24 hours later quotients of .728, .724, .752, and .790 respectively. The experiment was also repeated on rats fasted 24 hours, but with them the blood CO_2 analyses were omitted. In 5 animals the preliminary respiratory quotients were .785, .782, .765, .731, and .756 respectively before the operation, and, .723, .747, .741, .738, and .744, 24 hours after removal of 70% of the liver. In 3 other rats, on which no preliminary tests were made, respiratory quotients of .736, .739, and .749 were found 8 to 24 hours after ablation of a similar percentage of the liver.

In the past, experimenters have sought to ascertain the rôle of the liver in fat metabolism by respiratory quotient studies made after attempted exclusion of the organ from the circulation by ligation of the abdominal aorta and other vessels.[3, 4] Since the respiratory quotient was usually found close to unity, conclusions were drawn that the presence of the liver was essential to fat metabolism. Murlin, Edelmann and Kramer[5] have shown, however, that extensive interference with the circulation brings about changes in the blood CO_2 which alone may account for the results mentioned. They point out, too, that in the rare instances in which the animals survived more than 6 hours, much lower respiratory quotients were found. One may conclude from the findings reported above that the metabolism of fat is carried on adequately in animals deprived of over 90% of the organ and eventually dying of extreme liver insufficiency. It seems highly improbable that the liver possesses any vital function in fat metabolism.

[1] Mann, F. C., *et al.*, *Am. J. Physiol.*, series of articles published 1921-1927.
[2] Mann, F. C., *Ergebn. Physiol.*, 1924, xxiii, 212.
[3] Porges, O., *Biochem. Z.*, 1910, xxvii, 131.
[4] Porges, O., and Salomon, H., *Biochem. Z.*, 1910, xxvii, 143.
[5] Murlin, J. R., Edelmann, L., and Kramer, B., *J. Biol. Chem.*, 1913-14, xvi, 79.

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The Mucinate Content of Saliva.

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The method used for the determination of the mucinate content was the nephelometric procedure described by Inouye,[1] as follows: A 10 cc. sample of saliva is made alkaline with 2.5 cc. of 5% NaOH,

thoroughly mixed, and promptly filtered through a dry filter. Five cc. of the filtrate, in a collodion bag, is dialyzed against running water until no longer alkaline to phenolphthalein (but still alkaline to litmus), and then against several changes of distilled water. The contents of the bag are then transferred to a 50 cc. volumetric flask and diluted to volume, of which 20 cc. are then treated with 0.02 N HCl from a burette, drop by drop, until an additional drop fails to give more precipitate. This is then compared nephelometrically with a standard solution of Na mucinate solution prepared as follows: A 10 cc. sample of 0.1% Na mucinate solution is dialyzed (if the mucinate is completely soluble in water without the addition of NaOH, the dialysis is omitted), and made up to 50 cc., of which 20 cc. are then titrated to maximum turbidity. If the standard and unknown give widely divergent readings, appropriate dilution of one of them should be made to bring the readings closer together.

The mechanical stimulation of chewing paraffin was used to obtain the "controls". Twenty minutes after the end of collection of a control sample, the mechanical stimulus was again applied or a chemical stimulus with a few drops of lime juice or crystals of rock-sugar on the tongue (in these cases the first expectorations were discarded), or the smoking of a cigarette, and a new sample collected for analysis. Twenty-six samples, from 9 subjects, under the mechanical stimulatien, were analyzed. The subjects, "average" adult males, were selected with no reference to dental conditions. All samples were collected in the early afternoon, after lunch. The mucinate content ranged from 0.60% to 0.21%, with an average of 0.27%, with a P. E. of 0.05. If, however, we exclude one sample of 0.60% (which, though from an apparently "average" subject, may be an abnormally high mucin content) we then have a series of 25 samples, ranging from 0.29 to 0.21%, averaging 0.26% with a P. E. of 0.02. This, we believe, can be taken as a normal value of the mucinate content following the mechanical stimulation under these conditions.

The largest variation in the mucinate content of the samples from a given individual was 0.08%; subject W, 0.22-0.25%, five tests; subject H, 0.25-0.29%, three tests; subject F, 0.25-0.28%, six tests; subject C, 0.21-0.29%, two tests. Repetition of paraffin stimulation 20 min. after collection of the first "control" sample gave, in 2 of 6 cases, decreases of notable amounts (0.08%); but in 2 cases there was a decrease of only 0.01%, and in 2 case an increase of 0.03%.

Collection of samples under lime juice stimulation, 20 min. after

the "control" collection, gave a decrease in mucinate content in each of 6 cases (the decrease amounting in 4 cases to as much as 0.10%). This accords with the frequent observation of a "watery" saliva after acid stimulation, perhaps due to parotid stimulation. In a short series (3 cases) cigarette smoking gave no consistent change in the mucinate content. In 7 tests in which sugar ("rock candy") was used following the control, there was a consistent decrease in the mucinate content. The maximum fall was not determined, in 4 cases the dilution made the nephelometric comparison unreliable. This, it should be noted, followed stimulation by small amounts of sugar, and does not contradict the common observation of an increase in the muciginous quality of saliva following the action of large amounts of sugar.

As a partial check on the results, the total N content of cleared and dialyzed saliva was determined in many cases. The values obtained showed the same trend and magnitude of change under varying stimuli, and corroborated the mucin amounts on the assumption that the protein present was largely mucinate.

[1] Inouye, J. M., 1924, Studies of Salivary Mucin and its Quantitative Determination (Dissertation, Columbia University).

ERRATUM.

"Advanced Development of Some Echinoid Plutei," by A. R. Moore. Vol. XXV, No. 1, p. 38, 4th line from top of page, instead of "formed in 10 to 12 days, and in 10 days the third pair of arms ap-" to read, "formed, and in 10 to 12 days the third pair of arms ap-".