Composition of Whales' Milk

It has been possible to obtain eight samples of whales' milk for analysis through the very willing co-operation and help of Dr. E. Downing and Mr. J. A. B. Athey, of Chr. Salvesen and Co., Leith, and Dr. J. G. Sharp, of the Low Temperature Research Station, Cambridge. Two of the samples were from blue whales (*Balænoptera musculus*) and the remainder from fin whales (*Balænoptera physalus*). The milks were collected after dissection of the mammary glands during the flensing operation on board Salvesen and Co.'s factory ships *Southern Venturer* and *Southern Harvester* engaged in pelagic whaling in the Antarctic. The period between the death of the whales and the collection of the milk varied from 6 hr. for sample 7 to 19 hr. for sample 4. The samples were stored in glass bottles at a temperature of − 20° C. while on board ship and ashore, before being conveyed to the Hannah Institute with as little rise in temperature as possible. At the Hannah Institute the samples were kept at 4° C. and analysed without delay. Samples 1–3 were at a temperature of − 20° C. for six to seven months and samples 4–8 for two to three months.

It should be noted that the killing of lactating whales, that is, those accompanied by a calf, is illegal and that the samples discussed here were obtained from whales accidentally separated from their calves during the chase or, much more likely, from whales whose young had finished weaning and left their dam. It therefore seems probable, as the data of Mackintosh and Wheeler[4] would also suggest, that the majority of lactating whales caught during the antarctic whaling season (late December – early March) are in the last stages of lactation or in the process of drying-off. Thus the composition of the eight samples obtained may not be typical of normal whale milk; on the other hand, one of Salvesen and Co.'s chemists who has experience of the time when no restrictions on killing were in force, informed me that the percentage of fat in the milk from a whale actively feeding a calf was about 39 per cent—a value similar to the fat content of five of the present samples. Over the four seasons, 1948–49, 1949–50, 1950–51 and 1951–52, the combined catch of the *Southern Venturer* and the *Southern Harvester* was 16,000–17,000 whales, of which only twenty-four were lactating.

COMPOSITION OF WHALES' MILK

Species of whale	Length (ft.)	Date caught	gm./100 gm. milk					
			Water	Fat	Protein (N × 6·38)	Ash	Lactose (by diff.)	Lactose (detd.)
1. Blue	83	24.2.49	45·7	40·0	12·0	1·2	1·1	—
2. Blue	—	10.3.49	48·6	39·1	11·3	1·5	—	—
3. Fin	75	27.2.49	48·1	39·7	11·3	1·3	—	—
4. Fin	77	5.1.52	61·8	18·5	13·1	1·8	4·8	4·5
5. Fin	—	14.1.52	76·2	17·1	3·6	0·8	2·3	0·7
6. Fin	72	27.1.52	38·0	51·0	8·5	0·8	1·7	2·0
7. Fin	68	3.2.52	45·0	37·8	12·1	1·4	3·7	3·6
8. Fin	69	22.2.52	50·0	37·8	10·2	0·8	1·2	1·0
Average composition of milk from Ayrshire cows			87·2	4·0	3·3	0·9*	—	4·6

* By difference; includes approximately 0·2 per cent citrate

The milks were white or very pale cream in colour, had a slight fish-like odour reminiscent of cooked cod-roe and a consistency of thick cream at laboratory temperature; sample 5 had a thinner consistency and sample 4 was very slightly contaminated with blood from an external source. The samples were analysed by the methods usually employed for ordinary milk or concentrated milk products, with small modifications where necessary. The reducing sugar determined in samples 4–8 by a chloramine-*T* potassium iodide oxidation method was assumed to be lactose and was calculated as the anhydrous form. The sugar content of samples 4–7 was determined by Mr. Athey on board the *Southern Harvester* by the same analytical method. His results were not identical with those obtained under the much more favourable conditions at the Hannah Institute, but they suggest that no serious decomposition of lactose occurred during storage, except perhaps in sample 5.

The results in the accompanying table show that whales' milk is much richer in fat and protein and contains less lactose than cows' milk. In these respects, it is similar to the milk of the other cetaceans, the dolphins[1] and the porpoises[2], and also to seals' milk[3]. Rich milk of this type seems to be characteristic of mammals which live in a cold environment and whose young have a rapid rate of growth. The composition of the milk of the two species of whale is very similar; the differences among the samples are probably compounded of lactational effects, individuality and sampling errors, the lactational effects probably being of greatest importance.

With the help of Dr. F. C. Fraser of the British Museum (Natural History) a list of references to literature on the composition of whales' milk has been compiled. None of these reports gives as complete an analysis on as many samples as the present investigation. In general, the results in these publications for milk of several species of whale, including blue and fin whales, are similar to those presented here. Two of the most recent of these reports on whales' milk are by Rowland[5], who analysed three samples of milk from blue whales, and by Pedersen[6], who gives the composition of milk from a humpback whale (*Megaptera nodosa*).

This investigation will be reported in more detail elsewhere, when an account of some minor constituents of whales' milk will be given together with a review of the literature on the milk of this very valuable and largest mammal.

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J. C. D. WHITE

Hannah Dairy Research Institute,
Kirkhill, Ayr. Oct. 24.

[1] Eichelberger, L., Fetcher, E. S., Geiling, E. M. K., and Vos, B. J., *J. Biol. Chem.*, **134**, 171 (1940).
[2] Purdie, T., *Chem. News*, **52**, 170 (1885).
[3] Amoroso, E. C., Goffin, A., Halley, G., Matthews, L. H., and Mathews, D. J., *J. Physiol.*, **113**, 4P (1951).
[4] Mackintosh, N. A., and Wheeler, J. F. G., Discovery Reports, **1**, 412 (1929).
[5] Rowland, S. J., Nat. Inst. Res. Dairying, Report 1951, p. 66.
[6] Pedersen, T., *Norsk Hvalfangsttid.*, **41**, 375 (1952).