sequence for bovine growth hormone, though there are several differences from that given by the other groups.

We have studied the amino acid sequence of ovine growth hormone (Davies, 1974); this has also been investigated by other groups (Fernández et al., 1972; Li et al., 1972). The sequence is very similar to that of the bovine hormone, differing only at one or two amino acid residues.

We have also investigated the amino acid sequence of rat growth hormone, by using material labelled by biosynthesis in the presence of $^{14}$C-labelled amino acids (Davies & Wallis, 1971). Such an approach enables sequence techniques to be made very sensitive, and allows sequence determination to be effected with very small quantities of material. Labelled tryptic peptides were purified by peptide 'mapping' and detection by radioautography. Amino acid compositions and partial sequences were determined, by detecting and estimating peptides and amino acids by virtue of their radioactivity. Assignment of tryptic peptides within the growth hormone sequence was carried out with the help of homology with the bovine hormone. With this approach, tentative sequences have been assigned for about 60% of rat growth hormone, including an extended sequence at the C-terminus. The homology between ox and rat growth hormones is marked. They differ at about 11% of all residues in those regions of the sequence that have been determined so far.

Previous consideration of the sequences of growth hormones from different species (Wallis, 1971) led to the suggestion that rates of evolution within this hormone family are rather variable. Thus ox and sheep growth hormones are very similar and appear to represent a slow rate of evolutionary divergence (allowing for the fact that the ox and sheep are fairly closely related). Ox and human growth hormones are very different, however (about 35% of all residues), suggesting rapid evolutionary divergence. Rat growth hormone resembles the ox hormone much more closely than the human one. Since the divergence of the mammalian lines giving rise to the ox, man and rat occurred at about the same time, the rate of evolution of growth hormone in man (and probably other primates) must have been much more rapid than that in other mammals. This point is brought out very clearly when a phylogenetic tree for the growth hormone–prolactin family of pituitary proteins is constructed.

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The Amino Acid Sequence of Porcine Thyrotropin with Reference to the Molecular Evolution of Glycoprotein Hormones

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Highly purified porcine thyrotropin (39 units/mg) was prepared by using an original method combining ion-exchange chromatographies on CM-, DEAE-, SP- and

1974
Affinity Chromatography for Exhaustive Purification of the α and β Subunits of Human Luteinizing Hormone

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It has been widely documented that among the glycoprotein hormones, luteinizing hormone and thyroid-stimulating hormone, the primary structures of the α subunits are identical. In contrast, the β chains have been found to be the hormone-specific subunits (Liao & Pierce, 1971). In the human species, the primary structures of the α subunits of luteinizing hormone (Sairam et al., 1972; J. Closset, G. Maghuin-Register & G. Hennen, unpublished work) and of human chorionic gonadotrophin are identical (Bellisario et al., 1973). Here again, the β chains appear as the hormone-specific subunits.

Extensively purified preparations of both native hormone and the subunits are essential for biological and physiological studies, especially those employing radioimmunoassay. As soon as purified subunits were available, attempts were made to improve the