closure. Further investigations into its biochemical nature may shed light on its role in cell-cell interaction during morphogenesis.

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Influences of the submaxillary gland of male mice on the immune response to sheep red blood cells

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Summary. Removal of the submaxillary gland (SMG) from male but not female mice caused a suppressed immune response to sheep red blood cells. Administration of a SMG saline extract from male mice to SMG-ectomized males restored the suppressed response to control levels. This suggests that the male mouse SMG contains a factor(s), possibly of an endocrine nature, capable of influencing cells involved in an immune response.

Although the submaxillary gland (SMG) is generally regarded as an exocrine organ, some work has alluded to a possible endocrine function[1,2]. As reported previously, removal of the SMG enhanced the delayed type hypersensitivity response in male mice, and administration of saline extracts from male mouse SMG resulted in a lowering of the response in SMG-ectomized males to the level seen in normal males[3]. This suggests that the SMG of male mice contains an endocrine factor (or factors) which can suppress one kind of cell-mediated immune response. In this study we report on the consequences of removal of mouse SMG on antibody formation as measured by plaque forming cell (PFC) response to sheep red blood cells (SRBC).

Materials and methods. ICR-strain male and female mice were fed an ordinary laboratory diet and water ad libitum. The SMG was removed at the age of 6 weeks under

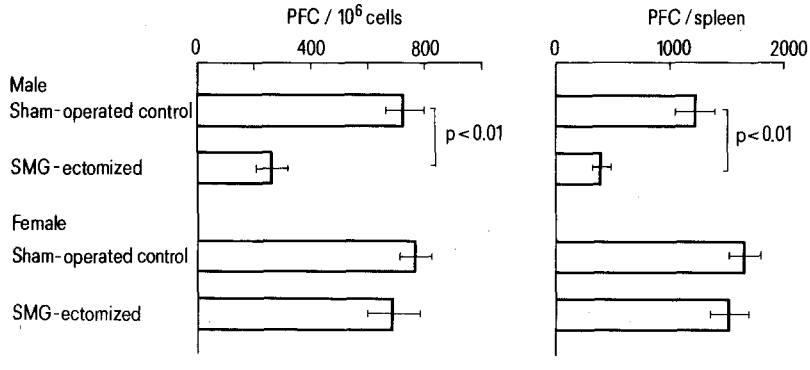

Fig. 1, Following the SMG-ectomy, male mice show a suppressed immune response to SRBC at 8 weeks after surgery. Each column shows the mean ± SE of 8 animals.

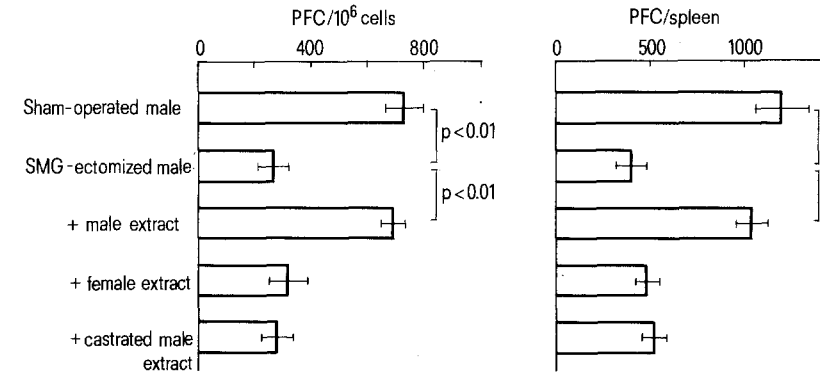

Fig. 2. Saline extract of the SMG of male mice normalize the suppressed PFC response in SMG-ectomized animals. But those of females and castrated males do not affect it. Each column shows the mean ± SE of 8 animals.

pentobarbital sodium anesthesia. Care was taken to avoid damage to the sublingual gland and surrounding lymphoid tissues. Sham-operated mice of matched age were used as controls. Each mouse was injected i.v. with 0.1 ml of a 20% suspension of SRBC (4×10^8 cells) on day 0. Some of the SMG-ectomized male mice were injected i.p. with the extracts described below at a dose of 50 µg protein/g b.wt daily 4 times from day 0 to day 3. Mice were killed by cervical dislocation on day 4 and the spleen was removed. It was minced in a petri dish containing 2.5 ml of ice-cold Eagle's medium with heparin. The material in the dish was transferred to a tube, allowed to settle for 10 min, and then decanted into another tube. The cell suspension was diluted to contain 10^6–10^7 cells/ml. Plaque-techniques were carried out by the method of Jerne and Nordin[4].

The extracts were prepared as follows; the SMG from 12-week-old male, female and castrated male mice (castration was performed at the age of 8 weeks) were homogenized with saline and the supernatants obtained by centrifugation at $105{,}000\times g$ for 1 h were designated as saline extracts. Protein content in the extracts was measured by the method of Lowry et al.[5].

Results. The removal of SMG caused suppression of the PFC response to SRBC in male but not female mice at 8 weeks after the operation. The number of PFC in the SMG-ectomized males was about $^1/_3$ of the value in the control males (figure 1). The administration of the saline extract from male mice to the SMG-ectomized males brought the suppressed response back to the levels seen in sham-operated controls. The extracts from females and castrated males did not affect the suppressed response (figure 2). It seems unlikely that the suppression of PFC response observed in the SMG-ectomized males is due to the nonspecific effect caused by SMG-ectomy because the administration of the SMG-extract from normal males restored the suppressed response to the levels seen in sham-operated controls. Thus the results presented above suggest that the SMG of male mice contains a possible endocrine factor or factors which influences immune response to SRBC and that the factor is androgen-dependent.

Discussion. The SMG of mice is an interesting organ, rich in biologically active proteins such as nerve growth factor (NGF) and epidermal growth factor (EGF). Concerning its effects on immunological cells, Kongshavn and Bliss[6] have demonstrated that extracts from male mouse SMG prolong the survival of H-2 incompatible skin allografts in mice. Koch and Rowe[7] have reported on the effect of SMG-extract on antibody formation in response to SRBC. There is no report, however, examining the possibility that the removal of the SMG in mice influences the immune response. Our previous[3] and present results suggest that the SMG of male mice contains a possible endocrine factor or factors capable of influencing cells involved in immune responses and that the factor(s) is androgen-dependent. But the divergence of findings between delayed type hypersensitivity and the SRBC response is still inexplicable.

A marked sexual dimorphism of the mouse SMG is well known[8,9]; NGF, EGF and proteolytic enzyme levels are much higher in males than in females and these proteins are induced by androgens[10–12]. Therefore the possibility that one or several of these proteins may be involved in the regulation of the immune response is worth considering. Further investigations are needed to clarify whether 1 or different factors regulate cell-mediated and humoral immune responses and to study the target cells of the factor(s).

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Adenosine deaminase activity in peripheral blood cells from SJL/J mice[1]

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Summary. Adenosine deaminase (ADA) activities were measured in peripheral blood cells of SJL/J mice, and compared with those of C57BL/6J animals. No association was observed between the levels of lymphocyte or erythrocyte ADA and immunologic abnormalities in SJL/J mice nor was evidence obtained to suggest a relationship between ADA activity and tumorigenesis in this strain.

In 1972, it was reported that the blood cells of 2 patients with severe combined immunodeficiency disease were deficient in adenosine deaminase (ADA), an enzyme of the purine salvage pathway[2]. This discovery was soon confirmed and then extended by other investigators to include findings relevant to the role of genetics and to the mechanism of the defect[3].

Recently, several investigations have failed to demonstrate an association between ADA deficiency and immunodeficiencies in animals such as the marmoset, mouse and horse[4,5]. This paper describes a related study with SJL/J mice, an inbred strain characterized by immune disorders and by spontaneous development of reticulum cell neoplasms[6].

Materials and methods. Animals. Female SJL/J mice were supplied from our breeding colony in the Animal Services Center, University of Alabama in Birmingham. Strain C57BL/6J females, obtained commercially (The Jackson Laboratory, Bar Harbor, Maine), were used as controls.

Blood cell preparations. Blood samples were collected by tail bleeding into heparinized tubes from groups of 12–16 mice at 12, 22, 32, 42, and 52 weeks of age. The lympho-