THE ROLE OF THE VAGINAL COLONIZATION OF THE MEDICAL AND PARAMEDICAL STAFF IN THE NOSOCOMIAL TRANSMISSION OF GROUP-B STREPTOCOCCUS

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SUMMARY

The Authors consider the presence of streptococcus of group B in the vaginal flora of the medical and paramedical staff who work at the Obstetrical and Gynaecological Clinic and at the Department of Neonatology at the S. Matteo Polyclinic. The identification of fellows (6 cases, 6.8%) colonized by GBS improves the hypothesis of the possibility of a hospital-transmission of the microrganism, and this transmission explains the possible bacterical colonization of newborns, whose mothers are GBS negative. The importance of such a type of transmission has to be referred overall to the possible onset of a neonatal meningitis, in regard to its mortality (20-30%) and to the neurological complications, which can be observed in the child even later on.

In the last few years a remarkable diffusion of the Streptococcus Beta Haemolytic of Group B (GBS) ([11, 19]) has been demonstrated among the human population, and their increasing responsability — "emergent pathogenic germs" — has been emphasized in the infections pathology of both newborns and adults ([4]). The GBS prove to have the major responsability in serious neonatal infections ([6]); in the U.S.A. ([29]) cases of new born sepsis and meningitis by GBS have been identified in percentages of 3‰; the death-rate resulted in 50%, and in 50% of the survivors some neurological defects (psychomotory disturbances, sensitivity deficits) have become evident. The virulence of GBS is connected with the liberation and elaboration not only of haemolysin but also of neuroamidase, hyalurodinase, esterase, protease, nuclease (DNase, RNase), sphingomyelin or CAMP factor ([27, 28]). The virulence of the GBS is also correlated to the presence of surface polysaccharide antigens (Ia, Ib, II, III) and to the protein Ibc: they would act as antiphagocytary factors and, in the soluble state, as neutralizing the circulating opsonins of the host ([22]). The presence of surface antigens allows us to differentiate between human and animal stocks ([20]).

MATERIAL AND METHODS

The study was undertaken on the female medical and paramedical staff of the Obstetrical and Gynecological Institute and of the Department of Neonatology at the S. Matteo Polyclinic of Pavia. The collection began after overcoming very considerable psychological resistance from the personnel. 87 women aged between 20 and 50 years underwent a bacteriological inquiry on their vaginal secretion. The vaginal samples were taken using tampons of Alginate of calcium immersed in the Stuart transport medium. The sowing of the culture followed within 24 hours of the sampling. As it was a matter of vaginal sampling, and considering that the contamination with bacterial commensal flora is considerable, we resorted, for the primary cultures, to the systematic utilization of a selective culture

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Table 1.

N.	C.	N.	Vaginal tampon	N.	C.	N.	Vaginal tampon
1	V	M	Streptococcus B	45	Q	A	Neg.
2	B	V	Neg.	46	A	M	E. Coli
3	B	L	Neg.	47	C	M	Neg.
4	M	D	Streptococcus B	48	C	E	Candida sp., E. Coli, Streptococcus faecalis
5	B	T	Streptococcus D				
6	M	E	Neg.	49	C	M	Neg.
7	T	A	Streptococcus B	50	C	G	Neg.
8	B	S	Neg.	51	C	S	Neg.
9	I	M	Neg.	52	C	S	Neg.
10	B	G	Neg.	53	M	M	Neg.
11	D	G	Neg.	54	M	C	Neg.
12	C	E	Neg.	55	L	V	Neg.
13	A	A	Neg.	56	O	G	Neg.
14	A	A	Neg.	57	P	R	Neg.
15	B	R	Neg.	58	P	A	Neg.
16	B	C	Neg.	59	R	E	Neg.
17	D	A	Neg.	60	R	F	Neg.
18	D	A	Neg.	61	Q	E	Neg.
19	F	M	Neg.	62	S	V	Neg.
20	F	M	Streptococcus B	63	S	E	Neg.
21	C	A	Streptococcus D	64	S	V	Neg.
22	L	M	Neg.	65	T	G	Neg.
23	M	P	Neg.	66	T	B	Neg.
24	L	A	Neg.	67	V	M	E. Coli
25	P	A	Neg.	68	C	B	Neg.
26	P	V	Neg.	69	G	B	Streptococcus B
27	Z	M	Neg.	70	A	F	Neg.
28	A	R	E. Coli	71	B	A	Neg.
29	C	A	Candida sp.	72	B	M	Stafilococcus C
30	P	P	Neg.	73	C	R	Neg.
31	P	E	Neg.	74	G	G	Enterococcus, E. Coli
32	S	G	E. Coli	75	L	S	Neg.
33	L	R	Neg.	76	C	L	Neg.
34	C	E	Neg.	77	M	F	Neg.
35	L	M	Neg.	78	M	M	Neg.
36	B	M	Neg.	79	T	L	Enterococcus
37	C	G	Neg.	80	V	L	Neg.
38	C	M	Neg.	81	V	F	Neg.
39	C	M	Neg.	82	A	T	Neg.
40	D	G	Candida sp.	83	B	C	Candida sp.
41	F	F	Neg.	84	C	M	E. Coli
42	G	A	Neg.	85	L	G	Streptococcus B
43	M	C	Neg.	86	P	M	Neg.
44	N	A	Neg.	87	S	F	Neg.

Table 2.

Vaginal tampons	No. ass. positive	%	No. ass. negative	%
87	20	22.9	67	77

Table 3.

Type of microrganism	Vaginal tampon	
	No. ass.	%
Streptococcus B	6	6.8
Enterococcus	2	2.2
Candida sp.	4	4.5
E. Coli	7	8
Streptococcus faecalis	1	1.1
Streptococcus D	2	2.2
Streptococcus C	1	1.1

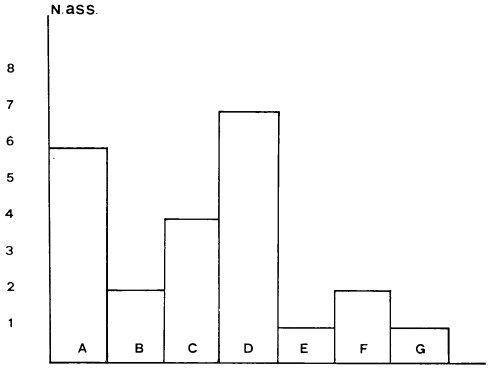
medium (Agar-blood base added to 150 mg of Nalidixic Acid and 100 mg of Chrystal Violet dissolved in 1 ml of absolute alcohol added to 99 ml of distilled water, as well as horse blood at 5%). The isolation and identification of the GBS was carried out as follows: the colonies which were suspected of streptococci (which look like mucous, a greyish white colour, all with a diameter of, or greater than, 2 mm and with a moderate haemolitic halo) were processed for identification based on morphological, tintorial and biochemical tests. We must emphasise that although, even with a frequency of about 1%, it is possible that stocks of non-haemolitic streptococci of Group B could grow, we nevertheless considered it unnecessary and inopportune to make systematic inquiries about the identification of all the streptococci which might be present. The biochemical identification was done by the utilisation of the gallery API 20 Strep (Ayerst). The biochemical reactions used are reported in table A.

RESULTS AND DISCUSSION

In 87 cases the percentage of the negative vaginal tampons was 77%, while the subjects who proved to be carriers of vaginal pathogenic flora were 20, with an incidence of 22.9% (tables 1-2). The total number of isolated micro-organismus types were the following was 23 (26.4%). The isolated microrganismus types were the following: Streptococcuc B (6.8%), Streptococcus D (2.2%), E. coli (8%), Candida sp. (4.5%), Streptococcus faecalis (1.1%), Enterococcus (2.2%), Stafilococcus C (1.1%) (table 3, fig. 1).

In adults the GBS may reach the digestive duct by ingesting cow-milk or its non-sterilized by-products, or through direct contact with cows or milkers, or even by bathing in polluted water or in water which has been contaminated by infected fish ([36]). The mechanism of inter-human transmission is mostly sexual, because from the digestive duct, and so from the rectum, the GBS go and contaminate the perineum and the female genitals ([18, 21]). The elective colonization sites in women are the rectum, the urethral meatus, the uterine cervix and the lowest third of the vagina ([29]).

In this way the patient may become a temporary, intermittent or chronic GBS germ-carrier. Baker and his collaborators ([5]) were among the first to give prominence to the high frequency of positivity to the GBS in vaginal tampons of IUD users, or of women under 20, or



A = Streptococcus B
B = Enterococcus
C = Candida Sp.
D = E. Coli
E = Streptococcus faecalis
F = Streptococcus D
G = Stafilococcus C

Fig. 1.

Table A.

Test	Reaction	Result
VP	Acetin production	+
HIP	Hippurate hydrolysis	+
ESC	Glucosidase	−
PYRA	Pyrrolidonylarylamidase	−
GAL	Galactosidase	−
GUR	Glucuronidase	V
GAL	Galactosidase	−
PAL	Alkaline phosphatase	+
LAP	Leucine arylamidase	+
ADH	Arginine deidrolase	+
RIB	Acidification	+
ARA	»	−
MAN	»	−
SOR	»	−
LAC	»	V
TRE	»	+
INU	»	−
RAF	»	−
AMD	»	V
GLYG	»	−

+: positive; −: negative; V: variable.
RIB: Ribose; ARA: L-Arabinose; MAN: Mannitol; SOR: Sorbitol; LAC: Lactose; TRE: Trealose; INU: Inulin; RAF: Raffinose; AMD: Starch; GLYG: Glycogen.

of women who, at the time of sampling, were in the first half of their menstrual cycle, or even women who had homosexual experience.

Sexual intercourse naturally facilitates the transmission to the partner, in whom there might occur urethritis, balanitis, prostatitis, cystitis, cystopielitis. In the newborn there are two form of infection: vertical transmission, mother to child, and hospital transmission of the infection ([1]). The first is, without doubt, the most frequent ([1]). According to Pasquinucci and his collaborators ([29]) research on 467 mother-newborn pairs there emerged the risk of newborn colonization in 38.9% if the mother was colonized, and of 2.3% if the mother was not colonized. We consider as risk-factors premature birth, weight under 2500 grammes, reduced metabolic and phagocytic activity of the polymorphonucleate, lack in the serum of opsonizing specific-type (IgG of maternal origin), precocious break of the membranes, intense colonization of the delivery-canal, protracted and persistent obstetric manual or instrumental manoeuvres ([5, 6, 8]).

The vertical type transmission would explain the cases of precocius fetal and newborn infections (within the first ten days after birth): sepsis, congenital pneumonia, respiratory syndrome (like the hyaline membrane disease), meningitis ([23]).

The onset of infections which arise 2-3 weeks after birth (late infections) ([15]), is caused by the nosocomial-type transmission, which comes about through contact with materials or instruments, or from the hands of staff carrying GBS. The most common late infections (which may appear from 10 days to 3 months after birth) are: late meningitis (which has a mortality of 20%), sepsis, conjunctivitis, ethmoiditis, middle otitis, omphalitis, osteomyelitis, suppurative arthritis, hypothalamus-hypophysial disorders, cellulitis, neurological consequences ([35]). In any case we must consider that in the newborn, as well as in the adult, the high degree of colonization does not correspond to the morbility, which is extremely low ([26]). Such a phenomenon allows us to consider the GBS as "opportunist" germs, which means that they present a pathological picture only under certain particular conditions ([29]).

Regarding delayed infections, a fundamental problem is the hospital conveyance, considered when cases of GBS infection have been known in the newborn of non-carrier mothers ([1]). There may be two forms of hospital-born infection ([4, 7]):

– the staff carry the GBS, spreading the infection even though they themselves are GBS negative;

– the staff is colonized by GBS.

After analysing the results, we came to these conclusions:

1) The sanitary staff serving in the obstetrical and neonatological departments (high-risk subjects, as they are in close contact with the newborn patients) must be considered carriers of the infection.

In the research 6% of the 20 cases which were contamined in the vagina by pathogenic flora were GBS positive. All of them were healthy carriers of the micro-organism. The extreme danger of the situation must be underlined, considering the possibility of the conveyance to the newborn, who may run the risk of developing serious delayed infections, the most important of which is meningitis ([8]). The problem is even more complicated by the difficulty existing in the identification of risk-subjects, unless regular checks on the vaginal secretion are made.

2) Once the selection and isolation of the GBS carrier cases among the sanitary staff has been made, it is necessary to eradicate the GBS. That is the second emerging problem in our research. In fact the GBS are extremely resistant germs ([34]). In our case the GBS positive subjects did not respond to antibiotic local therapy (CAF, tetracyclines). Perhaps the failure can be ascribed to the fact that the therapy used only permits the local eradication of GBS in patients who are probably colonized on a systemic level. That is why we transferred (always with positive results) to a therapy with Ampicillin (to be taken orally), which is easier to administer than Penicillin G, than Carbenicillin, or than CAF.

Concluding our enquiry we underline:

a) the importance of bacteriological checks of the vaginal secretions of the sanitary staff, which checks should be regularly repeated in order to identify the healthy carriers;

b) the use in the cases of healthy carriers of an active antibiotic therapy, not only at a local level but also on a systemic level, since an exclusively topic therapy has been proved inadequate.

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