(0.1)*	1 *(0.1)*	5 *(0.5)*			2 *(0.2)*			2 *(0.2)*		1 *(0.1)*		1 *(0.1)*	**13** ***(1.4)***
Unspecified		55 *(5.8)*	34 *(3.6)*	22 *(2.3)*	8 *(0.9)*		4 *(0.4)*	3 *(0.3)*							**126** ***(13.4)***
Total N *(%)*	**615** ***(65.4)***	**152** ***(16.2)***	**71** ***(7.5)***	**56** ***(6.0)***	**14** ***(1.5)***	**7** ***(0.7)***	**7** ***(0.7)***	**5** ***(0.5)***	**5** ***(0.5)***	**4** ***(0.4)***	**2** ***(0.2)***	**1** ***(0.1)***	**1** ***(0.1)***	**1** ***(0.1)***	**941** ***(100)***

Figure 2- Horses 2011 – Number of antibiograms by bacteria group and pathology



Note: *only values higher than 1% for bacteria groups and pathologies are represented. Detailed values are presented in table 2 below.*

Table 2- Horses 2011 – Number of antibiograms by bacteria group and pathology

Bacteria N (%)	**Pathology N (%)**														
	Reproductive pathology	Unspecified	Skin and mucous membrane pathology	Respiratory pathology	Ocular pathology	Arthritis	Mastitis	Digestive pathology	Abortion	Systemic pathology	Bone pathology	Healthy carriage	Septicemia	Kidney and urinary tract pathology	**Total N *(%)***
Streptococcus	*270* *(28.7)*	*76* *(8.1)*	*17* *(1.8)*	*23* *(2.4)*	*3* *(0.3)*	*2* *(0.2)*	*3* *(0.3)*	*1* *(0.1)*	*3* *(0.3)*	*1* *(0.1)*		*1* *(0.1)*			***400*** ***(42.5)***
E. coli	*202* *(21.5)*	*23* *(2.4)*	*1* *(0.1)*		*1* *(0.1)*	*1* *(0.1)*				*2* *(0.2)*				*1* *(0.1)*	***231*** ***(24.5)***
Coagulase-positive Staphylococcus	*14* *(1.5)*	*7* *(0.7)*	*29* *(3.1)*	*3* *(0.3)*	*3* *(0.3)*	*2* *(0.2)*	*4* *(0.4)*								***62*** ***(6.6)***
Coagulase-negative Staphylococcus	*18* *(1.9)*	*12* *(1.3)*	*5* *(0.5)*	*1* *(0.1)*	*2* *(0.2)*	*2* *(0.2)*									***40*** ***(4.3)***
Klebsiella	*27* *(2.9)*	*5* *(0.5)*	*1* *(0.1)*	*2* *(0.2)*									*1* *(0.1)*		***36*** ***(3.8)***
Acinetobacter	*22* *(2.3)*		*3* *(0.3)*		*1* *(0.1)*										***26*** ***(2.8)***
Pseudomonas	*9* *(1)*	*5* *(0.5)*	*4* *(0.4)*	*7* *(0.7)*	*1* *(0.1)*										***26*** ***(2.8)***
Enterococcus	*14* *(1.5)*	*4* *(0.4)*						*1* *(0.1)*							***19*** ***(2)***
Enterobacter	*12* *(1.3)*	*3* *(0.3)*	*1* *(0.1)*												***16*** ***(1.7)***
Corynebacterium	*3* *(0.3)*	*3* *(0.3)*	*3* *(0.3)*	*2* *(0.2)*							*1* *(0.1)*				***12*** ***(1.3)***
Pantoea	*4* *(0.4)*	*1* *(0.1)*	*1* *(0.1)*	*1* *(0.1)*	*1* *(0.1)*										***8*** ***(0.9)***
Pasteurella		*1* *(0.1)*	*1* *(0.1)*	*5* *(0.5)*											***7*** ***(0.7)***
Actinobacillus		*4* *(0.4)*		*2* *(0.2)*											***6*** ***(0.6)***
Alcaligenes	*1* *(0.1)*			*4* *(0.4)*											***5*** ***(0.5)***
Burkholderia	*2* *(0.2)*		*1* *(0.1)*		*1* *(0.1)*										***4*** ***(0.4)***
Salmonella								*3*	*1*						***4***

Bacteria N (%)	Pathology N (%)														Total N (%)
	Reproductive pathology	Unspecified	Skin and mucous membrane pathology	Respiratory pathology	Ocular pathology	Arthritis	Mastitis	Digestive pathology	Abortion	Systemic pathology	Bone pathology	Healthy carriage	Septicemia	Kidney and urinary tract pathology	
								(0.3)	*(0.1)*						***(0.4)***
Proteus	*2 (0.2)*	*1 (0.1)*													***3 (0.3)***
Aeromonas	*2 (0.2)*			*1 (0.1)*											***3 (0.3)***
Aerococcus	*1 (0.1)*		*1 (0.1)*	*1 (0.1)*											***3 (0.3)***
Citrobacter	*2 (0.2)*								*1 (0.1)*						***3 (0.3)***
Moraxella	*1 (0.1)*	*1 (0.1)*													***2 (0.2)***
Rahnella	*2 (0.2)*														***2 (0.2)***
Morganella			*1 (0.1)*								*1 (0.1)*				***2 (0.2)***
Arcanobacterium		*2 (0.2)*													***2 (0.2)***
Serratia	*1 (0.1)*	*1 (0.1)*													***2 (0.2)***
Bacillus		*1 (0.1)*			*1 (0.1)*										***2 (0.2)***
Providencia	*1 (0.1)*			*1 (0.1)*											***2 (0.2)***
Chryseobacterium	*2 (0.2)*														***2 (0.2)***
Raoultella	*1 (0.1)*														***1 (0.1)***
Bordetella				*1 (0.1)*											***1 (0.1)***
Shigella		*1 (0.1)*													***1 (0.1)***
Clostridium										*1 (0.1)*					***1 (0.1)***
Coagulase-unspecified			*1*												***1***

Bacteria N (%)	**Pathology N (%)**														**Total N *(%)***
	Reproductive pathology	Unspecified	Skin and mucous membrane pathology	Respiratory pathology	Ocular pathology	Arthritis	Mastitis	Digestive pathology	Abortion	Systemic pathology	Bone pathology	Healthy carriage	Septicemia	Kidney and urinary tract pathology	
Staphylococcus			*(0.1)*												***(0.1)***
Arthrobacter	*1 (0.1)*														***1 (0.1)***
Rhodococcus				*1 (0.1)*											***1 (0.1)***
Micrococcus	*1 (0.1)*														***1 (0.1)***
Vibrio				*1 (0.1)*											***1 (0.1)***
E. hermanii			*1 (0.1)*												***1 (0.1)***
Lactococcus		*1 (0.1)*													***1 (0.1)***
Total N *(%)*	***615 (65.4)***	***152 (16.2)***	***71 (7.5)***	***56 (6.0)***	***14 (1.5)***	***7 (0.7)***	***7 (0.7)***	***5 (0.5)***	***5 (0.5)***	***4 (0.4)***	***2 (0.2)***	***1 (0.1)***	***1 (0.1)***	***1 (0.1)***	***941***

Table 3 - Horses 2011 – Reproductive pathology - All age groups included – All *Streptococcus*: susceptibility to antibiotics (proportion) (N =270)

Antibiotic	*Total (N)*	**% S**
Oxacillin	*201*	**98**
Ceftiofur	*144*	**100**
Streptomycin 500 µg	*129*	**92**
Kanamycin 1000 µg	*121*	**92**
Gentamicin 500 µg	*128*	**100**
Tetracycline	*130*	**52**
Erythromycin	*267*	**88**
Spiramycin	*266*	**91**
Tylosin	*53*	**92**
Lincomycin	*130*	**96**
Enrofloxacin	*268*	**54**
Marbofloxacin	*230*	**87**
Rifampicin	*203*	**83**
Trimethoprim-Sulfonamides	*270*	**87**

Table 4 - Horses 2011 – Reproductive pathology - All age groups included – All *E. coli*: susceptibility to antibiotics (proportion) (N =202)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*196*	**77**
Amoxicillin-Clavulanic ac.	*202*	**86**
Cefalothin	*42*	**93**
Cephalexin	*48*	**92**
Cefoxitin	*56*	**100**
Cefuroxime	*45*	**93**
Cefepime	*33*	**97**
Cefoperazone	*50*	**92**
Ceftiofur	*202*	**96**
Cefquinome 30 µg	*202*	**96**
Streptomycin 10 UI	*55*	**80**
Kanamycin 30 UI	*196*	**96**
Gentamicin 10 UI	*202*	**96**
Neomycin	*199*	**96**
Amikacine	*145*	**100**
Tetracycline	*57*	**84**
Florfenicol	*54*	**96**
Nalidixic ac.	*46*	**100**
Oxolinic ac.	*146*	**99**
Flumequine	*156*	**98**
Enrofloxacin	*198*	**100**
Marbofloxacin	*202*	**100**
Danofloxacin	*48*	**100**
Rifampicin	*145*	**32**
Trimethoprim	*33*	**85**
Trimethoprim-Sulfonamides	*202*	**77**
Sulfonamides	*33*	**85**

Table 5 - Horses 2011 – All pathologies and age groups included – All Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N =62)

Antibiotic	*Total (N)*	**% S**
Penicillin	*60*	**67**
Cefoxitin	*49*	**80**
Streptomycin 10 UI	*44*	**82**
Kanamycin 30 UI	*44*	**77**
Gentamicin 10 UI	*58*	**81**
Tetracycline	*51*	**82**
Florfenicol	*30*	**97**
Erythromycin	*57*	**91**
Spiramycin	*56*	**98**
Lincomycin	*51*	**96**
Enrofloxacin	*52*	**92**
Marbofloxacin	*44*	**91**
Trimethoprim-Sulfonamides	*62*	**90**

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Annex 10

Dogs

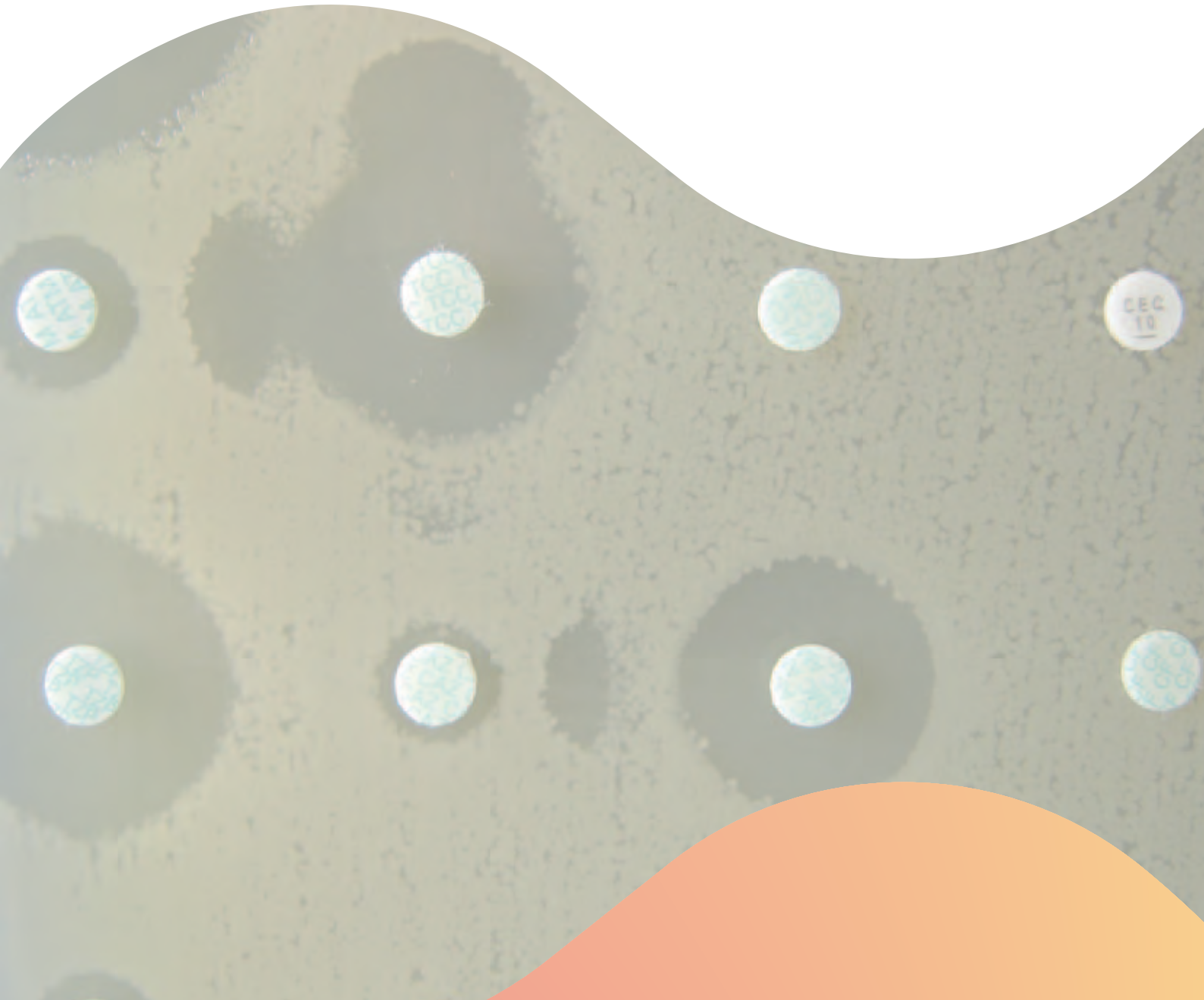


Figure 1- Dogs 2011 – Number of antibiograms by age group and pathology

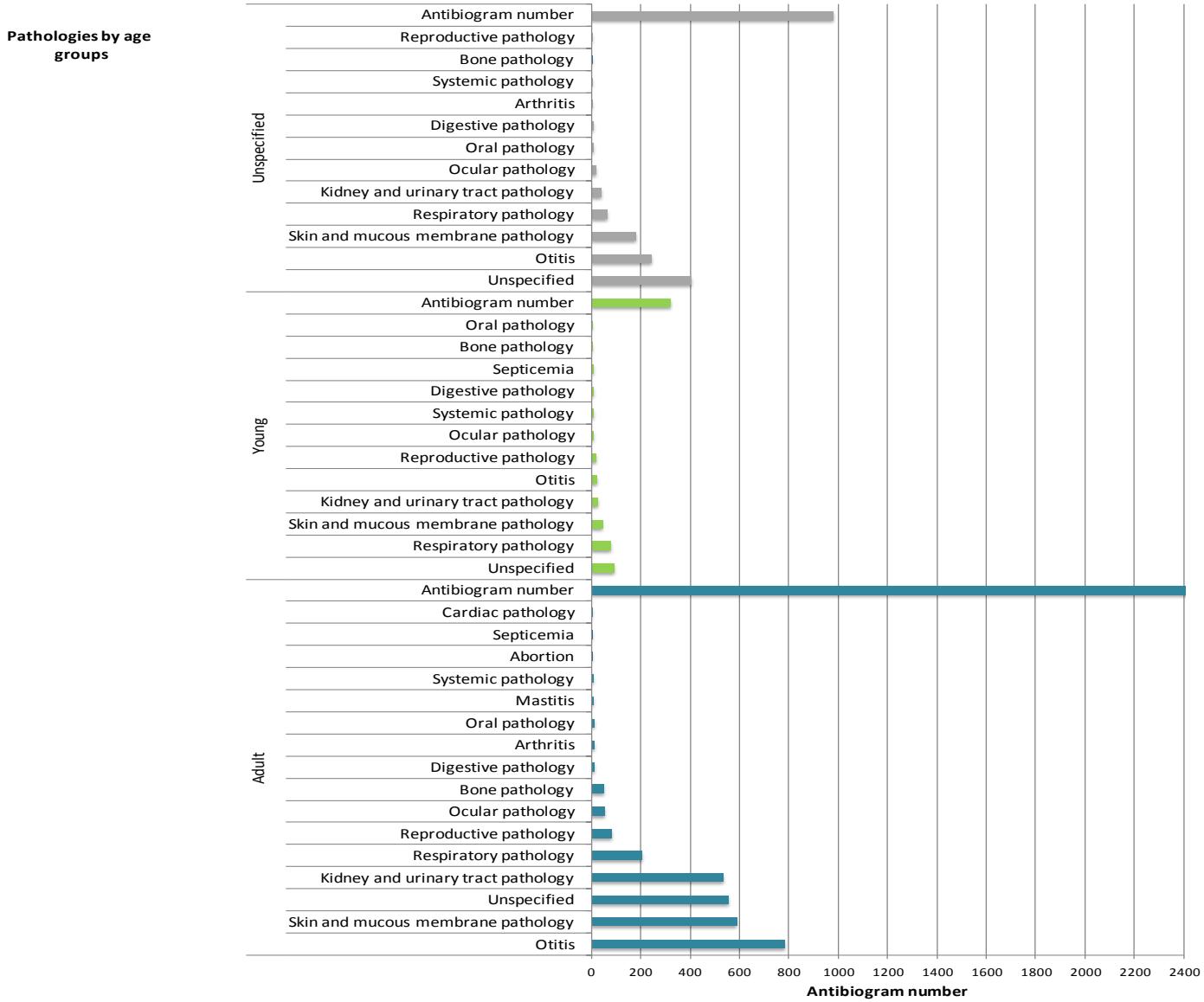
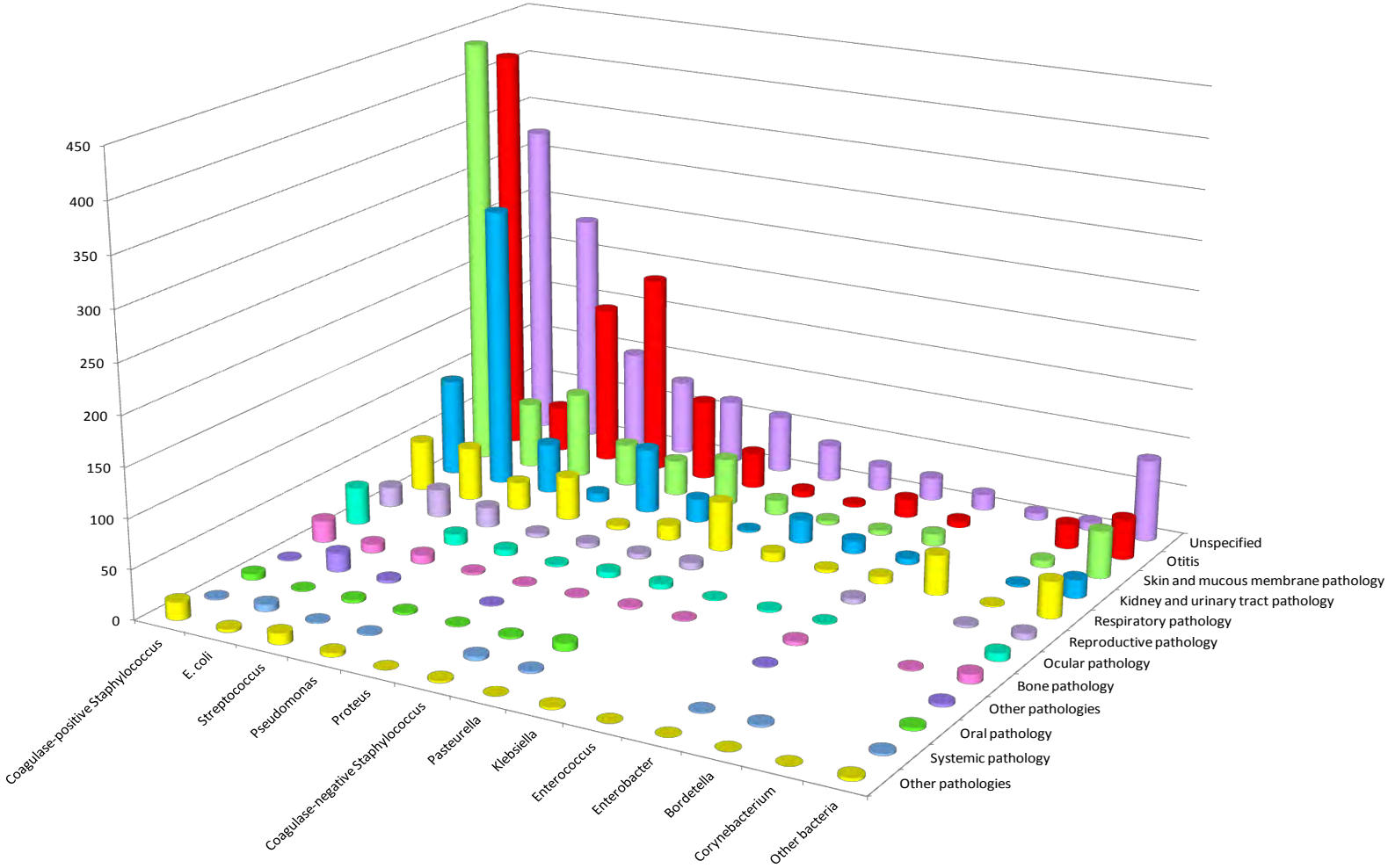


Table 1- Dogs 2011 – Number of antibiograms by age group and pathology

	Pathology N *(%)*																
Age group N *(%)*	Unspecified	Otitis	Skin and mucous membrane pathology	Kidney and urinary tract pathology	Respiratory pathology	Reproductive pathology	Ocular pathology	Bone pathology	Digestive pathology	Oral pathology	Systemic pathology	Arthritis	Mastitis	Septicemia	Abortion	Cardiac pathology	**Total N *(%)***
Adult	558 *(13.22)*	782 *(18.53)*	589 *(13.95)*	535 *(12.67)*	205 *(4.86)*	83 *(1.97)*	54 *(1.28)*	52 *(1.23)*	14 *(0.33)*	12 *(0.28)*	9 *(0.21)*	13 *(0.31)*	10 *(0.24)*	2 *(0.05)*	4 *(0.09)*	1 *(0.02)*	**2,923** ***(69.25)***
Young	92 *(2.18)*	24 *(0.57)*	44 *(1.04)*	27 *(0.64)*	76 *(1.8)*	17 *(0.4)*	9 *(0.21)*	6 *(0.14)*	7 *(0.17)*	4 *(0.09)*	7 *(0.17)*			7 *(0.17)*			**320** ***(7.58)***
Unspecified	405 *(9.59)*	243 *(5.76)*	178 *(4.22)*	40 *(0.95)*	62 *(1.47)*	2 *(0.05)*	17 *(0.4)*	3 *(0.07)*	7 *(0.17)*	10 *(0.24)*	5 *(0.12)*	6 *(0.14)*					**978** ***(23.17)***
Total N *(%)*	**1,055** ***(24.99)***	**1,049** ***(24.85)***	**811** ***(19.21)***	**602** ***(14.26)***	**343** ***(8.13)***	**102** ***(2.42)***	**80** ***(1.9)***	**61** ***(1.45)***	**28** ***(0.66)***	**26** ***(0.62)***	**21** ***(0.5)***	**19** ***(0.45)***	**10** ***(0.24)***	**9** ***(0.21)***	**4** ***(0.09)***	**1** ***(0.02)***	**4,221**

Figure 2- Dogs 2011 – Number of antibiograms by bacteria group and pathology



Note: *only values higher than 1% for the bacteria group and pathology. Detailed values are presented in table 2 below.*

Table 2- Dogs 2011 – Number of antibiograms by bacteria group and pathology

Bacteria N *(%)*	**Pathology N *(%)***																**Total N *(%)***
	Unspecified	Otitis	Skin and mucous membrane pathology	Kidney and urinary tract pathology	Respiratory pathology	Reproductive pathology	Ocular pathology	Bone pathology	Digestive pathology	Oral pathology	Systemic pathology	Arthritis	Mastitis	Septicemia	Abortion	Cardiac pathology	
Coagulase-positive Staphylococcus	323 *(7.65)*	415 *(9.83)*	439 *(10.4)*	99 *(2.35)*	51 *(1.21)*	20 *(0.47)*	38 *(0.9)*	22 *(0.52)*	1 *(0.02)*	6 *(0.14)*	1 *(0.02)*	9 *(0.21)*	4 *(0.09)*	1 *(0.02)*	2 *(0.05)*		**1,431** ***(33.9)***
E. coli	235 *(5.57)*	47 *(1.11)*	67 *(1.59)*	287 *(6.8)*	54 *(1.28)*	28 *(0.66)*		9 *(0.21)*	19 *(0.45)*	1 *(0.02)*	7 *(0.17)*		3 *(0.07)*	3 *(0.07)*			**760** ***(18.01)***
Streptococcus	98 *(2.32)*	163 *(3.86)*	87 *(2.06)*	51 *(1.21)*	28 *(0.66)*	20 *(0.47)*	11 *(0.26)*	9 *(0.21)*	3 *(0.07)*	3 *(0.07)*	1 *(0.02)*	6 *(0.14)*	1 *(0.02)*	1 *(0.02)*			**482** ***(11.42)***
Pseudomonas	77 *(1.82)*	203 *(4.81)*	43 *(1.02)*	9 *(0.21)*	44 *(1.04)*	4 *(0.09)*	6 *(0.14)*	2 *(0.05)*		2 *(0.05)*	1 *(0.02)*						**391** ***(9.26)***
Proteus	65 *(1.54)*	82 *(1.94)*	36 *(0.85)*	66 *(1.56)*	4 *(0.09)*	5 *(0.12)*	2 *(0.05)*	1 *(0.02)*	1 *(0.02)*	1 *(0.02)*							**263** ***(6.23)***
Coagulase-negative Staphylococcus	58 *(1.37)*	37 *(0.88)*	48 *(1.14)*	24 *(0.57)*	15 *(0.36)*	5 *(0.12)*	6 *(0.14)*	1 *(0.02)*		2 *(0.05)*	4 *(0.09)*	2 *(0.05)*	1 *(0.02)*		1 *(0.02)*		**204** ***(4.83)***
Pasteurella	37 *(0.88)*	7 *(0.17)*	15 *(0.36)*	2 *(0.05)*	50 *(1.18)*	7 *(0.17)*	5 *(0.12)*	2 *(0.05)*		8 *(0.19)*	2 *(0.05)*			3 *(0.07)*			**138** ***(3.27)***
Klebsiella	25 *(0.59)*	3 *(0.07)*	4 *(0.09)*	24 *(0.57)*	9 *(0.21)*		1 *(0.02)*	1 *(0.02)*								1 *(0.02)*	**68** ***(1.61)***
Enterococcus	23 *(0.54)*	19 *(0.45)*	5 *(0.12)*	13 *(0.31)*	3 *(0.07)*		2 *(0.05)*										**65** ***(1.54)***
Enterobacter	16 *(0.38)*	7 *(0.17)*	12 *(0.28)*	6 *(0.14)*	7 *(0.17)*	5 *(0.12)*	1 *(0.02)*	4 *(0.09)*	1 *(0.02)*		1 *(0.02)*	1 *(0.02)*					**61** ***(1.45)***
Bordetella	7 *(0.17)*				40 *(0.95)*						2 *(0.05)*			1 *(0.02)*			**50** ***(1.18)***
Corynebacterium	8 *(0.19)*	25 *(0.59)*	7 *(0.17)*	2 *(0.05)*	1 *(0.02)*	2 *(0.05)*		1 *(0.02)*									**46** ***(1.09)***
Pantoea	6 *(0.14)*	5 *(0.12)*	10 *(0.24)*	2 *(0.05)*		2 *(0.05)*	1 *(0.02)*			1 *(0.02)*							**27** ***(0.64)***
Acinetobacter	7 *(0.17)*	4 *(0.09)*	4 *(0.09)*	2 *(0.05)*	4 *(0.09)*		4 *(0.09)*			1 *(0.02)*							**26** ***(0.62)***
Bacillus	6 *(0.14)*	6 *(0.14)*	8 *(0.19)*	1 *(0.02)*	1 *(0.02)*	1 *(0.02)*											**23** ***(0.54)***
Serratia	9 *(0.21)*	1 *(0.02)*	4 *(0.09)*	2 *(0.05)*	2 *(0.05)*			3 *(0.07)*				1 *(0.02)*					**22** ***(0.52)***
Citrobacter	11 *(0.26)*	1 *(0.02)*	2 *(0.05)*	3 *(0.07)*		1 *(0.02)*					1 *(0.02)*						**19** ***(0.45)***

Bacteria N *(%)*	**Pathology N *(%)***																**Total N *(%)***
	Unspecified	Otitis	Skin and mucous membrane pathology	Kidney and urinary tract pathology	Respiratory pathology	Reproductive pathology	Ocular pathology	Bone pathology	Digestive pathology	Oral pathology	Systemic pathology	Arthritis	Mastitis	Septicemia	Abortion	Cardiac pathology	
Coagulase-unspecified Staphylococcus	6 *(0.14)*	5 *(0.12)*	2 *(0.05)*	1 *(0.02)*	1 *(0.02)*				1 *(0.02)*								**16 *(0.38)***
Aeromonas		2 *(0.05)*	1 *(0.02)*		5 *(0.12)*			3 *(0.07)*			1 *(0.02)*						**12 *(0.28)***
Morganella	7 *(0.17)*	2 *(0.05)*	1 *(0.02)*					1 *(0.02)*									**11 *(0.26)***
Burkholderia	1 *(0.02)*	3 *(0.07)*		1 *(0.02)*	3 *(0.07)*			1 *(0.02)*									**9 *(0.21)***
Stenotrophomonas	3 *(0.07)*	1 *(0.02)*	1 *(0.02)*		4 *(0.09)*												**9 *(0.21)***
Moraxella	2 *(0.05)*	2 *(0.05)*	2 *(0.05)*		3 *(0.07)*												**9 *(0.21)***
Rothia	3 *(0.07)*		2 *(0.05)*	1 *(0.02)*	2 *(0.05)*												**8 *(0.19)***
Rahnella	2 *(0.05)*		1 *(0.02)*		2 *(0.05)*	1 *(0.02)*	1 *(0.02)*										**7 *(0.17)***
Micrococcus	2 *(0.05)*	1 *(0.02)*	2 *(0.05)*	1 *(0.02)*		1 *(0.02)*											**7 *(0.17)***
Aerococcus	3 *(0.07)*			3 *(0.07)*													**6 *(0.14)***
E. vulneris	1 *(0.02)*	1 *(0.02)*	2 *(0.05)*	1 *(0.02)*													**5 *(0.12)***
Brevundimonas	1 *(0.02)*		1 *(0.02)*		1 *(0.02)*		2 *(0.05)*										**5 *(0.12)***
Comamonas	1 *(0.02)*				3 *(0.07)*												**4 *(0.09)***
Sphingobacterium	1 *(0.02)*	2 *(0.05)*															**3 *(0.07)***
Alcaligenes	1 *(0.02)*	1 *(0.02)*		1 *(0.02)*													**3 *(0.07)***
Leuconostoc		1 *(0.02)*													1 *(0.02)*		**2 *(0.05)***
Providencia		2 *(0.05)*															**2 *(0.05)***
Achromobacter	1 *(0.02)*				1 *(0.02)*												**2 *(0.05)***

Bacteria N *(%)*	**Pathology N *(%)***																**Total N *(%)***
	Unspecified	Otitis	Skin and mucous membrane pathology	Kidney and urinary tract pathology	Respiratory pathology	Reproductive pathology	Ocular pathology	Bone pathology	Digestive pathology	Oral pathology	Systemic pathology	Arthritis	Mastitis	Septicemia	Abortion	Cardiac pathology	
Delfia					1 *(0.02)*				1 *(0.02)*								**2 *(0.05)***
Salmonella	2 *(0.05)*																**2 *(0.05)***
Psychrobacter			2 *(0.05)*														**2 *(0.05)***
Ewingella									1 *(0.02)*								**1 *(0.02)***
Sphingomonas					1 *(0.02)*												**1 *(0.02)***
Shewanella	1 *(0.02)*																**1 *(0.02)***
E. fergusonii	1 *(0.02)*																**1 *(0.02)***
Bacteroides	1 *(0.02)*																**1 *(0.02)***
Hafnia										1 *(0.02)*							**1 *(0.02)***
Weeksella													1 *(0.02)*				**1 *(0.02)***
Leclercia	1 *(0.02)*																**1 *(0.02)***
Yersinia	1 *(0.02)*																**1 *(0.02)***
Ralstonia spp					1 *(0.02)*												**1 *(0.02)***
Actinomyces	1 *(0.02)*																**1 *(0.02)***
Rhizobium			1 *(0.02)*														**1 *(0.02)***
Arcanobacterium		1 *(0.02)*															**1 *(0.02)***
Eikenella	1 *(0.02)*																**1 *(0.02)***
Gemella			1 *(0.02)*														**1 *(0.02)***

Bacteria N *(%)*	**Pathology N *(%)***																**Total N *(%)***
	Unspecified	Otitis	Skin and mucous membrane pathology	Kidney and urinary tract pathology	Respiratory pathology	Reproductive pathology	Ocular pathology	Bone pathology	Digestive pathology	Oral pathology	Systemic pathology	Arthritis	Mastitis	Septicemia	Abortion	Cardiac pathology	
Ochrobactrum								1 *(0.02)*									**1 *(0.02)***
Chryseobacterium					1 *(0.02)*												**1 *(0.02)***
Clostridium					1 *(0.02)*												**1 *(0.02)***
Kocuria			1 *(0.02)*														**1 *(0.02)***
Total N (%)	**1,055 *(24.99)***	**1,049 *(24.85)***	**811 *(19.21)***	**602 *(14.26)***	**343 *(8.13)***	**102 *(2.42)***	**80 *(1.90)***	**61 *(1.45)***	**28 *(0.66)***	**26 *(0.62)***	**21 *(0.5)***	**19 *(0.45)***	**10 *(0.24)***	**9 *(0.21)***	**4 *(0.09)***	**1 *(0.02)***	**4,221**

Table 3 - Dogs 2011 – Otitis - all age groups included – All Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N =415)

Antibiotic	*Total (N)*	**% S**
Penicillin	*399*	**35**
Oxacillin	*46*	**96**
Cefoxitin	*357*	**94**
Florfenicol	*108*	**99**
Tetracycline	*245*	**62**
Streptomycin 10 UI	*201*	**63**
Neomycin	*54*	**81**
Kanamycin 30 UI	*206*	**63**
Gentamicin 10 UI	*403*	**88**
Chloramphenicol	*113*	**73**
Erythromycin	*357*	**65**
Spiramycin	*258*	**67**
Tylosin	*97*	**68**
Lincomycin	*310*	**68**
Pristinamycin	*79*	**99**
Rifampicin	*54*	**100**
Fusidic ac.	*248*	**75**
Enrofloxacin	*338*	**80**
Marbofloxacin	*411*	**85**
Furans	*67*	**93**
Trimethoprim-Sulfonamides	*414*	**86**

Table 4 - Dogs 2011 – Otitis - all age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N =47)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*46*	**61**
Amoxicillin-Clavulanic ac.	*47*	**74**
Cephalexin	*39*	**82**
Cefoxitin	*35*	**91**
Ceftiofur	*38*	**95**
Gentamicin 10 UI	*47*	**98**
Enrofloxacin	*44*	**82**
Marbofloxacin	*47*	**89**
Nalidixic ac.	*33*	**76**
Trimethoprim-Sulfonamides	*47*	**89**

Table 5 - Dogs 2011 – Otitis - all age groups included – *Streptococcus*: susceptibility to antibiotics (proportion) (N =163)

Antibiotic	*Total (N)*	**% S**
Oxacillin	*73*	**86**
Tetracycline	*79*	**33**
Streptomycin 500 µg	*69*	**81**
Kanamycin 1000 µg	*67*	**94**
Gentamicin 500 µg	*73*	**92**
Erythromycin	*123*	**57**
Spiramycin	*78*	**78**
Lincomycin	*116*	**80**
Enrofloxacin	*148*	**45**
Marbofloxacin	*150*	**69**
Trimethoprim-Sulfonamides	*162*	**80**

Table 6 - Dogs 2011 – Otitis - all age groups included – *Pseudomonas aeruginosa*: susceptibility to antibiotics (proportion) (N =197)

Antibiotic	*Total (N)*	**% S**
Ceftiofur	*153*	**5**
Cefoperazone	*40*	**70**
Cefquinome 30 µg	*83*	**35**
Gentamicin 10 UI	*196*	**80**
Neomycin	*73*	**26**
Enrofloxacin	*158*	**38**
Marbofloxacin	*191*	**64**
Tetracycline	*85*	**1**

Table 7 - Dogs 2011 – Skin and mucous membrane pathology – All age groups included – All Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N =439)

Antibiotic	*Total (N)*	**% S**
Penicillin	*383*	***26***
Cefoxitin	*388*	***90***
Oxacillin	*42*	***93***
Streptomycin 10 UI	*135*	***47***
Neomycin	*96*	***70***
Lincomycin	*334*	***61***
Gentamicin 10 UI	*429*	***86***
Kanamycin 30 UI	*196*	***56***
Chloramphenicol	*143*	***79***
Erythromycin	*327*	***54***
Spiramycin	*228*	***60***
Tylosin	*98*	***62***
Pristinamycin	*65*	***95***
Tetracycline	*220*	***54***
Florfenicol	*104*	***100***
Fusidic ac.	*319*	***79***
Enrofloxacin	*409*	***77***
Marbofloxacin	*432*	***79***
Danofloxacin	*45*	***91***
Furans	*61*	***93***
Tobramycin	*49*	***61***
Trimethoprim-Sulfonamides	*425*	***80***
Rifampicin	*46*	***96***

Table 8 - Dogs 2011 –Skin and mucous membrane pathology – All age groups included – All *E. coli*: susceptibility to antibiotics (proportion) (N =67)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*67*	**45**
Amoxicillin-Clavulanic ac.	*67*	**61**
Cephalexin	*66*	**82**
Cefoxitin	*39*	**82**
Ceftiofur	*42*	**83**
Gentamicin 10 UI	*67*	**100**
Nalidixic ac.	*41*	**68**
Enrofloxacin	*62*	**76**
Marbofloxacin	*66*	**80**
Trimethoprim-Sulfonamides	*66*	**85**

Table 9 - Dogs 2010 – Skin and mucous membrane pathology – All age groups included – All *Streptococcus*: susceptibility to antibiotics (proportion) (N =87)

Antibiotic	*Total (N)*	**% S**
Ampicilline	*35*	**97**
Ceftiofur	*41*	**93**
Enrofloxacin	*78*	**53**
Marbofloxacin	*84*	**76**
Erythromycin	*53*	**51**
Lincomycin	*57*	**74**
Trimethoprim-Sulfonamides	*85*	**69**

Table 10 - Dogs 2010 – Kidney and urinary tract pathology – All age groups included – All *E. coli*: susceptibility to antibiotics (proportion) (N =287)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*276*	**61**
Amoxicillin-Clavulanic ac.	*279*	**68**
Cephalexin	*276*	**83**
Cefoxitin	*139*	**91**
Ceftiofur	*157*	**95**
Cefquinome 30 µg	*72*	**93**
Streptomycin 10 UI	*55*	**49**
Gentamicin 10 UI	*286*	**97**
Nalidixic ac.	*149*	**78**
Flumequine	*77*	**75**
Enrofloxacin	*232*	**85**
Marbofloxacin	*285*	**86**
Trimethoprim-Sulfonamides	*286*	**85**
Tetracycline	*86*	**63**
Florfenicol	*34*	**91**

Table 11 - Dogs 2011 – Kidney and urinary tract pathology – All age groups included– All Coagulase-positive *Staphylococcus*: susceptibility to antibiotics (proportion) (N =99)

Antibiotic	*Total (N)*	**% S**
Penicillin	*84*	**19**
Cefoxitin	*80*	**90**
Streptomycin 10 UI	*43*	**37**
Erythromycin	*75*	**56**
Spiramycin	*61*	**57**
Lincomycin	*67*	**54**
Gentamicin 10 UI	*90*	**87**
Kanamycin 30 UI	*50*	**50**
Chloramphenicol	*39*	**82**
Tetracycline	*53*	**42**
Enrofloxacin	*99*	**78**
Marbofloxacin	*97*	**78**
Trimethoprim-Sulfonamides	*99*	**75**
Fusidic ac.	*51*	**76**

Table 12 - Dogs 2011 – Kidney and urinary tract pathology – All age groups included – All *Streptococcus*: susceptibility to antibiotics (proportion) (N =51)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*42*	**90**
Enrofloxacin	*50*	**64**
Marbofloxacin	*50*	**90**
Erythromycin	*33*	**52**
Trimethoprim-Sulfonamides	*51*	**55**

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Annex 11

Cats

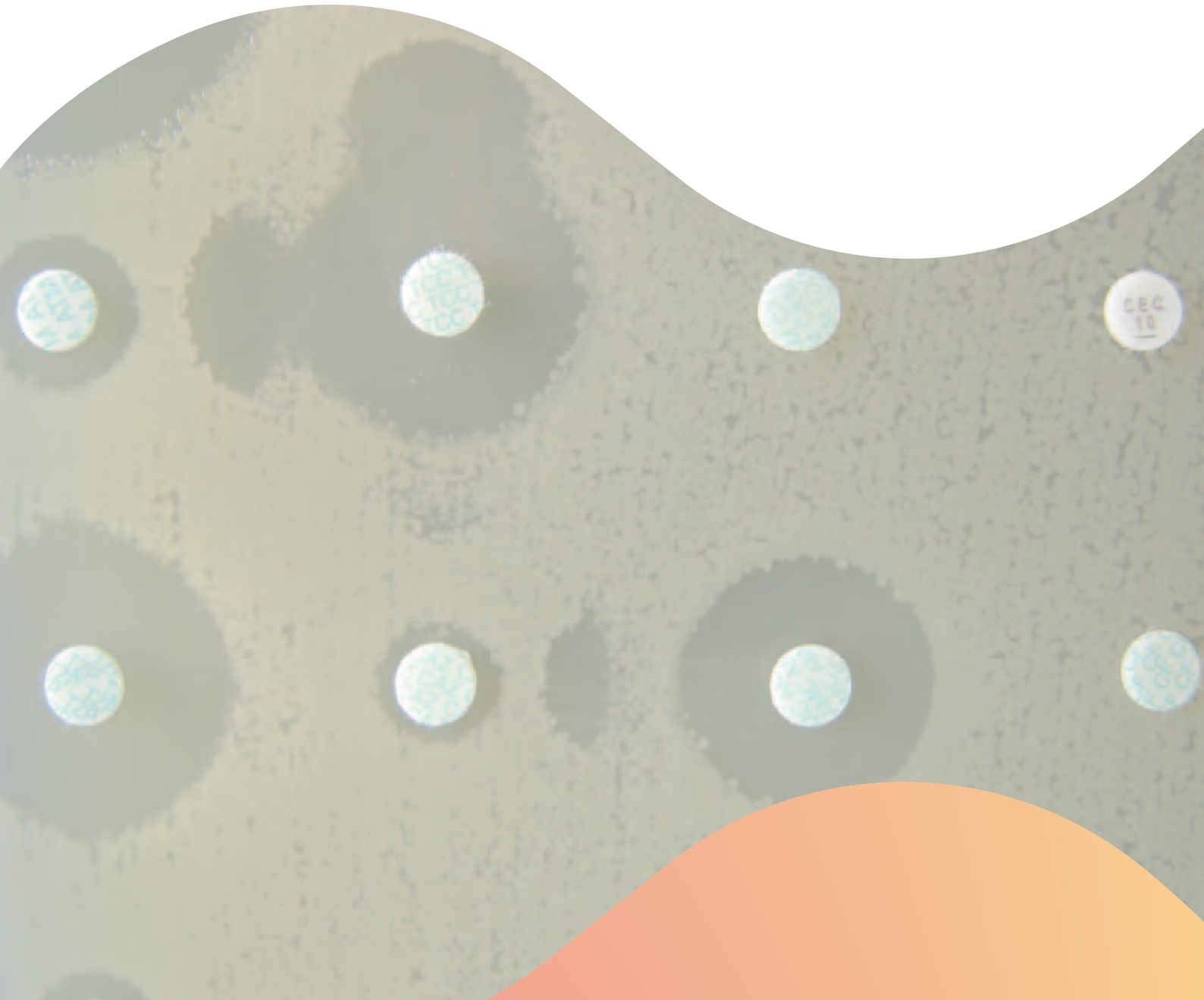


Figure 1- Cats 2011 – Number of antibiograms by age group and pathology

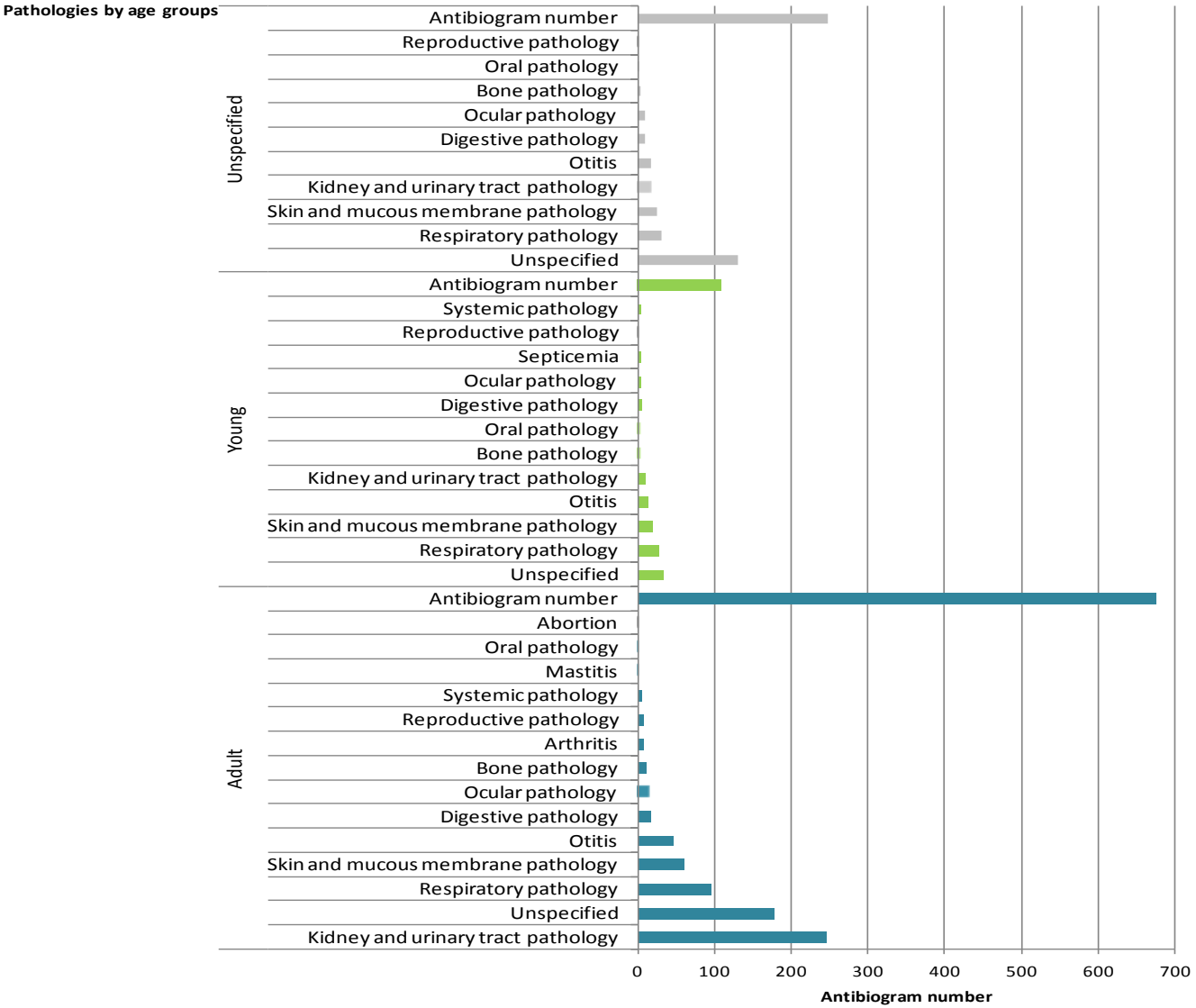
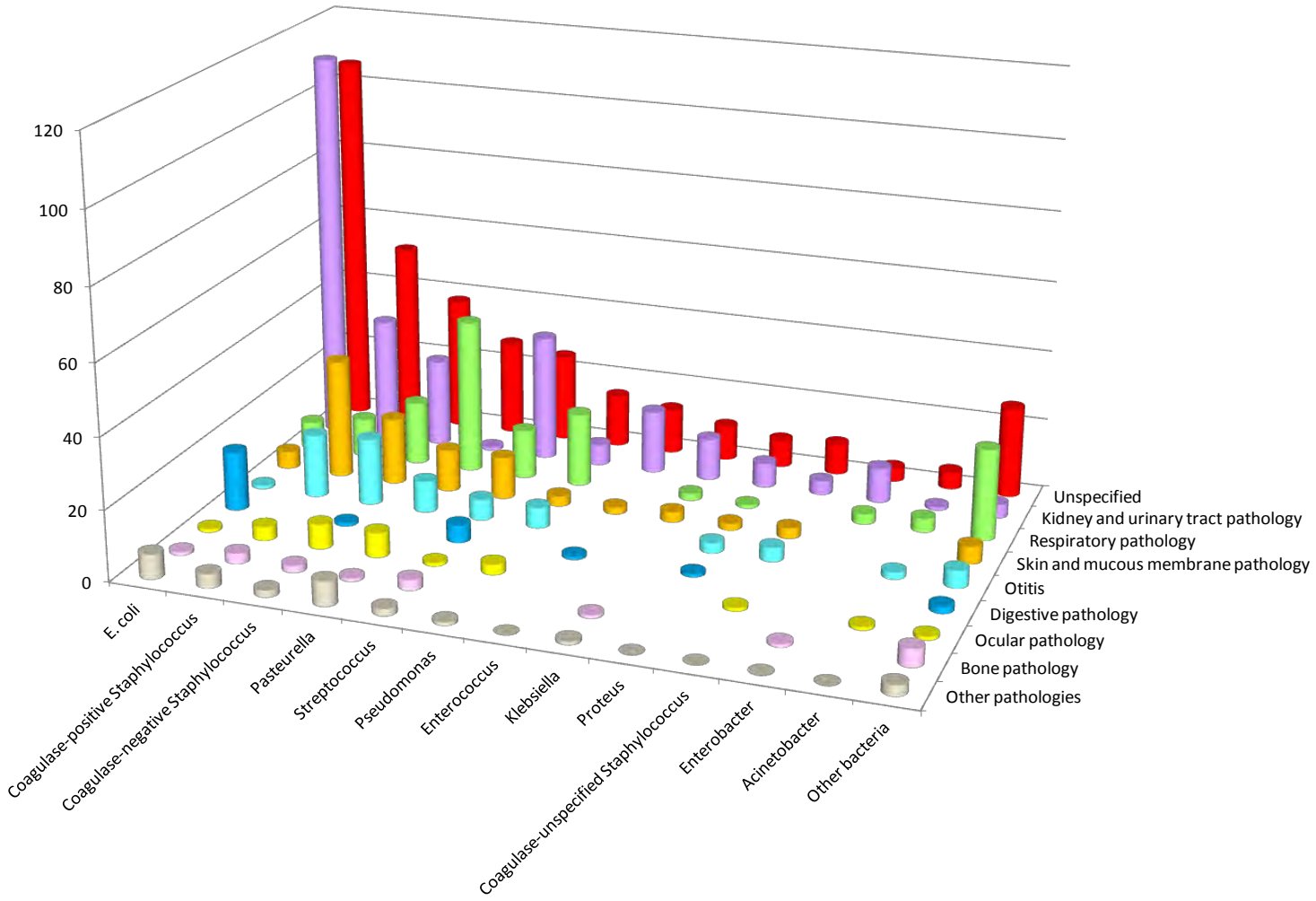


Table 1- Cats 2011 – Number of antibiograms by age group and pathology

	Pathology N *(%)*															
Bacteria N *(%)*	Unspecified	Kidney and urinary tract pathology	Respiratory pathology	Skin and mucous membrane pathology	Otitis	Digestive pathology	Pathology oculaire	Bone pathology	Reproductive pathology	Oral pathology	Arthritis	Systemic pathology	Septicemia	Mastitis	Abortion	**Total N *(%)***
Adult	176 *(17.09)*	244 *(23.69)*	94 *(9.13)*	58 *(5.63)*	44 *(4.27)*	15 *(1.46)*	15 *(1.46)*	10 *(0.97)*	5 *(0.49)*	1 *(0.10)*	5 *(0.49)*	3 *(0.29)*	1 *(0.10)*	2 *(0.19)*	1 *(0.10)*	**674** ***(65.44)***
Young	31 *(3.01)*	8 *(0.78)*	26 *(2.52)*	17 *(1.65)*	11 *(1.07)*	3 *(0.29)*	2 *(0.19)*	4 *(0.39)*	1 *(0.10)*	3 *(0.29)*		1 *(0.10)*	1 *(0.10)*			**108** ***(10.49)***
Unspecified	131 *(12.72)*	18 *(1.75)*	32 *(3.11)*	25 *(2.43)*	18 *(1.75)*	9 *(0.87)*	9 *(0.87)*	3 *(0.29)*	1 *(0.10)*	2 *(0.19)*						**248** ***(24.08)***
Total N *(%)*	**338** ***(32.82)***	**270** ***(26.21)***	**152** ***(14.76)***	**100** ***(9.71)***	**73** ***(7.09)***	**27** ***(2.62)***	**26** ***(2.52)***	**17** ***(1.65)***	**7** ***(0.68)***	**6** ***(0.58)***	**5** ***(0.49)***	**4** ***(0.39)***	**2** ***(0.19)***	**2** ***(0.19)***	**1** ***(0.10)***	**1030**

Figure 2- Cats 2011 – Number of antibiograms by bacteria group and pathology



Note: *only values higher than 1% for bacteria groups and pathologies. Detailed values are presented in table 2 below.*

Table 2- Cats 2011 – Number of antibiograms by bacteria group and pathology

Bacteria N *(%)*	**Pathology N *(%)***															
	Unspecified	Kidney and urinary tract pathology	Respiratory pathology	Skin and mucous membrane pathology	Otitis	Digestive pathology	Ocular pathology	Bone pathology	Reproductive pathology	Oral pathology	Arthritis	Systemic pathology	Mastitis	Septicemia	Abortion	**Total N *(%)***
E. coli	106 *(10.29)*	111 *(10.78)*	8 *(0.78)*	5 *(0.49)*	1 *(0.1)*	17 *(1.65)*	1 *(0.10)*	1 *(0.10)*	4 *(0.39)*			1 *(0.10)*	1 *(0.10)*	*1 (0.10)*		**257 *(24.95)***
Coagulase-positive Staphylococcus	52 *(5.05)*	35 *(3.4)*	11 *(1.07)*	34 *(3.3)*	18 *(1.75)*		4 *(0.39)*	3 *(0.29)*		2 *(0.19)*		1 *(0.10)*			1 *(0.10)*	**161 *(15.63)***
Coagulase-negative Staphylococcus	38 *(3.69)*	25 *(2.43)*	18 *(1.75)*	19 *(1.84)*	19 *(1.84)*	1 *(0.10)*	7 *(0.68)*	2 *(0.19)*			1 *(0.10)*	1 *(0.10*				**131 *(12.72)***
Pasteurella	27 *(2.62)*	1 *(0.10)*	44 *(4.27)*	12 *(1.17)*	9 *(0.87)*		7 *(0.68)*	1 *(0.10)*	1 *(0.10)*	2 *(0.19)*	2 *(0.19)*		1 *(0.10)*	*1 (0.10)*		**108 *(10.49)***
Streptococcus	25 *(2.43)*	36 *(3.5)*	14 *(1.36)*	12 *(1.17)*	6 *(0.58)*	5 *(0.49)*	1 *(0.1)*	3 *(0.29)*	2 *(0.19)*							**104 *(10.1)***
Pseudomonas	15 *(1.46)*	6 *(0.58)*	21 *(2.04)*	3 *(0.29)*	6 *(0.58)*		3 *(0.29)*			1 *(0.10)*						**55 *(5.34)***
Enterococcus	13 *(1.26)*	18 *(1.75)*		2 *(0.19)*		1 *(0.1)*										**34 *(3.3)***
Klebsiella	10 *(0.97)*	12 *(1.17)*	2 *(0.19)*	3 *(0.29)*				1 *(0.10)*		1 *(0.10)*						**29 *(2.82)***
Proteus	8 *(0.78)*	7 *(0.68)*	1 *(0.1)*	2 *(0.19)*	3 *(0.29)*	1 *(0.1)*										**22 *(2.14)***
Coagulase-unspecified Staphylococcus	9 *(0.87)*	4 *(0.39)*		3 *(0.29)*	4 *(0.39)*		1 *(0.10)*									**21 *(2.04)***
Enterobacter	4 *(0.39)*	10 *(0.97)*	3 *(0.29)*					1 *(0.10)*								**18 *(1.75)***
Acinetobacter	5 *(0.49)*	1 *(0.10)*	4 *(0.39)*		2 *(0.19)*		1 *(0.10)*									**13 *(1.26)***
Corynebacterium	5 *(0.49)*	1 *(0.10)*	1 *(0.10)*		2 *(0.19)*						1 *(0.10)*					**10 *(0.97)***
Bordetella	2 *(0.19)*		5 *(0.49)*		2 *(0.19)*											**9 *(0.87)***
Bacillus	2 *(0.19)*		1 *(0.10)*	2 *(0.19)*	1 *(0.10)*			1 *(0.10)*								**7 *(0.68)***
Moraxella	2 *(0.19)*			1 *(0.1)*			1 *(0.1)*									**4 *(0.39)***
Pantoea	1 *(0.10)*		1 *(0.10)*	1 *(0.10)*		1 *(0.10)*										**4 *(0.39)***

	Pathology N *(%)*															
Bacteria N *(%)*	Unspecified	Kidney and urinary tract pathology	Respiratory pathology	Skin and mucous membrane pathology	Otitis	Digestive pathology	Ocular pathology	Bone pathology	Reproductive pathology	Oral pathology	Arthritis	Systemic pathology	Mastitis	Septicemia	Abortion	**Total N *(%)***
Stenotrophomonas	1 *(0.10)*		3 *(0.29)*													**4 *(0.39)***
Serratia	1 *(0.10)*	1 *(0.10)*						1 *(0.10)*								**3 *(0.29)***
Aeromonas			3 *(0.29)*													**3 *(0.29)***
Micrococcus	1 *(0.10)*		1 *(0.10)*					1 *(0.10)*								**3 *(0.29)***
Rothia	1 *(0.10)*	1 *(0.10)*														**2 *(0.19)***
Agent pathogène non identifie	1 *(0.10)*		1 *(0.10)*													**2 *(0.19)***
Rahnella	1 *(0.10)*							1 *(0.10)*								**2 *(0.19)***
Salmonella	1 *(0.10)*										1 *(0.10)*					**2 *(0.19)***
Morganella			2 *(0.19)*													**2 *(0.19)***
Comamonas			2 *(0.19)*													**2 *(0.19)***
Gemella			2 *(0.19)*													**2 *(0.19)***
Achromobacter			1 *(0.10)*													**1 *(0.10)***
Alcaligenes	1 *(0.10)*															**1 *(0.10)***
Prophyromonas								1 *(0.10)*								**1 *(0.10)***
Microbacterium				1 *(0.10)*												**1 *(0.10)***
Shewanella			1 *(0.10)*													**1 *(0.10)***
Weeksella	1 *(0.10)*															**1 *(0.10)***
Prevotella	1 *(0.10)*															**1 *(0.10)***

	Pathology N *(%)*															
Bacteria N *(%)*	Unspecified	Kidney and urinary tract pathology	Respiratory pathology	Skin and mucous membrane pathology	Otitis	Digestive pathology	Ocular pathology	Bone pathology	Reproductive pathology	Oral pathology	Arthritis	Systemic pathology	Mastitis	Septicemia	Abortion	**Total N *(%)***
Chryseobacterium		1 *(0.10)*														**1 *(0.10)***
Clostridium												1 *(0.10)*				**1 *(0.10)***
Citrobacter	1 *(0.10)*															**1 *(0.10)***
Eubacterium	1 *(0.10)*															**1 *(0.10)***
Neisseria			1 *(0.10)*													**1 *(0.10)***
Fusobacterium	1 *(0.10)*															**1 *(0.10)***
Nocardia	1 *(0.10)*															**1 *(0.10)***
Ochrobactrum			1 *(0.10)*													**1 *(0.10)***
Campylobacter						1 *(0.10)*										**1 *(0.10)***
Total N *(%)*	**338 *(32.82)***	**270 *(26.21)***	**152 *(14.76)***	**100 *(9.71)***	**73 *(7.09)***	**27 *(2.62)***	**26 *(2.52)***	**17 *(1.65)***	**7 *(0.68)***	**6 *(0.58)***	**5 *(0.49)***	**4 *(0.39)***	**2 *(0.19)***	***2* *(0.19)***	1 *(0.10)*	**1,030**

Table 3 - Cats 2011 – All pathologies and age groups included – *E. coli*: susceptibility to antibiotics (proportion) (N =240) (N =257)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*245*	**63**
Amoxicillin –Clavulanic ac.	*247*	**75**
Cephalexin	*246*	**83**
Cefoxitin	*152*	**92**
Ceftiofur	*173*	**92**
Cefquinome 30 µg	*92*	**100**
Streptomycin 10 UI	*83*	**69**
Neomycin	*89*	**88**
Gentamicin 10 UI	*252*	**96**
Tetracycline	*96*	**58**
Florfenicol	*45*	**89**
Nalidixic ac.	*139*	**81**
Flumequine	*83*	**87**
Enrofloxacin	*198*	**86**
Marbofloxacin	*249*	**91**
Trimethoprim-Sulfonamides	*255*	**89**

Table 4 - Cats 2011 – Kidney and urinary tract pathology - All age groups included – All *E. coli*: susceptibility to antibiotics (proportion) (N =111)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*106*	**65**
Amoxicillin –Clavulanic ac.	*107*	**71**
Ceftiofur	*57*	**91**
Cefoxitin	*53*	**91**
Cephalexin	*110*	**82**
Gentamicin 10 UI	*111*	**97**
Tetracycline	*30*	**47**
Nalidixic ac.	*51*	**76**
Enrofloxacin	*88*	**86**
Marbofloxacin	*110*	**89**
Trimethoprim-Sulfonamides	*110*	**86**

Table 5 - Cats 2011 – All pathologies and age groups included – All Coagulase-positive *Staphylococcus* : susceptibility to antibiotics (proportion) (N =161)

Antibiotic	*Total (N)*	**% S**
Penicilline	*157*	**43**
Cefoxitin	*145*	**84**
Streptomycin 10 UI	*70*	**57**
Kanamycin 30 UI	*76*	**67**
Gentamicin 10 UI	*159*	**86**
Tetracycline	*93*	**75**
Chloramphenicol	*69*	**81**
Erythromycin	*128*	**62**
Spiramycin	*93*	**74**
Lincomycin	*110*	**64**
Tylosin	*57*	**82**
Enrofloxacin	*155*	**71**
Marbofloxacin	*158*	**75**
Pristinamycin	*31*	**100**
Trimethoprim-Sulfonamides	*157*	**85**
Fusidic ac.	*114*	**77**
Furans	*36*	**92**

Table 6 - Cats 2011 – Respiratory pathology - All age groups included – All *Pasteurella* : susceptibility to antibiotics (proportion) (N =44)

Antibiotic	*Total (N)*	**% S**
Amoxicillin	*43*	**93**
Amoxicillin –Clavulanic ac.	*42*	**98**
Cephalexin	*44*	**95**
Gentamicin 10 UI	*44*	**93**
Enrofloxacin	*43*	**98**
Marbofloxacin	*42*	**100**
Trimethoprim-Sulfonamides	*42*	**79**

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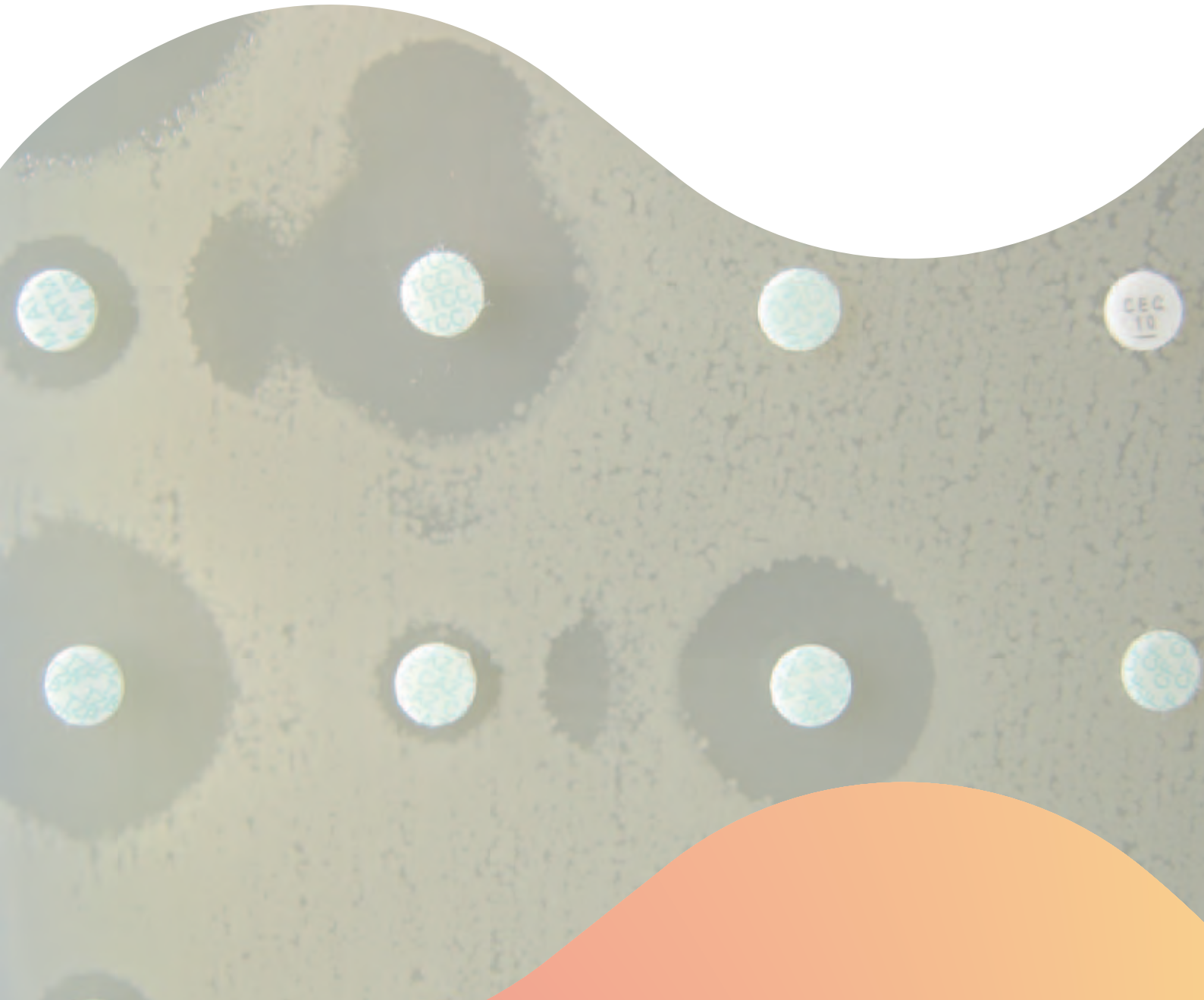
Annex 12

Publications based on the network's data and strains



Articles published in international peer-reviewed journals

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Haenni M. Galofaro L. Ponsin C. Bes M. Laurent F and Madec J-Y. (2011) Staphylococcal bovine mastitis in France: enterotoxins. resistance and the human Geraldine methicillin-resistant *Staphylococcus aureus* clone. *Journal of Antimicrobial Chemotherapy*. 66 (1): 216-225.

Haenni M. Châtre P. Boisset S. Carricajo A. Bes M. Laurent F. Madec J-Y. (2011). Staphylococcal nasal carriage in calves: multi-resistant *S. sciuri* and immune evasion cluster (IEC) genes in methicillin-resistant *S. aureus* ST398. *Journal of Antimicrobial Chemotherapy.* 66 (8): 1927-1928.

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Madec J-Y. (2011). Epidémies à *Escherichia coli* : un avant-goût des « superbactéries » ? *Pour la Science*. 407: 16-17.

Conference presentations and posters

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