

Influence of Dietary Lactalbumin Hydrolysate on the Immune System of Mice and Resistance to Salmonellosis

Legend. Effect of four weeks of dietary treatment with lactalbumin hydrolysate (LAH) on the immune responsiveness of adult male C3H/HeN mice.

Immune response	Dietary treatment			
	22% protein	12% LAH	20% LAH	28% LAH
Spleen weight:body weight ratio				
Immunized	55.2 ± 2.0*	48.0 ± 1.6	50.2 ± 2	54.4 ± 2.6
Unimmunized	37.5 ± 0.9*	41.1 ± 2.4	49.9 ± 1.8†	50.6 ± 0.6†
Plaque-forming cells‡	94 ± 10.0	59 ± 5.1†	155 ± 9.2†	159 ± 11.8†
Mitogen response§				
Stimulated	37.6 ± 1.0	35.9 ± 1.0	45.8 ± 1.5†	74.2 ± 2.4†
Background value	7.4 ± 0.7	8.5 ± 0.3	8.9 ± 0.2	7.5 ± 0.6
Unstimulated	19.9 ± 1.9	25.9 ± 0.9	33.7 ± 1.2†	31.6 ± 1.5†
Background value	5.5 ± 0.6	3.9 ± 0.2	4.4 ± 0.1	4.1 ± 0.3
Phagocytosis				
Stimulated	12,350 ± 648	11,189 ± 185	13,289 ± 509	12,094 ± 198
Unstimulated	627 ± 10	400 ± 30†	621 ± 181	595 ± 76
Percentage survival after#				
Day 7	ND	100	ND	100
Day 14	ND	30**	ND	60**
Day 21	ND	7	ND	7

NOTE. Dietary treatment, begun when the mice (10 per group) were five weeks old, consisted of either a 22% protein diet (Ralston Purina Co., St. Louis, Mo.) or a diet that contained 12%, 20%, or 28% LAH (Nestlé, Vevey, Switzerland). Immunized mice were inoculated iv with 5×10^6 sheep red blood cells. Stimulated mice were inoculated ip with 6×10^6 cfu of live *Mycobacterium bovis* strain BCG organisms (strain no. 1029; Trudeau Institute, Saranac Lake, N.Y.). Unless otherwise indicated, data are means ± SE. ND = not done.

* Value for immunized mice fed the 22% protein diet was significantly greater than for unimmunized mice fed the 22% protein diet ($P < 0.001$ by Student's *t*-test).

† Value for mice fed the indicated amount of LAH was significantly different from that for mice fed the 22% protein diet ($P < 0.05$ by Student's *t*-test).

‡ No. of plaque-forming cells per spleen five days after immunization of mice with 5×10^6 sheep red blood cells.

§ Mitogen response of mouse spleen cells to $10 \mu\text{g}$ of *Escherichia coli* lipopolysaccharide ($\text{cpm} \times 10^{-3}$). Stimulated mice were tested seven days after inoculation with *M. bovis*. Background values are those obtained without mitogen.

|| Phagocytosis of ^{51}Cr -labeled, opsonized sheep red blood cells by mouse peritoneal macrophages (cpm).

Mice (23-30 per group) were inoculated orally with 10^7 *Salmonella typhimurium* organisms; data are the percentage survival after the indicated number of days.

** Percentage survival of mice fed the diet that contained 28% LAH was significantly greater than that of mice fed the diet that contained 12% LAH ($P < 0.05$ by χ^2 analysis).

Summary

A 12% casein diet with a 34% restriction of phenylalanine and tyrosine provides the minimum amino acid level for normal growth of CBA mice [1]. Mice fed this diet exhibit a 100% increase in the splenic plaque-forming cell response to sheep red blood cells in comparison to control mice fed either a 12% casein diet or a 22% protein diet (Ralston Purina Co., St. Louis, Mo.) [1]. No differences were noted among C3H mice on 12%, 15%, or 28% casein diets in their capacity to develop HA antibody [2]. In the present study we investigated the effect of four weeks of treatment with a diet containing lactalbumin hydrolysate (LAH; Nestlé, Vevey, Switzerland) on the immune response of C3H/HeN mice. Our data indicate that the relative deficiency of phenylalanine in LAH has made it possible to increase the level of this type of protein in the diet above the

minimum requirement (12% LAH) and thus produce augmented humoral immune responsiveness and resistance to salmonellosis.

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