When the soluble dialyzed fraction was tested biologically, the results showed that approximately 0.57 γ of iron were made unavailable for the growth of *S. dysenteriae* by 1 mg. of the protein in nutrient broth. Since the soluble nitrogen represented approximately two-thirds of the total nitrogen of the dialyzed sample, it should be noted that the activity of this fraction in terms of iron-binding power was proportionately greater and accounted for all of the activity shown by the undialyzed fraction, IV-3,4.

The presence in human plasma of a protein fraction having the capacity to bind iron at physiological pH's may have some relevance to the problem of the regulation of iron absorption from the intestinal mucosa as well as that of iron transport by the blood through the body (*3*).[2] In this connection it is of some interest to note that for a medium-sized man of 70-kg. weight it is calculated that, through the intervention alone of the amount of active fraction in plasma when saturated with iron, as much as 9 mg. of iron (0.26 mg./100 cc. plasma) could be carried by the blood stream at any given moment. Analyses of iron content of normal plasma have given values of 0.1–0.3 mg./100 cc. under ordinary conditions (*1*). Of no less importance is the possible significance of this iron-binding fraction in the blood stream for the bacteriostatic action it exerts upon iron-sensitive pathogens as shown by the *in vitro* studies with *S. dysenteriae*. What value an iron-saturated solution of this plasma fraction may have for iron administration in certain anemias remains to be demonstrated.

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Origin of Nitrogen in Natural Gases

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About three years ago W. B. Lang (*3*) discussed the occurrence of nitrogen in natural gases and suggested that the probable source of the element could be established by analyzing suitable samples for nitrogen and the rare gases, argon, krypton, xenon, and neon. If the relative proportions of nitrogen and argon in a particular gas sample were found to be substantially the same as in air, one might reasonably conclude that the nitrogen and argon had originally been present in the atmosphere and had in some way become trapped within the earth. On the other hand, an abundance ratio of nitrogen to argon much higher than that for air might mean that the nitrogen in the gas had been produced within the earth by chemical reactions.

Similar deductions from gas analyses have been made in the past by others, and significant contributions to the literature about this topic have been made (*1, 4–9*). The interpretation of the data has not always been exactly the same as that of Lang. For example, Moureu was of the opinion that the substantially fixed relative proportions of nitrogen, argon, krypton, and xenon which he and A. Lepape (*5*) found in the atmosphere and in gases from within the earth could be explained by the hypothesis that these inert elements had not been separated from each other by natural processes and were therefore present in all terrestrial gases in the proportions established at the time of creation.

TABLE 1

Proportions by Volume of Nitrogen and Helium Group Gases in Certain Natural Gases

Sample No.	% by volume of N_2	% by volume of He	$\frac{N_2/A \text{ in gas}}{N_2/A \text{ in air}}$	$\frac{(Kr+Xe)/A \text{ in gas}}{(Kr+Xe)/A \text{ in air}}$
I	72.9	7.55	0.98	0.4
II	52.6	6.00	1.19	0.8
III	24.7	1.73	1.50	3.0
IV	96.8	0.047	4.0	2.9
V	30.6	0.19	3.0	3.0
VI	10.0	0.052	3.3	3.7
VII	28.0	0.55	2.4	3.0
IX	97.0	0.074	1.25	.
X	24.1	0.305	8.2	0.15

A few analyses of the type proposed by Lang (*3*) were made as a part of a study recently published by the author and his father, H. P. Cady (*2*). In this work the helium group gases and nitrogen were determined in a few natural gases of high nitrogen content. Data for the different samples are presented in Table 1. The sample numbers used are the same as those employed in the earlier publication (*2*), where one may find detailed descriptions of the gases.

The wide variation in the (krypton + xenon)/argon ratios shown in the table suggests that the rare gases have become partially separated from each other by natural processes. It is therefore possible that argon and nitrogen have also become separated from each other and consequently occur in different proportions in different gases. Since this is the case and since there is no assurance that the inert elements in natural gas originally came from the atmosphere rather than from within the earth, one cannot use the available

[2] Since the time this manuscript was submitted, an article by Holmberg and Laurell (*Acta Physiol. Scand.* (Sweden), 1945, **10**, 307–319) concerning the regulation mechanism of serum iron has become available. This article refers to a thesis by Vahlquist (*Das Serumeisen* (Diss.). Uppsala: 1941), whose data suggested that serum iron is bound to both the albumin and, especially, the globulin protein fractions.

analytical data as a basis for unquestionable conclusions regarding the origin of the nitrogen.

The suggestion of Lang (*3*) involves the assumption that the argon of a natural gas is derived from the atmosphere and that argon and nitrogen are not substantially separated from each other as the gas collects. If such an assumption is correct, it follows that nitrogen in natural gases originates both in the atmosphere and in chemical processes. In some gases, such as Samples IV, V, VI, and X, most of the nitrogen appears to be of chemical origin and in others, such as Samples I, II, III, and IX, of atmospheric origin.

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The Intestinal Absorption of Penicillin G

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Investigators are in general agreement that the oral dosage requirements of penicillin are four or five times the parenteral requirements in order to obtain comparable serum concentrations and equal therapeutic effectiveness (*2, 3, 5*). It has also been shown by Free, Parker, and Biro (*3*) and others that this approximate oral/parenteral ratio is substantiated by measurements of total urinary excretion of penicillin after administration by the two routes. Destruction by gastric acidity was found to account for only a minor portion of the loss of an oral dose.

In a survey of the problem Cutting, *et al.* (*1*) suggested that lack of intestinal absorption and subsequent destruction in the bowel by penicillinases may be of importance. The present work is an effort to obtain more specific information on the absorbability of penicillin from the intestine in order to evaluate this view.

Forty-four healthy adult mongrel cats, fasted for 24 hours previous to the experiments, were used for the study. Pure crystalline sodium penicillin G was used in order to make the results more referable. Under dial-urethane anesthesia (.7 cc./kg. dial with urethane, Ciba) .1 millimole penicillin/kg. body weight was placed in the ligated duodenum, the abdominal incision sutured, and absorption allowed to take place for various periods of time up to 3 hours. The penicillin had been dissolved previously in 2.5 cc. normal saline solution/kg. of cat in order to standardize intestinal fluid volumes and osmotic influences. At the end of the test period the incision was reopened, the duodenum removed, and the contents thoroughly washed out and analyzed for penicillin by the cylinder-plate method. Preliminary experiments showed that the duodenal contents of 24-hour fasted cats under dial-urethane anesthesia contained no substances interfering with the penicillin assay and that the duodenal contents alone gave no ring of inhibition with the test organism. Control recoveries of penicillin from injected loops removed and washed out immediately averaged 98 per cent of the injected quantity.

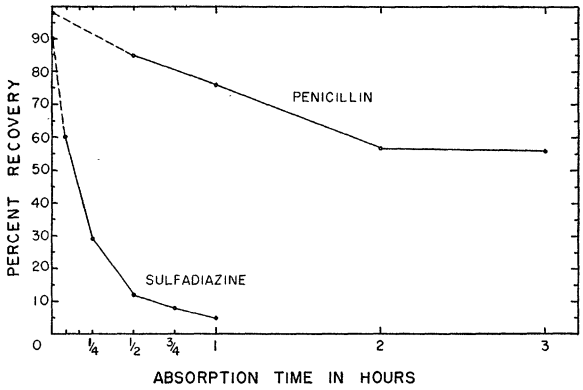

Fig. 1. Recoveries of sodium penicillin G and sodium sulfadiazine from the ligated duodenum of cats after various periods of absorption. Each point represents the average of four experiments.

As a comparison, the absorption of sulfadiazine, a chemotherapeutic agent known to be satisfactorily absorbed from the gastrointestinal tract, was studied under the same conditions. The dose used was .1 millimole sodium sulfadiazine/kg., and the administration, absorption, and recovery procedures were also the same as those used for the penicillin experiments. Sulfadiazine determinations were made by the colorimetric method of Marshall and Litchfield (*6*). Preliminary experiments showed that the duodenal contents of 24-hour fasted cats under dial-urethane anesthesia contained no substances interfering with the colorimetric assay for sulfadiazine. Control recoveries of sulfadiazine from injected loops removed and washed out immediately averaged 90 per cent of the injected quantity. Results are shown in Fig. 1.

The high recovery of penicillin from the ligated duodenum (an average of 76 per cent after 1 hour, 57 per

[1] With the technical assistance of Mary L. Wickert.