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The effect of compression on tissue enzymes.

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The senior author (B.H.H.) has studied various enzymes when subjected to great compression in a special hydraulic press, capable of delivering pressure of over $(10)^5$ pounds per square inch. As a rule, these enzymes are inhibited or destroyed. At the same time, there is generally lee-way between the destruction of enzymes and the total destruction of bacteria included in the preparations. It is well known from the work of investigators, such as Wolbach, Sakai and Jackson,[1] that it is difficult if not impossible to obtain aseptic autolytic digests by employing the most rigid asepsis in operations of removing organs from mammals, for included bacteria are practically always present. The junior writer (W.M.) has abundantly verified this conclusion, although there exist reports of investigations, as those of Magnus-Levy,[2] where the work was controlled by aërobic and anaërobic cultures and aseptic organ suspensions seem to have been obtained. We have no suggestion to make regarding this discrepancy.

In order to determine whether the lee-way mentioned above is of sufficient extent to warrant an attempt to study tissue enzyme action apart from bacteria, the following experiments were conducted, rabbits being used as subjects, the livers being excised, sieved, weighed to 20 per cent. digest, 10 g. and 25 g. portions being transferred to special blocked tin tubes, resembling vaseline tubes, which were tightly stoppered by means of screw-caps, each tube then being introduced into the cylinder of the press surrounded by a jacket of water. The following table gives the number of the sample, the pressure involved, the time of exposure to this pressure and the Kjeldahl data utilized to follow the rate of digestion, if any[3]; the term "initial" refers to the non-protein

[1] Wolbach, Sakai and Jackson, *Journ. Med. Res.*, 1909, 21, 267.

[2] Magnus-Levy, *Hofmeister's Beiträge*, 1902, 2, 261.

[3] For details see Bradley and Morse, *Journ. Biol. Chem.*, 1915, 21, 209.

nitrogen analyzed immediately after removal of the tubes from the press and "48 hrs.," that nitrogen found in aliquots after remaining in a thermostat at 37° for that period.

Sample Number.	Pressure.	Time.	Initial.	48 Hours.
Control (septic).....	xx	xx	0.50 c.c. 0.1 N.	0.80 c.c. 0.1 N.
I. septic.....	75(10)[3]	5 mins.		.90
II. sterile.....	16(10)[4]	2 hrs.		.50
III. sterile.....	(10)[5]	16 hrs.		1.40
IV. sterile.....	(10)[5]	1 min.		.50

The explanation of number III being at variance with number IV, where both are at the same degree of compression, doubtless lies in the fact that during the longer period of exposure (16 hrs.), some enzyme action may proceed before inhibition sets in, especially as the temperature rises somewhat[4] during this prolonged time of exposure.

It is evident that the method can be used only with the greatest care to adjust the pressure so that complete inhibition does not occur, while at the same time, all bacteria[5] are killed, which is of doubtful practicability.

At these pressures, egg albumen is coagulated (B.H.H.), but in the case of the tissue from the rabbit's liver, there is little evidence of change in the colloidal dispersion, although the Ringer's Solution used to make up the liver mass to 20 per cent. suspension separates in the tubes during compression from the semi-solid mass.

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The relation between the disappearance of foreign proteins from the circulation and the formation of antibodies.

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Some observations which Dr. Rackemann and one of us made a few years ago indicated that when serum disease followed the injection of horse serum in human beings anti-bodies, such as

[4] The cylinder is cooled during the period of compression.

[5] This probably lies near (10).[3]