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**Hermann Dexler's "Beiträge zur Kenntnis des feineren Baues
des Zentralnervensystems der Ungulaten." ¹**

**An Annotated English Translation of the
Original German Article**

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Part I: General Remarks

Abstract

The English translation of Dexler's original paper is split into five parts. They deal with different items, i.e., General Remarks (Part I), Rhombencephalon (Part II), Di- and Mesencephalon (Part III), Telencephalon – Literature Survey, Foetal Stages, Two Embryos (Part IV), and Telencephalon – Adult Stages (Part V).

Part I, presented here, is the shortest; it is preceded by a brief biography of Hermann Dexler and contains the translation of his introductory General Remarks that refer to the complete paper (comprising Parts I-V). Dexler points out substantial deficits of knowledge about the brain of the ungulates. He criticises the lack of a coherent picture and, in particular, of studies on the fine structure of the brain stem. Special investigations on ungulates (based on experimental physiology and pathology) are not available to him to a similar extent as those on the brains of frogs, rabbits or dogs. However, he rejects conclusions by analogy because he suspects them of being inaccurate.

In this part of his paper, Dexler specifies the methods that yielded the data presented in Parts II-V: He studied continuous or discontinuous serial histological sections and he refers to (a small number) of observations on brains with naturally or artificially caused secondary degenerations. He describes macroscopical features in case they contribute to understanding the inner structure. A detailed macroscopical description is given of those organs of which no uniform opinion about their surface architecture existed at that time, or which (in Dexler's opinion) had not been studied in sufficient detail. The findings are illustrated by Dexler's own drawings.

Dexler used the horse as the standard animal because he had more data on its brain at his disposal than on the brains of other ungulates (pigs, sheep or cattle).

Keywords: Brain, Horse, Central Nervous System, Ungulates

¹ first published in: Gegenbaurs Morphologisches Jahrbuch **32**, pp. 288-389 (1904)

Introduction

Hermann Dexler was born on May 10th, 1855 and died on May 9th, 1931 (FREUND 1932, SCHREIBER 1957). He studied veterinary medicine in Vienna (Austria) from 1884 to 1888. After graduation, he was employed as a veterinary public health officer, but returned to the University of Vienna in 1893 as an assistant lecturer at the Institute of Special Pathology and Therapy (SCHREIBER 1957). His early scientific work already reflected his special interest in neuropathological topics like hydrocephalus internus acquisitus, enchondrosis intervertebralis, or pachymeningitis ossificans. One year after his habilitation in Vienna (i.e., in 1898), Dexler was appointed Professor and Director of the Veterinary Institute of the German University in Prague (SCHREIBER 1957). He wrote substantial articles on a large range of neurological topics: Spinal compression myelitis and neuritis in dogs, post-infectious alterations of the spinal cord and brain, neoplasms and parasitological diseases of the central nervous system, diseases of the Cauda equina in horses, and many more. Also, he intensely studied the psychology and psychotic states of animals. Furthermore, his monograph on neurological diseases of the horse (*Die Nervenkrankheiten des Pferdes*) from 1899 is supposed to be the first ever scientific book on veterinary neurology (SCHREIBER 1957). Throughout his professional career Dexler gained an outstanding scientific reputation all over Europe (FREUND 1932).

This article (Part I) presents the translation of pages 288-290 of Dexler's original German text of which the entire length comprises pages 288-389 in Gegenbaurs Morphologisches Jahrbuch, Vol 32 (1904). Parts II-V will each be published in a separate article.

Technical Notes: This English translation does not aim to transfer the characteristic rhetorical style of early 20th century German language into idiomatic English. Rather, it attempts to present Dexler's anatomical descriptions, interpretations and discussion in plain modern English. Dexler's personal rhetorical style has been maintained whenever necessary in order not to omit relevant information. Whenever any German wording or term could not be appropriately translated into adequate contemporary English, the text or a footnote presents the German words in italics together with equivalent English synonyms and/or relevant explanations, or the term is replaced by the current version according to the Nomina Anatomica Veterinaria [N.A.V.] (2017). Dexler's Latin nomenclature has been maintained in the text, even though it does not always conform to the current version of the N.A.V..

Contributions to the Knowledge of the Fine Structure of the Central Nervous System of Ungulates

By Prof. Hermann Dexler

(From the Veterinary Institute of the k.k.² German University in Prague)

Our little knowledge of the normal state should be mentioned as a main obstacle (among others) that makes difficult any kind of experimental investigation dealing with the structure and function of the central nervous system in ungulates. This deficit frequently has a disturbing impact not only on physiologists and experimental pathologists, but also on those observers who process the relevant aspects of comparative pathology. Since we do not have special investigations at our disposal that are analogous to those of the brain of the frog, of the rabbit, and of the dog, we are either forced to undertake *ad hoc* time-consuming preliminary work or to reach for conclusions by analogy, which always have a touch of suspicion of being inaccurate.

It is correct that in a lot of main points a transfer of the morphological data of the human brain to the brains of more highly developed mammalian species³ and from these to ungulates must be allowed. However, there are numerous divergent results, and the further we investigate the fine structure of the nervous organs of various animal orders, the more cautious we become in making such comparisons. I recall well the clarifications which we have received in the last years concerning the central motor tracts of mammals, concerning the morphology of their cerebral cortex and concerning the variations in the brain's structural organisation which are related to the prevalence of one or the other sensory nerves. It is therefore certainly necessary to develop our knowledge further on this subject.

The brain of ungulates has, up until now, been investigated very little with regard to its fine anatomy⁴. The elementary structure has only been studied in part, mostly with regard to other issues. The reports concerning it were distributed in all kinds of journals making it very difficult to gain a coherent picture. Most of the studies are concerned with broader anatomical relationships, with the configurations of the cortex of the Cerebrum and Cerebellum. Recently SCHELLENBERG gave us a description also of the cerebral medulla⁵. In contrast, studies on the fine anatomy of the brain stem are almost completely missing.

² *k.k.*: imperial and royal (Austrian and Hungarian)

³ *höhere Säuger*: ontogenetically more highly developed mammalian species (The author does not mean to say "mammalian species more highly developed than the human".)

⁴ *feinere Anatomie*: fine anatomy, i.e., anatomy describing details of small sizes (Nuclei included), however, no histological study was performed

⁵ *Großhirnmark*: white matter (medulla) of the Cerebrum

I made it my business to compile as a whole my own findings that extend over several years of studies and to make reference whenever possible to the results hitherto laid down in the literature. The purpose is to gain a tool or a basis for those amendments that will arise from the future embryological, experimentally physiological and comparative anatomical methods.

The results of my investigations have derived from studies of continuous or discontinuous serial histological sections. The sections were cut either in frontal, horizontal or sagittal planes and were stained according to the method of WEIGERT-PAL. Continuous serial sections treated according to NISSL were used to detect the local distributions⁶ of nuclei⁷. Finally, I had at my disposal some observations in which I made use of naturally or artificially caused SECONDARY DEGENERATIONS. The value⁸ of ungulates is normally too high for transection experiments. Local, chronic pathological processes in the brain and the spinal cord do occur, but conglomerate tubercles⁹, parasites, and tumours are rarely detected. Despite plenty of suggestions from my side or from other investigators, these kinds of observations are rarely ever used to elucidate the process of degeneration, but investigators have rather preferred to be satisfied with the mere description of the primary alteration. Thereby, the investigator has dispensed with a device that has yielded the most important findings in anatomy of the human brain and that continuously brings forth new results.

My descriptions are preceded by the descriptions of the macroscopical features¹⁰, however, only in a brief manner¹¹, provided that they contribute to understanding the inner structure. A detailed description will only be given of those organs of which no uniform opinion about their surface architecture exist, or which (in my opinion) have not been studied as precisely as may be expected¹². I drew almost all of the figures from photographs of organs suspended in water. Depending on the purpose in mind, either fixed¹³ or fresh brains were used. For the sake of preserving the surface structure, I always performed the fixation of brains *in situ*, i.e., INSIDE THE SKULLS, by injecting formalin and by successive¹⁴ breaking-off of the skull's wall. I did not apply the freeze method because of the flaws in this method shown by CHRISTMASS.

The HORSE serves as the standard animal¹⁵. We have many more investigations on its brain at our disposal than on the brains of pigs, sheep or cattle. Also, I originally began to establish my collection with brains from horses.

⁶ *Ausdehnung*: local extension

⁷ *Nervenkern*: nuclei, i.e., accumulations of neuronal perikarya

⁸ *Wert*: value; in this context: material value, price

⁹ *Solitäre Tuberkel*: conglomerate tubercle

¹⁰ *makroskopische Verhältnisse*: macroscopical appearance

¹¹ *kursorisch*: cursory, excursive, i.e., rapid and short; superficial

¹² literally: as we are usually allowed to expect it to be

¹³ *gehärtet*: hardened by fixation (in formalin)

¹⁴ *sukzessiv*: successive, i.e., little by little

¹⁵ *Leittier*: standard animal/reference animal

----- End of Part I -----

To be continued: Part II (pages 290-322 of the original article)

APPENDIX 1

Literature from Dexler's List of References,

mentioned in this part of his article

(presented here in the reference style used in the original journal article):

SCHELLENBERG, _ (1900):

Großhirn der Ungulaten. Zürich, Inaugural-Dissertation.

In Dexler's list, there is no bibliographical reference to the other scientists mentioned in his text.

APPENDIX 2

List of References Cited by the Authors of this Translation:

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SCHREIBER, J. (1957):

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