are approximately equally effective when fed at intervals of 4 hours, whereas the sulfonhydroxamide is the more effective when the drugs are fed once daily.

Summary. 1. A colorimetric method for the determination of p-caproylaminobenzenesulfonhydroxamide has been described. 2. This drug is approximately equal, weight for weight, to sulfanilamide in antistreptococcal activity when fed at intervals of 4 hours, but it is somewhat more effective than sulfanilamide when fed only once daily. 3. When the sulfonhydroxamide and sulfanilamide were given in equal-weight oral dosage, the former gives the lower and more constant blood levels.

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Inhibition by Sulfapyridine of the Curative Action of Nicotinic Acid in Dogs.

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When *Staphylococcus aureus* is inoculated in a medium deficient in nicotinic acid, the addition of nicotinic acid will support growth, but the addition of nicotinic acid and sulfapyridine will not do so. The addition of coenzymes and sulfapyridine, however, gives excellent growth.[1] Dorfman[2] has shown that sulfapyridine inhibits the increased respiration of dysentery bacilli caused by nicotinic acid amide. The present investigation was undertaken to see if a similar relationship could be demonstrated in dogs on a diet deficient in nicotinic acid.

Young dogs were fed such a diet[3] until weight loss and diarrhea developed, although typical tongue lesions did not appear. Drugs and vitamins were administered orally in gelatin-coated capsules. Sodium sulfapyridine was given at 9 a. m. and 5 p. m. in doses sufficient to maintain a blood level of 3 to 10 mg per 100 cc just before the morning dose. Nicotinic acid was given in doses of

1 *a.* West, R., and Coburn, A. F., *J. Exp. Med.*, 1940, **72**, 91; *b.* West, R., and Coburn, A. F., *Tr. A. Am. Physicians*, 1940, 173.

2 Dorfman, A., Rice, L., Koser, S. A., and Saunders, F., PROC. SOC. EXP. BIOL. AND MED., 1940, **45**, 750.

3 Koehn, C. J., Jr., and Elvehjem, C. A., *J. Biol. Chem.*, 1937, **118**, 693.

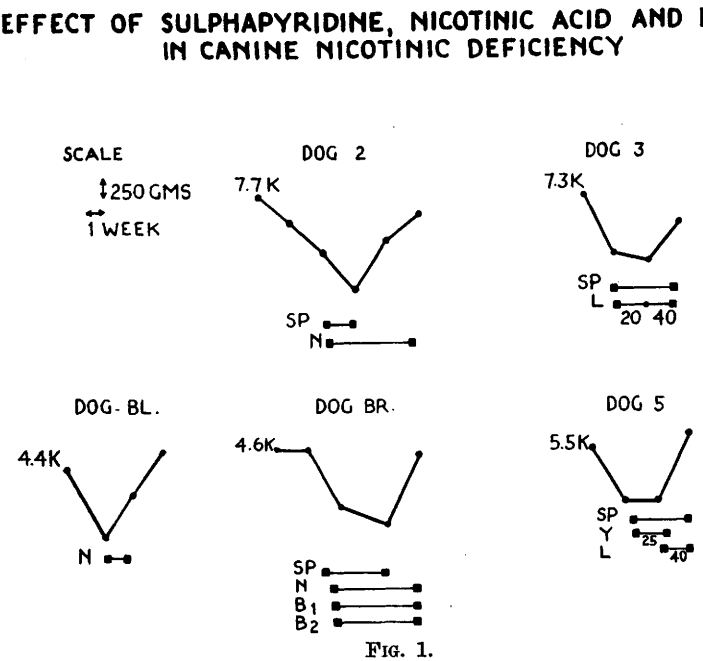

FIG. 1.

15 mg daily, thiamin chloride and riboflavin 0.2 mg each every second day.

The results are shown in the figure. Dog BL responded promptly to nicotinic acid, while dog 2 continued to lose weight when sulfapyridine was given with the nicotinic acid, but gained when the sulfapyridine was stopped and the nicotinic acid continued. Two other dogs, not shown in the figure, acted in a similar way, one of them dying before sulfapyridine was stopped. Dog BR received an additional supplement of thiamin and riboflavin and acted as dog 2 had. In all instances the sulfapyridine was started a day before the nicotinic acid.

As purified coenzymes were not available in sufficient amounts for this experiment, liver and brewers' yeast were fed in addition to the deficient diet. Dogs 3 and 5, though getting sufficient sulfapyridine to maintain a suitable blood level, gained weight when 40 g of raw beef liver were given daily, though 20 g of liver or 25 g of yeast had little effect. The liver was fed separately, but during the period of liver feeding greater amounts of the deficient diet were consumed, though sulfapyridine was given simultaneously. This makes it seem improbable that the weight lost during the sulfapyridine and nicotinic acid period was merely due to anorexia induced by the sulfapyridine.

Summary. When dogs were placed on a diet deficient in nicotinic acid, the addition of nicotinic acid corrected the deficiency, while the addition of nicotinic acid and sulfapyridine failed to do so. When raw liver and sulfapyridine were added to the diet, the deficiency disappeared. It seems possible, but not proven, that sulfapyridine inhibits the action of nicotinic acid but not of preformed coenzymes.

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Two Outbreaks of Influenza Caused by Antigenically Different Viruses.

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Early studies on influenza suggested that the virus agents of the disease, although not antigenically identical were closely enough related for the infection to evoke a demonstrable rise in antibodies reactive against the recognized strains of the influenza virus. The first convincing indication that influenza might be due to antigenically unrelated viruses was presented by Stuart-Harris, Smith and Andrewes,[1] who found that a rise in antibodies against the usual strains of influenza virus occurred in only 33% of the cases they studied in England in 1939; although they failed to isolate the actual virus, they concluded that a number of their cases must have been caused by an agent other than the usual influenza virus. More direct evidence has recently been obtained independently by Francis and by ourselves. In February, 1940, we[2] isolated a virus (termed *TM*) from 2 cases of influenza and showed that in each instance the infection evoked an increase in antibodies against the homologous *(TM)* virus but caused no detectable increase in antibodies reactive against the *PR8*[3] strain of influenza virus. At about the same time Francis[4] isolated a strain (termed "Lee") which was also distinct from the *PR8* and from other previously recognized strains. He showed that the con-

[1] Stuart-Harris, C. H., Smith, W., and Andrewes, C. H., *Lancet*, 1940, **1**, 205.

[2] Magill, T. P., PROC. SOC. EXP. BIOL. AND MED., 1940, **45**, 162.

[3] Francis, T., Jr., *Science*, 1934, **80**, 457.

[4] Francis, T., Jr., *Science*, 1940, **92**, 405.