ANTIGENIC PROPERTIES OF REGENERATING MUSCLE TISSUE

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Studies of the antigenic properties of the tissues in the course of normal embryonic development have shown that they contain three main types of antigens: species-, organ-, and stage-specific [2]. Investigation of the antigenic properties of regenerating muscle tissue has revealed that such tissue possesses, besides the species- and organ-specific antigens present in the normal muscle, antigens not found in this tissue (stage-specific antigens) [5].

The object of the present investigation was to continue the analysis of the antigens of regenerating muscle tissue by means of the reaction of anaphylaxis with desensitization in guinea pigs [3].

EXPERIMENTAL METHOD

Under ether anesthesia, and observing the rules of asepsis, the left gastrocnemius muscle was removed operatively from male albino rats weighing 110-130 g, and in some animals minced muscle tissue was used to replace the excised muscle (autotransplantation) while in others it was not replaced.

After periods of 10, 14, 21, and 30 days the regenerating muscles were removed, freed from vessels and nerves, and freeze-dried. The lyophilized tissues were used as antigens for sensitizing guinea pigs. The guinea pigs were given a subcutaneous injection of 0.2 ml of a suspension of the regenerating tissues taken on the 10th, 14th, and 21st days after the operation. On the 21st day after sensitization the animals were successively desensitized to different antigens.

In these cases each reacting injection was at the same time a desensitizing injection, and after testing for completeness of desensitization, the same animals could be used for detection of another group of antigens [1, 4].

Before the reacting and desensitizing injections, the protein concentration in all the materials used for the inoculations was determined by Lowry's method, and their protein concentrations were subsequently equalized.

For the sensitizing injection, homogenates were used in doses estimated in relation to the dry weight of the lyophilized muscle tissue [5].

EXPERIMENTAL RESULTS

The guinea pigs sensitized with suspensions from regenerating tissues taken on the 10th, 14th, and 21st days after the operation gave a distinct reaction of anaphylactic shock in response to intravenous injection of an extract of normal muscle tissue.

This indicated the presence of common antigens (species- and organ-specific) in the regenerating and normal muscle tissue.

After complete desensitization to normal muscle extract and confirmation of completeness of desensitization to this antigen, the guinea pigs received the first reacting injection of an extract of regenerating muscle* obtained at another time after the operation. The guinea pigs again developed an anaphylactic reaction. The development of this reaction in this case was probably associated with the presence of a large amount of connective tissue among the regenerating muscle tissue, possibly possessing antigenic properties different from those of normal (nonregenerating) muscle tissue. Consequently, the connective tissue may be responsible for the "common antigens" in the regenerating tissues at different times after the operation.

* The 1st reacting injection was at the same time desensitizing.

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After complete desensitization of the guinea pigs to the "common antigen" and verification of the completeness of desensitization, the animals were given the 2nd reacting injection of extract of the regenerating muscles taken at the same times as those used for sensitization. The guinea pigs sensitized by a suspension of regenerating muscle tissue taken on the 10th and 21st days after the operation again developed an anaphylactic reaction after desensitization to extract of normal muscle and of the regenerating muscle 30 days after operation in response to the injection of extract of regenerating muscle taken after 10 and 21 days. This shows that, besides antigens similar to the antigens of normal muscle and of regenerating muscle 30 days after operation, the regenerating muscle tissue taken on the 10th and 21st days after operation also contained antigens undetectable either in normal muscle or in 30-day regenerating muscle (stage-specific antigens).

Extract of the 10-day regenerating muscle completely abolished the sensitivity of the guinea pigs to the 14-day regenerating muscle. This demonstrates that common antigens are shared by the regenerating muscle taken on the 10th and 14th days after operation.

It was thus shown that stage-specific antigens are present in regenerating muscle tissue taken on the 10th, 14th, and 21st days after the operation.

Similar results were obtained in the other series of experiments.

Guinea pigs sensitized with a suspension of regenerating muscles taken on the 10th and 14th days after the operation were desensitized to the serum of normal intact rats. The positive reaction, accompanied in some cases by death of the animals, showed that the regenerating muscle tissue on the 10th and 14th days after operation contained species-specific antigens.

After complete desensitization of the guinea pigs to species-specific antigens and verification of the completeness of desensitization, the animals were given an injection of normal muscle tissue extract. The positive anaphylactic reaction indicated that the regenerating muscles on the 10th and 14th days after the operation contained another group of antigens, similar to the antigens of normal muscle (tissue and organ).

After desensitization and verification of the completeness of desensitization to tissue- and organ-specific antigens, the guinea pigs were given a further injection of extract of regenerating muscles of the same periods as those used for sensitization. The positive reaction obtained shows that, besides antigens common to the antigens of normal muscle (species- and organ-specific), the regenerating muscle tissue also contained stage-specific antigens not found in normal muscle.

The experiments of series III were carried out to test the validity of this hypothesis.

Guinea pigs sensitized with a suspension of normal muscle tissue were desensitized to species-specific antigens (by injection of serum), and then, after testing for completeness of desensitization, they were given an injection of extract of 10-day regenerating muscle. A positive reaction was obtained, confirming again the presence of common organ (tissue) antigens in normal and regenerating muscle tissue. Besides species- and organ-specific antigens, no other groups of antigens could be found in the normal muscle tissue.

When unsensitized animals were injected with the antigens in the maximal dose no such reaction was observed.

Hence, by means of the reaction of anaphylaxis with desensitization in guinea pigs, it was shown that regenerating muscle tissue, on the 10th, 14th, and 21st days after the operation possesses, besides antigens similar to the antigens of normal muscle (species- and organ-specific), stage-specific antigens not found in normal muscle.

As in the course of normal embryonic development, when three main groups of antigens (species-, organ-, and stage-specific) have been shown to be present, so also in regenerating muscle tissue the same three groups of antigens are found.

SUMMARY

The reaction of anaphylaxis with desensitization on guinea pigs was used to study the antigenic properties of regenerating muscle tissue of an albino rat on the 10th, 14th, 21st, and 30th day after an operation.

The regenerating muscle has been found to contain the three basic groups of antigens (species-, organ-, and stage-specific) just as those found in tissues with a normal embryonal development.

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All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of the first issue of this year.
