VII. SUMMARY

The structure, function and quality of the horn in the coronet of the equine hoof

The dermal and epidermal structure of the coronet of 28 adult domestic horses was studied. Because several samples along the back of the hoof were taken it was possible to show the influence of the time of the year on the hoof horn quality.

The keratinized epidermis can be divided into an inner, middle and outer zone because of structural and histochemical differences. The middle and the outer zone show several similarities.

The horn of the coronet undergoes a hard keratinization. Above the corial papillae, the living epidermis forms horn tubules and intertubular horn. The inner zone consists of round horn tubules with an usually wide and empty marrow. It shows a lower horn hardness and a higher elasticity than the middle and outer zone of the coronet which possess oval horn tubules. The marrow is narrow and filled with partly intact, partly cracked horn cells. Only the horn tubules near the surface of the hoof stay intact, the medullary cells do not decay in any area of the hoof. The transmission electron microscopical investigation shows that the cells of the horn tubules and the intertubular horn have a spongious cytoarchitecture and mostly an enlarged intercellular space. In contrast to this, the horn cells of the middle and outer coronet are solid and have a narrow intercellular space. In the electrophoratical studies it is shown that in the middle and outer area of the coronet appear two additional cytokeratins in contrast to the inner zone, while the intermediate filament proteins show now differences in the three areas.

Because of the horn structure, the cytoarchitecture, the histometric studies and the results of the hardness and moisture content measurements, it can be concluded that the horn of the inner coronet has to absorb the proximodistal forces that act on the hoof during the motion of the horse. The function of the middle and outer coronet is the protection of the sensitive structures in the inner areas of the hoof against lateral forces. Horn that is probably produced in the summer has a decreased horn quality in comparison to horn that is probably produced in the winter because the intercellular space is mostly enlarged and incompletely filled with intercellular cementing substance. The histometrical studies pointed out that it showed less horn tubules per

mm² hoof horn. These tubules have an enlarged marrow, which- in the same way as an incompletely filled intercellular space- is a predilection site for the entrance of microbial and chemical invasion. A reduction of horn quality is also caused by the natural process of ageing.

In contrast to the Przewalski horse (PATAN, 2001) the intercellular space of the domestic horse is wider and the gel-electrophoresis shows differences in the appearence of proteins. In histometrical studies the domestic horse also shows discrepancies in comparison to the Przewalski horse. Furthermore, the domestic horse possesses a lower horn hardness in the outer coronet than the Przewalski horse. The shown seasonal differences are not so distinct in the domestic horse compared to the Przewalski horse, which can be explained by the different conditions of housing and the influence of domestication. Additional investigations should analyze whether domestic horses which are accomodated under conditions of semi-reservate also show distinct histometrical and mechanical-physical results and a marked seasonal rhythm of the horn production, horn abrasion and horn quality like the Przewalski horses.