turnover of cell membrane constituents[14]. Participation of macrophage membrane receptors was also suggested in ALS-induced depression of macrophage migration in vitro[15] since the effect was substantially reduced by trypsinization[16].

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Résumé. Etude des effets des sérums antilymphocytes sur la phagocytose in vitro par les macrophages de la rate et du péritoine de la souris. L'inhibition partielle de la phagocytose a été transitoire; les cellules macrophages ont récupéré leur capacité fonctionelle deux jours après l'administration de sérum antilymphocyte.

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Inhibition of Epinephrine-induced Glycogen Phosphorylase Activation by *Bordetella pertussis* Vaccine in Rats

It has been previously shown that hyperglycemic response to epinephrine was inhibited by *Bordetella pertussis* vaccine (BPV)[1,2], and this mechanism may be involved in the development of increased sensitivity to anaphylactic shock and shock mediators following BPV treatment. The purpose of the present study was to investigate how BPV influences epinephrine-induced liver and muscle glycogen phosphorylase activation. Since in BPV-treated rats the normal hyperglycemic response was restored by prednisolone treatment[2], the effect of prednisolone on the disturbed glycogen phosphorylase activation was also investigated.

Materials and methods. Wistar male rats (150–200 g) were maintained on a standard diet and drinking water was given ad libitum. Experiments were performed on fed animals at 09.00 h to insure adequate glycogen levels. BPV was administered i.p. in a single dose of 3×10^{10} organisms. Some groups of normal and BPV-sensitized rats were treated with 25 mg/kg prednisolone succinate (Organon) s.c. twice daily over a period of 3 days. The last dose of prednisolone was injected 12 h before phosphorylase examination.

All rats were anaesthetized with pentobarbital 30 min before sacrificing. Liver and muscle samples were taken 10 min after the i.p. injection of epinephrine (0.1 mg/kg) or phys. saline. Active liver phosphorylase was assayed according to the procedure of Hedrick and Fisher[3]. Gastrocnemius muscle samples were prepared as described by Schaeffer et al[4]. Total and active muscle phosphorylase levels were determined by assaying with and without 1 m*M* AMP, respectively, according to the method of Hedrick and Fisher[3]; and besides active phosphorylase levels, the ratios of active to total enzyme activities are indicated in Table II. Phosphorylase activities are expressed as mmol released inorganic phosphate/g tissue/h (mmol $P_i/g^{2'}h^{-1}$). The results are statistically evaluated by Student's *t*-test.

Results and discussion. BPV, prednisolone, or BPV + prednisolone did not influence active liver phosphorylase levels (Table I). Epinephrine caused about a 100% increase of active phosphorylase level in normal rats. The response to epinephrine was significantly inhibited by BPV pretreatment. Prednisolone alone caused no changes, however, in BPV inoculated rats the sensitivity to epinephrine was restored by prednisolone.

BPV alone did not alter the level of active and total muscle phosphorylase (Table II). Prednisolone treatment resulted in an increase both in normal and in BPV-treated rats; however the ratio of active to total phosphorylase was not significantly influenced. Following epinephrine administration an activation of muscle phosphorylase could be observed in normal rats as indicated by the increase of the ratio of active to total enzyme activity. This effect of epinephrine was merkedly inhibited by BPV pretreatment. The sensitivity of BPV-treated rats to epinephrine was partially restored by prednisolone.

The diminution of epinephrine-induced hyperglycemia in BPV-treated rats[1,2] may be due to the disturbance of insulin secretion and to the changes of liver glycogen metabolism. An increased sensitivity of insulin secretion mechanism in BPV-treated rats was demonstrated by our previous results[5]. Recently Kreutner et al.[6] reported that BPV did not influence the effect of epinephrine on liver glycogen synthetase, whereas it inhibited epinephrine-induced activation of liver glycogen phosphorylase. The latter findings are supported by our present observations. In addition, a diminished response of muscle phosphorylase to epinephrine was demonstrated in this paper.

The inhibited response of BPV-treated rats to epinephrine is probably due to an impairment occurring at any one

Table I. Effect of epinephrine on active liver phosphorylase level in normal, BPV, prednisolone and BPV + prednisolone-treated rats

	Phosphorylase activity mmol $P_i/g^{2'}h^{-1} \pm$ SE	
	Phys. saline	Epinephrine
Normal	1.18 ± 0.06 (8)	2.37 ± 0.12^{a} (9)
BPV	1.28 ± 0.07 (10)	$1.76 \pm 0.06^{b,c}$ (9)
Prednisolone	1.25 ± 0.10 (8)	2.40 ± 0.12^{a} (9)
BPV + prednisolone	1.27 ± 0.11 (8)	2.26 ± 0.10^{a} (9)

[a] $p < 0.001$; [b] $p < 0.01$ related to values obtained after phys. saline. [c] $p < 0.01$ if the increase caused by epinephrine in normal rats was related to that detected in BPV-treated animals. Numbers in parentheses represent the number of animals in each group.

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Table II. Effect of epinephrine on muscle phosphorylase activity in normal, BPV, prednisolone and BPV + prednisolone-treated rats

	Phys. saline		Epinephrine	
	Active phosphorylase mmol $P_i/g'^2\,h^{-1} \pm$ SE	a/T [a]	Active phosphorylase mmol $P_i/g^2'h^{-1} \pm$ SE	a/T [a]
Normal	1.53 ± 0.18	0.27 ± 0.03 (9)	2.73 ± 0.24	0.45 ± 0.05 [b] (9)
BPV	1.72 ± 0.15	0.29 ± 0.03 (7)	1.92 ± 0.16	0.33 ± 0.04 [c] (7)
Prednisolone	2.43 ± 0.20	0.32 ± 0.05 (7)	4.71 ± 0.29	0.58 ± 0.06 [b] (7)
BPV + Prednisolone	2.13 ± 0.28	0.32 ± 0.04 (7)	3.83 ± 0.31	0.52 ± 0.06 [b] (7)

[a] Ratio of active to total phosphorylase activity [b]. $p < 0.01$ related to values obtained after phys. saline. [c] $p < 0.01$ if the increase caused by epinephrine in normal animals was related to that of detected in BPV-treated rats. Numbers in parentheses represent the number of animals in each group.

of the sequential steps involved in the conversion of inactive to active phosphorylase. Previous experiments regarding the disturbed insulin secretion [5] and the inhibited hyperglycemic response to cyclic AMP [7] in BPV-treated rats indicate that adenylcylase is not depressed by BPV. Since it is known that insulin [8] and adrenalectomy [9] elevate the activity of cyclic AMP phosphodiesterase, besides other possibilities, an increase of phosphodiesterase activity caused by elevated plasma insulin [7] and by decreased blood cortiocosterone level [10] of BPV-treated animals could be taken into account.

Prednisolone restored the ability of epinephrine to induce hyperglycemia [2] and to activate glycogen phosphorylase. Its inhibitory effect on phosphodiesterase activity [9] may play a role in the restoration of sensitivity to epinephrine in BPV-treated animals. Naturally, there are other possibilities, too. Further experiments will have to be carried out to elucidate this problem.

Zusammenfassung. Die Glycogen-Phosphorylase-aktivierende Wirkung von Epinephrin wurde in Lebern und Muskeln von Ratten durch BPV-Behandlung gehemmt und die Epinephrinempfindlichkeit der BPV-behandelten Tiere durch Prednisolon wiederhergestellt.

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Erythrocyte Chimaerism in *W*-Series Anaemic Mice after Allogeneic Splenic Transplants to the Renal Cortex

Anaemic mice of the genotype W^vW^v have a genetically determined, lifelong, normochromic, macrocytic anaemia, which does not respond to therapy with iron or liver extract [1], folic acid or vitamin B12 [2]. Such mice can however, be cured by the administration of a cellular suspension of normal haemopoietic tissue [3, 4], usually derived from the foetal liver or adult bone marrow.

In the mouse, although the spleen is intimately involved in the lymphoid system it is also an erythropoietic organ [5, 6]. In the present work, a portion of whole spleen from a haematologically normal mouse is transplanted to the renal cortex of W^vW^v mice. It is found that stem cells emanate from this graft, proliferate and supplant the defective host's bone marrow, and permanently cure the animal.

Table I. Mean red blood cell count/mm$^3 \times 10^6$ of W^vW^v mice treated with ALS or NRS before and after receiving a solid tissue graft of spleen from haematologically normal mice

Number of mice	Serum Treatment	Day 0	40	80	120	200
9	ALS	6.7	10.3	10.3	11.1	10.7
10	NRS	6.8	7.7	7.1	6.9	7.1

Adult anaemic W^vW^v mice were used as the recipients. The spleen donors were a pure line CBA-H strain. They have a different haemoglobin from the *W* mice, and possess the T6 chromosome markers. This permitted the identification of the donor cells in the hosts. Skin grafts exchanged between the two strains were rejected in approximately 11 days, indicating a strong histocompatibility difference, thus necessitating immunosuppression for survival of the spleen grafts. Antilymphocytic serum (ALS) was used for this purpose and was prepared in rabbits as previously described [7].

W^vW^v mice were injected i.p. with 0.25 ml of ALS each morning for 5 consecutive days. Control mice received the same amount of decomplemented normal rabbit serum (NRS). On the afternoon of the 5th day, approxi-

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