maintains lactation at 60% of normal, based on the litter growth index plus several additional indices.

It is not possible to measure a daily secretion rate of a hormone by the technique of gland extirpation and single daily injection of the hormone that is normally being secreted constantly from that gland. However, this method does provide an estimate of the relative value of the hormone and the levels required for maintenance of a particular physiological function, lactation in this case.

This study suggests that daily requirements of aldosterone and corticosterone in maintenance of normal lactation in the rat exceed 25 μg per day for aldosterone and 1 mg per day for corticosterone. The combination of the 2 adrenal steroids acting synergistically appears to be obviously better than either hormone alone.

Summary. Lactating albino rats were adrenalectomized or adrenal-ovariectomized on day 4 of lactation and maintained on aldosterone and/or corticosterone by daily subcutaneous injection until day 20. Criteria of lactational performance, including litter weights on days 14 and 20, milk production on day 14, and litter growth index, indicated that 25 μg aldosterone acetate and 1 mg corticosterone acetate per day maintained lactation at approximately 80% of the normal level.

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Failure of Secretin or Duodenal Acidification to Inhibit Ethanol-Induced HCl Secretion by Heidenhain Pouches.* (28232)

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Acidification of duodenal contents is a potent stimulus for liberation of secretin which in turn stimulates the pancreas to secrete. Intravenous administration of commercially prepared secretin inhibits the response of Heidenhain pouches to a meal of meat(1), an inhibition not influenced by removal of the pancreas(2). Since acidification of the duodenum can inhibit gastric secretion(3), the suggestion has been made that secretin may mediate the inhibitory effects of acidification of the duodenum on gastric secretion(1). The following tests were done to determine whether acidification of the duodenum and intravenous administration of secretin have similar effects on the gastric secretory response to ethanol.

Methods. Vagally denervated (Heidenhain) gastric pouches were prepared in 6 mongrel dogs. Two dogs underwent a second operation in which the pylorus was divided, the duodenal stump was closed, a metal cannula was placed in the duodenum, and the open end of the gastric antrum was anastomosed to the side of the upper part of the jejunum. Tests of secretory function were begun 3 or more weeks after operation when the animals were eating well and were in excellent condition.

The dogs were fasted for 24 hours before each experiment. In all tests gastric secretion was stimulated by instillation into the

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TABLE I. Effect of Duodenal Acidification and of Secretin on Heidenhain-Pouch Response to Intragastric Ethanol.

Dog	Period (min)*	Control studies HCl (meq/30 min) n	Avg	Range	Tests HCl (meq/30 min) n	Avg	Range	% change
Ethanol:		w/intravenous saline			w/intravenous secretin, 1 unit/min			
1	0-30	3	.47	(.18- .72)	2	.25	(.17- .34)	—47
2	0-30	3	.42	(.33- .50)	2	.33	(.21- .46)	—21
3	0-30	3	.25	(.22- .28)	3	.30	(.20- .32)	+20
	30-60	3	.30	(.24- .38)	3	.30	(.27- .35)	0
4	0-30	3	1.05	(.95-1.23)	3	1.17	(.89-1.32)	+12
	30-60	3	.58	(.38- .93)	3	.63	(.51- .71)	+ 9
Ethanol:		w/intraduodenal saline			w/intraduodenal HCl			
5	0-30	4	.58	(.39- .68)	4	.37	(.13- .50)	—36
	30-60	4	.62	(.50- .86)	4	.64	(.40- .79)	+ 3
6	0-30	4	1.27	(.96-1.5)	4	.87	(.44-1.26)	—31
	30-60	4	.80	(.42-1.06)	4	.89	(.54-1.18)	+11

* After intragastric administration of ethanol.

stomach of 15 ml of 7% ethanol per kilogram of body weight.

The effect of secretin on the secretory response of the pouches to ethanol was tested in 4 dogs. Secretin (Vitrum, Stockholm, Sweden) was given intravenously at a rate of 1 unit/min. In 2 of these dogs, secretin was given for the first 30 minutes after administration of alcohol; in the other 2, for the first 60 minutes. In all 4 dogs, physiologic saline instead of secretin was given intravenously during control tests.

The effect of acidification of the duodenum on the gastric secretory response to ethanol was tested in the 2 dogs with Heidenhain pouches and duodenal fistulas. For 1 hour after ethanol had been instilled into the stomachs, 0.15 N HCl (or 0.15 N NaCl for control studies) was instilled into the duodenum. The pH of duodenal contents was monitored continuously by an indwelling glass electrode attached to a Beckman recording pH meter. A motor-driven syringe delivered HCl at a rate of 80 ml/hr, and additional amounts were added manually as needed to keep the duodenal pH at approximately 2.5. The required hourly volume of 0.15 N HCl ranged from 130 to 195 ml.

In all tests, the amount of free HCl in samples of gastric juice was estimated by titration with 0.1 N NaOH, using Töpfer's reagent (dimethylaminoazobenzene) as indicator; and output of acid per unit time was calculated and expressed as milliequivalents.

Results. Ethanol, as given in these experiments, was a strong stimulus of secretion of HCl by the Heidenhain pouches.

During administration of secretin, mean rates of secretion of HCl in response to ethanol were slightly increased in 2 dogs, slightly decreased in a third, and decreased by 47 per cent in a fourth (Table I). In all dogs, ranges of control and test data overlapped to such an extent that the differences were not significant.

Similarly, acidification of the duodenum in 2 dogs was accompanied by changes in gastric secretory response to alcohol that varied from −36 to +11 (Table I). Again, values for individual tests varied considerably and changes were not significant.

Discussion. Ethanol given orally or intravenously stimulates gastric secretion in dogs. Although it has been proposed that this effect of ethanol may be the result of liberation of histamine(4), measurements of urinary excretion of histamine during and following administration of alcohol have failed to provide evidence for generalized release of histamine (5). As always, the possibility of localized release of histamine near the parietal cells was not excluded. Ethanol placed in the dog's gastric antrum causes liberation of gastrin; but the ability of alcohol to stimulate gastric secretion when given either orally or intravenously persists after antrectomy(5,6). Likewise, ethanol given intravenously stimulates gastric secretion by vagally denervated

mucosa, even after the entire antrum and small intestine have been removed(6). Ethanol does not stimulate secretion upon contact with the mucosa of the fundus and corpus of the stomach, despite the fact that it is absorbed in the process. Thus the evidence suggests that, in the dog, alcohol can stimulate gastric secretion both by causing liberation of gastrin and, more importantly, by a local effect when it is delivered to the gastric mucosa *via* the bloodstream.

Data presented here indicate that secretin (Vitrum) is not an effective inhibitor of the gastric secretory response to intragastrically administered ethanol. Yet the same preparation of secretin, given to dogs with the same type of pouch, inhibited the response to a meal of meat by 79 to 97%(2). Again in dogs, another brand of secretin (Eli Lilly & Co.) has been reported to inhibit decisively the gastric secretory responses of Heidenhain pouches to food and to perfusion of antral pouches with liver extract(1). Neither brand of secretin inhibited the gastric secretory response to histamine(1,2).

Likewise, acidification of the duodenum is a poor inhibitor of histamine-stimulated secretion from Heidenhain pouches(7) and, as shown here, of the response to alcohol. Yet acidification of the duodenum can inhibit secretion of Heidenhain pouches in response to food(3). Evidently parallels exist between the action of secretin preparations and of acidification of the duodenum on gastric secretion.

In evaluation of data such as these, one must recall that commercially prepared secretin, although in the present instance highly purified, is still an extract of duodenal mucosa that may contain substances other than the hormone secretin. Consequently, one cannot be certain that the substance in commercial preparations of secretin that inhibit gastric secretion is indeed the pancreatic hormone.

Conclusion. Neither secretin (Vitrum) nor acidification of the duodenum is an effective inhibitor of the gastric secretory response of Heidenhain pouches in dogs to ethanol given intragastrically.

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Nucleic Acid Content of Rat Mammary Glands During Post-Lactational Involution.* (28233)

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Failure to withdraw the products of milk secretion causes cellular loss in the rat mammary gland(1,2,3) and phagocytic neutrophiles and lymphocytes are associated with the collapse and degeneration of alveoli(4,5, 6). Deoxyribonucleic acid content of mammary glands generally reflects loss of cells observed histologically during involution(7,8,9), although Slater(10) reported an increase in mammary DNA during the first 48 hours of involution, after which it decreased.

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