Difference of the IgE Memory Cells in SJL and BALB/c Mice

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Abstract

Memory cells for adoptive transfer for IgE production must be primed with Al(OH)₃ as adjuvant in the SJL strain of mice, but can be primed also with Freund's complete adjuvant in the BALB/c strain.

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It has been shown that to obtain the highest IgE antibody titers in primary immunization of mice Al(OH)₃ is much better than Freund's complete adjuvant (FCA) [1]. Bordetella pertussis was also used with good results [2, 3]. Even much higher IgE antibody titers can be obtained by adoptive transfer [4, 5]. In the past, donors were immunized with small amounts of antigen and Al(OH)₃ as adjuvant, several weeks before their spleen cells were injected into irradiated recipients.

IgE production in the SJL strain is transient, because this strain possesses IgE class-specific suppressor cells [6]. In the BALB/c strain the IgE antibody production with the same immunization is higher and persists for weeks. It has also been shown that immunization with FCA favors the production of suppressor substances [7].

In adoptive transfer, the memory cells play an important role. The adjuvants for the production of these memory cells has not yet been investigated. We report here the great difference between the SJL and the BALB/c strains for formation of memory cells depending on the adjuvants. The antigens used were keyhole limpet hemocyanin (KLH), dinitrophenylated ovalbumin (DNP-OVA), and DNP-bovine serum albumin (DNP-BSA). DNP-mouse albumin (DNP-MA) and DNP-KLH were the same as described previously [8].

8-week-old female SJL mice from the Jackson Laboratories (Bar Harbor, Me.) and BALB/c mice raised by ourselves were used as donors for immunization and as recipients. CFW mice from Charles River (Wilmington, Mass.) were used for mouse passive cutaneous anaphylaxis (PCA) and 300-gram male Sprague-Dawley rats from Camm (Black Oak ridge, Wayne, N.J.) for rat PCA.

Spleen cells from immunized donors were harvested 4 weeks after immunization and injected intravenously into syngeneic recipients irradiated with 600 rad

1 day previously [4]. The adoptive transfer takes advantage of the carrier effect [9].

Antibody-producing B cells are primed with DNP-OVA, the T cells with KLH and the challenging antigen is DNP-KLH. Every recipient was injected intravenously with a mixture of 2×10^7 spleen cells from donors primed with DNP-OVA and 2×10^7 spleen cells from donors primed with KLH.

Table I shows the experimental protocol and table

II the results. IgE was determined by PCA reactions in rats with a 2-hour sensitization period using 1 mg DNP-BSA as challenging antigen and IgG1 by PCA with 1.5-hour sensitization period in CFW mice using 0.5 mg DNP-MA as challenging antigen as described [10]. Complement-fixing antibodies (IgM, IgG2a, IgG2b, IgG3) were titrated by passive hemolysis of DNP-coated sheep erythrocytes as described [11, 12].

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Table I. Protocol of the experiment

Strain

Group

Cells injected i.v.

2×10^7 from donors primed with DNP-OVA

2×10^7 from donors primed with KLH

Challenging antigen DNP-KLH

SJL

BALB/c

SJL

0.2 μ g + 1 mg Al(OH)₃ 10 μ g + FCA

0.2 μ g + 1 mg Al(OH)₃ 10 μ g + FCA

10 μ g + FCA

1 μ g + 1 mg Al(OH)₃,

10 μ g + FCA

1 μ g + 1 mg Al(OH)₃ 10 μ g + FCA

1 μ g + 1 mg Al(OH)₃

1 μ g + 1 mg Al(OH)₃ 10 μ g + FCA

1 μ g + 1 mg Al(OH)₃ 10 μ g + FCA

1 μ g + 1 mg Al(OH)₃

Table II. Antibody titers after adoptive transfer

IgE titrated by PCA in rats; IgM1 by PCA in mice; C-fixing antibodies by passive hemolysis of DNP-coated sheep erythrocytes. ND = Not determined.

Excellent memory cells and very good IgE production can be obtained in BALB/c mice with Al(OH)₃ and FCA; however, in the SJL strain, IgE production can be obtained only with Al(OH)₃ as adjuvant. When the B cells were primed with 10 μ g DNP-OVA and FCA, the T cells with 1 μ g KLH with 1 mg Al(OH)₃ and the challenge was 1 μ g DNP-KLH with 1 mg Al(OH)₃ still no IgE antibody was produced as opposed to the high titer (3,200) of IgG1. In addition, in the SJL strain the production of IgE antibody lasts a shorter period of time than in the BALB/c strain probably because the SJL strain has the class-specific (IgE) suppressor t cells. No difference was found in IgG1 production when Al(OH)₃ or when FCA was used.

Acknowledgement

This work was supported by grant AI-03075 from the National Institutes of Health.

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