

by addition of nitric and acetic acids. The iodine liberated by digesting this precipitate in an acid solution of potassium iodide was then titrated with standard thiosulphate and the zinc calculated from the reading on the burette. The time required to run four determinations, without any effort at speed, was about eight hours.

The analysis of the ore by careful gravimetric methods was

	Per cent.
Zinc oxide.....	37.58
Manganese monoxide.....	15.33
Ferric oxide.....	29.69
Calcium oxide.....	1.12
Magnesium oxide.....	0.77
Silicon dioxide.....	12.77
Carbon dioxide.....	1.23
Water.....	0.76
	99.25

Metallic zinc, 30.18 per cent.

By the volumetric method, outlined above, the results were

	Metallic zinc. Per cent.
1.....	30.00
2.....	29.98
3.....	30.04
4.....	29.98

LAFAYETTE COLLEGE, EASTON, PA.,
January 18, 1900.

NOTES.

*The Alleged Adulteration of Milk with Brain-matter.*¹—
In the 1898 report of the Dairy Commissioner of the State of New Jersey, page 50, one of the chemists acting for the Commissioner, refers in rather intemperate language to the statements made in some text-books, concerning brain-pulp as a possible adulteration of milk and asserts that such adulteration has never occurred. He quotes the statement of König² to the effect that such addition to milk involves practical knowledge and resources which would hardly be possessed by milk-producers or purveyors, but Dr. König has not foreseen

¹ Read before the Philadelphia Section of the American Chemical Society, March 15, 1900.

² *Nahrungs- u. Genussmittel*, 2, 256.

the spread of education and the aid that such people may get from books and even from newspapers. We may, however, judge from König's statement that the German reports give no authentic instance of such addition, but we would be mistaken if we were to regard the allegation as on the same par with the popular fallacies about sand in sugar or chalk and water as a milk substitute. A consultation of trustworthy authorities will furnish some interesting data.

The earliest reference to the subject seems to have been in an anonymous article in the *Gazette d. Hôpitaux* (1841). Unfortunately the file of the *Gazette* at the College of Physicians lacks the numbers for 1841, but the general opinion of those who have consulted the article is that its statements are not worthy of credit. It appears to have been written in consequence of the agitation in France at that time over the enactment of laws regulating the sale of milk. The general subject of the composition of milk, its adulterations and the means of detecting them, had been discussed at great length by Quevenne in the *Ann. d. Hyg. Pub. et d. Med. Leg.* for 1841. In the same journal for 1842, many pages are given to the discussion of the adulteration of milk by brain-matter, the papers being by Quevenne and Gaultier de Claubry. A summary of the paper by the latter author is published in the *Bull. d. Acad. d. Med.*, 7 (1842). Quevenne regards the adulteration as unlikely, and thinks that it could not serve as a means of concealing added water but might be made to conceal skimming.

These French experimenters found that milk that had been adulterated by them with brain-matter presented properties different from those described by the anonymous writer in the *Gazette*.

A. H. Hassell, in his work on "Food Adulteration" (1876, p. 418) states that Mr. Queckett, the famous microscopist, exhibited drawings made from examinations of milk containing nerve tissue. It is further on record that Queckett stated before a committee of the House of Commons that he had found such structures in the sediment from a sample of milk examined about 1850, but had not observed it since. He submitted drawings of fields obtained from cows' milk with and without addition of calves' brains. As Queckett was an accomplished microscopist

and a scientific investigator, it does not seem likely that he would be mistaken on this point and he was evidently sure enough of it to make drawings of what he saw, and bring them to professional and official notice. We may, therefore, accept this record as one of trustworthy character. Hassell figures, on page 426 of the work above noted, a field showing the appearance of milk containing brain-matter, but does not state whether it is a copy of Queckett's drawings or from a sample prepared for the purpose.

Additional evidence as to this form of adulteration is presented in a communication by Sidney Gibbons, F. C. S., in the *Chemical News*, 33, 134 (1874). After a brief reference to the statements of Hassell and Queckett, Mr. Gibbons details an interesting experience of which the following is an abstract:

At a suburban hotel, near Melbourne, Victoria, frequent complaints had been made of the quality of the milk supplied, and on a certain date a sample was furnished to the chemist. As received, the sample had formed into three layers, the highest and lowest being thick and dirty gray, the middle one thin and colorless. When shaken, the mass became uniform and pulpy without frothing but stratified again on standing. Its specific gravity was 1022. The top layer did not closely resemble cream and contained but few fat-cells. The lowest stratum was darker, including dirt, sand, and vegetable matter. Much granular and clotted matter was present which was distinguished from fat by staining with magenta. There was no material amount of starch, though a few granules were present. Many peculiar cell-structures resembling brain-cells were seen under the microscope. Mr. Gibbons mixed some sheep's brain with milk and obtained optical appearances similar to those in the sample. He did not succeed, however, in making so smooth a mixture, possibly because the milkman had manipulated the material more elaborately. The fields observed agreed closely with the drawings given by Hassell.

From these reports it seems justifiable to record brain-matter, especially calves' and sheep's brains, as adulterations of milk that have occurred and may again occur, and therefore not to be overlooked in the analytic manuals.

Quevenne and Gibbons incline to the view that this form of adulteration is not dangerous to the public health, although, of course, not in any sense permissible. Such views may be easily excused when we consider how little was known, even at the date of Gibbons' report, concerning the diseases likely to be conveyed by milk. The view of the French and English chemists is based on the fact that brain-matter is a regular article of food but this loses its value when we remember that for such purpose the brains are cooked, which would be rarely the case when used for milk adulteration. Apart from the liability of the brain to contain virulent microbes, the localization there of certain stages of dangerous entozoa is by no means infrequent.

It is a question whether some of the special milk-laws would cover this form of adulteration but it is clearly prohibited by the general food-law in operation in most of the states of the United States, and butter made from such milk would come under the provisions of the national and state laws concerning oleomargarin.

It seems to me that this form of adulteration might easily escape notice. Brain-matter may give a rich creamy color to skimmed milk. All those who have written about the subject have spoken of the use of the microscope for detecting the adulterations, but in the routine inspection of milk-supplies, microscopic examination is rarely employed, and hence the adulteration might be overlooked. I have prepared samples by adding to skimmed milk, some calves' brain well pulped and strained through a close-mesh sieve. The nerve tissue can easily be seen with a moderate magnifying power. Evaporation in a milk-dish does not show anything different from ordinary milk, but the odor emitted when the residue is charred, preparatory to taking the ash, is suggestive of foreign animal matter. When the sample was treated with the mixture of pentyl-alcohol and hydrochloric acid, and then with strong sulphuric acid in the usual manner for rapid fat-determination, no peculiar reactions were noted. The proteids dissolved quite as readily in the acid as that from pure milk. The brain-pulp was found to be rapidly soluble without striking color in cold strong sulphuric acid.

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