du sujet ne permettant pas de suivre l'évolution du comportement[3,4].

Les modifications de la valeur de l'hématocrite permettent donc de penser que: (1) dans les jours qui suivent la double vagotomie, la perméabilité à l'eau est accrue et cela entraîne une augmentation des liquides corporels, et donc de la volémie; (2) plusieurs semaines après l'opération, le volume sanguin diminue, l'animal semble retrouver un certain équilibre, après avoir éliminé l'eau en excès. Ce fait est à rapprocher des travaux de GAS et al.[5], qui ont constaté chez la Carpe un début de régénération du nerf vague, quelques semaines après vagotomie. Ce phénomène pourrait ainsi expliquer la reprise d'une volémie normale chez la Tanche bien que de notables différences individuelles soient constatées. Le facteur endocrinien n'est cependant pas à rejeter et des études sont en cours pour vérifier l'influence que peuvent avoir les hormones chez les Poissons vagotomisés.

Conclusion. La section bilatérale des nerfs vagues entraîne chez la Tanche une diminution de la valeur de l'hématocrite, probablement consécutive à une augmentation de la volémie. Plusieurs semaines après l'opération, la valeur de l'hématocrite redevient normale: la régénéra- du nerf vague et la présence d'un relais endocrinien pourraient être parmi les causes à envisager.

Summary. In the Tench the section of the both vagi induces a decrease of the hematocrit value, which is probably due to an increase of the blood volume. Several weeks after cutting the parasympathetic system, the value of the hematocrit returns to normal. This normalization may be due to nervous regeneration or to endocrine changes.

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Tritiated Thymidine Incorporation into Aortic Cells in vivo: Cell Regeneration in Spontaneous Atherosclerosis in Monkeys

Numerous studies have used tritiated thymidine as a most promising technique for the autoradiographic detection of newly formed DNA and the site of cell formation. However, in vivo and in vitro studies on DNA synthesis in aortic cells utilizing H^3-thymidine are limited[1-3]. The present paper is concerned with in vivo studies of the regeneration of aortic cells with H^3-thymidine in relation to the occurrence of spontaneous atherosclerosis in monkeys. An attempt has also been made to localize the site of cell renewal and the accumulation of acid mucopolysaccharides (AMPS) which is closely related to the repair process.

Six squirrel monkeys (*Saimiri sciureus*) averaged 0.55 kg of body weight in both sexes were used in the study. Because of an expected stable population of aortic cells, H^3-thymidine[4] was injected 3 times in doses of 0.5 μC/Gm of body weight, twice i.p. at 24 and 6 h and then once i.v. 1 h prior to sacrifice. After the animals were killed under nembutal anaesthesia, the removed aortas were carefully examined. No visual atheromatous plaques were defined. Serial cross sections from 10% formalin-fixed materials followed by paraffin process were prepared at 6 μ for autoradiograms[5]; the slices were applied for the dipping method with tracer emulsion (Kodak NTB-2). After 3 weeks exposure, the specimens were developed and the H^3-grains incorporated into the aortic cells were examined. AMPS and lipids in the selected specimens were also stained with alcian blue and Sudan IV.

The H^3-thymidine uptake in the monkey tissues, as in other species studied[6], was very high in the gastrointestinal tracts; intermediate in the liver, kidneys, spleen, pancreas and lung, and less in the heart and vascular walls. Actually, H^3-thymidine uptake determined in the DNA fraction[7] of the aortic tissues giving a value of 264 ± 35 dpm/mg protein was the lowest among the above examined tissues and no variation was shown in the aortic portions.

Although the aortic tissue showed such a stable population of cells, distinct grains were detected in the nuclei in the proliferating aortic cells (Figure). The labelled cells were more frequently observed immediately underneath or in the atheromatous lesions but less in the normal sites. Thus the naturally occurring atherosclerosis was detected in the intima and subintima as cellular vascular lesions. Two types of labelled cells were distinguished: one was foam cells occurring in the initial lesions, and the other appeared to be smooth muscle cells which would migrate in the intimal lesions from the media as a compensative response.

The extent of the cellular atheromatous lesions, as shown in the Table, was higher in the arch and abdominal aorta than the thoracic aorta. There appeared to be more active DNA synthesis in the upper parts of the aorta, when compared with the number of the labelled cells in each aortic part. However, the labelled cells were so relatively few that only a qualitative significance should be attributed to them so far. Yet this study clearly shows that the number of the labelled cells was closely correlated with the extent of the intimal atheromatous lesions and principally with the occurrence of the slight or initial changes. When compared with the number of the labelled cells according to the extent of the normal and atheromatous sites, the sequence is definitely greater in the atheromatous lesions. The normal parts of the intima, media and adventitia showed less cell proliferation. Such

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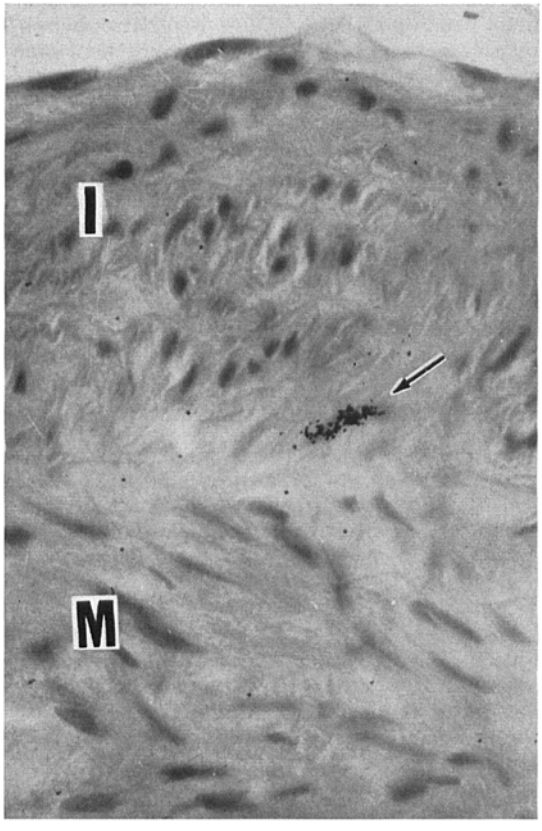
Relation of spontaneous atherosclerosis to tritium labelled cells in monkey aorta

Body weight, sex, and total cholesterol in serum	Portion of aorta	% of atheromatous lesion in examined length of aorta	Labelled cells		% of labelled cells in aortic tissue					
			No.	No./length cm	Intima				Media	Adventitia
					Grade of cellular lesion[a]					
					0	I	II	III		
1. 0.60 kg, male, 107 mg%	Arch	5.9	124	1.15	21	52	2	0	15	10
	Thoracic	2.9	115	0.58	17	41	9	4	19	10
	Abdominal	6.8	119	0.43	12	48	2	16	9	13
2. 0.59 kg, female, 122 mg%	Arch	9.3	–	–	–	–	–	–	–	–
	Thoracic	2.8	206	1.38	22	40	4	3	19	12
	Abdominal	8.0	65	0.48	11	40	9	6	28	6
3. 0.60 kg, female, 166 mg%	Thoracic	2.7	155	0.82	19	40	6	4	18	13
	Abdominal	7.8	180	0.52	10	34	9	17	21	9
4. 0.42 kg, female, 101 mg%	Arch	9.9	106	1.03	19	46	10	8	9	8
	Thoracic	2.3	53	0.49	33	53	1	0	7	6
	Abdominal	7.2	150	0.56	23	61	7	1	5	3

[a] O, normal; I, slight, diffuse, superficial thickness; II, moderate, thicker hyperplasia; III, remarkable, pronounced elevated thickness.



The photograph shows hyperplasia in the intimal layer of the thoracic aorta. The H^3-grains are incorporated into the nucleus of a cell adjacent to the hyperplasia. Hematoxylin-eosin stain. I, intima; M, media. × 920.

proliferation is possibly higher in the intima, if one considers the total number of cells in each layer.

AMPS stainable substance, which is located mainly around the intimal elastic membrane in the normal aorta[8], accumulated intensively beneath or around the intimal lesions occurring in the initial stage of atherosclerosis as reported previously[9–11]. Although quantitative evaluation of AMPS in such tissue is difficult histochemically, the accumulation of AMPS was clearly related to the sites of the intimal lesion in various types from singular to massive cellular lesions. The increase of AMPS in initial atheromatous changes is in agreement with the recent biochemical findings by SMITH[12] and BÖTTCHER et al.[13]. The concomitant evidence indicates that the increase of AMPS surrounding the site of proliferative cellular lesions may play an important role in the regeneration mechanism in the aortic cells as evidenced by DNA synthesis.

Increased in vivo utilization of H^3-thymidine in vascular cells has been reported in rabbits made atherosclerosis by long term cholesterol feeding[2] and in rats made hypertensive by injection of desoxycorticosterone[3]. These observations also indicate that the cell renewal is higher among vascular cells in experimentally induced vascular lesions.

The present results regarding the incidence of naturally occurring atherosclerosis in squirrel monkeys is in agreement with the recent report by MIDDLETONE et al.[14] that the grossly visible atheromatous plaques were found in 5 of 74 monkeys, while 72 displayed atheromatous lesions detected microscopically. The high incidence of spontaneous atherosclerosis in the primate is of interest in its resemblance to that of the human.

Zusammenfassung. Aorta-Zellen des Saimiriäffchens zeigten H^3-Thymidinaufnahme im Bereich von spontan entstandener atheromatöser Schädigung. Möglicherweise besteht eine Beziehung zwischen der Regeneration von Aorta-Zellen und der Anhäufung von Mucopolysacchariden in atheromatösen Läsionen.

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