toward the belief that the substance is a calcium soap, formed from fatty acids derived from the fat and the calcium salts of the cheese.

The occurrence of tyrosine in cheese is not a new observation. In Cheddar cheese it has been found by Van Slyke and Hart;[1] in Roquefort cheese by Sieber;[2] in Emmenthal cheese by Weidmann,[3] by Benecke and Schulze,[4] by Röse and Schulze,[5] by Winterstein and Thöny,[6] and in Camembert cheese by the writer.[7] In no case, however, has it been observed in the form of crystals. The peculiarity of Roquefort in this regard may be accounted for by the greater abundance of tyrosine formed and the more favorable opportunity presented for its crystallization along crevices where there is more or less circulation of air. In Swiss and Cheddar cheese tyrosine is less abundant and sometimes occurs only in traces. In both of these varieties, a decomposition product of tyrosine, *p*-hydroxyphenylethylamine, has been found. This substance results from a simple loss of carbon dioxide from the carboxyl group, a type of reaction brought about by many species of bacteria. Although *p*-hydroxyphenylethylamine has not yet been sought for in Roquefort cheese, we know that the high salt content of this variety (4 per cent. or more) very materially reduces the growth of this type of bacteria, and the tyrosine liberated by the proteolytic enzyme of the mold would be left to accumulate in the substratum until crystallization ensued.

[From the Laboratory of Physiological Chemistry of the University of Illinois.]

FASTING STUDIES: II. ON THE CATALASE CONTENT OF TISSUES AND ORGANS AFTER PROLONGED FASTING.

By P. B. Hawk.

Received January 18, 1911.

The catalytic power of pathological tissues has been studied by several investigators. For example, Jolles and Oppenheim[8] found that the blood of patients suffering from carcinoma, nephritis or tuberculosis possessed decreased catalytic power. Later it was shown by Blumenthal and Brahn[9] that secondary cancer nodules of the liver showed far less catalytic activity than normal liver tissue and, furthermore, that the liver tissue between the nodules was less active than normal liver tissue

[1] New York Agric. Expt. Sta. *Bull.* 231, 26.
[2] *J. prakt. Chem. N. F.*, 31, 203.
[3] *Landw. Jahrb.*, 11, 592.
[4] *Ibid.*, 16, 321.
[5] *Landw. Vers. Sta.*, 31, 119.
[6] *Z. physiol. Chem.*, 36, 29.
[7] Bureau of Animal Industry, *Bull.* 109, 20.
[8] *Münch. med. Wochschr.*, 1904, 47.
[9] *Z. Krebsforschung*, 8, 436,

although more active than the cancer tissue. A sarcoma showed even less catalase than did carcinoma.

An interesting series of experiments upon the catalytic power of pathological tissues has been conducted by Winternitz and Meloy.[1] They found the catalytic values for the various tissues to vary in a pronounced manner under pathological conditions. The most marked reduction in the catalytic power of nephritic tissues was exhibited by the kidney. In eclampsia the blood showed no reduction from the normal catalase value, thus furnishing an ante-mortem medium by which eclampsia and nephritis may be differentiated. In tuberculosis the lung tissue was found to have a low catalytic power. The tissues in jaundice and diabetes mellitus exhibited no reduction in catalytic power, whereas, congenital syphilis and asphyxiation by illuminating gas produced a marked lowering of the catalase values. These investigators determined that post-mortem changes produced but a slight lowering of the catalytic power of the tissues. Their finding that the age of the subject has no material influence upon the catalytic power of the tissue is also of interest. This was shown by the fact that the tissues of a still-born infant showed normal catalytic power.

In connection with the last-mentioned finding of Winternitz and Meloy, certain experiments upon the catalase values for embryonic tissues are of interest. For example, Battelli and Stern[2] found a very low but increasing catalase value for embryonic guinea pig tissue, followed by a marked increase in the catalase content of the liver and kidney during the first week after birth. They claim a relationship between the catalytic power of a tissue and its functional activity. Buxton and Shaffer[3] likewise found that the catalytic power of embryonic tissues was always lower than that of normal tissues. On the other hand, Mendel and Leavenworth[4] working with pig embryos have determined that the catalytic power of such embryonic tissues is approximately the same as that of the adult tissue. Herlitzka[5] also reports the presence of catalase early in the development of the embryo.

The only statement as to the catalytic power of fasting tissues with which we are familiar is that made by Vernon[6] to the effect that the tissues of rats fasted from 4–8 days and the tissues of frogs fasted several months exhibited no change in catalase value. No experimental data are submitted. Vernon was likewise unsuccessful in securing any alteration in the catalytic power of the tissues of animals subjected to fatal

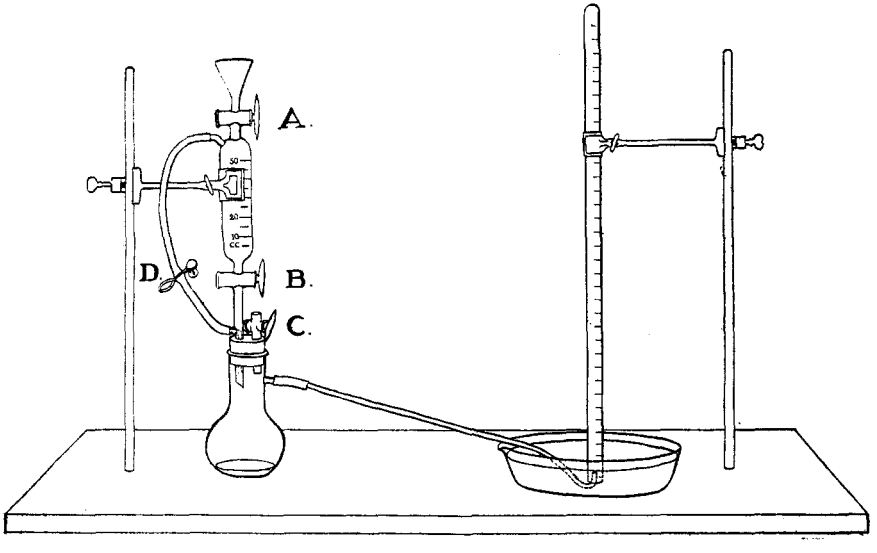
[1] *J. Exp. Med.*, 10, 759 (1908).
[2] *Arch. fisiol.*, 2, 471 (1905).
[3] *J. Med. Res., N. S.*, 8, 543 (1905).
[4] *Am. J. Physiol.*, 21, 85 (1908).
[5] *Biochem. Centr.*, 6, 234 (1907).
[6] Vernon, *Intracellular Enzymes*, London, 1908, 130.

poisoning with potassium cyanide or with phosphorus. Doses of phosphorus not sufficient to kill but large enough to produce fatty degeneration of the liver caused the catalytic power of this organ to decrease to $^1/_2$ or $^1/_3$ of its normal value.

Experimental Findings and Discussion.

In connection with our study of the alterations in catalytic power accompanying fasting the tissues and organs of four fasting dogs were utilized. Two of these animals (1 and 3) were "repeated fasters," that is, they were previously subjected to fasting periods which were carried to the premortal rise in the nitrogen excretion, then were subsequently fed through a long intermediate period until the original body weight was again assumed and finally subjected to a second fast. Of these "repeated fasters" No. 3 was a male adult animal whereas No. 1 was a female about 1–2 years of age. Dogs 2 and 6 were each subjected to but a single fast, No. 2 being a male adult whereas No. 6 was a male pup one month old. The fasting periods ranged from 7 to 104 days, being shortest for the pup and longest for the adult "repeated faster."

For the determination of the catalytic power weighed portions of the tissues under examination were ground with sand in a mortar, then treated with four volumes of chloroform water and permitted to extract for 24 hours at room temperature. From 1–4 cc. of the chloroform water filtrate was then treated with 5 cc. of hydrogen peroxide and its catalytic power, as measured by the volume of oxygen evolved through a two-minute interval, determined. An apparatus such as that reproduced in the figure was employed in determining the catalase values. The



main features of the apparatus are based upon those of a delivery funnel for introducing liquids under increased or diminished pressure as described by Bryan.[1] A similar apparatus has been used by Dr. A. W. Peters in connection with some unpublished experiments.

In making our determinations of the catalytic power of the fasting tissues and organs a measured amount (1–4 cc.) of the extract was introduced into the small flask[2] and the modified Johnson buret graduated to 5 cc. and containing 50 cc. of hydrogen peroxide (neutralized[3] Oakland dioxygen) was introduced into the neck of the flask. The eudiometer was now properly arranged, stopcocks A and C were then closed and stopcock B and pinchcock D opened and 5 cc. of the peroxide permitted to flow into the flask. The contents of the flask were now shaken briskly,[4] and the volume of the evolved oxygen determined, readings being taken at 15-second intervals through a two-minute period. For purposes of comparison the catalytic power of the tissues and organs of two normal dogs was determined.

Normal Dogs.—In Table I are given the data upon the tissues of normal dogs Nos. 3 and 4. It will be noted that the volume of oxygen liberated by the liver extract was greater than that liberated by any other extract. The value (66.7) was however but slightly higher than that of the kidney

TABLE I.—CATALASE VALUES OF NORMAL TISSUES.

Tissue.	Volume of extract	Volume of oxygen liberated in two minutes, cc.
		Normal Dog No. 3.
Liver	1 cc.	47.0, 61.0, 65.0, 65.5, 65.9, 66.3, 66.3, 66.7
Kidney	1 cc.	31.0, 47.0, 57.4, 61.0, 63.5, 64.6, 65.7, 66.2
Spleen	4 cc.	0.1, 1.4, 2.2, 4.6, 6.5, 8.6, 8.9, 9.2
Lung	4 cc.	2.0, 2.9, 3.5, 4.4, 5.0, 6.0, 6.8, 7.8
Heart	4 cc.	0.7, 1.0, 1.3, 1.8, 2.1, 2.2, 2.9, 3.2
Muscle	4 cc.	1.2, 1.2, 1.5, 1.5, 1.8, 2.0, 2.3, 2.3
Brain	4 cc.	0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 1.1
Pancreas	4 cc.	0.4, 0.4, 0.4, 0.4, 0.4, 0.4, 0.7, 0.7
		Normal Dog No. 4.
Liver	1 cc.	26.0, 42.0, 51.0, 56.4, 59.8, 63.6, 65.4, 66.6
Kidney	1 cc.	47.0, 57.0, 60.0, 61.0, 62.2, 62.6, 62.9, 63.2
Spleen	4 cc.	1.6, 2.2, 2.8, 4.0, 5.2, 5.8, 7.0, 8.3
Lung	4 cc.	1.7, 2.5, 3.9, 4.3, 5.2, 5.8, 6.4, 6.6
Heart	4 cc.	1.3, 1.6, 2.2, 2.8, 3.4, 4.1, 4.8, 5.3
Muscle	4 cc.	1.5, 1.8, 2.1, 2.4, 2.6, 2.6, 2.8, 3.1
Brain	4 cc.	0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.5, 0.5
Pancreas	4 cc.	0.7, 0.7, 0.7, 0.7, 0.7, 0.7, 0.7, 0.7

[1] Bryan, THIS JOURNAL, 28, 80 (1906).

[2] In case less than 4 cc. of extract were used the volume was made up to 4 cc. by the addition of distilled water.

[3] Congo red.

[4] Care was taken that the intensity of the shaking process should be uniform from determination to determination.

tissue (66.2). With the exception of the liver and kidney the other tissues examined showed low values, the spleen (9.2) and lung (7.8) being highest and the brain (1.1) and pancreas (0.7) being lowest. The values for the tissues of normal dog No. 4 are very closely comparable with those for the tissues of normal dog No. 3 just considered. The liver for example gave a figure (66.6) which was practically the same as that of dog No. 3 whereas the kidney was but slightly lower with a value of 63.2. As was the case with the other normal animal the liver and kidney possessed much higher catalytic power than did the other normal tissues examined. The spleen and lung tissue again came next in order after the liver and kidney in so far as their catalytic activity was concerned.

The average catalase values for these normal animals calculated on the basis of the different determinations are given in Table IV, p. 432. An examination of this table will show the average values for normal dog tissues to be as follows: liver 67.1, kidney 64.9, spleen 8.8, lung 7.2, heart 4.3, muscle 2.7, brain 0.8, and pancreas 0.7.

Fasting Dog No. 3.—In Table II are tabulated the data from the tissues of fasting dogs Nos. 3 and 2. Dog No. 3 the year previous to the final fasting test had been subjected to a fast of 117 days, this being by many days the longest fast on record. Some features of this fast have already been reported.[1] Following this record-breaking fast the animal was carefully fed and gradually brought back to his normal condition. He was then subjected to a second fast of 104 days at the end of which time his tissues were examined as to their catalytic power. If the withdrawal of food from an animal for a period is to exert any influence upon the catalytic power of the tissues of that animal we certainly would expect that fasts of the nature just described would accomplish such a result. We consider it decidedly surprising that the catalase values for the tissues of this animal were so nearly like those of the tissues of the normal dogs. For example the liver was 52.0 as against a normal average of 67.1, and the kidney was 50.7 as against a normal average of 64.9. Then followed the spleen, heart and pancreas with values but slightly lower than normal values. The lung yielded a value of 10.8 which was nearly 50 per cent. higher than the normal whereas the brain was 8.2 as against 0.8 a most surprising increase of eight-fold in the catalytic power. Of all the tissues examined the muscle was the only one showing entire loss of catalytic power.

A close comparison of the oxygen volumes liberated by the liver and kidney tissues of the normal dogs and fasting dog No. 3 will exhibit a most interesting fact. The total volumes are very closely comparable as has already been mentioned, yet when we examin into the rate of the reaction we find that the oxygen was liberated much more slowly through

[1] Howe, Mattill and Hawk, *Proc. Am. Soc. Biol. Chem.*, June, 1910, 260.

the medium of the catalase of the fasting tissues than through the medium of the catalase of the normal tissues. Under normal conditions 40–75 per cent. of the total volume of oxygen liberated in a two-minute period from 5 cc. of hydrogen peroxide through the catalytic power of 1 cc. of liver or kidney extract was evolved in the first 15 seconds. In the case of the tissues of fasting dog No. 3 the volume of oxygen liberated under the same conditions and in a similar time interval was only 16–36 per cent. of the total volume liberated. In other words although the catalytic powers of the tissues of the normal and fasting dogs were rather closely comparable from the standpoint of the total volume of oxygen liberated there were striking differences in the velocity of the reaction. The rate was less rapid during the first part of the two-minute interval in the case of fasting tissues and more rapid during the second part than was the rate in the case of the normal tissues.

TABLE II.—CATALASE VALUES OF FASTING TISSUES.

Tissue.	Volume of extract.	Volume of oxygen liberated in two minutes, cc.
		Fasting Dog No. 3.
Liver	1 cc.	8.4, 14.2, 23.4, 34.2, 42.1, 47.2, 50.5, 52.0
Kidney	1 cc.	18.4, 25.0, 32.7, 39.9, 44.2, 47.5, 49.4, 50.7
Spleen	4 cc.	0.9, 1.2, 1.7, 2.3, 2.5, 3.4, 4.2, 5.1
Lung	4 cc.	1.5, 2.7, 3.7, 5.2, 6.5, 7.8, 9.0, 10.6
Heart	4 cc.	0.4, 0.8, 1.0, 1.3, 1.5, 1.8, 2.0, 2.6
Muscle	4 cc.	negative
Brain	4 cc.	1.6, 2.8, 3.9, 4.8, 5.9, 6.5, 7.3, 8.2
Pancreas	4 cc.	0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.5
		Fasting Dog No. 2.
Liver	1 cc.	2.1, 4.1, 6.5, 9.9, 12.9, 16.2, 19.6, 23.0
Kidney	1 cc.	0.5, 0.8, 1.2, 1.6, 2.1, 2.8, 3.5, 4.4
Spleen	4 cc.	negative
Lung	4 cc.	1.2, 2.3, 3.0, 4.6, 5.2, 6.3, 7.1, 8.2
Heart	4 cc.	negative
Muscle	4 cc.	negative
Brain	4 cc.	negative
Pancreas	4 cc.	negative

The relative order of the tissues when placed according to their catalase values was rather different for fasting dog No. 3 than for the normal animals. This may be seen by examining Table V. The order as determined for the normal animals was liver, kidney, spleen, lung, heart, muscle, brain and pancreas. In the case of the faster the liver and kidney still retained their preëminent positions and the pancreas was still at the end of the list but the intermediate positions of lung, spleen, brain and heart were rearranged. The order of tissues for this dog was liver, kidney, lung, brain, spleen, heart and pancreas.

Fasting Dog No. 2.—When we come to consider this animal we find a condition decidedly at variance with what we have already observed

in the case of the repeated faster just discussed. For example a value of 23.0 is registered for the liver as against 52.0 for fasting dog No. 3, a value of 4.4 is registered for the kidney as against 50.7 and the only other tissue which showed any catalytic power was the lung which gave a value of 8.2. It will be noted that the catalase value of the lung tissue was above that of kidney tissue, this being the sole instance during the series of studies in which this relative order was observed. The significance of the pronounced variations between the catalase values for the tissues of the two fasting dogs under consideration will be further emphasized when it is remembered that they were both adult animals, one of them (No. 2) an "initial faster" the other (No. 3) a "repeated faster." One characteristic was possessed in common by the tissues of these two fasters. This relates to the velocity of the reaction by which the oxygen was evolved. Here again as was shown in the case of fasting dog No. 3 the liberation of oxygen was much slower than normal during the first part of the 2-minute interval, a condition which was followed by a compensating acceleration during the second part of the period.

Fasting Dog No. 1.—Here for the first time we have a catalase value for kidney tissue above that for the liver tissue of the same animal. This may be observed if Table III be examined, the recorded catalase value for liver tissue being 34.7 as against the higher one of 47.9 for kidney

TABLE III.—CATALASE VALUES OF FASTING TISSUES.

Tissue.	Volume of extract.	Volume of oxygen liberated in two minutes, cc.
		Fasting Dog No. 1.
Liver	1 cc.	1.2, 2.3, 4.6, 9.6, 16.1, 21.6, 29.2, 34.7
Kidney	1 cc.	7.2, 18.9, 32.4, 41.1, 45.0, 46.6, 47.6, 47.9
Spleen	4 cc.	negative
Lung	4 cc.	0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.5, 0.5
Heart	4 cc.	negative
Muscle	4 cc.	negative
Brain	4 cc.	negative
Pancreas	4 cc.	negative
		Fasting Dog No. 6.
Liver	1 cc.	2.0, 19.0, 28.1, 41.5, 50.8, 54.8, 56.2, 57.0
Kidney	1 cc.	0.8, 1.3, 2.3, 3.6, 4.9, 7.0, 8.7, 11.1
Spleen	4 cc.	not examined
Lung	4 cc.	0.0, 0.5, 0.5, 0.5, 0.5, 0.9, 0.9, 1.2
Heart	4 cc.	0.9, 1.4, 2.2, 3.4, 4.9, 7.2, 9.6, 12.3
Muscle	4 cc.	negative
Brain	4 cc.	negative
Pancreas	4 cc.	negative

tissue. In common with dog No. 2 this animal showed absence of catalytic power in all but three tissues, the third tissue in connection with which catalytic power was demonstrated being the lung. With the exception of the lung value the tissues of dog No. 1 showed stronger catalytic

power than did the tissues of dog No. 2, the average value for the kidney tissue being 46.5 (Table IV) as compared with 4.4 for the last mentioned animal.

In line with the conditions in force with the other fasting dogs the evolution of the oxygen was less rapid during the first part of the experimental period and more rapid during the second part of this period than was the case with the normal dogs.

Fasting Dog No. 6.—Here we are dealing with a pup only one month old, and for this reason the data cannot logically be compared with those obtained from the analysis of the tissues of the other animals. Tables III and IV show that the value for liver tissue (57.0) was approximately normal. Kidney tissue however yielded a catalase value of only 11.1 which is the second lowest kidney value secured. One of the striking features of the tissue examination in the case of this animal was the high catalase value for heart tissue, this being 12.3, which was about 3 times as great as that of normal heart tissue and also slightly above that of the kidney tissue of the same animal. In the relative order of the tissues for this animal the heart tissue therefore comes second as may be seen in Table V. Here again we note the slow rate of the catalytic action as compared with that for normal tissues.

TABLE IV.—AVERAGE CATALASE VALUES.

	Tissue.								
Dog.	Liver.	Kidney.	Spleen.	Lung.	Heart.	Muscle.	Brain.	Pancreas.	Days.
Normal	67.1	64.9	8.8	7.2	4.3	2.7	0.8	0.7	...
Fasting (3)	52.7	50.4	5.1	10.8	2.6	0.0	8.2	0.5	104
Fasting (2)	23.8	4.4	0.0	8.2	0.0	0.0	0.0	0.0	48
Fasting (1)	34.8	46.5	0.0	0.5	0.0	0.0	0.0	0.0	30
Fasting (6)	57.0	11.1	...	1.2	12.3	0.0	0.0	0.0	7

TABLE V.—RELATIVE ORDER OF TISSUES.

Normal	Liver	Kidney	Spleen	Lung	Heart	Muscle	Brain	Pancreas	...
Fasting (3)	Liver	Kidney	Lung	Brain	Spleen	Heart	Pancreas		104
Fasting (2)	Liver	Lung	Kidney						48
Fasting (1)	Kidney	Liver	Lung						30
Fasting (6)	Liver	Heart	Kidney	Lung					7

General Considerations.—A general conclusion to be drawn after a careful examination of all data submitted is to the effect that fasting tended to *lower* the catalytic power of the animal tissues under examination. There were certain isolated instances however in which the fasting régime tended to increase the catalytic power. It may further be stated as demonstrated that there was no regularity in the extent to which the catalytic power of a given tissue from different animals was lowered.

Of the four fasting animals examined two may be directly compared inasmuch as they were adult animals. These are Nos. 2 and 3. When we compare the data from the examination of the tissues of these two

dogs as given in Table IV, we are confronted by very striking variations. Dog No. 2 showed entire absence of catalytic power in 5 of the 8 tissues examined and furthermore of the 3 tissues which contained catalase the maximum value was 23.8 for liver tissue, a value which was only about $^1/_3$ that of normal tissue. The kidney value was the surprisingly low one of 4.4, a value only 7 per cent. as great as that shown by normal tissues. Now turning to the other adult animal (dog No. 3) we observe that the values throughout are not far removed from the normal, the data showing slightly lower catalase values in five tissues, higher in two tissues and entire absence of a catalytic power in but a single tissue.

Why do we find these pronounced differences in the catalase values for the tissues of these two adult fasting dogs? The answer we believe is centered in the fact that in one case we are dealing with a dog fasting for the first time whereas in the other case we are dealing with a "repeated faster."

When we are considering the close agreement between the catalase values for the tissues of fasting dog No. 3 and those of the normal animals we must not forget that we are here dealing not with an ordinary fasting dog but rather with an animal which had undergone two very long fasts. We venture to assert, and we believe certain of our other data will bear us out in the assertion, that had this dog been killed at the end of his first fast and the catalytic power of his tissues determined, the values would have been much lower and more widely at variance with the normal than were these values as determined by us at the end of his second fast.

Our experiments upon "repeated fasters"[1] have led us to the conclusion that the animal organism is in much better condition, from all observable standpoints, at the end of a second fast than at the end of the original fast provided that during the intermediate period the animal be fed carefully and restored as nearly as possible to the physical condition in force before the initial fast. This is true even though the repeated fast be of longer duration than the original fast.

We believe that an animal organism which has once been subjected to a severe fast acquires from this fact a kind of *immunity or resistance* which enables such an organism to more successfully cope with the problems of the abnormal fasting condition as they arise and that this and other associated factors permits the animal to regulate its varied activities more efficiently and to make a more economical utilization of the available body tissues. We expect to further investigate the question of a possible fasting immunity or resistance.

Whether or not the suggestions as to the fasting immunity or resistance are generally accepted, the central and important fact, determined by actual experimentation, still remains. This is the observation that *the*

[1] Howe and Hawk, THIS JOURNAL, 33, 215 (1910).

tissues of an adult dog which had been subjected to two fasts of 117 days and 104 days in duration respectively, possessed catalytic powers which were much more comparable with the catalytic powers of normal tissues than with the catalytic powers of the tissues of another adult dog which had been subjected to but a single fast 48 days in length. Arguments against drawing any important conclusions from these facts may of course be adduced from the standpoint of individuality. However, in view of other related data already mentioned as obtained from repeated fasters[1] we are willing to stand upon our interpretation. That our data upon catalase values may properly be interpreted as indicating the efficacy of "repeated fasting" is brought out still more clearly in connection with the work of Battelli and Stern[2] in which they determined that the catalytic power of the tissues was an index of functional activity. On the basis of this finding, therefore, our observation of higher catalase values for the tissues of adult "repeated fasters" as compared with adult "initial fasters" may be taken as indicating the more efficient functional activity of the repeated faster.

[CONTRIBUTION FROM THE DEPARTMENT OF CHEMISTRY, INDIANA UNIVERSITY.]

THE DECOMPOSITION OF URIC ACID BY ORGANIC ALKALINE SOLVENTS.

BY HANNAH STEVENS AND CLARENCE E. MAY.

Received December 11, 1910.

From time to time, there have appeared in the literature statements regarding the decompositions uric acid underwent when exposed to the action of alkaline inorganic solvents. Various chemists, Austin, Schittenhelm, Folin and others have noted a loss of uric acid while using an alkali, such as sodium hydroxide, as solvent. Austin has quite conclusively shown the effects of inorganic alkalis in splitting uric acid. He digested solutions of uric acid in Na_2CO_3, Li_2CO_3, Na_2HPO_4 and NaOH respectively for different periods of time and at different temperatures. He proved beyond a doubt that uric acid was destroyed by alkalies, even when acting in the cold, and that this destruction was greatly increased when the temperature was increased to that above room temperature. Sodium hydroxide was found to be by far the most active, for although a solution of only 0.024 gram NaOH per 400 cc. of water was allowed to act on some of the acid, he was able to recover only about 50 per cent. of his acid. Sodium carbonate proved to be least destructive. Schittenhelm also, in using sodium hydroxide as a solvent lost about one-sixth of his uric acid. Further, Folin found that uric acid was decom-

[1] Howe and Hawk, *loc. cit.*

[2] Battelli and Stern, *loc. cit.*