

A COMPARISON OF THE COMPOSITION OF COW'S MILK, GOAT'S MILK, AND HUMAN MILK.

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We have published statements attempting to indicate the individual forms or compounds in which the salts exist in cow's milk and in human milk.¹ The same has been done for goat's milk in the preceding paper. It is a matter of interest to bring these results together in order to see in what respects the three kinds of milk differ. It is understood, of course, that the arrange-

Compounds in Cow's Milk, Goat's Milk, and Human Milk.

Compounds.	Cow's milk.	Goat's milk.	Human milk.
	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>
Fat.....	3.90	3.80	3.30
Milk-sugar.....	4.90	4.50	6.50
Proteins, combined with calcium...	3.20	3.10	1.50
Salts	0.901	0.939	0.313
Di-calcium phosphate.....	0.175	0.092	0.000
Tri-calcium "	0.000	0.062	0.000
Mono-magnesium phosphate.....	0.103	0.000	0.027
Di-magnesium "	0.000	0.068	0.000
Tri-magnesium "	0.000	0.024	0.000
Mono-potassium "	0.000	0.073	0.069
Di-potassium "	0.230	0.000	0.000
Potassium citrate.....	0.052	0.250	0.103
Sodium "	0.222	0.000	0.055
Potassium chloride	0.000	0.160	0.000
Sodium "	0.000	0.095	0.000
Calcium "	0.119	0.115	0.059

¹ Van Slyke, L. L., and Bosworth, A. W., *J. Biol. Chem.*, 1915, xx, 151. Bosworth, A. W., *ibid.*, 1915, xx, 707.

ment of the constituents is based upon a limited amount of work. We know that there is variation in the quantitative relations of the different compounds. There remains much work to be done in applying our methods to the study of milks produced under a variety of known conditions. The present results are, therefore, tentative in character and are likely to be modified by more extensive work.

In the preceding table the figures which have a special interest are those relating to the salts, and we notice the following points in relation to these compounds.

Phosphates.

Cow's Milk.—The insoluble phosphate is di-calcium phosphate; tri-calcium, di- and tri-magnesium phosphates do not appear to be present. The soluble phosphates are mono-magnesium and di-potassium, which constitute about two-thirds of the total phosphates.

Goat's Milk.—This differs from cow's milk (1) in containing tri-calcium, di- and tri-magnesium, and mono-potassium phosphates, and (2) in containing no mono-magnesium or di-potassium phosphates.

Human Milk.—This differs noticeably from both cow's milk and goat's milk in containing no insoluble phosphates, but only the soluble compounds, mono-magnesium and mono-potassium phosphates. The phosphates in human milk are much less in amount than in cow's or goat's milk.

Citrates.

All three milks contain potassium citrate, while cow's milk and human milk contain sodium citrate also.

Chlorides.

Chlorides are present in goat's milk in much larger amounts than in cow's milk or human milk; the amount in cow's milk is considerably larger than in human milk. In cow's milk and human milk the chloride appears to be calcium chloride, while in goat's milk potassium and sodium chlorides are also present.

Total Salts.

The total amount of salts in human milk is about one-third that in cow's milk or goat's milk. The number of different salts appears to be greatest in goat's milk and least in human milk.