

Physician's Test for "Curds and Whey" Finds the Best Milk For Baby's Bottle

Pediatrics

By Marjorie MacDill

*"Little Miss Muffet
She sat on a tuffet
Eating of curds and whey."*

HOW many of us have ever personally observed any curds and whey? The country-bred may faintly recall a pan of sour milk on the back of the kitchen stove, from which whey was eventually strained off and curds squeezed out into cottage cheese.

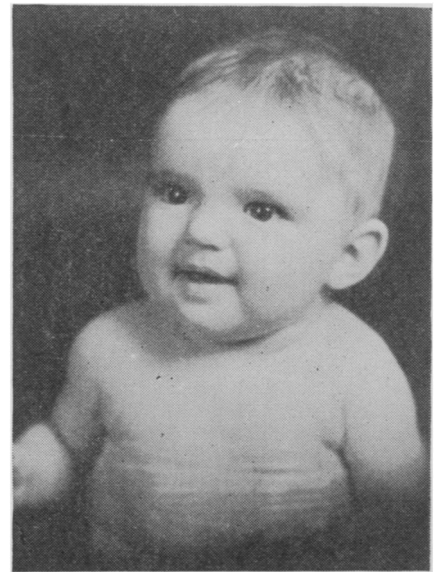
To most, however, the old nursery rhyme calls up idle wonderment about the nature of tuffets and an anticipatory shudder over the onset of the audacious arachnid. The real kick was in the line about the spider. Only a few have speculated over the strange dietetic preferences of Miss Muffet.

One of these, we may suppose, was Dr. Reuben L. Hill, in charge of human nutrition investigations at the Utah Agricultural Experiment Station at Logan, Utah. Whey does not seem to interest him particularly, but curds he has dragged very much into the limelight; and thereby is held out the promise of better days for the world's youngest citizens that have to make a start in life under a bottle handicap.

To date no satisfactory substitute for the food traditionally supposed to be best for babies has ever been invented. The ingenuity of man instrumental in the building of skyscrapers and Zeppelins and radio has never yet succeeded in synthesizing mothers' milk, for lack of which thousands of babies die annually. In a study made by the U. S. Children's Bureau the death rate among bottle babies during the first month of life was three times that of those that were breast-fed.

The principal by-product of the domestic animal described by Stevenson as "the friendly cow, all red and white," is generally conceded to be

This bright-eyed young citizen has been brought up on a diet of soft-curd milk. He is 4½ months old and weighs 19 pounds.



the best we can do by way of artificial food for the newborn infant. Modern sanitation and pasteurization of cows' milk have greatly enhanced, of course, the chances of the baby deprived of his natural food. Much as these two factors have helped, however, there is still a long way to go before cow's milk can be assimilated with comfort by all the newcomers in a cold world who must depend on it for sustenance.

The new development, sponsored by Dr. Hill, that may come to mean much in the problem of rearing young and delicate babies, is a test that measures the toughness of the curd formed by the normal coagulation of milk. By this means cows' milk can be selected that closely approximates mothers' milk in curd density. Its use in connection with the feeding of sickly and orphaned babies in Utah health centers has been attended with great success.

Certain points, furthermore, have been brought out by the curd test that indicate that some of the factors governing the selection of the contents of baby's bottle in the past, have tended in the wrong direction.

"In selecting a milk for the use of infants," says Dr. Hill, "much attention is usually given to the fat content of the milk and no attention is paid to the protein content, found in the curd, which in reality is far more important than the fat. Nutritionists apparently are not conscious of the fact that the protein content of milk is almost as variable as the fat content, and that between indi-

vidual cows' milk there is a wide difference in the quantity and quality of the protein or curd content."

It has long been the opinion of many children's specialists and health experts that milk from a herd is advisable for infant feeding because there is less danger of obtaining milk from a diseased cow and the variation in composition is less. Every mother with a baby that has been weaned has learned that the percentage of fat is the criterion by which a choice is made between the output of the dairies in her neighborhood. It is possible that this time-honored procedure may be considerably modified by the principle, advocated by Dr. Hill, of finding the individual cow whose milk is best suited to the digestion of the baby in question, particularly in the case of very young and sickly infants whose care always presents a difficult problem.

Some work in this field, done as far back in 1914, showed the superiority of Holstein and Ayrshire milk over the richer product of Jersey and Guernsey cows, prize butter-fat yielders of the dairy world.

Except for this slight beginning and some curd analyses made in connection with the cheese-making industry in Europe, Dr. Hill has been more or less a pioneer in the field of finding the right milk for tiny babies.

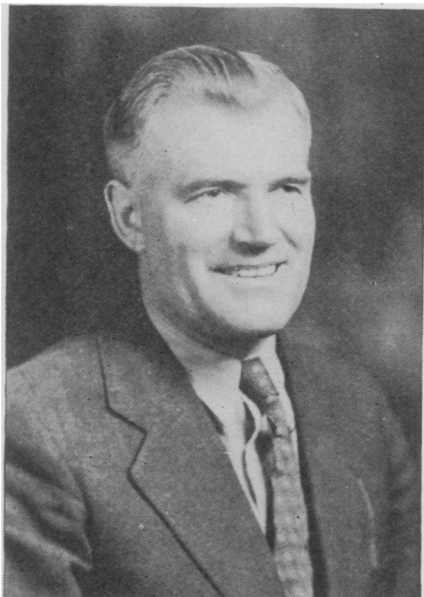
"Comparatively little research," he explains, "has been done on the difference in the digestibility and food value of milks from the different cows for the infant. It is a well-known fact that the curd of cow's

milk forms a tough mass which varies considerably from the soft flaky curd obtained from human milk. That there is a wide variation in the toughness of the curd obtained from the milk of different cows is not generally known. Variation of the toughness of the curd of milk from different cows has been given very little attention in this field of research."

Dr. Hill first began his search to find the true values of different milks as baby food in 1916 when he was on the staff of the Maryland Agricultural Experiment Station. He noticed first that there was a great difference in the curd from different breeds of cattle. These he classified into five groups, grading them in the order of curd texture from those that gave a fine creamy-like curd, most closely approximating that of human milk, to a tough rubbery type. Next he tried to devise some means of measuring mechanically the toughness of these different curds. For this purpose he eventually evolved a star-shaped knife fixed at right angles to a long handle in the center. The knife is drawn up through the curd which it cuts with an upward movement which is much the same principle as that of a cookie cutter cutting down through the dough.

Considerable work was done with the test at this stage of its development. A vast variation in the milks of different breeds and individual cows was noted. The onset of the war in 1918, however, caused the project to be temporarily abandoned.

Work was resumed about a year later at the Utah Agricultural Ex-



Dr. Reuben L. Hill of the Utah Agricultural Experiment Station who developed the test that finds the right milk for the baby's bottle.

The spring balance shows the pull necessary to draw the curd knife through the coagulated milk in the jar. This is a sample of soft curd milk suitable for babies. The hard curd milk would stretch the balance almost to its limit.

periment Station, where a great deal of time was spent in perfecting the test so that fairly uniform results can now be obtained.

Milk should be tested as soon as possible after it is drawn from the cow. Samples are put in glass jars and a small measured quantity of coagulant, the substance that causes milk to separate into curds and whey, is added. This coagulant is a compound of pepsin, the enzyme in human gastric juice that causes milk to curdle in the stomach after it is swallowed. The milk samples are placed in jars, a curd knife having been previously placed in each jar. The coagulant is then added, the milk being gently shaken to secure an even distribution of the coagulant. After the jars have stood about 10 minutes in warm water, the handle of the knife attached to a specially constructed spring balance, a not-too-distant relative of the old-fashioned scale on which Grandmother used to weigh her hams and bacon and from which the new baby was suspended in a blanket to see how he tallied up in pounds and ounces. The spring balance of the curd knife measures the amount of tension necessary to draw the knife through the curd and gives the nutrition workers the numerical basis on which to judge its relative toughness in different samples of milk.

The variation in the curd of the milk of different cows was so great, Dr. Hill found, as to be apparent in many cases to the naked eye. The soft curd most suitable for infant feeding can be wrung through a fine-meshed cheesecloth, while hard-curded milk from another cow will resist squeezing and remain a hard rubbery mass inside the cloth.

The test has been applied to the milk of approximately 2,000 cows in different parts of the state of Utah. Only from five to ten per cent. of these gave a soft-curded milk. That is, when milk from these particular cows is coagulated by the processes



of digestion in the stomach, it gives a soft curd closely resembling that obtained from human milk. Milk of this type is consequently pre-eminently suitable for baby feeding.

The new technique in baby milk selection met with an enthusiastic response on the part of physicians and nurses all over the state. In one county the test was installed in nine high schools with a trained man to do the testing.

"From a group of over seven thousand infants and small children registered at our conferences," declared Mrs. Evalina Reed, public health nurse of Utah County, "we have a very great number who owe their lives to the fact that a known soft-curded milk, easily digestible, can be secured. Our doctors are very much pleased with this service and feed only soft-curded milk to their delicate feeding cases. I believe it is rapidly solving the difficult problem of infant feeding."

One little baby only nine days old was fed on soft-curded milk from a Holstein cow with no other modification than one-eighth part diluted orange juice. It gained splendidly. Mothers with young hopefuls on formulae, take note.

Cows' milk for the modern baby is usually diluted with water and further modified with additions of sugar and starch in the form of oatmeal or barley gruel. The proportion varies with the age and physical condition of the baby. Mixing this concoction every morning and storing it in bottles in the refrigerator is one of the matutinal tasks of every woman who (*Turn to page 76*)

Cosmic Rays May Be Particles

Physics

Germans Find Similarity to Beta and Alpha Rays

THE cosmic rays, penetrating radiations that come into our ken from somewhere outside the solar system, may not be radiated waves at all, results of the latest experiments indicate. In a communication to the German scientific journal *Forschungen und Fortschritte*, Dr. Walther Bothe of Berlin and Dr. Werner Kolhörster of Potsdam state that they have evidence that the cosmic rays are really high-velocity particles like beta rays, which are free electrons moving at high speed, or possibly like alpha particles, which are the stripped nuclei of hydrogen or helium atoms.

The two German physicists obtained their results with a specially built adaptation of the physical instrument known as the electron counter. It consisted of a cylindrical chamber, within which was a very slender oxidized wire, connected to an electroscope. Whenever a charged particle made contact with the wire the electroscope registered the impact.

Using two of these instruments one above the other within a lead-armored vessel to keep out the earth-originated radiations, Dr. Bothe and Dr. Kolhörster frequently obtained coincidental registrations of particle impacts on their electroscopes. These they regard as having been due, in most cases, to the same particle striking both wires in succession. This would indicate that the particle came from above, with sufficient velocity to carry it through the lead armor and both tubes.

The possibility that cosmic rays may consist of moving particles instead of mere waves of energy is admitted to have radical implications by the two experimenters. To carry such particles through the resistance offered by the earth's atmosphere would require a starting velocity imparted by a potential of at least a billion volts. On the other hand, the total energy of the bombardment that reaches the earth is small, for the measurements indicated only one impact per second for every square

centimeter of exposed surface. Considering the almost infinite minuteness of beta or alpha particles, this sinks to almost immeasurably small quantities.

The possibility that cosmic rays may be penetrating particles rather than true radiations receives some support from work done at the U. S. Bureau of Standards by Dr. L. J. Curtis. Dr. Curtis has used a different method from that employed by Dr. Bothe and Dr. Kolhörster. He states that his results lend some support to the opinion of his German colleagues, but he is not yet satisfied that either the German work or his own constitutes full and conclusive proof.

The technical report of Dr. Curtis' experiments will be published in a few weeks by the Bureau of Standards.

Science News-Letter, February 1, 1930

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New Test for Baby's Milk—Continued

is responsible for the care of an artificially fed baby under one year.

In many of the bottle formulae in current use, attempts are made to soften the curd in various ways. One authority on infant feeding states that unless raw milk is modified so that hard curds will not be formed in the baby's stomach, the casein in the milk offers serious digestive difficulties not present if it had been previously boiled.

Boiling is probably the most common method of curd modification in general use at the present time. Adding lime water is another method, while oatmeal gruel is said to give a flocculent precipitate that approximates somewhat the curd of human milk. In some cases it is even necessary to take all the curd out of the milk with pepsin and feed the whey.

In spite of all these changes rung on the milk of the honest bossy cow, many babies refuse to thrive.

For such as these, not to mention their mothers and nurses, the use of the curd test, if its continued use gives such gratifying results as it has achieved already, should prove a

most beneficent boon. It gives the particular advantage that once the right milk is found it requires little or no modification. This, of course, greatly simplifies the preparation of the daily bottle.

"Milk", declares Dr. Hill, "that tests between 10 and 20 grams is especially suited for infant feeding, and in most cases requires little, if any, modification other than proper sterilization. Milk with a test of from 20 to 30 grams is also suitable, but will probably require more modification to be digested properly by delicate infants. A curd test of from 30 to 50 grams is fair, and when properly modified, milk of this curd hardness can be handled by most infants without difficulty. While enough work has not been done to determine accurately these limits, results obtained to date would indicate that milk with a test above 60 grams will probably cause digestive troubles with the infant, and milk which tests more than 100 grams is almost certain to cause trouble unless the infant is especially robust and the milk is greatly diluted and modified."

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