

CROSS-REACTION OF HETEROGENEIC ANTIGENS OF *Escherichia coli* WITH HUMAN A, B, AND O ANTIGENS

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A study of the antigens of 27 strains of *Escherichia coli* by absorption of monospecific anti-A, anti-B, and anti-O antibodies revealed the presence of heterogeneous antigens in six strains. Antigens similar to A and B antigens were found in one strain of serotype O86, three strains contained only B antigen, and one strain of serotype O128-0 contained antigen O(H). A small quantity of B antigen was found in *E. coli* K-12 200 PS. A connection is postulated between the pathogenicity of bacteria and their content of heterogeneous antigens.

Heterogeneous antigens similar to antigens of human tissues and cells have now been detected in many microorganisms [1-3].

It is considered that these antigens are evidence of the character of evolution of the pathogenicity of parasites (biological or antigenic mimicry) and that they may be a cause of autoimmune processes developing in diseases produced by them.

Investigations into strains of *Escherichia coli* containing cross-reacting antigens such as isoantigens or human intestinal antigens [4, 5] are particularly interesting from this point of view. The role of these heterogeneous antigens in the etiology and pathogenesis of severe diarrhea in children, colitis and enterocolitis, pyelonephritis and other diseases has been postulated.

It was accordingly decided to investigate the presence of heterogeneous antigens of the human A, B, and O(H) isoantigen type in a collection of strains of *E. coli* including the most widely distributed enteropathogenic serotypes of this organism* as well as some strains of *E. coli* K-12,† the subject of many previous genetic studies.

EXPERIMENTAL METHOD

Experiments were carried out on 22 strains of *E. coli* of known serotypes and five strains of unknown serotypes, but of known genetic characteristics.

Antigens of types A, B, and O were detected in the bacteria by a modified method of absorption of monospecific anti-A, anti-B, and anti-H(O) sera and of anti-H(O) lectin from elderberries. Forensic medical sera of different series were used. The experiments were repeated no fewer than 3-5 times, with con-

*The enteropathogenic strains were obtained from the collection of the All-Union *Escherichia* Center from Professor I. V. Golubeva (I. M. Mechnikov Research Institute of Vaccines and Sera), to whom the authors are grateful.

†The strains of *E. coli* K-12 were obtained from Professor A. P. Pekhov's collection.

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TABLE 1. Presence of Heterogeneous Human A, B, and O Antigens in Some Strains of *E. coli* K-12

Name of strain	Fertility			Heterogeneous antigens		
	sensitivity to specific "male" phages (F ₂ , MS ₂)	ability to give recombinants in crosses with standard recipient	sexual type	O	B	A
200 PS	+	+	Intermediate donor	-	+	-
Hfr H	+	+	Donor of type Hfr	-	-	-
AB312	+	+	Donor of type vHfr	-	-	-
P678	-	-	Recipient	-	-	-
C600	-	-	Recipient	-	-	-

Legend: +) presence of property; -) absence of property; Hfr) high frequency of recombination; vHfr) very high frequency of recombination.

trols in every case consisting of material containing and not containing heterogeneous group antigens.

To eliminate nonspecific reactions through contamination with components of the nutrient medium, the bacteria were grown for 2-3 days on a minimal protein-free medium and the 3rd-4th subculture was used in the experiments. A bacterial suspension was thus obtained in a concentration of 2 billion bacterial cells per ml (not less than 200 ml altogether). The bacteria were sedimented at 3,500 rpm for 30 min and the supernatant was decanted and the residue used for absorption of the antisera. Tubes with a solid residue (50-60 mg) were used in the experiments, and successful results were obtained with residue from both living and heat-killed (1 h at 100°C) bacteria.

To obtain more accurate results, the forensic-medical monospecific sera (rabbit anti-A, sheep anti-B) and the lectin (anti-H) were diluted with physiological saline to a titer of 1:64 when tested with the corresponding red cells of persons of blood groups A, B, and O. Goat anti-H(O) serum, because of its low initial titer (1:16-1:24), was diluted to a titer of 1:4. These dilutions of serum were added in a volume of 0.1 ml to each tube with the residue of bacteria, and after careful resuspension, incubated at 37°C for 2 h. The suspension was then centrifuged again and the supernatant used subsequently for the tests.

To determine the presence or absence of specific agglutinins, freshly obtained red cells of blood groups A, B, and O were used. The cells were washed three times at 1,000 rpm for 5 min, and a 5% suspension was then made up in physiological saline. One drop of absorbed serum was placed on a slide, and the 5% suspension of red cells added in a volume of approximately one tenth that of the serum. The specimen was mixed and gently shaken and the results read after 5 min. The results were recorded by a 3-point system: +++) macroscopically visible agglutination (floccules, clots); ++) microscopically visible agglutination (large agglomerations, magnification 56 ×); +) microscopic agglutination (small agglomerations, of 5-10 red cells or more); -) no agglutination of red cells.

EXPERIMENTAL RESULTS

The experiments yielded reproducible results, which are summarized below. During investigation of 22 strains of known serotype (O86, O26, O6, O128, O41, O25, O100, O111, and O55) heterogeneous antigens were detected in only five strains, as follows: type O in one strain of serotype O128, type B in three strains of serotype O86, types A and B in one strain of serotype O86. Among the five strains of *E. coli* K-12, type B antigen was detected in a comparatively small amount only in strain 200 PS (an intermediate F-lact donor) (Table 1).

It can be concluded from these results that some strains of *E. coli* contain antigens similar to human isoantigens of the A-B-O system. There is reason to suppose that the presence of these cross-reacting heterogeneous antigens may be important in increasing the pathogenicity of certain strains of *E. coli* for persons of the corresponding blood group.

LITERATURE CITED

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