

We have given these notes to call attention to our work and to see if others have not perhaps already arrived at similar conclusions. We are well aware that many others have labored hard in this field, but we have done our work with every endeavor to arrive at facts, and hope to be able to continue the investigation the coming winter, when we shall prepare this body in other ways and analyze the oil obtained by fusing with potassic hydrate.

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### XXXIII.—ON THE COMPOSITION OF ELEPHANT'S MILK.

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In the spring of 1881 an opportunity presented itself for obtaining several specimens of milk from the elephant Hebe. The analysis of these samples were reported in Vol. III of the journal of the society. The exceptional character of the milk made it desirable to obtain further specimens. At the time the first investigation was undertaken two other female elephants were supposed to be with young. Such proved to be the case with one only.

The elephant Queen gave birth to a female calf at Bridgeport, Connecticut, on February 22, 1882, and the new baby was named after its birthplace. My intention was to collect some of the first milk secreted, but, though unsuccessful in this, I procured a quantity about thirty-six hours after the birth of the calf. This milk still possessed the qualities of colostrum.

The colostrum collected presented the appearance of thin milk. On standing it separated into three layers—the cream uppermost, then the usual blue layer, and at the bottom a yellow stratum composed mostly of mucous cells held together in a glairy fluid. These cells were uniform in size and in comparison with the oil globules not of that relative size usual in colostrum corpuscles. Of those peculiar bodies there were indeed few, unless these smaller cells represented them. The fat globules were not uniform in size, nor did they present that peculiar aggregation noticed in the milk from the elephant Hebe, or later that of Queen.

As the presence of albumen is one of the characteristics of colostrum, an attempt was made to determine its quantity, as well as the quantity of casein. The task proved difficult. At first Hoppe-Seyler's method was adopted, viz., that of acidulating the milk, greatly diluted, nearly to the point of coagulating the casein and then completing the reaction by saturating the liquid with  $\text{CO}_2$ . A flocculent

deposit was obtained after very long standing, but though the test was repeated several times no complete filtration could be effected. Qualitatively the experiment was successful; the presence of albumen was readily detected in the filtrate on boiling.

As Tolmatscheff\* claims that Hoppe-Seyler's method proved unsuccessful in his hands when applied to milk from women and advises the use of magnesium sulphate to saturation to precipitate casein, and alcohol to precipitate casein and albumen together, experiments were made to test its value in this instance.

By the use of magnesium sulphate the casein was separated, but the milk became so thick and mucilaginous that though left to filter during two days so viscous a mass remained on the filter that all attempts to wash it with magnesium sulphate solution proved futile. The filtrate, what there was of it, was clear and gave a coagulum when heated. The coagulum seemed more copious than that in the filtrates by Hoppe-Seyler's method, but this may have been due to the greater concentration of the liquid.

Not being able to separate the casein by these methods in such form as to weigh it, 20 cc. of the milk were treated by Hoppe-Seyler's method and the albumen determined in 100 cc. of the filtrate. The combined percentages of casein and albumen were then ascertained, which, less the percentage of albumen already found, gave that of the casein. Alcohol proved to be the best precipitant for casein and albumen. The casein separated in fine flocks, carrying albumen and fat with it. The latter was subsequently removed by ether. The liquid filtered nicely, and the precipitate could be thoroughly washed on the filter. The usual method of precipitating albumen and casein by heat and acetic acid gave a precipitate that could not be separated by filtration. Three specimens of milk were collected. Most of the determinations were duplicated. The methods of analysis was the same as that followed in the case of the milk from the elephant Hebe, except as regards albumen and casein. It was not found necessary to dry the milk in vacuo. Once, with the colostrum, sand was mixed with the milk to aid dessication.

The sugar when determined by Fehling's solution volumetrically in the colostrum and No. II. was too low, but estimated gravimetrically in No. III. it agreed closely with the figures in the table. In No. I. the milk treated by alcohol and filtered left on evaporation a residue, less ash, equal to 8.0101 per cent. of sugar.

\*v. Gorup-Besanez Physiologische Chemie, pp. 418 and 420.

	I.	II.	III.	IV.
	Feb. 24th.	April 9th.	April 22d.	Milk
	Morning.	Afternoon.	Afternoon.	from Hebe.
Quantity.....	335 cc.	420 cc.	120 cc.	72 cc.
Cream.....	7.7 vol. %	7.7	33	62
Reaction.	Alkaline.	Slightly Acid.	Neutral	Slightly Acid.
Sp. gr. at 60° F....	1,036	1,036	1,028	1,023.7
In 100 Parts by Weight.				
Water.....	86.5930	82.2390	76.9930	66.697
Solids.....	13.4070	17.7610	23.0070	33.303
Fat.....	3.0100	7.0576	12.6175	22.070
Solids not fat....	10.3970	10.7034	10.3895	11.233
Casein .....	2.0676	5.7060	5.7590	3.212
Albumen.....	0.3455			
Sugar*.....	7.6533	4.5494	4.1510	7.392
Ash.....	0.3306	0.4480	0.4795	0.629
Taste.....	Disagreeable	Much improved	Excellent.	Excellent.
Odor.....	Unpleasant	Pleasant	Pleasant	Pleasant
Color.....	{ Yellowish white	White and opaque	White and opaque	White and opaque
Consistency.....	{ Yellow de- posit, other- wise fluid	Very fluid	Fluid	Fluid

Specimen No. III. was drawn after the elephant had been exhibited in the circus circus-ring and while the calf was nursing at the other teat. The calf had not nursed for some hours. Of all it approaches nearest in composition to the milk from Hebe. The solids not fat, remain constant throughout, while the fat varies considerably. Apparatus to serve as a breast pump was constructed in order to collect the milk from one teat or both during say half a day, in order to gain a knowledge of the quantity secreted daily, but the plan unfortunately could not be carried out. "Bridgeport" grew quite as rapidly as the other "baby," more than doubling her weight during the period of these experiments.

The character of the fat in the last specimen was like that obtained from Hebe, the size and aggregation of the globules and the odor of the fat after extraction being the same. During the last month's of Hebe's period of lactation the employees about the circus frequently partook of her milk and found it most palatable.

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\*By difference.