That the softening of coagulated fibrin is an elementary pathological condition of frequent occurrence, distinct from suppuration, and constituting a considerable proportion of the cases generally denominated suppurative phlebitis." These remarks threw a flood of light upon numerous morbid conditions of the blood, separating them from inflammation, and accounting for obstruction in the bloodvessels altogether independent of that pathological state. There especially resulted from them, in conjunction with the further original observations of Gulliver as to the fatty degeneration of bloodvessels, the now established fact of impaction of portions of the clot so broken up in distant vessels. That foreign solid bodies floating in the blood would obstruct the smaller vessels and occasion exudations was first shown by the experiments of Magendie, Cruveilhier, Gaspard, and others, who injected starch, quicksilver, and various substances into the blood, with the effect of producing fatal inflammations. In like manner fragments of the blood clot, softened and broken up in the manner described by Gulliver, have been shown, by Virchow, Kirkes, Tufnell, and others, to be carried by the circulation to the brain, lungs, or extremities, where they become impacted in smaller arteries, producing hæmorrhage, inflammation, and diminished nutrition in distant organs.

On all these topics it is to be observed that, whilst throughout Germany these facts have been widely published, under the new terms of Thrombosis and Embolismus, the name of Gulliver has never been mentioned. Well may that gentleman remark in his recent lectures on the blood, speaking of physiological science, "certain it is that many branches of it which have been well cultivated and wrought out in this country, are afterwards transferred to the continent, and published in books there, and then translated and brought back as novelties to us, in such simplicity—not to say duplicity—as to the real origin of the facts, that they are actually paraded as part and parcel of foreign genius and discovery "

Chemical alterations of the blood in disease.—The most laborious investigations into this subject have been made by the French chemists and pathologists, more especially by Andral and Gavarret,* in 1840, and by Becquerel and Rodier, in 1844, whose researches have for the most part been confirmed by subsequent investigators. The results which the latter chemists arrived at are as follows:—1st. Venesection greatly diminishes the number of the blood corpuscles, increases the amount of water, slightly diminishes the albumen, but in no way affects the fibrin, extractive matters, or salts. 2nd. That plethora is a simple increase of all the constituents of the blood. 3rd. That anæmia is in truth a misnomer, but is used in the sense of a diminished number of the corpuscles, or spanæmia. 4th. That inflammation increases the amount of the fibrin from 3 to 10 in 1000 parts, doubles the quantity of cholesterine, and diminishes the albumen. 5th. That the fibrin is diminished in fevers, exanthematous disorders, intoxication, starvation, and purpura hæmorrhagica. 6th. When any secretion is checked, its essential principles accumulate in the blood. 7th. The albumen of the blood is diminished in Bright's disease, in cardiac dropsy, and in puerperal fever.

These conclusions, founded on a large number of data, are most important, and, as we shall subsequently see, while opposed to former views of medical practice, especially in acute inflammatory diseases, completely harmonize with the results of modern experience.

General view of diseases of the blood.—To enter at length into all the diseases of the blood is here impossible. I shall therefore content myself, in conclusion, with giving a list of the chief alterations to which it is subject in man:—

1. Increase or diminution of the blood as a whole—*Plethora, spanæmia.*
2. Increase or diminution of the coloured corpuscles—*Polypyrenæmia* (πυρην, nucleus), *oligo pyrenæmia.*
3. Increase of the colourless corpuscles—*Leucocythæmia.*
4. Increase of the fatty molecules—*Lipæmia.*
5. Increase of the fibrin—as in *inflammations.*
6. Decrease of the fibrin—as in *fevers, exanthemata, purpura hæmorrhagica,* and *scurvy.*
7. Increase of albumen—as in *scrofula, cancer,* and *morbid growths.*
8. Decrease of albumen—as in *Bright's disease, cardiac dropsy,* and *puerperal fever.*
9. Increase of uric acid—*Uræmia,* as in *rheumatism, gout,* and *calculi composed of lithates.*
10. Increase or diminution of earthy salts—as in *rachitis, malacosteon, calculi composed of phosphates.*
11. Increase of sugar—*Glycohæmia,* as in *diabetes, calculi composed of oxalates.*
12. Increase of bile—*Cholæmia,* as in *jaundice.*
13. Poisons of various kinds—*Toxihæmia,* divided into:
    a. *Animal poisons,* such as from *putrid pus* or *ichorhæmia* (commonly called pyhæmia); from *syphilis, small pox, scarlatina, measles, erysipelas, glanders, plague,* &c.; from *bites of venomous animals,* &c.
    b. *Vegetable poisons,* such as from *opium, belladonna, aconite, strychnia,* &c. &c.
    c. *Mineral poisons,* as from *carbonic acid gas, sulphur vapour, mercury, arsenic,* &c. &c.

* Annales de Chimie et de Phys., (tome 75, p. 225.)

EXPERIMENTS ON FOOD; ITS DESTINATION AND USES.

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In reference to the purposes fulfilled by food and its classification, it seems to me that the following experiments may be worthy of notice.

Abundant, nay superfluous, evidence has been furnished to prove that no one principle of food will alone suffice for nutrition; but clear and unequivocal evidence is still wanting to show how far each principle of food is essential to life and health, provided all else, save that one, be sufficiently supplied. This is a very different question.

Again, ever since Liebig's famous classification of food into plastic or nutritive and respiratory or calorifacient—for whatever obscure hints may have preceded him, he was clearly the first to set this forth—some most important questions in connexion with it have engaged the attention of physiologists. Amongst them are these:—

Is any food destined to the production of heat without being concerned in the repair of the tissues—that is, is any portion of the food directly burnt in the blood?

Is any portion of albuminous food directly calorifacient—that is, burnt in the blood without forming tissue?

This last question has more recently assumed another form —viz., What is the source of urea? Is it derived wholly from the metamorphosis of tissues, or directly to some extent from the blood? In other words, Does any portion of nitrogenous food undergo a directly retrograde metamorphosis into urea, carbonic acid, and water?

In reference to these and some other questions (which I will afterwards allude to), I performed the following experiments:—

Experiment 1st.—Statements concerning the proportion of fat contained in the lean of various meats differ very widely.

A portion of the lean of veal, carefully cleansed from all adhering fat, was analyzed for me by Mr. Attfield, and found to contain 1·55 per cent of fat.

On September 20th, 1860, I commenced feeding a healthy female kestril hawk with veal from which every visible particle of fat and cellular tissue had been previously removed. Nothing but the simple lean was given, and no other food of any kind. The bird had a full supply of this diet till the 20th November.

During the whole of that period the condition of the bird was excellent, and at the termination of the experiment it had unquestionably improved in appearance and general condition, and also in courage and ferocity.

During the whole period it was kept in a wicker cage in the open air, the temperature of which during the greater portion of the experiment varied between 40° and 60° Fahr.

At the commencement of the experiment the temperature in the rectum was 106°, and at the termination the same, 106°.

Active exercise of course was out of the question. The bird was usually seen motionless either on the perch or the floor of the cage.

In relation to the purpose of this experiment, I regard the lean veal upon which this hawk was exclusively fed as simply a nitrogenous diet, non-nitrogenous food being practically absent, for a hundred parts of flesh, about one-fourth of which consists of solids, contained only about one and a half parts of fat.

Experiment 2nd.—On September 26th I placed four tame, healthy rats* in a cage in a warm place (the temperature on an

* Rats were chosen as subjects for these experiments because they are omnivorous, and will readily feed on almost any kind of diet. Moreover, from their size, they are very convenient to manage.

average being about 65°), and fed them exclusively upon a diet composed of equal parts by weight of arrowroot, sago, tapioca, lard, and suet.* The last two substances were, previous to their admixture, boiled and strained, so as to separate extraneous matters.

Through the kindness of Dr Frankland, this mixed diet was carefully analyzed, and found to contain only ·22 per cent. of nitrogen.

The rats were allowed as much of this food and water as they chose to take.

At the commencement of the experiment the rats weighed collectively 1 lb. $6\frac{3}{4}$ oz. after a full meal.

For the first few days they appeared to be very well, and exhibited no material alteration. Then after awhile they evidently lost weight, and gradually became very emaciated and weak.

On October 24th one rat, a black-and-white one, died. It weighed 3 oz.

On October 29th a second rat, a brown-and-white one, died. It weighed $1\frac{3}{4}$ oz. without intestines, which had been partially devoured by the remaining two before the dead rat could be removed.

On November 2nd the temperature of one of the rats still living, a white one, was $94\frac{1}{4}$° in the rectum.

On November 19th a third rat, a white one, died. It weighed $2\frac{1}{4}$ oz.

On November 20th the weight of the fourth rat, a white one, still living, was 4 oz. 10 grs.

All the rats were reduced to an extreme degree of emaciation. Their weights showed a loss of more than 40 or 50 per cent.

A post-mortem examination revealed the same condition as after the complete deprivation of food. The fat had entirely disappeared. The intestines were pale. What muscular tissue was left appeared healthy and normal. There was no falling off of the hair; no affection of the cornea. The fæces were well formed, and presented a natural aspect.

All the rats up to the time of death appeared to be lively, though of course at last very feeble. The surviving rat was carefully fed, after the death of the third one, upon good food containing nitrogen—bread, milk, cheese, &c.; but it did not improve, and in a day or two it died.

The food upon which these rats were fed may be regarded as consisting of various non-nitrogenous substances only, and practically wanting in nitrogenous principles; for there was only about one part of nitrogen in 500 parts of food.

Experiment 3rd.—Three tame rats,—a white, a brown-and-white, and a black-and-white one,—in good health, weighed collectively on the 22nd of May, 1861, after a miscellaneous diet, 1 lb. $3\frac{1}{2}$ oz.

On May 23rd they were placed on a diet of wheat and water.

On June 4th their collective weight was 1 lb. 3 oz.

The urine collected† from one P.M. June 3rd to one P.M. June 4th, amounted to 101 grs., and contained 4·76 per cent. of nitrogen.‡

June 7th.—Their weight was 1 lb. 4 oz.

The urine collected from one P.M. June 5th to one P.M. June 6th, amounted to 74 grs., and contained 3·97 per cent. of nitrogen.

The urine collected from one P.M. June 7th to one P.M. June 8th, amounted to 63 grs., and contained 5·22 per cent. of nitrogen.

On June 8th, at one P.M., they were placed exclusively upon the same diet as that employed in Experiment 2—viz., upon equal parts, by weight, of arrowroot, sago, tapioca, lard, and suet, the mixture yielding upon analysis only ·22 per cent. of nitrogen. They were allowed as much of this food and water as they chose to take, but nothing more.

* My object in making this mixture was, while avoiding, so far as it was practicable, the presence of nitrogen, to obtain variety.

† The urine was collected in the following way.—The floor of a small cage, of sufficient size to contain the rats for twenty-four hours without inconvenience, was formed of thin wire, the bars of which were placed so closely as to prevent the passage of the fæces, and all solid particles except those of a very small size, but through which of course the urine could freely escape. The cage was placed over a porcelain vessel, in which the urine was collected. From this it was transferred into a small bottle kept ready for the purpose.

Of course in this case there would always be some loss of urine, partly from its contact with different surfaces, and still more from evaporation. In a future experiment it will be seen that I have endeavoured to avoid this as far as possible. But the loss by evaporation could scarcely affect the absolute amount of nitrogen contained in the urine, while the loss which resulted from other causes could not have been such as to affect materially the main conclusion drawn from this part of the experiment—that there was no more nitrogen excreted in the urine than could be accounted for by the disintegration of the original tissue.

‡ All the numerous analyses of the urine recorded in these experiments were most kindly made for me by Dr. Attfield, our late Demonstrator of Practical Chemistry, and therefore their accuracy may be relied on.

Urine collected from one P.M. June 14th, to one P.M. June 15th, amounted to 102 grains, and contained 1·326 per cent. of nitrogen.

June 20th.—They weighed collectively 1 lb. 2 oz.

Urine collected from one P.M. June 21st, to one P.M. June 22nd, amounted to 95 grains, and contained 1·765 per cent. of nitrogen.

June 21st.—They weighed 1 lb. 1 oz. 7 drs.

27th.—Their weight was 1 lb. $\frac{3}{4}$ oz.

28th.—Their weight was 1 lb. $\frac{1}{4}$ oz.

From one P.M. June 28th, to one P.M. June 29th, only 7 grs. of urine were collected. This was not analyzed.

Urine collected from one P.M. July 1st, to one P.M. July 2nd, weighed 47 grains, and contained 2·02 per cent. of nitrogen.

Urine collected from one P.M. July 5th, to one P.M. July 6th, weighed 42 grains, and contained 1·09 per cent. of nitrogen.

July 6th.—Their weight was $14\frac{1}{2}$ oz.

8th.—Their weight was $13\frac{3}{4}$ oz.

12th.—Their weight was 13 oz. 2 drs.

Urine collected from one P.M. July 12th, to one P.M. July 13th, weighed 42 grains, and contained 2·40 per cent. of nitrogen.

19th.—Their weight was $11\frac{3}{4}$ oz.

Urine collected from one P.M. July 19th, to one P.M. July 20th, weighed 22 grains, and contained 4·25 per cent. of nitrogen.

24th.—Their temperature in the rectum was—
Brown-and-white rat, 98°.
Black-and-white rat, 97°.
White rat, 93°.

Urine collected from one P.M. July 26th to one P.M. July 27th, amounted to 14 grains, and contained 1·19 per cent. of nitrogen.

27th.—Their weight was 10 oz. 7 drs.

On July 28th the white rat died, and was partly eaten by the others. A post-mortem examination revealed a state of extreme emaciation. No trace of fat could be discovered.

The two rats still living were in a most emaciated and feeble condition. The state of the fur was remarkable; it was rough and matted as if wetted, and decidedly greasy. This was very obvious to the touch. Moreover, the spine was abruptly curved in the back, corresponding with the contracted state of the abdomen.

July 29th.—The two surviving rats were placed on a nitrogenous diet—bread and meat.

August 1st.—Their temperature in the rectum was—
Brown-and-white rat, 99°. Black-and-white rat, 98°.

The total amount of the non-nitrogenous diet consumed during the whole period of the experiment was $3\frac{1}{2}$ lbs.

The foregoing facts are arranged in the following table:—

Date.	Weight of three Rats.			Amount of Urine collected.	Percentage of Nitrogen in it.	Total Amount of Nitrogen.
	lb.	oz.	dr.	Grains.	Grains.	Grains.
May 22 (diet miscellaneous) ...	1	$3\frac{1}{2}$				
May 23 (commenced diet of wheat and water)						
June 3—4		...		101	4·76	4·8
4	1	3				
5—6		...		74	3·97	2·93
7	1	4				
7—8		...		63	5·22	3·28
June 8 (commenced non-nitrog. diet)						
June 14—15		...		102	1·326	1·35
20	1	2				
21	1	1	7			
21—22		...		95	1·765	1·67
27	1	$0\frac{3}{4}$				
28	1	$0\frac{1}{4}$				
28—29		...		7	(Not analyzed.)	
July 1—2		...		47	2·02	·94
5—6		...		42	1·09	·46
6		$14\frac{1}{2}$				
8		$13\frac{3}{4}$				
12		13	2			
12—13		...		42	2·40	1·00
19		$11\frac{3}{4}$				
19—20		...		22	4·25	·93
26—27		...		14	1·19	·16
27		10	7			

Experiment 4th.—The two surviving rats were, after the death of the white one, as just mentioned, placed on a diet of bread and meat. They would, in all probability, have lived only a day or two longer on the non-nitrogenous food.

On the fourth day, August 2nd, at nine A.M., they were placed on a diet of lean veal (precisely similar to that on which the hawk was fed in Experiment 1) and water. They drank very freely. They were not allowed active exercise.

A striking improvement in their condition was visible almost immediately after they were allowed nitrogenous food. The rapidity with which a change for the better occurred was very remarkable. They became active and lively. The fur recovered its natural aspect, and the sharp curve in the spine disappeared.

August 9th, one week after the diet of lean veal, their united weight was 9 oz. 1½ dr.

Temperature in rectum of brown-and-white rat, 100°.
,, ,, black-and-white rat, 99½°.

August 10th, their united weight was 10 oz. 1 dr.
,, 12th, ,, ,, 10 oz. 1 dr.
,, 14th, ,, ,, 10 oz. 1 dr.
,, 17th, ,, ,, 9¼ oz.

Temperature in rectum of brown-and-white rat, 99½°.
,, ,, black-and-white rat, 98°.

August 20th.—Their united weight was 10 oz. 2 drs.
Temperature in rectum of brown-and-white rat, 99°.
,, ,, black-and-white rat, 98½°.

August 23rd.—Their united weight was 10 oz.
Temperature in rectum of brown-and-white rat, 101°.
,, ,, black-and-white rat, 100°.

August 30th.—Their united weight was 10 oz. 1 dr.
Temperature in rectum of brown-and-white rat, 101°.
,, ,, black-and-white rat, 100°.

The large quantity of urine which the rats passed while fed upon this diet corresponded with the large quantity of water taken, and afforded a striking contrast to the amount of urine excreted in the previous experiment.

They passed upwards of a fluid ounce in the twenty-four hours; on an average about nine drachms.

Experiment 5th.—On the 30th of August, at twelve noon, the two rats which were the subjects of the previous experiments were placed on a mixed diet of nitrogenous and non-nitrogenous food. They were allowed as much as they chose to eat of the veal and the non-nitrogenous mixture with water.

September 2nd.—Their united weight was 11 oz.
Temperature in rectum of brown-and-white rat, 101½°.
,, ,, black-and-white rat, 101°.

September 6th.—Their united weight was 14¾ oz.
Temperature in rectum of brown-and-white rat, 101½°.
,, ,, black-and-white rat, 100°

September 13th.—Their united weight was 14¼ oz.
Temperature in rectum of brown-and-white rat, 100°.
,, ,, black-and-white rat, 100°.

The striking increase of weight here noted was accompanied by a corresponding improvement in their general condition.

Experiment 6th.—On December 31st, two tame healthy rats were placed in one of the cages described in Experiment 7, and fed for seven days upon an exclusive diet of wheat and water.

The quantity of food consumed from January 1st, twelve noon, to January 2nd, twelve noon, was of wheat 9 drs.

January 3rd.—Their united weight was 11 oz. 7 drs.

The quantity of wheat consumed from January 3rd, twelve noon, to January 4th, twelve noon, was 10 drs.

The urine was collected in the manner described in the next experiment from January 6th, twelve noon, to January 7th, twelve noon.

The total quantity was 148 grs.
This contained of nitrogen 3·5 grs.

On January 7th, one week from the commencement of the experiment,

Their united weight was 12 oz.
Temperature in rectum, 100½° and 99½°.
The temperature of the room was 60°.

Jan. 7th.—One P.M.: They were now placed on an exclusive diet of lean veal and water.

The quantity of veal consumed from Jan. 9th to Jan. 10th was 10 drs.

From Jan. 13th to Jan. 14th, 12 drs.

Jan. 14th.—Their united weight was 11 oz. 7 drs.
Temperature in rectum, 100° and 100°.
Temperature of room, 60°.

Jan. 18th.—Their united weight was 10¾ oz.
Temperature in rectum, 100½° and 99°.
Temperature of room, 52°.

Quantity of food consumed from Jan. 17th to Jan. 18th was 15 drs.

From Jan. 20th to Jan. 21st, 14 drs.
From Jan. 23rd to Jan. 24th, 15 drs.

Jan. 25th.—Their united weight was 10 oz. 5 drs.
Temperature in rectum, 102° and 101°.
Temperature of room, 63°.

The urine was collected from January 27th, twelve noon, to January 28th, twelve noon.

The total quantity was 990 grs.
This contained of nitrogen 27 grs.

Quantity of food consumed from Jan. 29th to Jan. 30th was 15 drs.

From Jan. 31st to Feb. 1st, 20 drs.
From Feb. 3rd to Feb. 4th, 17 drs.

Feb. 4th.—Their united weight was 8¾ oz.
Temperature in rectum, 100° and 100°.
Temperature of room, 65°.

The urine was collected from Feb. 4th to Feb. 5th.
The total quantity was 909 grs.
This contained of nitrogen 28·5 grs.

On Feb. 5th, at one P.M., the two rats, which, excepting loss of weight, did not appear the worse for the experiment, were placed on a miscellaneous diet.

On Feb. 12th, one week afterwards—
Their united weight was 12½ oz.
Temperature in rectum was 101½° and 101°.
Temperature of room was 66°.

(To be concluded.)

ON THE USE OF GLYCERINE IN SURGERY AND MEDICINE.

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GLYCERINE is not sufficiently valued in this country as a therapeutical agent; whereas the high estimation in which it is held on the Continent may be inferred from the fact, that from 1851 to 1861 the annual consumption of glycerine in the Paris hospitals rose from 300 lbs. to 3000 lbs. I propose to point out the principal advantages of glycerine from personal experience, and from that of an eminent Paris surgeon, M. Demarquay, who has been chiefly instrumental in introducing this agent, and has just published the results of his experience in an interesting little work. In the process of making lead plaster glycerine is produced, but, as it contains lead, it has an irritating action on abraded surfaces. The only glycerine, therefore, fit for medical and surgical uses is Price's, which is made by subjecting palm oil to steam raised to a temperature of 300° centigrade, and its specific gravity should be 1·26.

Glycerine is too well known to require description. Although derived from fatty substances, it will not combine with them, but mixes with water in any proportion, and has the power of dissolving all our active therapeutical agents about as readily as weak alcohol.

SURGICAL USES OF GLYCERINE.

Pure glycerine.—In household surgery, glycerine is known as the best remedy for chapped hands and slight irritation of the face and lips. I have found it invaluable when freely used in nasal, pudendal, and anal irritation. It is applied in a large number of skin diseases in France; and Maisonneuve, Denonvilliers, and Demarquay use it to dress ulcers and wounds, instead of cerate. It appears to have antiseptic properties, inasmuch as it speedily gives a healthy appearance to foul, unhealthy, and even pultaceous-looking wounds. This is admitted by Baron Larrey, whose report is in other respects unfavourable to its use in surgery. Indeed this antiseptic property might be inferred from its preserving from decomposition meat and microscopic objects that are kept in it, or have been steeped in it.

Liniments.—Glycerine does not become rancid, like oil. It is cleaner, can be easily washed off, and does not stain the