

guinea pig is approximately 10 days, a much shorter time than in the larger animals. If man were to develop immunity as rapidly as the guinea pig—and it is believed that this prevention is immunity and not interference—the results would encourage fewer injections of vaccine in larger amounts than is the current practice.

The findings suggest that a part, at least, of the antigen is incorporated in the immune body, an idea that is not new but one that has not been confirmed. It is desirable that more work be done on this subject.

For evaluating vaccine to be used in man the power to protect after the injection of virus has advantages that merit consideration. It is this property of a vaccine that we want to measure, and furthermore the results are known in a short time. Extensive comparative tests have not been made but it appears that the vaccines that have a high protective value when given 3 weeks before the challenge are the ones that give protection when injected at the same time as the virus.

That guinea pigs may be sensitized to virus by vaccines, with a resulting shorter incubation period and more infections than in the controls, is a disturbing fact. In the past since the use of inactivated vaccines was begun, great numbers of individuals have been injected with products that had little immunizing ability. It is not likely that it can be determined whether man was in some instances made sensitive to the virus,

but the findings emphasize the need, which is generally realized, for better vaccines and should stimulate efforts to concentrate the immunizing substances in vaccines, with the elimination of unnecessary proteins. Many experiments have been made in our laboratory and elsewhere on this problem. We have succeeded in eliminating some of the extraneous proteins without loss of immunizing ability but have not succeeded in concentrating the immunizing substance. All such experiments have been made with active virus that was later treated with mustard. In the preceding paper(2) it is shown that mustard inactivated virus retains its immunizing ability over a long period of time when stored in the refrigerator, and it now seems that this is the material to attempt to purify rather than the active virus which is so unstable.

Summary. Guinea pigs inoculated intramuscularly with street virus can be protected by mustard inactivated fixed virus injected at the same time or 24 hours later, provided the virus has a high immunizing titer. These results give experimental proof that vaccine will protect after infection and also provide a test that could be used in evaluating vaccines for human use. If non-protecting amounts of vaccine or fixed virus are injected, the incubation period may be shorter and the death rate slightly higher than in the control animals receiving only street virus.

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Influence of APF and Aureomycin on the Growth of Dairy Calves.* (18254)

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Wallace and Loosli(1) have reported on a series of diets which can be used to replace

successfully fluid whole milk in feeding dairy calves after they are 10 to 14 days of age. In these studies it was observed that generally the rates of growth on the milk substitutes were not as rapid during the first month as on whole milk and that the calves

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1. Wallace, H. D., Loosli, J. K., and Turk, K. L., *J. Dairy Sci.*, in press.

TABLE I. Effect of APF on Growth Rate and Incidence of Diarrhea in Dairy Calves to 8 Wks of Age.

Trial	Diet	No. of calves	Avg daily gain on		Avg incidence of scours	
			APF, lb.	No APF, lb.	APF, days	No APF, days
I	10	8	0.88	0.81	1.0	4.5
	11	8	1.09	1.01	0.0	2.7
	12	8	1.08	0.94	1.0	1.0
	Milk	8	1.20	0.95	0.2	2.7
II	11	6	1.15	0.67	12.7	21.3
	13	8	1.07	0.94	5.5	12.2
	Milk	8	1.22	1.02	0.2	7.5
		54	1.11 ± .04	0.92 ± .04	2.5	6.9

consistently showed more diarrhea. Following the report by Cunha *et al.*(2) that APF supplements increased the growth rate of pigs fed a diet containing adequate amounts of vitamin B₁₂, a series of experiments was conducted to test the effect of an APF supplement upon the growth rate and incidence of scours in dairy calves.

Experimental. The diets used and the methods of feeding and management have been reported elsewhere(1). The milk substitutes all contained 50 to 70% of dried skim milk or dried whey or a combination of the two. Mixture 11 was composed almost entirely of dried whey. The mixtures were suspended in water and fed as a drink to replace the fluid whole milk during the second to eighth weeks. Hay and a grain mixture were allowed *ad lib* and the amounts consumed were recorded. In trial I the APF supplement† was added to the milk substitute at the rate of 56 lb per ton. This provided approximately 10 g of APF per kilogram of total dry matter intake. It was also stirred into the whole milk at each feeding to give the control group the same amount as calves fed the substitutes. In trial II crystalline aureomycin† was added to the milk substitutes at the rate of 10.0 g per ton and added to the whole milk to furnish an equal daily intake. In all comparisons the calves were selected by pairs at

1 to 4 days of age according to size, age and sex and placed at random on the APF supplement or held as negative control.

Results and discussion. The results of 2 experiments with a total of 27 pairs of calves are summarized in Table I. Considering all comparisons the calves gained an average of 1.11 lb per day with APF and only 0.92 lb without APF. The difference between these rates of gain is statistically significant ($P < 0.01$). There was also a striking difference in the incidence and severity of diarrhea. As an average the calves fed APF showed some degree of undesirable looseness of the feces on 2.5 days during the 8-week study in comparison with 6.9 days for their control pair mates. From estimates of the degree of scouring it became clear that both the APF supplement and the aureomycin reduced the severity as well as the duration of diarrhea, suggesting that an antibiotic effect of aureomycin in the intestinal tract may be primarily involved. One control calf on mixture 11, trial II, died from scours, thus data are shown for only 3 pairs on this diet. It is especially interesting that with every dietary treatment APF feeding showed an advantage.

These results do not agree with the reports of Rusoff and Haq(3) or Williams and Knodt(4). Possibly the differences can be explained on the small numbers of calves used by these workers. The increased rate of gain from

2. Cunha, T. J., Burnside, J. E., Buschman, D. M., Classcock, R. S., Pearson, A. M., and Shealy, A. L., *Arch. Biochem.*, 1949, v23, 324.

† The APF supplement and crystalline aureomycin were furnished by Dr. T. H. Jukes, Lederle Laboratories, Pearl River, N. Y.

3. Rusoff, L. L., and Haq, M. O., *J. Dairy Sci.*, 1950, v33, 379. (Abs.)

4. Williams, J. B., and Knodt, C. B., *J. Dairy Sci.*, 1950, v33, 380. (Abs.)

APF of 20% is not a large increase and, considering variations, would not be significant from a few pairs of calves. The results become impressive with larger numbers, however. Rusoff and Haq(3) used Merck's APF (a vitamin B₁₂ supplement) and added it only to the grain mixture, which is usually consumed in rather small amounts by calves during the first 4 to 6 weeks. It is not surprising that no response was observed from vitamin B₁₂ under these conditions. The effect observed in our experiments appears to be largely antibiotic since crystalline aureomycin gave a response equal to the APF supplement alone, both on the milk and milk

substitute diets. The response observed in these studies appears to agree with the results reported by Dyer *et al.*(5) using pigs.

Summary. Adding an APF supplement (Lederle) and crystalline aureomycin to the diet of young dairy calves significantly increased the rates of growth and reduced the incidence and severity of diarrhea. The data suggest that the responses observed may be largely the result of an antibiotic effect of aureomycin.

5. Dyer, I. A., Terrill, S. W., and Krider, J. L., *J. Animal Sci.*, 1950, v9, 281.

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Particulate Component of Plasma from Fowls with Avian Erythro-Myeloblastic Leucosis.* (18255)

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Recently, studies were undertaken in this laboratory directed toward the purification and the determination of the chemical and physical properties of the virus of avian erythro-myeloblastic leucosis. With the progress in the work there has been encountered a particulate component in the blood plasma of birds affected with this disease. The component cannot be identified unequivocally with the virus without quantitative biological correlation based on infectivity measurement. Though investigations are underway for the development of suitable procedures for such correlation, the results will not be available for some time. Meanwhile, the possible significance of the component would appear to warrant a preliminary account of the results thus far observed.

Experimental. The condition studied was the erythro-myeloblastic form of avian leucosis identified as the BAI Strain A(1) obtained from a diseased bird provided by Dr. E. P. Johnson.[‡] The disease, characterized by the appearance of exceedingly large numbers of primitive cells in the blood stream, has been maintained for the past year by continual passage either by whole blood or filtered plasma injected intravenously in 0.1 or 0.05 ml volumes in 3-day-old New Hampshire Red chicks. The procedures employed in the isolation and partial purification of the component may be illustrated by those of a typical experiment. Blood was drawn into heparin (10 ml heparin, Liquaemin, "Roche-Organon," 1 ml = 10 mg, per 100 ml blood) from 15 chicks by heart puncture 39 days after intravenous injection of 0.05 ml of filtered plasma each. The individual samples yielded a pool of 255 ml whole blood

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1. Hall, W. J., Bean, C. W., and Pollard, M., *Am. J. Vet. Res.*, 1914, v2, 272.

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