ORGAN-SPECIFIC ANTIGENS IN THE HUMAN LUNG

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As many as four organ-specific antigens can be found in the human lung, together with antigens common to the lung, spleen, liver, and kidneys.

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Specific antigens of the human lung have received very little study, and no definite data are available concerning the presence of a specific organ antigen in the lung. Avdeev [1], who studied antigens of the human lung, reached no definite conclusion regarding the presence of a specific antigen in lung tissues. On the other hand, two specific tissue antigens have been found in the lungs of rats [6].

In the present investigation an attempt was made to detect a specific antigen in the human lung.

EXPERIMENTAL METHOD

Antigens obtained from the lungs of 27 cadavers of persons dying accidentally were investigated. Besides antigens in the lungs, antigens of the liver, spleen, and kidney were studied for comparison.

The antigens for investigation were prepared by the method described in [3]. This method yields preparations consisting of a mixture of nucleoproteins together with other cell proteins.

Pieces of the organs were weighed, cut into small fragments, washed under a strong jet of tap water for 6 h, and then with physiological saline to remove all the blood. The pieces of organs were then homogenized in physiological saline in the ratio of 1:1. The suspension was diluted with physiological saline (1 g tissue of 4 ml saline); the pH of the suspension was adjusted to 8.0-8.5 with 1% NaOH solution. The homogenate was allowed to stand overnight in the refrigerator. Next day the pH of the material was tested, and if it had changed, alkali was added to give a pH of 8.5, after which the solution was centrifuged for 40 min at 4000 rpm. The residue was discarded, and the supernatent was acidified with 1% acetic acid to pH 6.0. The precipitate thus produced was removed by centrifugation and the supernatent was acidified to pH 4.0-4.5.

The residue remaining after centrifugation was washed with distilled water acidified to pH 4.0-4.5, and then dissolved in distilled water alkalified with 1% NaOH solution to pH 8.0-8.5. The antigens prepared in this manner were poured into sterile flasks and preserved with merthiolate (1:10,000) and kept in the cold at 4-6°.

The protein content of the antigens was determined by the micro-Kjeldahl method. In most cases the protein content was between 6 and 20 mg/ml.

Tissue antigens were studied in the precipitation test. Ninety-two antisera obtained by immunization of rabbits with lung antigens, with or without Freund's adjuvant, and three antisera obtained by immunization of animals with human serum were used in this test. The method used was that of Ouchterlony as modified by Gusev and Tsvetkov [2]; hyperimmune serum was poured into the central well, and the test antigen into the peripheral wells. Altogether 520 tests were carried out to investigate about 110 different antigens.

Immunoelectrophoresis was carried out by Grabar's method in Scheidegger's micromodification [7].

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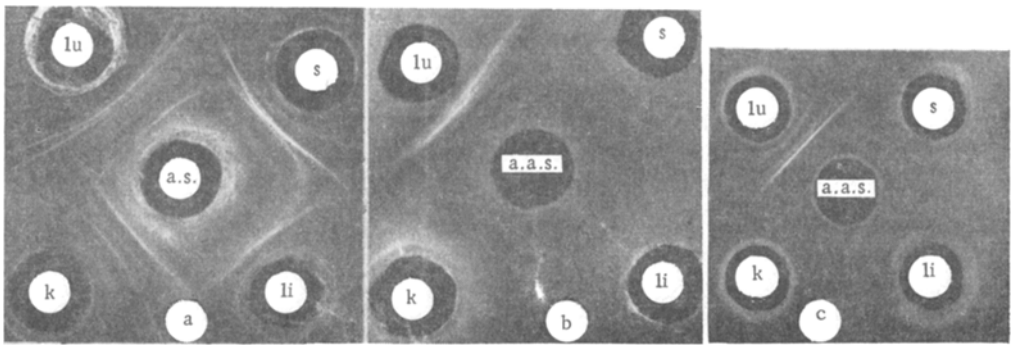

Fig. 1. Precipitation test in agar with unabsorbed (a) and absorbed (b) antisera and Bjorklund's absorption test (c) with different antigens: a.s.) antisera; a.a.s.) absorbed antiserum; lu) lung; s) spleen; k) kidney; li) liver.

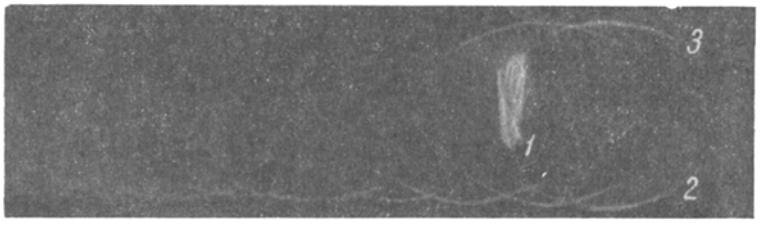

Fig. 2. Immunoelectrophoretic investigation of lung antigen: 1) lung antigen; 2) unabsorbed antiserum; 3) absorbed antiserum.

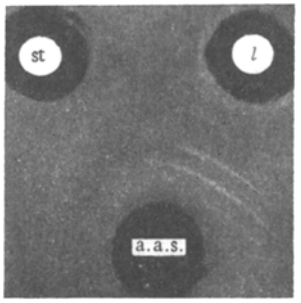

Fig. 3. Precipitation test in agar on absorbed serum with lung antigen and staphylococcal antigen: *l*) lung; st) antigens of staphylococci isolated from normal lung; a.a.s.) absorbed antiserum.

EXPERIMENTAL RESULTS

Analysis of the results of the precipitation test using antiserum against lung antigen and various tissue antigens showed that lung, kidney, spleen, and liver antigens and normal human serum form between 2 and 9 precipitation lines. Some of the lines (1-3) usually join together to form a complete circle, indicating that these antigenic structures are common to these various organs and to human blood serum. This was confirmed by the results of the precipitation test when antiserum against human serum was made to react with tissue antigens.

It was also found that when lung antiserum was tested against antigen from lung tissue, in most experiments more precipitation lines were obtained than with antigens from the other organs (Fig. 1a).

To detect organ-specific antigen in lung tissue, sera of narrow specificity containing antibodies only against lung tissue were used. Sera of this type were obtained in two ways: by absorption of nonspecific antibodies by Bjorklund's method [4, 5] and by preliminary absorption of the antiserum with a mixture of antigens.

Absorption by Bjorklund's method was carried out with antigens from the liver, kidney, spleen, and human blood serum directly in the agar before the precipitation test, by saturating the wells for 3 days, after which the test was carried out in the usual manner.

Antiserum introduced in the central well gave a precipitation reaction only with lung tissue, and gave no precipitation lines with antigens from the liver, kidney, and spleen (Fig. 1c).

The presence of organ-specific antigens in the lung tissue was confirmed in the precipitation test after preliminary absorption of the antiserum with tissue antigens and normal blood serum. These sera did not react with liver, kidney, or spleen tissue, but they continued to give a precipitation reaction with lung tissue (Fig. 1b).

Immunoelectrophoresis with unabsorbed hyperimmune serum produced up to 10 precipitation arcs. When immunoelectrophoresis was carried out with absorbed serum, from 1 to 4 precipitation arcs were obtained depending on the quality of the serum (Fig. 2).

To verify the organ-specificity of the detected antigens and to exclude possible bacterial contamination of the antigen, the flora from the tested lung was cultured, and found to consist mainly of Staphylococcus albus and Staphylococcus aureus, an antigen of which was prepared. The precipitation test, carried out on absorbed lung antiserum with bacterial antigens, yielded no precipitation lines (Fig. 3).

These experiments thus showed that human lung tissue contains organ-specific antigens. In addition, several human organs (lung, liver, kidney, spleen) possess certain common antigens.

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