Amylase in Fallopian Tubes.* (24270)

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We have been interested in locating the site of synthesis of extrapancreatic, extrasalivary amylase(2) in animals. Green(1) has recently shown that fluids from various cysts associated with human Fallopian tubes have amylase contents of from 1,100 to 80,000 Somogyi units per 100 ml, or 10-700 times the normal human serum amylase level. Since these cysts had epithelial linings which were morphologically identical to the epithelium lining of the Fallopian tubes, Green postulated that this epithelium secretes an enzyme whose physiological substrate is the intraluminal glycogen produced by secretory endometrium. His determinations indicated that the enzyme is an alpha-amylase. However, since his work dealt only with the cystic fluids and not the Fallopian tubes, we were interested in determining the amylase contents of the tubes themselves. This report deals with such observations in various species, including man.

Methods and materials. Amylase activities of both sera and Fallopian tubes were determined by Van Loon's amyloclastic method (3). All values reported are in Van Loon units, numerically identical to Somogyi units, per 100 ml of serum or 100 g of tissue. The Fallopian tubes and sera were obtained from stock animals in the case of the rat, dog, guinea pig and cat, from animals at the abbatoir for the cow, hog and sheep. All of the animals used were adult, sexually mature females with the exception of one group of monkeys as noted in the table. Human specimens were provided by the Dept. of Obstetrics and Gynecology and Pathology, Univ. of Louisville School of Medicine. The Fallopian tubes were carefully freed of excess surrounding tissue and kept frozen at -18°C until used for analysis. Fluids for analysis were obtained by homogenizing the tubes with 0.9% NaCl, first in a Waring blendor and then in a Dounce glass homogenizer(4). The final dilutions with 0.9% NaCl were 1:10 to 1:50, varying with the animal used.

In some of the human specimens small parovarian or paroophoron cysts were found in the tubes or in the tissue surrounding the tubes. These cysts were carefully removed and their fluids also analyzed for amylase.

In some of the experiments on dogs and rabbits, one tube was removed and a blood specimen taken, then pilocarpine was injected and after 30-45 minutes the other tube was removed and another blood specimen taken.

Results. Our data on the fluids from human Fallopian tube cysts (Table I) show amylase levels many times that of human serum, in agreement with Green's findings. The amylase levels of the Fallopian tubes themselves are much lower, although still several times higher than serum amylase. For other animals, the Fallopian tube amylase levels (Table II) were greater than serum amylase levels only in the rabbit, the cow and the sheep. In the rat, dog, hog, guinea pig, cat and monkey, the serum amylase levels were higher than the corresponding tubal amylase levels. The amylase levels of tubal secretions were not appreciably increased in the dog and rabbit by injection of pilocarpine, al-

TABLE I. Amylase in Human Fallopian Tubes and Fallopian Tube Cysts.

Serum amylase	Fallopian tube amylase	Cyst fluid amylase	Type of cyst
—	410	—	—
—	400	5,010	Parovarian
88	147	—	—
50	565	—	—
—	313	29,100	Paroophoron
110	391	37,100	"
—	309	1,940	Parovarian
—	132	—	—
—	822	14,500	Paroophoron
—	265	—	—
—	76	—	—
—	85	—	—

* This work was supported by a research grant from Nat. Inst. Health.

TABLE II. Amylase of Fallopian Tubes of Various Species.

Animal	No. of animals	Fallopian tube amylase		Avg serum amylase
		Range	Avg	
Rat	3	477– 687	575	2250
Dog	4	357–1125	500	770
Monkey (mature)	6	30– 640	215	585
Monkey (immature)	6	250– 278	264	685
Rabbit	5	223– 614	371	236
Guinea pig	4	98– 440	201	2070
Cat	2	175– 220	200	1020
Cow	6	27– 254	170	79
Sheep	1	330	—	110
Hog	3	485– 700	590	2025

though serum levels in the dog were increased.

Since Green indicated that amylase was not found in the cysts from preadolescent girls, tubes and sera from both mature and immature monkeys were analyzed. There was no noticeable difference between these two groups.

Discussion. It is evident that, except in the human cysts, amylase is not found in the Fallopian tubes in quantities comparable with the pancreas and salivary glands(2). Since the Fallopian tubes do not have any secreting glands but only a secreting mucosa which makes up a relatively small proportion of the total organ, perhaps one should not expect a very high amylase level even if amylase is synthesized in the tubes. However, in the human, cow, rabbit and sheep, where the Fallopian tube amylase levels are greater than the serum levels, at least some of that amylase must be synthesized by the Fallopian tubes. The only other possible explanation would be collection and concentration of amylase from the serum by the tubes.

In the other animals tested, the fact that serum amylase levels are higher than tubal amylase allows one to say only that the amylase in the tubes may have been synthesized therein. Where the serum amylase levels are higher than Fallopian tube amylase levels, it is possible that the amylase found in the tubes *could* have come from the serum since amylase seems able to penetrate most body tissues(2).

It should be pointed out that the serum amylase levels of monkeys, not previously reported in the literature, ranged from 314 to 860 Van Loon units per 100 ml in 12 animals, with a mean value of 635. This is much higher than the normal human serum levels of 60-180.

Summary. Amylase levels in the Fallopian tubes of the human, cow, rabbit and sheep are greater than the corresponding serum levels, hence amylase must be produced in the tubes of these animals. Amylase is also found in the Fallopian tubes of the rat, dog, hog, guinea pig, cat and monkey but in lower concentrations than the corresponding sera. High levels of amylase are found in the fluids from cysts associated with human Fallopian tubes.

We wish to thank Eli Lilly and Co. and Drs. H. A. Dettwiler and H. K. Cohen for generously providing monkey sera and Fallopian tubes used in these experiments.

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Received July 8, 1958. P.S.E.B.M., 1958, v99.