

**DYNAMICS OF THE SUSCEPTIBILITY TO DIFFERENT  
ANTIBIOTICS AND CHEMICAL-THERAPY TREATMENTS  
OF ISOLATED GERMS FROM PUERPERAL COW  
GENITAL SECRETIONS**

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**ABSTRACT** - *The study was conducted on a group of 10 cows, belonging to Bălțată cu Negru Românească breed, at the Cattle Research and Development Station of Dancu , Iași district. Genital secretions were sampled from puerperal cows (first 4 post-partum weeks), for determining the uterine bacterial flora and germ susceptibility to different antimicrobial products. The obtained results have shown a lower germ susceptibility in the first post-partum week, compared to the next weeks. In weeks 2,3 and 4 post-partum , the mean values of germ susceptibility to antibiotics had very high levels (90-100%) to Rifampine, Erythromycin, Cephalotin, average levels (70-83.3%) to Amoxicillin, Kanamycyn, Chloramphenicol, Streptomycin, Gentamicyn, bacteria showing resistance to Penicillin, Oxaciclillin, Sulphametazol, Methycillin. The most frequent bacterium isolated from genital secretions of cows with inflammatory genital troubles was Arcanobacterium pyogenes, in single bacterial colony (31.6%) or in mixed bacterial colony with E.coli (5.3%).*

**Key words:** puerperal cow, bacterial flora, germs, antibiotics

## INTRODUCTION

During the puerperal period, diverse clinic and paraclinic, metabolic, neuro-hormonal and immunologic changes took place for the female body recovering after gestation (Bogdan et al., 1981; Boitor, 1984; Bodogaie, 1993; Ruginosu et al., 1994; Ruginosu et al., 2000; Runceanu, Cotea, 2001).

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Situated at the limit between physiological and pathological, the puerperal period in cows is influenced by many internal and external factors, which could change the normal post-partum uterine involution, uterine kinetics, neural-hormonal activity of hypothalamus, hypophysis and ovary and the capacity of anti-microbial self-protection (Boitor, 1984; Bodogaie, 1993; Ruginosu, 1994). Under these conditions, different genital inflammatory troubles may appear with repercussions on animal fertility, which therapy is difficult, because of germ resistance (from polymicrobial flora, in most of cases) at different drugs used inadequately. The determination of germs involved in the etio-pathogenesis of different genital infections (antibiogram) has an important role to the indication of the most active antimicrobial products.

The present paper had the aim to establish the susceptibility of germs isolated from secretions of puerperal cows, in dynamics, to different antimicrobial products, taking into account the variation factors according to the livestock, specificity of bacterial flora and capacity of the self-defending of involved organisms.

## MATERIALS AND METHODS

The investigations have been conducted on a group of 10 cows belonging to the Bălțată cu Negru Românească breed at the Research Agricultural Station for Cattle Breeding of Dancu Iași, where samples of genital secretions have been taken every week during a month, in the puerperal period. This was done for the determination of isolated bacterial flora at the uterus level, as well as the susceptibility of germs to different antimicrobial substances.

The culture mediums used for bacterial isolation were usual and special for diagnosis (M.I.U., T.S.I., CHAPMAN). The working method used for the determination of germ susceptibility to different antibacterial products was the method of diffusiometry, based on the characteristic of the studied drug (as micro-tablet). A Dispenser Disc spread the micro-tablet automatically. Reading was done by assessing the size of areas of inhibition induced by drug, where the microbial colonies are lacking. The diameter of these areas is directly proportional to germ susceptibility to the tested drug. The degrees of germ susceptibility to drugs used for testing were assessed by 4 steps: very sensitive (VS), moderately sensitive (MS), sensitive (VS+MS) and resistant (R) (expressed as percentage).

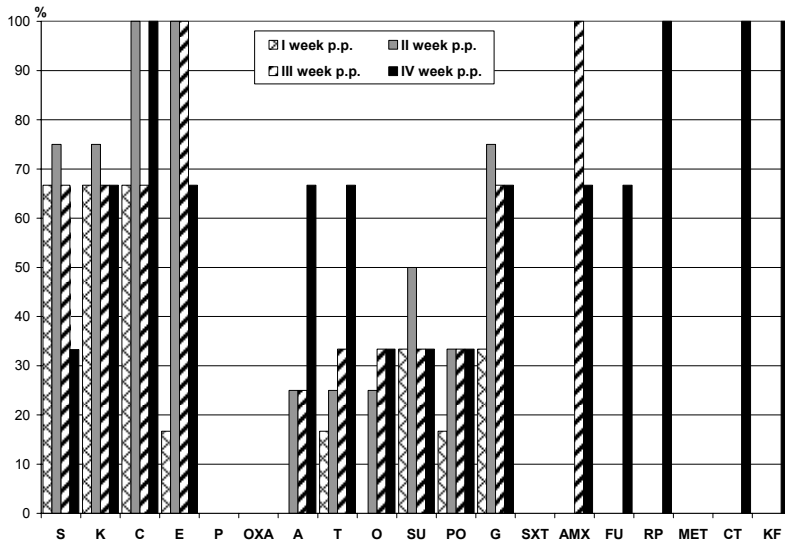
## RESULTS AND DISCUSSION

Analysing the susceptibility of germs isolated from genital secretions of puerperal cows to different antibiotics and chemotherapy, variable values in dynamics were assessed in the first 4 post-partum weeks (*Table 1, Figure 1*).

SUSCEPTIBILITY OF PUERPERAL COWS TO ANTIBIOTICS

Table 1  
Dynamics of susceptibility to different antimicrobial products of germs isolated from genital secretions from puerperal cows

Week p.p.	No. of isolated stems	Susceptibility degrees		S - Streptomycine	K - Kanamycin	C - Chloramphenicol	E - Erythromycin	P - Penicillin	OXA - Oxacillin	A - Ampicillin	T - Tetracycline	O - Oxitetracycline	SU - Sulphatiazol	PO - Polymixin	G - Gentamycin	SXT - Sulphametazol	AMX - Amoxicillin	FU - Furazolidon	RP - Rifampicin	MET - Methicillin	CT - Colistin	KF - Cephalothin	
		S	R																				
I	6	n	4	4	4	4	1	0	0	0	1	0	2	1	2	-	-	-	-	-	-	-	-
		%	66.7	66.7	66.7	16.7	0	0	16.7	0	0	16.7	0	33.4	16.7	33.4	-	-	-	-	-	-	-
II	4	n	2	2	2	5	6	6	6	6	5	0	4	5	4	-	-	-	-	-	-	-	-
		%	33.3	33.3	33.3	83.3	100	100	83.3	100	100	83.3	0	66.6	83.3	66.6	-	-	-	-	-	-	-
III	3	n	3	3	4	4	0	0	0	1	1	1	2	2	3	-	-	-	-	-	-	-	-
		%	75.0	75.0	100	100	0	0	25.0	0	25.0	25.0	25.0	50.0	33.4	75.0	-	-	-	-	-	-	-
IV	3	n	1	1	0	4	4	3	3	3	3	0	2	4	1	-	-	-	-	-	-	-	-
		%	25.0	25.0	0	100	100	75.0	75.0	75.0	75.0	0	50.0	66.6	25.0	-	-	-	-	-	-	-	-
V	3	n	2	2	2	3	0	1	1	1	1	1	1	1	2	-	-	-	-	-	-	-	-
		%	66.7	66.7	66.7	100	0	25.0	33.4	33.4	33.4	33.4	33.4	33.4	66.7	-	-	-	-	-	-	-	-
VI	3	n	1	1	1	0	3	3	3	3	2	2	2	2	1	-	-	-	-	-	-	-	-
		%	33.3	33.3	33.3	0	100	100	66.6	66.6	66.6	66.6	66.6	66.6	33.3	100	-	-	-	-	-	-	-
VII	10	n	2	3	2	2	0	2	0	2	2	1	1	1	1	-	-	-	-	-	-	-	-
		%	66.7	100	66.7	66.7	0	0	66.7	33.4	33.4	33.4	33.4	33.4	33.4	66.7	-	-	-	-	-	-	-
VIII	10	n	1	-	1	1	3	3	3	3	1	1	2	2	2	-	-	-	-	-	-	-	-
		%	33.3	-	33.3	33.3	100	100	33.3	33.3	33.3	33.3	66.6	66.6	66.6	66.6	-	-	-	-	-	-	-
IX	10	n	7	8	8	9	0	0	0	4	4	3	4	4	7	-	-	-	-	-	-	-	-
		%	70.0	80.0	80.0	90.0	0	0	40.0	40.0	40.0	40.0	30.0	40.0	40.0	70.0	-	-	-	-	-	-	-
X	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XI	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XIII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XIV	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XV	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XVI	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XVII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XVIII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XIX	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XX	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXI	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXIII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXIV	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXV	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXVI	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXVII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXVIII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXIX	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXX	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXXI	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-	-	-	-	-
XXXII	10	n	3	2	2	1	10	10	7	6	6	7	6	6	3	-	-	-	-	-	-	-	-
		%	30.0	20.0	20.0	10.0	100	100	70.0	60.0	60.0	70.0	60.0	60.0	60.0	30.0	-	-	-</				



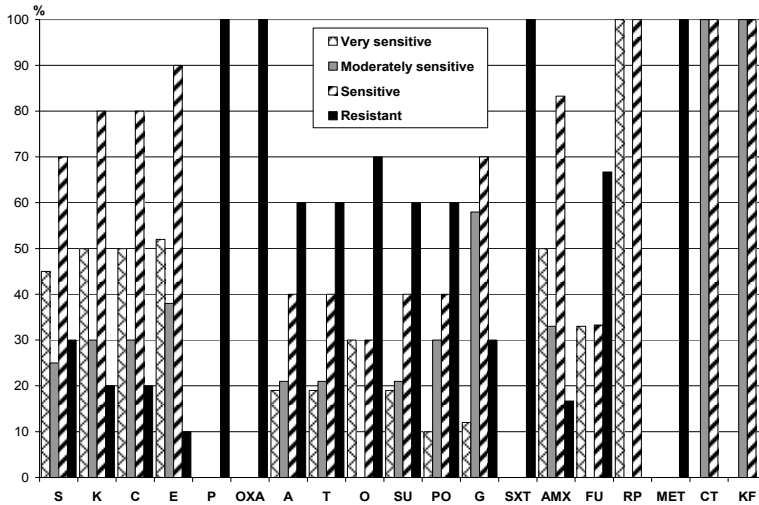
**Figure 1 - Dynamics of susceptibility to different antimicrobial products of germs isolated from genital secretions from puerperal cows**

In the first post-partum week, in most of cases a lower susceptibility was found, in comparison to the following weeks, the values varying between 16.7% (Erythromycin, Tetracycline, Polymixin) and 33% (Sulphatiasole, Gentamycin). Germs have shown a moderate susceptibility (67%) to other antibiotics, such as Streptomycin, Kanamycin and Chloramphenicol, and bacteria have shown a total resistance to Penicillin, Oxacillin, Ampicillin and Oxitetracillin.

In the second post-partum week, value increases were found in most of cases compared to the first week. As concerns the tested drugs, variations of the values of susceptibility were found, the germs presenting a higher susceptibility (75% to Streptomycin, Kanamycin and Gentamycin and 100% to Chloramphenicol and Erythromycin), compared to other antimicrobial substances (25% to Ampicyclin and Tetracycline, 33.3% Oxitetracycline, Polymixin and 50% to Sulphatiasol). In III and IV post-partum weeks, the germs isolated from genital secretions of dairy cows have shown values of susceptibility to tested antimicrobial products with small variations compared to the previous period. In II and IV post-partum weeks, the average values of antibiogram have shown variations of bacteria susceptibility from 30-40% for Oxitetracyclin, Furasolidon, Ampicyclin, Tetracycline Sulphatiasol until 70-83.3% for Amoxicillin, Kanamycin, Chloramphenicol, Streptomycin, Gentamycin and 90-100% for Rifarupycin, Erythromycin and Cephalothin.

In the entire studied period, bacteria isolated from genital secretions of puerperal cows have shown resistance to Penicillin, Oxacillin, Sulphametasol, and Methicillin (Figure 2).

## SUSCEPTIBILITY OF PUERPERAL COWS TO ANTIBIOTICS



**Figure 2 - Mean degrees of susceptibility to different antibiotics and chemotherapy substances of germs isolated from genital secretions of cows found in 2-4 post-partum weeks**

Bacteriological investigations have shown a variability of frequencies for different isolated bacterial species from cows with normal calving, compared to those isolated from cows with difficult calving and diverse puerperal troubles. In cows with retention of foetal annexes and puerperal endometritis, the isolated bacteria were found in 52.6% of cases in unique culture, 26.3% in mixed culture and 21.1% in association culture, in 2, 3 and 4 post-partum weeks (*Table 2*).

Among the isolated bacterial species, the most frequent one was *Arcanobacterium pyogenes*, in unique culture (31.6%) or mixed culture (5.3%). These assessments were confirmed by other authors, indicating that the most frequently isolated bacterium was *Arcanobacterium pyogenes*, both in normal cows (40%) and in cows with retention of foetal annexes (58%).

As concerns the bacterial flora isolated from cows with retention of foetal annexes and post-partum endometritis, a very great susceptibility was found to Cephalotin, Rifamicin, Erythromycin, Amoxicillin and Kanamycin, a moderate susceptibility to Ampicillin, Tetracycline, Sulfatiazol, Oxitetracycline, Polimixin, Chloramphenicol, Gentamycin, Streptomycin, Colistin and very high resistance to Penicillin, Oxacillin, Meticillin and Sulfametazol.

Most of the studies from the speciality literature have shown that infection was caused by germs of intrinsic virulence (*Staphylococci*, *Proteus*, *Colibacili*), but frequently, it could be caused by germs from a polybacterial flora. The frequency of different bacteria isolated from genital secretions of puerperal cows varied according to some factors, such as: studied livestock, farm size, farming system, calving season sort of parturitions, micro-climate conditions, management technologies, and self-defense ability.

Table 2  
 Dynamics of isolating different bacteria species from post-partum cows with endometritis and susceptibility to antibiotics and chemotherapy substances

	Isolated bacteria										Germ susceptibility to antibiotics and chemotherapy		
	Unique culture			Mixed culture			Association culture				FS	MS	R
	n	%	Bacterial species	n	%	Bacterial species	n	%	Bacterial species				
Weeks II-IV post-partum	6	31.6	-Arcanobact. pyogenes;	1	5.3	-Arcanobacterium pyogenes+ E. coli	4	21.1	-Actinomyces sp.+ Staphylococcus aureus + Proteus sp. + Strept. sp. anaerobic.	Kf Rp E Amx K	A T Su O Po C G S Ct	P Oxa Met Sxt	
	2	10.5	- E. coli;	2	10.5	Actinomyces py. + Strept. sp. aerobic							
	1	5.3	- B. cereus;										
	1	5.3	- Strept. sp. anaerobic	2	10.5	Actinomyces py.+ Strept. sp. anaerobic							
Total of bacterial cultures	10	52.6		5	26.3		4	21.1					

## SUSCEPTIBILITY OF PUERPERAL COWS TO ANTIBIOTICS

At puerperal stage, an active conflict took place between the body of the parturient and bacteria populating the uterine medium, having as result a mobilization of defence of general and local resources. The puerperal period was a critical period in the life of females, due to great instability of the processes of post-partum tissue regeneration, when the local self-defence could be easily affected by diverse external or internal factors.

The immunology studies conducted on puerperal cows have shown variations of the values of cell factors (number of leukocytes, leukogram) and humour factors (serous complement, globulin fractions). Uterus involution and recovery of ovarian function took place at physiological parameters, allowing the female to become suited for a new gestation. This process was carried out according to the capacity of mobilizing the body self-defence against post-partum bacterial invasion (which appears after calving). In most of cases, we recommend the use of broad spectrum antibiotics, which, administered alone or in association with diverse sulphamides, in local or general use, proved to be efficient in the therapy of genital infections: Tetracycline, Polymixine, Chloramfenicol, Oxitetracycline, Tetramycine, Solvociline, Erythromycin, Negamycin, Nitrofurantoin, Sulfametazine, Sulfathiazol (Bogdan et al., 1981; Boitor, 1984; Runceanu, Cotea, 2001).

The use of proper antibiogram in each group of animals, as current method for establishing the drugs for different genital inflammatory troubles, is required as a necessity, in the context of variation factors concerning the frequency of different involved bacterial species, and their susceptibility to different antimicrobial products.

Although non concordances were found between *in vitro* and *in vivo* susceptibility (Bogdan et al., 1981), caused by *in vitro* instability of germs, different requirements to the culture environment, drug over-dosing or technique errors, the antibiogram could be useful to the practitioner in choosing the most efficient antibacterial products. This method is good, as, in the last period, the bacterial germs involved in the etiopathogeny of different genital inflammatory troubles became resistant to a larger scale of antimicrobial products, diminishing the efficiency of treatments.

## CONCLUSIONS

In the first post-partum week, a reduced susceptibility was found in most of studied cases, compared to the following weeks, the values representing variations from 16.7% (Erythromycin, Tetracycline, and Plymyxin) until 33% (Sulphathiazol, Gentamycin) and 67% (Streptomycin, Kanamicin, and Chloramphenicol) and total resistance to Penicillin, Oxacillin, Ampicillin, and Oxitetracycline.

From the second post-partum week, the increase of values in most of cases was found, compared to the first week.

In II and III post-partum weeks, the mean values of antibiogram have shown variations of bacteria susceptibility from 30-40% to Oxitetracycline, Furazolidon, Ampicillin, Tetracycline and Sulphatiasol, and until 70-83.3% to Amoxicillin, Kanamicin, Chloramphenicol, Streptomycin, Gentamicin, and 90-100% to Rifampicine, Erythromycin, and Cephalothin.

In the entire studied period, the bacteria isolated from puerperal cow genital secretions have shown resistance to Penicillin, Oxacillin, Sulphametasol and Methicillin.

In cows with the retention of foetal annexes, the isolated bacteria were of 52.6% in unique culture, 26.3% in mixed culture and 21.1% in association culture, in post-partum 2, 3, and 4 weeks, the most frequent being *Arcanobacterium pyogenes*, in unique culture (31.6%) or in mixed culture with *E.coli* (5.3%).

Bacteria isolated from cow genital secretions with retention of foetal annexes and post-partum endometritis have shown a very great susceptibility to Cephalotin, Ampicillin, Erythromycin, Amoxicillin, and Kanamicin. They were moderately susceptible to Ampicillin, Tetracycline, Sulfatiasol, Oxitetracycline, Polimixine, Chloramphenicol, Gentamicine, Streptomycin, Colistin and they have shown a total resistance to Penicillin, Oxacillin, Methicillin and Sulfametasol.

The utilization of antibiogram in each group of animals is required as a necessity, for establishing the drugs for different genital inflammatory troubles, in the context of variation factors. They concern the frequency of different involved bacterial species and their susceptibility to different anti-microbial products.

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