The coefficient of correlation was $r = +0.82$ ($p < 0.001$). Sodium excretion within 6 h after unclamping was also correlated with the mean blood pressure before unclamping; the coefficient of correlation was, however, lower ($r = +0.73$). The Figure shows the fall in blood pressure as a regression on sodium excretion; the slope of the regression line was $b = 16.6$ mm Hg/mEq/kg body wt. of sodium excreted in 6 h and differed highly significantly ($p < 0.001$) from 0.

These data suggest, but do not prove, that the fall in blood pressure after unclamping is related to a loss of sodium and extracellular fluid. TOBIAN et al.[11] found that the total exchangeable sodium in the 'Goldblatt-type' hypertension in rats is increased by 3.9 mEq/kg when compared to that of normal rats, or of animals with hypertension induced by constricting one renal artery without removing the opposite kidney. This amount is nearly the same as the additional sodium excreted within 6 h after unclamping. Thus it is possible that the 'Goldblatt-type' of hypertension is causally related to retention of sodium and water. The possible role of sodium retention in the pathogenesis of different types of hypertension has recently been stressed by GUYTON and COLEMAN[12]. However, it should be pointed out that, in the experiments of LEDINGHAM and COHEN[7], a fall in blood pressure occurred after unclamping 'Gold-blatt-type' hypertensive rats, even when they were thought to have a positive water balance, and in 3 animals in spite of the fact that the urine excreted was reinjected. It appears unlikely that suppression of the fall in blood pressure after unclamping by ligating the ureter could be due to the additional secretion of renin induced by this operation[13].

Résumé. Chez le rat hypertendu par constriction partielle d'une artère rénale et néphrectomie controlatérale, la suppression chirurgicale de la constriction entraîne une normalisation de la pression artérielle et une excrétion urinaire importante d'eau et de sodium; la ligature préalable de l'uretère empêche la normalisation de la pression.

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Mast Cells and Hibernation: Observations in the Indiana Bat, *Myotis sodalis*

An increase in the number of mast cells has been reported as occurring in tissues of hibernating hedgehogs (*Erinaceus europaeus*)[1]. The clotting time of the blood of hedgehogs, hamsters and bats is apparently also increased during hibernation[2–4]. These observations have been used to support the contention that heparin, which is one of the main pharmacologically active substances produced by the mast cell[5,6], is of physiological significance for the circulatory system by decreasing the coagulability of the blood and thus preventing spontaneous thrombosis[2,4].

The evidence for an increase in the blood clotting time in hibernating animals seems conclusive, whereas the existence of a corresponding general increase in the number of mast cells – which is mainly based on studies in a few specimens of a single species[1] – needs confirmation. We have therefore re-investigated the matter of possible changes in the mast cell population during hibernation by studying the mast cells in the interfemoral membrane of the Indiana bat, *Myotis sodalis*, in the autumn and throughout the winter. Prior to and at the end of the hibernating period, tissue levels of histamine in this bat were also determined. Considering that mammalian mast cells in addition to heparin also store the bulk of tissue histamine, and that variations in mast cell number in a particular tissue are usually paralleled by variations in its histamine content[7,8], the histamine determinations may serve as an additional indicator of changes in the mast cell population.

Once every month, from October to April, 6 specimens of *Myotis sodalis* (equal numbers of either sex) were collected from a common hibernating place in Carter Cave (Kentucky). The first collection (October) was made while the bats were gathering in increasing numbers in the cave, and they were still leaving the cave for flights at night-time. Transient arousals from the dormant state were noticed occasionally during the winter months (November to March). Cave temperatures in the winter averages about 5 °C. The last collection (April) was made when bats started to leave their hibernating place for the summer.

Upon capture, the bats were taken to the laboratory and killed with ethyl ether. The interfemoral membrane was then removed and its 2 layers of skin partially split from each other by insertion of a hypodermic needle, followed by injection of methyl alcohol into the tissue between these layers. Subsequently, the whole tissue sample was placed in jars with methyl alcohol for additional fixation. After 2–3 days some of the samples were completely split into 2 layers, stained with alcoholic thionin (0.1%), and studied under the microscope. Other samples were stored in the fixative until April when the mast cell density of samples obtained on all collection trips was compared. Notwithstanding that tissues from the intestinal tract have been included in earlier studies on the mast cells during hibernation[1,4], we avoided such tissues because hibernation is accompanied by fasting which per se may fundamentally affect tissues directly involved in the digestive process.

Judging from the single-layered skin preparations, the interfemoral membranes were always rich in mast cells. We performed both general observations of mast cells

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over a rather large area and direct counting of mast cell number within 10 randomly chosen observation fields, but were unable to find evidence for any seasonal difference in the mast cell population. Equally high numbers of mast cells were apparently present in all preparations, and the granulation and staining properties of the cells were also similar.

Histamine was assayed in interfemoral membranes and lungs of 8 bats, 4 collected in October and 4 in April. A standard spectrofluorometrical assay technique[9] was applied, except that all samples had been dried in air (at about 30 °C) and were kept in the dry state for a few weeks before being subjected to assay. In accordance with the microscopic examination, a comparison of the histamine contents of the samples, calculated as μg of the base per g of fresh tissue (Table), revealed no significant difference between bats collected in October and bats collected in April.

Our observations are in good agreement with those of BALLOWITZ[10], who studied the effect of inanition on the mast cells in various tissues of bats of the species *Vesperugo noctula* and found that bats kept in the laboratory without food for the winter (5–6 months) maintained a mast cell population similar to that of bats killed immediately upon capture in the autumn. Another more recent report[4] directly compares the mast cell number of winter bats (*Myotis lucifugus*) obtained from a cave with that of summer bats of the same species obtained from a farmhouse and also lists data in agreement with ours. However, by stressing that the failure to find any difference in mast cell number in tissues from summer and winter bats might be accounted for by strain differences, the latter report unfortunately leaves the impression – which has subsequently been passed on by reviewers[6,11] – that during hibernation there is probably an increase in the number of tissue mast cells after all. From the results hitherto published it nevertheless seems that as far as bats are concerned, hibernation fails to induce any general changes in the mast cell population.

Histamine levels in tissues of the Indiana bat (*Myotis sodalis*) immediately prior to and at the end of the hibernating period

Time of year	Histamine content (μg/g) Interfemoral membrane	Lung
October	9.9–15.8	1.3–2.8
April	10.2–13.2	1.0–3.3

Zusammenfassung. Untersuchungen über die Zahl der Mastzellen und den Histamingehalt in Gewebe der Indiana-Fledermaus *Myotis sodalis* während des Winterschlafes zeigten keine Unterschiede zwischen den im Herbst, Winter und Frühling getöteten Tieren.

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Evidence for a Cholinergic Mechanism Inducing Histamine Increase in the Rat Brain in vivo

The function of cerebral histamine is not well established as yet[1,2]. Cerebral acetylcholine has been attributed a role in excitatory as well as inhibitory mechanisms[3–6]. Electrical[7] or chemical[8] stimulation of the central nervous system induces depletion of brain acetylcholine presumably through an accelerated release of this neurohumor[9–12]. It is shown here that during central nervous system stimulation, a cholinergic mechanism induces an increase in cerebral histamine.

Material and method. Albino rats of either sex, 150–200 g of body weight, were placed in individual wooden cages provided with a copper-wired grid bottom connected to an electronic stimulator. Electrical stimulation to the paws was applied over a period of 5 min, 4 c/sec, 20 msec duration, and a voltage high enough to cause a discrete jumping of the animal. At the end of the stimulation period the rats were sacrificed by decapitation, the brains were removed as soon as possible (less than 3 min) and the cerebral hemispheres and brain stem homogenized in ice-cold acid ethanol. After extraction, acetylcholine and histamine were separated by descending paper chromatography and the eluates assayed in the rat duodenum and guinea-pig ileum respectively. Antagonists were employed for further testing of specificity. Recoveries obtained were over 72% for amounts added to sample homogenates in the range of concentrations studied. Drugs used for treatments added to sample homogenates (3 μg/g for cholinesterase inhibitors and 3 mg/g of fresh tissue for L-histidine) did not interfere with the procedure.

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