

of scarring and adhesions, not a single open ulcer was found in the treated rats. The untreated animal (No. 76498) on the other hand showed the typical changes of active cecitis with a large ulcer.

Summary. The lesions of ulcerative cecitis of rats resolved within 10 days of streptomycin treatment. The antibiotic was added

to the animals' drinking water in an average dose of 0.1 g per day per rat. The bacilli of the *Salmonella* group which are invariably associated with the ulcers of cecitis were sensitive to streptomycin in the test tube and they could no longer be grown from the cecums of treated rats with healed lesions.

16600 P

Simple Intestinal Obstruction: Prolongation of Life for 45 Days with Parenteral Alimentation.

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(Introduced by I. S. Ravdin.)

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The average length of survival of animals having a low simple obstruction of the ileum when allowed fluids by mouth or when given saline parenterally is around 8 to 14 days.^{1,2} Death has been attributed to loss of fluid and electrolytes, possible nervous effects of distension, or the absorption of toxins from the obstructed bowel. By administering fluids, electrolytes, and nutritive material into an enterostomy below a high simple intestinal obstruction, Jenkins^{3,4} has maintained animals for from 50 to 70 days. No cause for death other than the long standing emaciation was found.

We have studied the course and length of survival of animals having a simple obstruction of the ileum in which electrolyte imbalance, dehydration, anemia, and starvation were combatted by the intensive administration intravenously of sodium chloride, 5 or

10% glucose, casein hydrolysate,* blood, plasma, gelatin, and vitamins in an effort to see if by parenteral administration obstructed animals could be maintained as long as those fed by enterostomy.

Method. Ten healthy adult dogs weighing between 10.0 and 15.0 kg were used. The mid-ileum was obstructed by severing the bowel and closing the ends. Postoperatively fluids were administered daily either by intermittent rapid drip intravenously with the animal on the table or, in the later experiments, by constant intravenous drip through a capillary plastic tube threaded into the jugular vein or inferior vena cava after the method of Rhode, Parkins and Vars,⁵ except that a deBaakey pump was not used. The amounts of fluids and calories to be administered were determined by the output (urine and vomitus) and chemical studies on the blood, but it was not always possible to meet the requirements because of the limitations of the methods used for administration; namely, the length of time the animal

¹ Harper, W. H., and Lemmer, R. A., *Bull. Johns Hopkins Hosp.*, 1946, **79**, 207.

² Elman, R., and Hartman, A. F., *Surg., Gynec. and Obst.*, 1931, **53**, 307.

³ Jenkins, H. P., *PROC. SOC. EXP. BIOL. AND MED.*, 1930, **28**, 111.

⁴ Jenkins, H. P., and Beswick, W. F., *Arch. Surg.*, 1933, **26**, 407.

* Amigen 5% in 5% dextrose solution made by Mead Johnson & Company.

⁵ Rhode, C. M., Parkins, W. M., and Vars, H. M., *Bull. Am. Coll. Surg.*, 1947, **32**, 255.

would remain on the table, thrombosis of veins, dislodgement of the plastic tube, and inconstancy of rate of flow. Water and dog biscuits were placed in the cages of the animals receiving fluids intermittently but not in the cages of those receiving constant parenteral alimentation.

Results. Five of the 10 animals died between 2 and 6 days, 2 of electrolyte imbalance, 1 of intussusception with gangrene and necrosis of the distal turned-in end, 1 of leakage of the suture line with a resulting peritonitis, 1 of distemper. The remaining 5 lived between 16 and 45 days with an average survival time of 27.6 days. One died suddenly at 16 days, and necropsy revealed an intussusception of the distal turned-in end with gangrene and necrosis. Another was re-operated at 21 days, while in good condition, and the intestinal continuity restored. The remaining 3 dogs survived for 24, 32, and 45 days respectively, and death was due to emaciation and resulting complications.

That the length of survival was closely correlated with the adequacy of parenteral alimentation was indicated by the animal which lived for 45 days. This animal was maintained in electrolyte balance throughout the course of survival. The average daily intake was 1,091 cc and output 722 cc. Hypoproteinemia and anemia became marked around the fifth and sixth weeks. The animal lost 26% of the initial body weight and was extremely emaciated at death. For the first 10 days, due to much technical difficulty with the plastic tubing, an average of 140 cc of milk daily was allowed and taken orally. Thereafter nothing was allowed by mouth except 10.0 cc of a vitamin mixture daily.

It will be noted (Table I) that only during the last 15 days were we able to administer parenterally sufficient nitrogen and calories to even approach a level adequate to maintain nitrogen balance,⁶ and even at this level the animal continued to lose an average of 0.7% of the body weight daily. However,

⁶ Riegel, C., Koop, C. E., Grigger, R. P., Rhoads, J. E., and Bullitt, L., *S. Clin. N. Am.*, 1945, 1096-1105.

TABLE I.

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		Avg daily							
Dog No. 10	Time	Intake, cc	CHO, g/kg	N, g/kg	cal./kg	NaCl, mg	Output, cc	Weight loss, kg	Temp.
Length of survival 45 days	First 10 days	881	4.36	0.14	22.45*	4.81	396	0.06	1024
	Second 10 days	958	5.15	0.18	23.86	5.58	745	0.12	1030
	Third 10 days	1,230	7.20	0.23	32.68	7.55	834	0.07	1026
	Last 15 days	1,226	7.76	0.33	37.20	6.78	850	0.09	1030

* Includes calories from fat in milk administered for first 10 days.

despite the inability to maintain adequate nutrition, and in the face of intermittent, severe vomiting (1500 to 2500 cc every 3-4 days) and a sustained elevated temperature due to thrombosis of veins resulting from the methods used, this animal was maintained for 45 days, and during the last 35 days all fluids were administered intravenously.

Conclusions. The length of survival of

dogs having a low simple intestinal obstruction depends upon the ability to maintain fluid, electrolyte, and nutritional requirements. By parenteral alimentation with the methods used adequate nutritional requirements were not obtained, but in 1 animal in which these requirements were approached more closely the length of survival was 45 days.

16601 P

A Rapid Mouse Test for Laboratory Diagnosis of Tuberculosis.*

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Recent reports have shown that pigmented strains of mice (dba, C3H and C57 black) are more susceptible to tuberculosis than albino mice.^{1,2} We have confirmed these findings and have completed additional experiments in which albino and pigmented mice were inoculated intraperitoneally with tubercle bacilli suspended in various diluents. This was done with the hope of finding an enhancing agent for a rapid diagnostic test for tuberculosis.

This paper is a preliminary report on the use of gastric mucin for enhancing the virulence of the H37Rv and several recently isolated strains of mammalian tubercle bacilli for pigmented mice. Although there have been no previous reports to our knowledge on the inoculation of mice with mucin suspensions of tubercle bacilli, Mills and Colwell³ showed that guinea pigs inoculated sub-

cutaneously with small doses of tubercle bacilli suspended in mucin developed larger local lesions than controls inoculated with saline suspensions. These workers found no difference in pathogenicity when larger dosages were inoculated. More recently Pierce *et al.*² have shown that the infectivity of tubercle bacilli for mice is enhanced by egg yolk.

For the present studies CFW albino mice and C3H, dba and C57 black strains of pigmented mice weighing about 13 g were used. The virulent human type tubercle bacillus H37Rv or recently isolated strains from cases of tuberculosis were studied. Suspensions were prepared from 3-4-week-old cultures grown on Petragnini medium. The organisms were suspended in physiological saline and clumps were dispersed by means of glass beads. The suspension was adjusted to approximately 1 million organisms per cc by a nephelometer tube, and the count was checked with a Petroff-Hausser counting chamber. Mucin was prepared by suspending 5 grams of granular mucin (Type 1701-W, Wilson lab.) in 100 cc of distilled water, adjusted to pH 7.4 and autoclaved. Egg yolk was obtained aseptically and diluted with equal parts of physiological saline.

Results comparing the virulence of the H37Rv strain suspended in mucin, egg yolk

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¹ Long, E. R., and Vogt, A. B., *Am. Rev. Tuberculosis*, 1941, **44**, 196.

² Pierce, C., Dubos, R. J., and Middlebrook, G., *J. Exp. Med.*, 1947, **86**, 159.

³ Mills, M. A., and Colwell, C. A., *Am. Rev. Tuberculosis*, 1939, **40**, 109.