TABLE I.

	Eckstein %	Wilkerson[1] %	Block[2] %
Humin N	2.02	2.11	—
Amide N	7.68	3.60	—
Arginine	5.91	10.01	6.00
Lysine	4.68	3.06	4.50
Histidine	0.64	0.59	0.82
Cystine	3.82	2.31	3.40
Tyrosine	3.42	5.70	—
Tryptophane	1.80	1.49	—

lished by Wilkerson. Those given for human nitrogen and amide nitrogen are expressed in terms of total nitrogen while the ones shown for the amino acids are given in terms of the residual tissue. It is clear from the tabulations that a considerable difference exists between the two sets of data. This may be due to the fact that whereas the author analyzed skin that had been digested with proteolytic enzymes, Wilkerson merely examined partially defatted skin. On the other hand, Block[2] who digested skin with pepsin found 6.0% of arginine, 4.5% of lysine, and 0.82% of histidine in his dry digested material. Block's results are in accordance with the writer's. Block also used a modification of the Vickery and Leavenworth method.

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Basic Amino Acids of Human Skin.*

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The older definition of keratin based on the physical properties and behavior towards the common proteolytic enzymes of the tissue proteins has been modified by Block and Vickery.[1] They define keratin as "a protein which is resistant to digestion by pepsin and

2 Block, R. J., PROC. SOC. EXP. BIOL. AND MED., 1935, **32**, 1574.

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† The data in this paper are taken from the dissertation submitted by R. J. Block in partial fulfillment of the requirement for the degree of Doctor of Philosophy, Yale University, 1931.

1 Block, R. J., and Vickery, H. B., *J. Biol. Chem.*, 1931, **93**, 113.

trypsin, which is insoluble in dilute acids and alkalies, in water and in organic solvents, and which on acid hydrolysis, yields such quantities of histidine, lysine, and arginine, that the molecular ratios of these amino acids are respectively approximately as 1:4:12." However, proteins which do not yield approximately such quantities of the basic amino acids even though they fulfill the other criteria of the definition are not considered by Block[2] to be true keratins. Thus, for example, neurokeratin, which is insoluble in dilute acids and alkalies, not digested by pepsin and trypsin, etc., was considered *not* to be a true keratin because it yielded histidine, lysine, and arginine in the molecular ratios of 1:2:2.

Human skin (cornified epithelium from the sole of the foot and scales from patients with exfoliative dermatoses of various kinds) was obtained through the kindness of Dr. H. S. Burr of New Haven, Dr. H. B. Lewis of Ann Arbor, and Dr. G. M. McKee of New York City. The washed skin was extracted with hot alcohol, ether, and digested with pepsin-hydrochloric acid. Fourteen gm. of the dried skin, after hydrolysis, yielded 6.0% of arginine, 0.82% of histidine, 4.3% of lysine, and 3.4% of cystine. The basic amino acids were isolated by the silver precipitation method[3] and cystine was determined colorimetrically.[4] These results agree remarkably well with those reported by Eckstein[5] who used the Van Slyke nitrogen distribution method.

The molecular ratios of histidine:lysine:arginine in the samples of skin analyzed by Eckstein and by ourselves are of the order of 1:6:7 and, therefore, the samples of tissue analyzed, although insoluble and indigestible, are not in strict conformance with the definition of true keratins. On the other hand, the sample of epidermal scales analyzed by Wilkerson[6] obtained from a patient suffering from dermatitis exfoliativa yielded histidine, lysine, and arginine in the molecular ratios of 1:6:15, characterizing this sample of tissue as a true keratin. So, it appears possible that the process of keratinization had been completed in the sample of skin studied by Wilkerson, but that these changes were still in progress in the tissues analyzed by Eckstein and by ourselves.‡

2 Block, R. J., *J. Biol. Chem.*, 1932, **94**, 647.

3 Vickery, H. B., and Block, R. J., *J. Biol. Chem.*, 1931, **93**, 105.

4 Folin, O., and Marenzi, A. D., *J. Biol. Chem.*, 1929, **83**, 103.

5 Eckstein, H. C., (see accompanying paper).

6 Wilkerson, V. A., *J. Biol. Chem.*, 1934, **107**, 377.

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