amine in ethanol yielded the desired amidoxime which could be converted to the dihydrochloride salt with ethanolic hydrogen chloride; recrystallization from ethanol gave material that melted with decomposition at 183–185° (found: C, 42·01; H, 8·43; N, 16·22; Cl, 27·28 per cent. $C_9H_{19}N_3O$. 2HCl requires: C, 41·90; H, 8·20; N, 16·29; Cl, 27·49 per cent).

Numerous structurally related compounds have been prepared and their pharmacological activity investigated. Alteration of the side-chain and ring-size usually resulted in diminution of the aforementioned antihypertensive properties.

SU-4029 is at present being tested clinically, and the results as well as chemical and pharmacological studies will be published *in extenso* at a later date.

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[1] Reported without characterization of the compound by Hendry, J. A., Rose, F. L., and Walpole, A. L., *Brit. J. Pharmacol.*, **6**, 201 (1951).

Oligosaccharides of Human Milk

THE presence of fucose as a constituent sugar in oligosaccharides obtained from human milk was reported by Kuhn[1] in 1952. Since that time Kuhn and his associates have characterized four oligosaccharides from this source, in all of which fucose is found: a trisaccharide, fucosido-lactose; two pentasaccharides referred to as lacto-N-fucopentaoses I and II, and a hexasaccharide, lacto-N-difucohexaose; the last three are derivatives of a common, fucose-free parent compound—lacto-N-tetraose[2]. Montreuil, in a series of communications, has reported the occurrence of compounds probably identical with those analysed by Kuhn, and in addition, a further range of fucose-containing substances of still greater complexity[3]. He has isolated thirteen sugar compounds, other than lactose, from human milk, all of which contain galactose and glucose and most of them fucose and acetylglucosamine as well.

There seems little doubt that these compounds isolated by Montreuil are in many cases identical with the series of compounds which we have ourselves obtained from human milk samples by rather different fractionation procedures. However, our agreement with this author does not always extend to his estimates of the molecular proportions of the various hexose units in his original compounds, and we give in Table 1 a summary of our own results, based on a study of the relationships existing between these oligosaccharides such as can be shown by their hydrolysis under very mild conditions. By correlating these results with analyses given by a modification of the method of Dische and Shettles for fucose[4], designed to give a simultaneous estimation and characterization of the non-fucose 'core' of the molecule in addition to a simple fucose analysis, we are able to suggest the probable identity of this range of compounds.

The substances analysed here account almost quantitatively for the total fucose in the original unfractionated milk samples, and it would therefore appear that all the fucose oligosaccharides of human milk, with the exception of fucosido-lactose and possibly the compound, or compounds, in fraction *A* (see Table 1), may be regarded as derivatives of lacto-N-tetraose or of a di- or tri- polymer of this compound. We may add that so far we have identified only one mono-fuco-lacto-N-tetraose (cf. ref. 2) and only one fucosido-lactose (cf. ref. 3), and also that trilacto-N-tetraose, which might be expected to occur as a member of our series, has not yet been observed except, on chromatograms, as the probable primary product of the mild hydrolysis of compound *C*.

Table 1

Fraction	*Rf**	Primary products on mild hydrolysis	Type of compound
A	0·08	Fucose + ?	? mixture
B	0·13	Fucose + *C*	Di-fuco-tri-lacto-N-tetraose
		Lacto-N-tetraose + *D*	
C	0·17	Fucose + tri-lacto-N-tetraose (?)	Mono-fuco-tri-lacto-N-tetraose
D	0·28	Fucose + *E*	Di-fuco-di-lacto-N-tetraose
E	0·43	Fucose + *F*	Mono-fuco-di-lacto-N-tetraose
F	0·55	Lacto-N-tetraose	Di-lacto-N-tetraose
G	0·64	Fucose + *H*	Di-fuco-lacto-N-tetraose†
H	0·77	Fucose + Lacto-N-tetraose	Mono-fuco-lacto-N-tetraose‡
I	1·00	—	Lacto-N-tetraose
J	1·43	Fucose + Lactose	Fucosido-lactose

* *Rf*, distance run by spot/distance run by lacto-N-tetraose on Whatman 3*MM* paper. Solvent: ethyl acetate/pyridine/water (ref. 5).
† Lacto-N-difucohexaose (ref. 2).
‡ Lacto-N-fucopentaose (ref. 2).

A full account of our methods and results will be published elsewhere.

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[1] Kuhn, R., *Angew. Chem.*, **64**, 493 (1952).
[2] Kuhn, R., *Angew. Chem.*, **69**, 23 (1957).
[3] Montreuil, J., *Bull. Soc. Chim. Biol.*, **39**, 395 (1957).
[4] Dische, Z., and Shettles, L. B., *J. Biol. Chem.*, **175**, 595 (1948).
[5] Jermyn, M. A., and Isherwood, F. A., *Biochem. J.*, **44**, 402 (1949).

Use of Goose Cells in Hæmagglutination Tests with Arthropod-borne Viruses

HÆMAGGLUTINATION studies with arthropod-borne viruses are normally carried out using red blood cells from one-day-old chicks, although cells from mature pigeons have been used in the case of Murray Valley encephalitis virus[1]. An observation made in the West African Council for Medical Research Laboratories in Lagos that cells from mature ducks were agglutinated by a yellow fever antigen led to a study of readily available domestic birds. Cells from Muscovy ducks (*Cairina maschatai*), from a local (Badagri) variety of the domestic duck (*Anas boscas*) and from Chinese geese (*Cygnopsis cygnoides*) were compared with cells from one-day-old chicks against yellow fever, Uganda *S*, Zika and West Nile antigens. Goose cells gave titres which were at least as high as those obtained with chick cells, and usually higher, and the settling patterns were consistently sharp and easy