THE STRUCTURE OF DOWN FEATHER KERATIN

A thesis submitted by

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SUMMARY

The work of this thesis is concerned with the structural basis for the heterogeneity of chick down feather keratin chains. The number of keratin chains was investigated by examining discrete fractions of the S-carboxymethylated feather protein by polyacrylamide gel electrophoresis at two pH values and at least nineteen prominent proteins were found to comprise the down feather. Each of these proteins was remarkably similar to the others with respect to molecular weight and amino acid composition.

Sequence analysis of the $^{14}$C-SCM-tryptic peptides of down feather keratin indicated that the electrophoretic variants of feather keratin differed only at a few sites in the primary structure from one another. The nature of these amino acid substitutions were compatible only with the existence of multiple genes, each encoding a specific keratin variant. However, few of these substitutions, if any, could be the result of alleles and their existence is due to the presence in the chick genome of mutationally altered replicates of an ancestral keratin gene. Extensive homology exists between the amino acid sequences of down feather keratin and that of a purified protein of emu feather rachis, and this homology allowed the deduction of a partial amino acid sequence for down feather keratin.

Amino-terminal sequence analysis of the keratin chains of chick down feather, adult barbs and scales established that whereas the two feather tissues may have possessed common keratin chains, all the keratin chains of scales are unique.
The origin and the possible arrangement of keratin genes within the chick genome is discussed.
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