

UDC 616.311/.32-008.87-053.31(477.84)

**Romaniuk L.B.,  
Kravets N.Y.,  
Pokryshko O.V.,  
Borak V.P.,  
Oliinyk N.M.**

*SHEE "I. Horbachevsky Ternopil State Medical University of Ministry of Health of Ukraine", Ternopil, Ukraine,  
kravetc@i.ua*

## **GUT MICROBIOTA IN INFANTS WITH PERINATAL PATHOLOGY OF THE CENTRAL NERVOUS SYSTEM**

**Abstract.** *Colonization of an infant's body by microorganisms occurs as early as during its birth. Opportunistic microorganisms play an important role in the formation of the microbial landscape of the intestine. The study showed that infants with complicated course of early neonatal period had transient intestinal dysbiosis prevailed by opportunistic flora, namely fungi of the genus *Candida*, *S. epidermidis* and *E. coli*.*

**Key words:** *infants, opportunistic flora, dysbiosis.*

**Introduction.** Intestinal microflora is one of the factors that ensure the resistance of the infant's body, the proper formation of its digestive system, the formation of its normal metabolism and immune status.

Formation of the intestinal microbiota starts on the first days of the infant's life, and is determined, besides its status, by such factors as microbial environment, getting colostrum, the time of breast-feeding, health of the mother, the course of labor. The classic type of the formation of the intestinal microflora in healthy full-term baby is as follows: 1-3 days of life - time prevalence of aerobic microorganisms over bifidobacteria; starting with the 4<sup>th</sup>-5<sup>th</sup> days – predominance of bifidobacteria in microbiocenosis, which constitute more than 98% of all microorganisms sown [1,2].

The positive effect of bifidobacteria, which do not form spores, on the physical functions of the infant's body is due to the fact that, producing acetic (60%) and milk (30-40%) acids, they create an acidic environment in the intestines and thus prevent the growth of pathogenic and gas-forming putrefactive flora. That is why the intestinal discharge of a healthy infant with an optimal level of bifidoflora in the gut have a sour smell, with no signs of putrefactive processes or gas-formation.

The joint stay of mother and child in the maternity institution influences positively the formation of microbiocenosis in all infants' biotypes: colonization by bifidobacteria and lactoflora is accelerated from the first days of life, the correct relationship between aerobic and anaerobic flora gets established. In a delayed mode of the joint stay, the infant's separation from mother in the first hours of life creates favorable conditions for colonization of the infant by opportunistic microorganisms [2,3].

**Objective:** to analyze the degree of dominance of a microorganism in the group of the intestinal microbiota based on a retrospective analysis of case histories of the children who were treated in the intensive care unit (ICU) of the Regional Perinatal Center in Ternopil. For this purpose, we used the constancy index C (%) and the incidence rate (Pi).

**Materials and methods.** The material for bacteriological study, taken with the consent of the parents were the infants' intestinal discharges. They were immediately placed into a sterile tube or into a tube with transport medium and sent to the laboratory, then sowed on sterile vivifying media (blood IPA with 5% sheep erythrocytes, yolk-salt agar, medium

Endo, Saburo medium). Inoculations were incubated at the optimum temperature for 24-72 hours. The microorganisms were identified by the classification of Bergey. Statistical analysis of the results was performed using standard software package on a personal computer.

**Results and discussion.** The study involved 32 infants, among whom there were 15 (46.9%) girls and 17 (53.1%) boys. All children were treated in the ICU for perinatal CNS lesions of various origins, combined with varying degrees of prematurity – 29 (72, 5%), and intrauterine infections - 13 (32.5%).

43 strains of microorganisms were isolated from the experimental material of 27 children examined. There was no growth in 5 samples (15.6%). While studying the intestinal microflora we found the dominance of coccal flora (15-37,5%), fungi of the genus *Candida* were isolated in 13 (32.5%) infants, *E. coli* - 10 (25.0%). The degree of dominance of a microorganism in a grouping was determined by the frequency of its discovery (Table). For this purpose, the constancy index *C* was used, which is expressed in the share of the product of the number of samples containing the study type (*p*) multiplied by 100% of the taken samples (*P*). Species, which were the most common (50%) were considered to be constant, those within 20-50% were secondary, those that do not occur frequently from 1 to 19%, those that are rare - less than 1%.

**Table**

**The degree of microorganism dominance in the intestinal contents of infants**

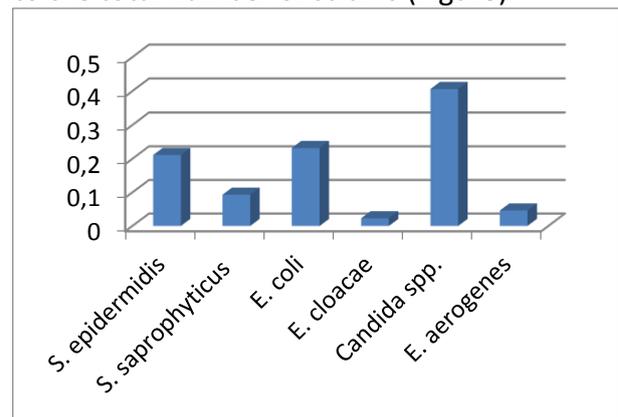
No	Name of the microorganism	Number of samples (n=32)	C (%)
1	<i>S. epidermidis</i>	11	34,4
2	<i>S. saprophyticus</i>	4	12,5
3	<i>E.coli</i>	10	31,3
4	<i>E.cloacae</i>	1	3,1
5	<i>Candida spp.</i>	13	40,6
6	<i>E. aerogenes</i>	2	6,3

As an infant's gut gets colonized by microflora gradually, there were no constant kinds among the isolated microorganisms, but *S. epidermidis*, *E. coli* and *Candida spp.*, were referred to minor

species and the rest of the selected strains are recognized as those which occur frequently. There was no aerobic flora among five samples taken from infants with complicated course of early neonatal period. As the material was taken on the first days of life, it may not necessarily contain aerobic microorganisms.

Frequent discharge of fungi of the genus *Candida* and *E. coli* out of the stool, which indicates transient dysbiosis arouses some concern. Such changes normally can last up to 6 days of life, so it would be appropriate to repeat bacteriological examination at the end of the first week, provided a long-term stay in the perinatal center.

To assess the the incidence of the populations of different microorganisms in the bowels we used the incidence index *Pi*, which is the ratio of the number of strains of this species to the total number of strains (Figure).



*Figure. Variability of the incidence index (Pi) of microorganisms in the intestinal microbiota of infants with perinatal damage of the CNS*

These values of incidence index *Pi* indicate a high prevalence of *Candida* fungi in the intestines of infants, which may be due to the peculiarities of feeding due to immaturity (prematurity) and abnormalities in the regulatory function of the central nervous system on the one hand and to a separate stay of the mother and baby in the hospital while having such diseases on the other hand.

**Conclusions.** Infants with complicated course of early neonatal period have transient intestinal dysbiosis prevailed by opportunistic pathogens, namely fungi of the genus *Candida*, *S. epidermidis* and *E. coli*. Since all the children

were treated at the intensive care unit of the Regional Perinatal Center of Ternopil, not with their mothers, it can be argued that it affects the amount of saprophyte flora of this biotype and requires a further study in dynamics, on intestinal colonization by resident flora and learning its properties, depending on the type of feeding and on the technique of the latter, because some of the children were premature.

**Prospects of further research.** The species composition of the intestinal microflora will determine the future landscape of this habitat in infants and young children and therefore will affect the functioning of the digestive system and the formation of immunity in neonatal period. Therefore, the study of the properties of aerobic and facultative anaerobic pathogenic flora will help prevent the development of dysbiotic changes in the future, to diagnose

increasing the number of pre-clinically significant concentrations and transforming virulent properties of representatives of transient microflora in these areas.

#### References:

1. Дещекина М.Ф. Изучение формирования микрофлоры кишечника у новорожденных детей при совместном и раздельном пребывании с матерью. / М.Ф. Дещекина // Педиатрия. – 1990. – №1. – С. 13-18.
2. Filoche S. Oral Biofilms: Emerging Concepts in Microbial Ecology. / S.Filoche, L.Wong, C.H. Sissons // Journal of Dental Research. – 2010. – 89. – P.8-18.
3. Robinson C.J. From Structure to Function: the Ecology of Host-Associated Microbial Communities/ C.J.Robinson, B.J.M. Bohannan, V.B. Young // Microbiology and Molecular Biology Reviews. – 2010. – № 74. – P. 453-476.