Results. Table I shows the results obtained. In 3 of the 4 children the urinary excretion per minute of non-protein and urea nitrogen was slightly increased after the casein hydrolysate was given. In one child the values for these substances decreased. The excretion per minute of amino acid nitrogen increased slightly in each instance. Following the meal the loss of amino nitrogen was greater than the fasting level in 2 children, less in one and the same in one. In each child there was slightly less amino nitrogen in the urine after eating than after intravenous injection but the range was small.

Assuming that all the amino acid nitrogen secreted in the urine during the period immediately following intravenous injection was derived from the amino acid mixture given, the loss amounted to approximately 1%. Since normally there is some excretion of amino acids in the urine even under fasting conditions, it may be concluded that the loss of injected amino acids as such is insignificant. The absence of an increase in the excretion per minute of total non-protein nitrogen and urea plus ammonia nitrogen indicated that the amino acids given were not rapidly broken down to end-products of metabolism and excreted. This suggests that the nitrogen supplied by a casein hydrolysate given intravenously is available for nutritional needs. Further studies have already been carried out on this point and will be reported later.

Summary. There was no significant immediate increase in the urinary excretion per minute of non-protein nitrogen, urea plus ammonia nitrogen nor amino acid nitrogen, by 4 nephrotic children 5 to 7 years of age who had received intravenously 5 g of an amino acid mixture from casein hydrolyzed by enzymes. Therefore it appears probable that the injected amino acids are utilized for the nutritional needs of the patients.

10933 P

Effect of Pyocyanin on Cerebral Metabolism.*

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Young[1] has demonstrated that pyocyanin evokes an initial stimulatory effect on the respiratory exchange of excised cerebral tissue,

* Aided by a grant from the Child Neurology Research (Friedsam Foundation).

1 Young, L., *J. Biol. Chem.*, 1937, **120**, 659.

an effect which is subsequently followed by an irreversible depression. Gerard[2] has reported beneficial results with small concentrations of pyocyanin for the treatment of dementia praecox. The present communication consists of a report of results obtained with large concentrations of pyocyanin (5 to 10 times that used by Gerard) on cerebral metabolism *in vivo*.

The animals were divided in two groups. The members of the first were operated under either ether or nembutal. The skull of dogs was trephined, exposing the superior longitudinal sinus. The etherized animals were then permitted to recover from the anesthesia and were, therefore, studied without the complicating effects of a narcotic. Blood samples were drawn practically simultaneously from the superior longitudinal sinus and the femoral artery and analyzed for oxygen[3] and glucose.[4] The second group of animals was studied for neurological changes. These dogs and cats received varying amounts of pyocyanin on from 2 to 4 successive days.

In 14 observations after the intravenous injection of pyocyanin (150 mg) variable results were obtained in the oxygen differences between the blood entering and leaving the brain of dogs. In 7 of the 14 experiments there was a rise in the oxygen consumption while in the other 6 experiments a decrease was noted. In one instance there was no change. The results obtained on a dog (Table I) reveal that the oxygen A-V difference first increased and then diminished, only to be followed by another increase after a second injection of pyocyanin. In this experiment blood sugar fell. Blood flow measurements have not been made in these experiments. However, it is improbable that such large variations in the A-V differences may be attributed entirely to variations of blood flow. In 16 experiments the effect of pyocyanin on the blood sugar was studied in both cats and dogs. In 9 of these experiments injection of pyocyanin was followed by a definite fall in the blood sugar while in 7 experiments no change was observed.

In the second group (6 dogs and 10 cats) pyocyanin produced acute and chronic neurological changes. Four of these dogs succumbed with tonic clonic convulsions after receiving 150 mg of pyocyanin. Since the symptoms observed resemble those noted in cats, they will be described together. The cats received from 16 to 20 mg of pyocyanin intraperitoneally on 3 or more occasions. Within a few days these animals exhibited varying deviations from their usual

2 Gerard, R. W., *Arch. Neur. and Psychiat.*, 1938, **40**, 985.

3 Van Slyke, D. D., and Neill, J. M., *J. Biol. Chem.*, 1924, **61**, 523.

4 Hagedorn, H. E., and Jensen, B. N., *Biochem. Z.*, 1923, **135**, 46.

TABLE I.
Cerebral Oxygen Uptake After Pyocyanin.

Min. after injection of pyocyanin	A.-V. Difference, vol. %	Blood sugar, mg%		Remarks
		Arterial	Venous	
	9.15	90	79	Control
15	15.68	83	68	150 mg pyocyanin, clonic spasms, vomiting
30	11.70	81	65	Panting
43	9.52			"
58	5.77	74	66	
		54	48	150 mg pyocyanin
20	11.52	52	20	

behavior. In all instances marked muscular weakness was noted. Those animals that were able to walk at all sank to the floor after a few steps. The uncontrolled movements of the head resembled those of an animal with disturbance of vestibular apparatus. In 2 instances the animals gave evidence of a release of emotional mechanism. For example, the animals ran about in a frightened manner with tail hairs widely spread. Six of the 10 cats succumbed later, although they received no additional dosage of pyocyanin. In those animals that survived, the neurological changes persisted for 3 weeks and gradual signs of improvement were noted. Further studies in the biochemical and morphological changes of the brain are now in progress.

Conclusions. Pyocyanin administered *in vivo* produces an increased cerebral oxygen utilization which may be followed by a decrease. These changes are accompanied by symptoms of disturbed function of the central nervous system.

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The Filterability of Bacteria.

S. P. KRAMER. (Introduced by J. H. Northrop.)

If one filters a 1:30,000 solution of night blue, a colloidal basic dye, through a siliceous filter Berkefeld N, the filtrate is colorless.

If, now, we add a so-called "wetting agent" to the dye solution it is found that the dye passes the filter. A number of such agents have been tried, of which I give a partial list: Blood serum, bile, sodium taurocholate, glycocholic acid, turkey red oil, mucin, soap, castor oil soap, lecithin, sodium lauryl sulfate, etc.