Moreover, the results show a statistically significant increase in the number of monocytes in rats receiving the cholesterol-cholic acid containing diet. An elevated number of monocytes is also observed, if an accumulation of pulmonary foam cells is induced by cloforex, an anorogenic drug[14] or Intralipid®, a triglyceride preparation[9]. Thus, experimental studies give evidence that there is a monocytosis in connection with an accumulation of pulmonary foam cells. This might also be true of related conditions in which foam cells are involved.

Zusammenfassung. Cholesterol-cholsäurehaltiges Futter verursachte bei der Ratte einen statistisch sichergestellten Anstieg der Monozyten im Blut und eine fokale Anhäufung von Schaumzellen in der Lunge.

H. Flodh, G. Magnusson and O. Magnusson

The Toxicology and Research Laboratories,
AB Astra Pharmaceuticals,
S-151 85-Södertälje (Sweden), 3 May 1974.

The Branching Pattern in Apical Dendrites of Cortical Neurons

The morphometry of dendrites is important for functional modelling[1] and for the question of functional adaptation of neurons to environmental conditions[2,3]. Therefore, our analysis for segment lengths and bifurcation probabilities per order of the basal dendrites[3] is supplemented here with the similar analysis of the apical dendrites. The analysis was carried out with the same 30 pyramidal neurons from laminae II, III and IV of the striate area of the adult rabbit[3]. This provides the basic material for the above-mentioned questions.

Methods. All data were calculated from the 3 cartesian coordinates of all the initial points, the bifurcation points and the end points, measured in 80 µm thick Golgi sections. A centrifugal ordering[3] of segments was applied, since some branches are inevitably cut. The difficulty that the apical dendrites do not have a symmetrical branching structure[3], was met by distinguishing 2 parts in the apical dendrites (ref.[4]): 1. the main branch, ordered starting at the proximal segment; 2. the oblique branches, ordered separately starting at the segment arizing from the main branch. Along with order, also type was determined: i.e., end segment or intermediate segment. Cut segments were not considered for segment length calculations. The ith order branching probability, $p(i)$, is defined, irrespective of the length of the segment, as the quotient of the number of intermediate segments (N_I) and the total number of segments ($N_I + N_E$) of that order.

Results and discussion. The lengths of the segments of the basal dendrites[3] and the lengths of the segments of the apical main branches and of the apical oblique branches all show frequency distributions that are skewed to the right for all orders (e.g. Figure 1).

It is remarkable that the lengths of the intermediate segments of the apical main branches show the maximum in the same class (10–20 µm) for the orders 1, 2 and 3, as do the intermediate segments of the basal dendrites[3]. The intermediate segments of the apical oblique branches

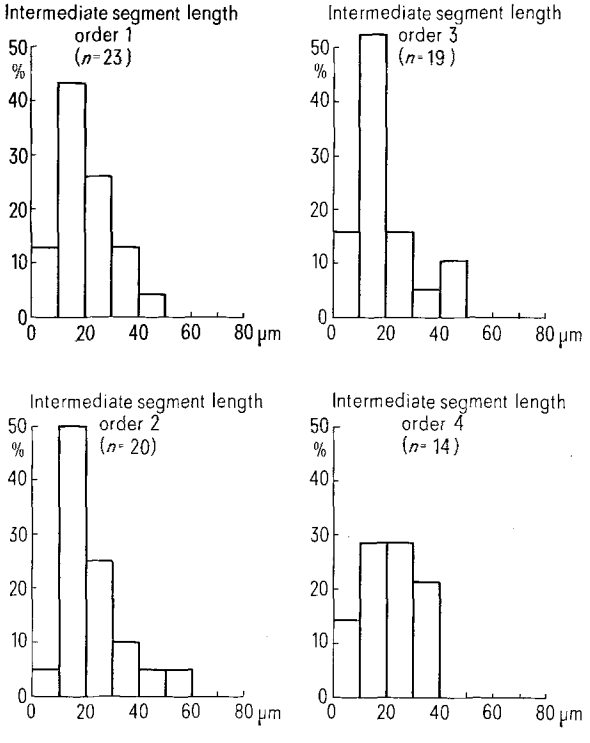

Fig. 1. The frequency distributions of the intermediate segment lengths of the main branches from the apical dendrites.

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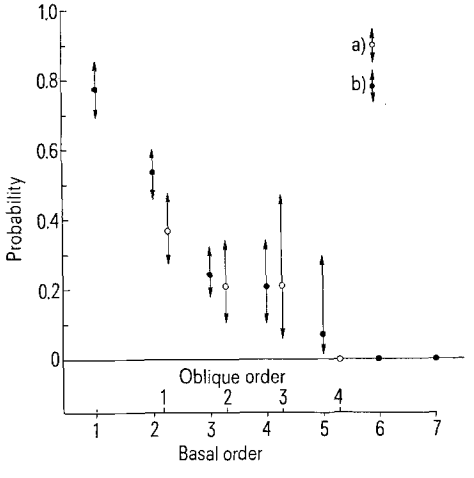

Fig. 2. The bifurcation probability as a function of the order. a) The corrected bifurcation probabilities of the oblique dendrites with a 0.95 binomial confidence interval. b) The corrected bifurcation probabilities of the basal dendrites with a 0.95 binomial confidence interval.

Table I.

Order	Lengths of intermediate segments[a] (in μ)			Lengths of end segments[a] (in μ)			Bifurcation probability[a] P(i) estimates corrected for cutting
	Mean and S.D.	Mean and S.D. of the log. values	No.	Mean and S.D.	Mean and S.D. of the log. values	No.	
1	38.4 ± 25.8	3.41 ± 0.77	26	60.6 ± 53.3	3.62 ± 1.12	36	0.37
2	28.4 ± 26.6	3.00 ± 0.93	8	46.2 ± 30.5	3.57 ± 0.81	23	0.21
3	—	—	3	51.7 ± 32.3	3.74 ± 0.70	10	0.21
4	—	—	0	—	—	2	0.00
			37			71	

[a] of oblique branches from apical dendrites.

Table II. Segment lengths of main branch from apical dendrites (in μ)

Order	Intermediate segments			End segments		
	Mean and S.D.	Mean and S.D. of the log. values	No.	Mean and S.D.	Mean and S.D. of the log. values	No.
1	20.3 ± 9.9	2.88 ± 0.58	23	23.5 ± 14.4	2.91 ± 0.85	7
2	22.0 ± 12.7	2.97 ± 0.49	20	—	—	2
3	19.2 ± 11.5	2.77 ± 0.64	19	—	—	1
4	28.1 ± 25.4	3.05 ± 0.78	14	65.2 ± 44.7	3.96 ± 0.81	4
5	50.6 ± 47.3	3.57 ± 0.92	9	—	—	1
6	—	—	3	—	—	3
7	—	—	1	—	—	0
8	—	—	0	—	—	1

and of the 4th order apical main branches also follow this trend, but less markedly. For the apical oblique branches, the average lengths of the end segments are about 1.6 times as long as the intermediate segments (Table I). A similar difference in the average length was also found in basal dendrites[3]. This indicates that – as contrasted with the present anatomical analyses – it is necessary to distinguish the intermediate segments and the end segments in doing any kind of quantitative study (ref.[5]). The number of end segments of apical main branches is too small to draw conclusions about differences between end and intermediate segments (Table II). There is equivalence in length between the intermediate segments in basal dendrites and those in apical dendrites (ref.[3] and Figure 1). This suggests that common processes within both types of dendrites, e.g. electronic transmission of signals or transport of cytoplasm, determine the segment lengths.

The bifurcation probabilities of the apical oblique dendrites were corrected for the different probabilities of being cut following from the difference in average lengths between end and intermediate segments (ref.[3]). These corrected bifurcation probabilities (Table I and Figure 2) show a relationship with (the segment) order that compares well with the relationship found in the basal dendrites from order 2 or 3 onwards. This is suggestive for the predominance of terminal branching[3,6], since oblique dendrites do not arise from the perikaryon, but from the main shaft of the apical dendrites. The bifurcation probabilities found for the basal dendrites[3] and the apical oblique dendrites are consistent with the relative numbers of segments in the different orders found by WINKELMANN et al.[7] in 150–200 μm thick sections of the albino rat cortex.

Zusammenfassung. Untersuchungen über Dendritenverzweigungen von Rindensensoren ergaben, dass die Längen der Zwischensegmente bei basalen und apikalen Dendriten gleich sind.

H. B. M. UYLINGS and G. J. SMIT

Central Institute for Brain Research, Ijdijk 28, Amsterdam – 1006 (The Netherlands),
10 April 1974

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