ABSTRACTS AND REVIEWS

BACTERIOLOGY

General

L. Thompson. Value of vegetable extracts in culture mediums. *J. Bact.* **17**, v, 379–86, May 1929.

Extracts of potato, carrot, radish and spinach were compared with beef heart. Vegetable extracts promote the growth of many streptococci, and potato extract when added to blood agar gives more vigorous growth to *Neisseria gonorrhoeae*, and may be used in place of fresh blood. Experiments show that the nitrogenous materials in fresh plant and animal tissues which are water soluble, are better food substances for bacteria than vitamins or food accessory substances. C. Maddock

A. I. Kendall and I. Mitzutern. The significance of certain reactions induced by "resting" bacteria. Studies in bacterial metabolism. *J. Inf. Dis.* **44**, iv, 282–91, April 1929.

The authors have shown that the ability of coliform and other organisms to ferment certain carbohydrates, etc., runs parallel with the ability of the "resting" organism to reduce methylene blue in the presence of the substrate. This reduction is not due to multiplication, but is a property of the microbic protoplasm, which may act as a hydrogen acceptor. Resting bacteria initiate the primary reversible reactions involved in the degradation of the substrate. J. G. Davis

A. J. Salle. Differentiation of the coli and aerogenes groups of bacteria. *J. Amer. Water Works Assoc.* **21**, 71–8, 1929. (*Chem. Abst.* **23**, ix, 2200, May 10, 1929.)

A summary of methods and media employed in differentiating *Escherichia* (*coli*) from the *Aerobacter* (*aerogenes*) organisms is given. Crystal violet is considered superior to brilliant green for this purpose. J. G. Davis

A. Castellani. Symbiotic gaseous fermentation by bacteria. *Rev. hyg. med. prev.* **51**, 232, 1929. (*Chem. Abst.* **23**, x, 2457, May 1929.)

B. typhosus, producing only acid in maltose, mannitol and sorbitol, and *B. morgani*, producing neither acid nor gas in these sugars, are able when grown together to produce both acid and gas. This symbiotic fermentation may be used as a means of differentiating various groups, *e.g.* the three dysentery groups. Carbohydrates may be identified in this way. J. G. Davis

G. J. Hucker. The effect of the medium upon the formation of chains by the streptococci. *Zbl. Bakt.* I, Orig. **111**, iv–v, 161–6, 1929.

The author concludes that long-chained streptococci in milk, especially if associated with an excessive number of leucocytes, indicate that they may be pyogenic in character. On the other hand, the presence of paired cocci alone would not justify the assumption that the milk may not contain infective streptococci. He points out the influence of the constituents of the medium upon the tendency to chain formation of streptococci. R. Stenhouse Williams

G. J. Hucker and L. M. Thatcher. A study of the motility of certain cocci. *Zbl. Bakt.* I, Orig. **111**, iv–v, 166–71, 1929.

The study of 150 strains of cocci showed only four actively motile cultures; three of these strains were micrococci and two are recorded as motile varieties of *Micrococcus citreus* and *Micrococcus flavus* respectively, while the third, *Micrococcus agilis*, is considered to be a separate species.

One strain of *sarcinae*, *Planosarcina ureae* Beijerinck, was found to be actively motile and flagella could easily be demonstrated. This culture appears to belong to a species of *sarcina* distinct from all other described species. R. Stenhouse Williams

R. H. Bedford. A rapid method for obtaining the Voges-Proskauer reaction. *J. Bact.* **18**, ii, 93–4, August 1929.

A rapid Voges-Proskauer reaction may be obtained by adding about 10 mg. of sodium peroxide and 1 c.c. of 40 per cent. sodium hydroxide to 2·5 c.c. of a 72-hour culture of the organism under test. The tube is placed in boiling water for 1 minute and then vigorously shaken. The colour becomes perceptible in 1 minute, and may easily be seen by pouring the contents of the tube into a white basin.

J. G. Davis

V. Dimitrijevic-Speth and M. Rajevski. Neuartige Isolierungsmethode für anaërobe Bazillen. (New isolation method for anaerobic bacilli.) *Zbl. Bakt.* I, Orig. **113**, vii–viii, 523–4, September 1929.

A method of anaerobic culture without the usual apparatus is described. The description of the method appears to be inadequate. J. G. Davis

H. Braun, K. Hofmeier and F. Mündel. Zur Ernährungsphysiologie der Diphtheriebazillen. II. Die Nahrungsbedürfnisse der Diphtheriebazillen in synthetischen Nährböden in qualitativer Hinsicht. (Physiology of the nutrition of diphtheria bacilli. II. Nutritional requirements of diphtheria bacilli in synthetic media from a qualitative point of view.) *Zbl. Bakt.* I, Orig. **113**, vii–viii, 530–4, September 1929.

The authors have previously shown that *C. diphtheriae* can be grown on a synthetic medium containing asparagine, cystine, sodium acetate and salts. Nitrogen in inorganic form cannot be assimilated.

A list of those substances which the organism can utilise as sources of (1) nitrogen and (2) carbon is given. The latter include dextrose, laevulose and maltose but not sucrose. Amino acids other than cystine, asparagine and glutaminic acid cannot be used as a source of nitrogen. Anaerobic growth is not possible on a medium consisting of asparagine, cystine and dextrose. Toxin production on synthetic media is very poor. J. G. Davis

M. Steiner. Ueber eine neue Bakterienzählkammer. Ein Beitrag zur Methodik der direkten Keimzahlermittlung. (A new bacterial counting chamber.) *Zbl. Bakt.* I, Orig. **113**, iii–iv, 306–12, July 1929.

The author describes an improved cell-counting apparatus, which has avoided certain errors and disadvantages of the old Thoma type of apparatus. Full details of the apparatus and method are given, together with figures showing the accuracy obtainable. J. G. Davis

G. J. HUCKER and A. M. HUCKER. The number and type of bacteria in commercially prepared infant foods. *New York State Agr. Exp. Sta. Tech. Bull.* **153**, August 1929. The sanitary control of commercially prepared infant foods. *Ibid.* **154**, August 1929.

The authors bring forward evidence to show the variations which may occur in the numbers of organisms which may be present in different types of infant foods, and in consequence suggest that a standard with a maximum of 10,000 colonies per g. of dried milk shall be adopted.

R. STENHOUSE WILLIAMS

J. H. HILL and E. C. WHITE. Sodium chloride media for the separation of certain Gram-positive cocci from Gram-negative bacilli. *J. Bact.* **18**, i, 43–57, July 1929.

Gram-positive cocci (15) may be separated from *B. typhosus* (5), *B. dysenteriae* (6), *B. pyocyaneus* (7), *B. proteus* (7), coliform organisms (7), *C. pseudodiphtheriticum* (10) and *B. anthrax* (8) by culture on salt agar or in salt broth. The figures represent the approximate NaCl concentrations (per cent.) at which inhibition takes place.

J. G. DAVIS

S. G. PAINE and J. C. RAMCHANDANI. Improved method of culture from a single bacterial cell. *J. Bact.* **17**, v, 377–8, May 1929.

The method described is a modification of an earlier method of Paine, combined with that of Burri. The appropriate dilutions are made in sterile nigrosine solution, and are streaked on a thin film of agar on a coverslip by means of a fine mapping pen, which is attached to the holder by a short coil of wire. The lines are examined under the microscope, and the positions of what appear to be single cells are marked by means of spots of Chinese ink. The slides are then incubated in a moist chamber.

E. R. HISCOX

O. B. WILLIAMS. The heat resistance of bacterial spores. *J. Inf. Dis.* **44**, vi, 421–65, June 1929.

This paper gives a critical survey of the available literature dealing with the heat resistance of bacteria, together with an account of extensive original researches on the heat resistance of spores of *B. subtilis*, produced under widely varied conditions of nutrition and environment, and exposed to high temperatures.

Changes in the nutritive medium brought about marked variations in the resistance of the spores; *e.g.* the kind of peptone used was significant, all digest media (except casein digest) gave spores of diminished resistance, infusions of vegetable matter gave spores of increased resistance, as also did media containing suitable concentrations of magnesium or phosphates.

The initial reaction of the medium was without influence, but the temperature of incubation was of considerable importance. The influence of surface tension, concentration of spores, the action of hydrogen and hydroxyl ions, desiccation and storage were also examined.

The resistance of the spores could be increased by a process of selection but not by repeated cultivation in media which gave spores of high resistance.

E. R. HISCOX

A. L. SERGENT. *Les facteurs de croissance des microbes sur milieux artificiels.* Paris: Doin, 1928.

Dr Sergent has surveyed the literature of this difficult subject from Pasteur's original observations to the most recent work on the chemical nature of the factors alleged to be essential for the normal growth of micro-organisms, plants and animals, known respectively as "growth factors," auximones and vitamins. The experimental data summarised are classified according to the method of production of the "factor" and the type of organism requiring it, thus bringing some systematisation into a very confused field of work. The brevity and lucidity of the author's summary of individual papers make the book a very readable one.

A list of media deficient in, and containing the growth factors, is appended; there is also a good bibliography. Certain bacteria, especially the pathogens, require traces of substances of unknown composition for normal development.

The present position with regard to "growth factors" may be summarised by the statement that bacterial growth factors are definitely not identical with animal vitamins, although the two classes of substances are closely associated and comparable in properties. Bacteria can synthesise factors for other bacteria, plants and animals; plants are able to supply vitamins to animals, but the latter cannot synthesise their own factors.

J. G. DAVIS

H. V. MOYER. A continuous method of culturing bacteria for chemical study. *J. Bact.* **18**, i, 59–67, July 1929.

The author has constructed an apparatus which permits continued growth of an organism in a flowing culture medium. The organisms are separated by a centrifuge. Aeration tubes permit the passing of gas, and of alkali for neutralising purposes.

A mercury seal type of tap is used with concentrated sulphuric acid in place of mercury.

Details are given of the medium and yield when growing *B. aerogenes*. The author's statement that *B. aerogenes* is of "common occurrence in the intestinal tract" is contrary to the findings of Rettger (*J. Bact.* **5**, p. 253, 1920) and others.

J. G. DAVIS

N. C. WETZEL. A note on the application of Buchanan's formula to heat production in bacterial cultures. *J. Bact.* **18**, ii, 117–32, August 1929.

A paper by Bayne-Jones and Rhees ("Bacterial calorimetry," *J. Bact.* **17**, 123–40, 1929), is criticised adversely, and it is shown that the authors have confused the time-rate at which heat is developed *per bacterium* with the quotient obtained by dividing the total heat output in a certain time of a bacterial culture, increasing in population, by the final number of bacteria (cells, organisms). The approximate equality of these quotients to the time-rate sought and calculated from Buchanan's formula is shown to be fortuitous, and its application here to be inadmissible. Some conclusions are reached concerning the time-rate.

J. P. CLATWORTHY

V. BURKE and M. W. BARNES. The cell wall and the Gram reaction. *J. Bact.* **18**, ii, 69–92, August 1929.

A description of twelve experiments is given which were carried out to determine the influence of the cell wall on the Gram reaction.

Gram + yeast cells were used and where it was considered advisable, *S. albus*, *B. megatherium* and *B. coli* were included.

Under experiment 10 there is an interesting discussion on the exact function of Gram's Iodine in the reaction.

The results of these experiments favour the view that the permeability of the cell wall determines the Gram reaction of a cell. J. McClemont

Dairy Bacteriology

F. Schönberg. Die Dahlia-Färbung, eine einfache zuverlässige kontrastreiche Färbemethode für die bakteriologische Milchuntersuchung. (The dahlia stain, a simple, convenient and well contrasting staining method for the bacteriological examination of milk.) *Berl. tierärztl. Wschr.* pp. 254–5, 1929. (*Zbl. Bakt.* I, Ref. **95**, vii–viii, 192, September 19, 1929.)

The stain is prepared by dissolving 1 g. of dahlia in a mixture of 20 g. concentrated acetic acid and 500 c.c. distilled water, and staining takes from 1 to 1½ minutes. Mastitis streptococci are stained dark violet and can be seen very clearly. E. R. Hiscox

H. A. Cummins, V. C. E. Kennelly and M. Grimes. A study of fungi found in milk. *Sci. Proc. Roy. Dublin Soc.* **19**, xxv, 311–17, September 1929.

A description, with illustrations, is given of twenty-one species of fungi isolated from milk received for examination at the University College, Cork, during a clean milk competition. E. R. Hiscox

B. W. Hammer. *Dairy Bacteriology.* London: Chapman & Hall. 1928.

Prof. Hammer has wisely not attempted to combine in one volume a general textbook of bacteriology and a manual for dairy workers. His *Dairy Bacteriology* assumes a sound elementary knowledge of general bacteriology, with the result that he has been able to devote the whole of some 450 pages to the study of micro-organisms in milk and milk products.

The author has treated his subject from the aspect of the effects of micro-organisms on milk and its derivatives rather than from that of the micro-organisms themselves. Students of public health and the commercial side of dairy practice will read the book with interest; much space is devoted to the discussion of the milk-borne diseases and faults in dairy products.

Numerous tables and references are given, but the latter are drawn from a restricted field of workers. While the text consists largely of quotations from original papers, the author is not afraid to express his own opinion on some highly controversial questions.

The book is intended to supplement a course in practical work, hence no instructions or details for practical investigation are given. The work is a descriptive textbook rather than a student's handbook. J. G. Davis

R. S. Breed. The sanitary significance of leucocytes in milk. *New York State Agr. Exp. Sta. Bull.* **568**, April 1929.

The author concludes that the relationships between the number and types of leucocytes in milk, and the conditions that give rise to variations in numbers and types of these cells, are so complex that they cannot be summarised in any simple way. The only relationship that stands out sufficiently distinctly to have been utilised in a practical way in routine microscopic examinations, is that excessive numbers of leucocytes, predominantly of polynuclear types, accompanied by long-chain streptococci and particularly when phagocytes containing bacteria are also present, indicate streptococcic udder infections with practical certainty. If one or

more of the specified conditions are lacking, then the indications become less certain. On the other hand, milk containing small numbers of leucocytes of any kind and no indication of abnormal bacterial infection, may certainly be regarded as normal so far as microscopic examination is concerned. When conditions intermediate between these two extremes are found, interpretation of microscopic findings is difficult and uncertain.

No mention is made of Andrewes' work on this subject (*J. Path. and Bact.* **18**, 1913–14) and the stress he laid upon the importance of using Ehrlich's tri-acid stain for the demonstration of polymorphonuclear leucocytes in milk.

R. STENHOUSE WILLIAMS

R. S. BREED. The microscopic appearance of unpasteurised market milk and cream. *New York State Agr. Exp. Sta. Bull.* **566**, March 1929.

This bulletin contains twenty photomicrographs of methylene blue preparations of raw market milk and cream selected to represent the various conditions encountered during the examination of 60,000 samples of market milk over a period of 12 years. Typical preparations by the microscopic method from normal good quality milk, milk from animals suffering from mastitis, milk handled in dirty utensils, improperly cooled milk and cream and skimmed milk have been photographed and reproduced.

A. T. R. MATTICK

J. D. BREW. The comparative accuracy of the direct microscopic and agar plate methods in determining numbers of bacteria in milk. *J. Dairy Sci.* **12**, iv, 304–19, July 1929.

Details of 643 samples of milk are given, and it is shown that the statistical comparison of the methods of counting which were used was unduly influenced by a comparatively small proportion of samples with very large counts. The coefficient of variability ranged from 200 to 600 per cent., while the mean was from four to fourteen times the median. It is suggested that the median is a better measure than the mean. Coefficients of correlation between individual microscopic, group microscopic and plate counts are given and it is shown that by the addition of lactose, the variability of the plate count (plain agar) is decreased as well as its ratio to the individual count. The correlation coefficient is also increased thereby. The author does not consider that one method of counting has more significant accuracy than the other, but prefers the plating method when the number of bacteria per c.c. is only a few thousand. Both methods could be used to control the handling of milk "without inflicting an undue hardship upon anyone."

J. P. CLATWORTHY

A. MUGGIA. Vitality of *Streptococcus pyogenes* in milk powder. *Boll. Sezione Italiana*, **1**, iv, 89, April 1929.

The author shows that *Streptococcus pyogenes* remains alive and virulent in commercial milk powder for a period of about 5 months, which is considerably longer than it can survive in the usual laboratory media. The necessity for care in the manufacture of milk powder is pointed out.

A. T. R. MATTICK

A. WOLFF. Impfung der Pasteurisationsmilch. (Inoculation of pasteurised milk.) *Milchw. Zbl.* **57**, xviii, 277–83, September 1928; **57**, xxii, 341–6, November 1928; **57**, xxiii, 357–64, December 1928; **58**, vii, 105–10, April 15, 1929; **58**, ix, 157–60, May 15, 1929.

From a number of experiments, the author concludes that it is possible to suppress the undesirable flora of pasteurised milk by the addition of lactic acid bacteria before or after pasteurisation. Such an inoculation has a favourable in-

fluence on the flora, and the changes occurring in the final product more nearly resemble those of raw milk. Most members of the group of lactic acid bacteria can be used, but the best results are obtained when small quantities of a pure culture of a heat-resistant strain are added to the milk which is to be pasteurised. The addition of an unheated culture after pasteurisation is dangerous, since the lactic acid bacteria are apt to develop too quickly, bringing about too rapid a souring. E. R. Hiscox

M. Grimes and J. Doherty. A study of lactose fermenting yeasts isolated from milk, cream and butter. *Sci. Proc. Roy. Dublin Soc.* **19**, xx, 261–4, May 1929.

Eleven lactose fermenting yeasts isolated from milk, cream and butter were examined and placed in two groups referred to as Type A and Type B. Systematic examination showed that the organisms included under Type A were similar to *Torula lactosa* Harrison, isolated from Canadian cheese, and that the organisms of Type B were similar to or identical with *T. cremoris* Hammer, isolated from yeasty cream. E. R. Hiscox

M. J. Prucha. Comparison of methylene blue, Janus green and plate counts in grading raw milk. *Milk Dealer*, **18**, xii, 118–20, September 1929.

Janus green can be substituted for methylene blue in the reductase test, but since it has no special virtues the author recommends that the use of methylene blue, which is already well established, should be continued. E. R. Hiscox

M. Gressel. Die Veränderung der Lackmusmilch durch Mastitisstreptokokken und Milchsäurestreptokokken. (Alteration of litmus milk by streptococci of mastitis and lactic acid streptococci.) *Berl. tierärztl. Wschr.* pp. 26–30, 1929. (*Zbl. Bakt.* I, Ref. **93**, xxi–xxii, 508, May 1929.)

Working with thirty strains of streptococci from the milk of cows suffering from mastitis and with twenty pure cultures of streptococci isolated from milk coagulated at room temperature, the author found that 7 per cent. litmus milk is a valuable help in differentiating *S. mastitidis* and *S. lacticus* on account of characteristic colour changes.

With *S. mastitidis* litmus milk is still red after 24 hours at 37° C. but with *S. lacticus* the medium is decolorized.

In the case of *S. mastitidis* subsequent decolorization begins from the bottom of the tube and extends upwards, but subsequent reddening of the *S. lacticus* cultures begins from the top and extends downwards.

The use of litmus milk is only to be recommended as an aid to correct diagnosis in doubtful cases and in combination with other culture media such as plates of saccharose-bromcresol-purple agar.

It is not suitable for mass investigation because of the long time required for cultivation, incubation and observation. A. T. R. Mattick

J. M. Sherman, C. H. Stark and P. Stark. An unappreciated but important factor in the pasteurisation of milk. *J. Dairy Sci.* **12**, v, 385–93, September 1929.

The authors demonstrated that young and actively growing cultures of a ropy organism isolated from pasteurised milk were destroyed more rapidly at 62·8° C. for 30 minutes than were the mature cells. By applying these results to practical conditions, it was found that the rate of destruction of bacteria by pasteurisation was far greater when bacterial multiplication had been previously encouraged, than when it had been checked by keeping the raw milk at a low temperature before treatment. L. J. Meanwell

E. D. Devereux. A comparison of the bromthymol blue milk test and the methylene blue reduction test for determining quality of milk. *J. Dairy Sci.* **12**, v, 367–73, September 1929.

The author has examined the accuracy of the bromthymol blue (Cooledge) test and the methylene blue reduction test in the grading of milk, using the keeping quality (*i.e.* the length of time required for the milk to become unfit for use) as a standard. If individual results were considered, then irregularities occurred in each test, but when the average score and reduction time were taken for each group according to the keeping quality, then each test gave a fairly accurate system of grading. The most reliable results were obtained for good and very bad milk. Most of the inaccuracies occurred in the intermediate grades. E. R. Hiscox

R. Viertbauer. Vergleichende Untersuchungen über die Reduktionsfähigkeit der Kuhmilch bei Methylenblau und Janusgrün. (Comparative experiments on the reducing power of milk for methylene blue and Janus green.) *Milchw. Forsch.* **7**, v–vi, 631–52, March 1929.

As a result of a series of comparative experiments, the author finds that Janus green is experimentally preferable to methylene blue; it has the one disadvantage that its colour change (blue green to pink) is not so easily observed as that of methylene blue (blue to white).

The method of testing and conditions to be observed are described. Variations in the composition of the milk will tend to give inaccurate results. Hence, although suitable for practical purposes, the reductase test cannot be used where accuracy is essential.

A useful summary of previous work is given. J. G. Davis

K. L. Demeter. Studien über Milchsäurestreptokokken. (Studies on lactic acid streptococci.) II. Der *Streptococcus lactis* (Lister) Löhnis und seine Beziehungen zu den Fäkalstreptokokken. (II. *Streptococcus lactis* (Lister) Löhnis and its relation to faecal streptococci.) III. Über die Eignung verschiedener aus Milch und Fäkalien isolierten Milchsäurestreptokokken als Rahmsäuerungsreinkultur (sog. Säurewecker). (III. Suitability of different lactic acid streptococci.) IV. Über Gasbildung in "Säureweckern." (IV. Gas formation.) *Milchw. Forsch.* **8**, iii–iv, 201–67, 268–84, 285–9, August 1929.

This issue contains three important papers on streptococci. Paper No. II deals with the relationship of *S. lactis* (Lister) to the faecal streptococci. Paper No. III deals with the use of different milk and intestinal streptococci for cream ripening in pure culture. Paper No. IV deals with the question of gas formation in acid fermentations.

[Owing to the importance and length of these papers it is advisable that the originals should be consulted by those interested in them.] A. T. R. Mattick

F. S. Jones and H. S. Simms. Adaptation of *mastitis* streptococci to milk. *J. Exp. Med.* **50**, iii, 279–91, September 1929.

The work recorded in this paper was carried out to provide information upon the mode of action of the substance in fresh milk, or milk heated at 58°–60° C. for 20 minutes, which is responsible for the inhibition of streptococci inoculated into it.

A non-haemolytic *mastitis* streptococcus accustomed to artificial media was used, after 16 hours' incubation at 38° C. in broth.

On transference to milk heated at 58° C. for 20 minutes, a slight decline in numbers took place during the first 6 hours' incubation at 38° C., followed by a sudden rapid rise. In boiled milk the lag was only 1 hour.

Three explanations for the abrupt onset of growth in milk heated to 58° C. were offered. (1) That the inhibiting substance is used at some time during the lag phase, so that the uninhibited organisms grow rapidly. (2) That a resistant form originally present multiplies only slowly to an appreciable number. (3) That within the lag phase a resistant form develops which is capable of rapid growth. Further experiments showed that the substance is not in fact utilised during the lag phase.

Streptococci removed from a fresh-milk culture about half an hour before the end of the lag phase and inoculated into fresh milk, failed to grow for an hour but then increased rapidly. Organisms removed during the active growth phase grew without lag in fresh milk.

It was further shown that the streptococci were able to adapt themselves to the addition of fresh milk during the growth period, but a retardation of growth was noticed which was absent when boiled milk was added.

The inhibiting substance was not removed by dead streptococci or by viable organisms, provided the tubes were not incubated long enough to allow of growth, so that the inhibiting substance was not adsorbed by bacterial cells.

It was concluded that the sudden onset of growth after the lag phase must be ascribed to adaptation, and not to the presence of resistant forms. A. T. R. Mattick

H. Barkworth, L. J. Meanwell and M. G. D. Taylor. Bacterial content and the keeping quality of milk. *J. Min. Agric.* **36**, ii, 170–3, May 1929.

The additional figures obtained from eight further clean milk competitions, as a result of the examination of 2400 samples, confirm the results of a previous paper (*J. Min. Agric.* **33**, ii, February 1927). The presence of coliform organisms has a marked deleterious influence on the keeping quality of milk. The study of the keeping quality based on the bacterial count alone may, therefore, lead to erroneous and unjust conclusions. E. R. Hiscox

N. M. Erb. A rapid stain for the direct microscopic examination of milk. *J. Lab. and Clin. Med.* **14**, 377–9, 1929. (*Bull. Hyg.* **4**, viii, 676, August 1929.)

The author submits an improved method of staining and treating milk films by the Breed method. The milk films are prepared and dried by the ordinary Breed technique, then placed in the undermentioned staining solution for 1 minute, thoroughly rinsed in water and air dried. The solution consists of ether (sulphuric) 50 c.c., absolute methyl alcohol 50 c.c., methylene blue (preferably certified) 0·5 g. Add the dye to the mixed alcohol and ether; when dissolved, filter through paper and keep in a tightly stoppered bottle. The preparations are defatted, fixed and stained in one operation. It is claimed that there is sharp differentiation between the bacteria and the background and that leucocytes are well stained.

C. K. Johns and A. G. Lochhead. Bacteriological studies of milking machines. *J. Hyg*, **29**, i, 35–50, April 1929.

This paper reports experiments carried out to determine the factors concerned in the production of low-count milk by means of milking machines.

It is claimed that the failure to wash cows' udders, to discard the fore milk, and to handle the teat cups carefully has comparatively little effect upon the bacterial count of the milk, and does not account for the very large counts often found in machine-milked milk.

However, the practice of discarding the fore milk to facilitate early detection of abnormal milk is advocated.

Various methods of freeing the machines from bacteria were tried.

(1) Immersion in water at 170° F. for 20 min. and then allowing the parts to remain immersed till required.

(2) Immersion as in (1), but at 160° F.

(3) Immersion in water at 170° F. for 20 min. and then removing the parts.

(4) As in (3), but a preliminary cleansing by a cold water rinse followed by brushing of tubes, etc.

[No details of the methods of maintaining and controlling these temperatures are given.]

(5) Immersion for 1 min. in water at 200° F. removing and hanging up to dry.

(6) Heating for 15 min. in flowing steam and leaving in the chest until required.

All these treatments are said to be effective, but in (1), (2) and (6) the elasticity of the rubber tubing of the Alfa Laval machine was affected. It is pointed out that this can be avoided by removing the rubbers from contact with metal before sterilising. In addition to the heat treatments, the efficiency of hypochlorites was investigated.

The authors state that (1) hypochlorite, (2) hypochlorite strengthened daily, (3) hypochlorite and brine, all work satisfactorily, but that a hypochlorite rinse before milking was not effective.

The authors, believing that the treatment (3) above (immersion in water at 170° F. for 20 min.), was "the most generally satisfactory of the heat treatments," used this method for making comparisons with disinfectants when used under practical conditions.

A chloramine solution containing about 100 parts per million of available chlorine in 10 per cent. brine solution was used, and adjusted to strength once weekly. The teat cups were dismantled once a week, but the milk tubes were not removed during the experiment. The cows' udders were washed but not dried, and the fore milk was not discarded.

Samples of bulk milk after each milking were taken and placed *in ice water*. The age of the morning samples when examined was 4 hours, and that of the evening milk 18 hours.

Hand milking was carried out at the same time as the above experiments were done, for purposes of comparison.

The authors state that both methods of sterilising the rubber parts (the pails were sterilised by steam in all cases) proved to be adequate, and the results compare most favourably with those of the product of careful hand milking, even during the warm weather.

Examination of the tables given reveals, however, that in the case of the hand-milked milk, although the plate count averaged only 4276, coliform organisms were present in 57·6 per cent. of cases in 1 c.c. of milk and in 18·6 per cent. of cases in 1/10 c.c. The corresponding figures for the presence of coliform organisms in the case of the hot-water treated machines were 57·6 and 6·8 per cent. and for the chemically treated machines 59·3 and 22 per cent.

[When it is remembered that the milk was taken in all cases into pails sterilised by steam, which Hoy and Rennie (*J. Hyg.* **26**, ii, 1927) have shown to be, for cleansing churns, superior to the same strength of available chlorine as used by the authors for cleansing churns, and that the samples were placed in ice-water and examined when either 4 or 18 hours old, it is certain that by the standards of judgment in England these results would not be considered good. It is well known that a true picture of the commercial usefulness of milk cannot be gained by examining milk when only 4 hours old or even after 18 hours' storage in ice-water.]

A. T. R. Mattick

Bacteriological examination of the milk supplied from the Pusa dairy. *Rev. Agric. Operations, India*, 1927–8, p. 54 (1929).

It is stated that the bacterial counts of milk from the Pusa herd vary with the season, being highest in September and lowest in February. The use of covered pails, the number of bacteria in the cows' udders and the rejection or otherwise of the fore milk also influence the count. J. McClemont

M. Ziegler and I. Müller-Lonsky. Die Zuverlässigkeit der Thybromolprobe. (Reliability of the bromthymol blue test.) *Deuts. tierärztl. Wschr.* **17**, 1929. (*Milch. Zbl.* **58**, ix, 161, May 1929.)

The authors have investigated the reliability of the bromthymol blue test. The material was divided into two groups, the first comprising milk from quarters from sound cows and the second from those suspected to be suffering from mastitis. The milk in the first group was tested 2 to 5 hours after taking, while that in the second group was received by post and tested 24 to 36 hours after taking. The method of testing is described.

In 68 out of 368 tests (1st group) the B.T.B. test did not agree with the microscopic and cultural tests. In the second group it failed to agree in 26 per cent. of the tests. The B.T.B. negative results were compared only with the microscopic and cultural positive results. The test appears to be of use only as a preliminary one of limited reliability. J. G. Davis

H. Barkworth. The reductase test. A comparison and some observations. *Milk Industry*, **9**, xii, 85–9, June 1929.

The author seeks to establish a connection between the reduction time, the plate count, and the keeping quality as tests for the quality of milk. From the results it appears that, whilst the agreement between the bacterial count as presumed by the reductase test, and as determined by the English plate count method, is good for Grades I and IV, there is a considerable amount of disagreement and overlapping in Grades II and III. The author discusses the usefulness of this test in factories, and for the grading of milk for consumption in the raw state. E. R. Hiscox

P. S. Prickett and R. S. Breed. Bacteria that survive and grow during the pasteurisation of milk and their relation to bacterial counts. *New York State Agr. Exp. Sta. Bull.* **571**, August 1929.

This paper is a further contribution to the study of "pin-point" colonies. Direct microscopical examination is a valuable asset in the control of pasteurised milk, since it aids in the detection of heat resistant and heat-loving bacteria. Special media and temperatures of incubation can then be adopted for the plate counts if necessary.

An account is given of the chief thermophilic organisms isolated during an investigation of raw and pasteurised milk, of pasteurising plants and of the equipment on farms in various localities.

The organisms were abundant in the dust and foodstuffs at the farm, and in the plant at the factory. Precautionary measures for control are suggested.

E. R. Hiscox

M. M. Diehm. The nature of pin-point colonies in raw and pasteurised milk. *J. Inf. Dis.* **45**, i, 61–72, July 1929.

With a view to defining more clearly what is implied by the term "pin-point," the author suggests that the term "minimo-visible" should be substituted and

limited to colonies which are just visible to the naked eye, and which appear small with a magnification of 2½ diameters.

Lactose agar formed a suitable medium for the isolation, and litmus milk for the cultivation of the organisms giving rise to such colonies. A number of cultures were isolated from milk in which the "pin-point" colonies did not constitute a problem, but from which they might be expected to be obtained in small numbers. These proved to be varieties of *Streptococcus lactis*. The organisms were thermo-resistant but not thermophilic.

E. R. Hiscox

Butter

P. Clerkin. Estimation of yeasts and moulds in butter. Influence of hydrogen-ion concentration of the medium on the mould and yeast counts of butter. *J. Dept. Lands. Agr. Ireland*, **28**, ii, 199–207, 1929.

A reliable yeast and mould count of butter is of practical value, since it serves as an index of the efficiency of the pasteurisation of the cream and of the care exercised in the management of the plant, etc., at the factory.

Plating out on a wort agar medium of *p*H 6·5–4·5 was unsatisfactory, since the majority of the colonies developed on the plates were bacterial. When, however, the *p*H of the medium was reduced to the region of 3·5, the colonies consisted almost entirely of yeasts. Moulds appeared to grow satisfactorily over the whole range.

E. R. Hiscox

D. B. Shutt. Surface flavour in pasteurised butter caused by contaminated water. *Butter and Cheese J.* **20**, xxviii, 22–4, July 1929.

Numerous cases of surface flavour (putrefactive) in butter were found to be intimately connected with the use of water contaminated with *Pseudomonas fluorescens* at the creameries concerned.

This organism inoculated into good butter reproduced the typical surface flavour. The fault could be controlled by the substitution of a pure water supply for the contaminated, or, where this was not possible, by subjecting the contaminated water to a temperature of 190° F. for 10 min.

E. R. Hiscox

G. F. V. Morgan. Moulds in unsalted butter. *New Zealand J. Agric.* **39**, i, 38–46, 106–13, 174–9, July, August and September 1929.

H. Macy and H. B. Richie. The mould and yeast count as an index of the keeping quality of butter. *J. Dairy Sci.* **12**, iv, 351–66, July 1929.

The mould and yeast counts and keeping quality are given for 597 samples of butter, 297 of which were in tubs and 300 in 1 lb. cartons. As a rule, high yeast counts were found to accompany high mould counts, but no consistent relationship could be traced between the mould or yeast counts and the quality of fresh butter. Whilst, taken as a group, the samples of butter with the lower mould, yeast and total counts showed a tendency towards slightly better keeping quality than those with higher counts, the results do not show that the mould and yeast counts have any value as indices of the keeping quality of individual samples of butter.

E. R. Hiscox

Cheese

A. I. Virtanen and E. Lundmark. Über das Wesen der Caseinspaltung durch Milchsäurebakterien. (Method of casein splitting by lactic acid bacteria.) *Milchw. Forsch.* **8**, iii–iv, 375–82, 1929.

Experiments are described which show that treatment of milk cultures of *B. casei* ϵ with toluene does not affect the rate of protein cleavage. The authors conclude that, since the toluene treated cultures contain no living bacteria, the casein cleavage is due to a pure enzymatic degradation and is not dependent on the life of the cell.

Hence although *B. casei* ϵ dies out rapidly in Emmental cheese, its presence initially in large numbers would still allow it to be the chief ripening factor in this cheese.

It is not yet known whether the degradation of casein by *B. casei* ϵ is due to a single trypsin-like enzyme or to a series of enzymes which successively attack the casein. Amino acids are split off from both casein and pepsin-treated casein. Gelatine is rapidly hydrolysed. Lactic acid bacteria do not split casein in highly acid media (*p*H 4).

J. G. Davis

F. C. Harrison. Potassium nitrate in Canadian cheese. *Canadian J. Res.* **1**, iii, 256–60, September 1929.

Some bacteria (staphylococci, coliforms, and pseudomonas), which are able to reduce NO_3 to NO_2, will produce a pinkish brown colour when grown with nitrate and annatto. An acid reaction is necessary. Such bacteria are present in saltpetre, which, if added to the curd according to the practice of some cheese makers, is liable to produce a discoloration in the ripened product. Since the saltpetre is added to the curd the discoloration is patchy. The chemistry of the process is unknown.

The author recommends that the use of saltpetre for cheese-making be discontinued.

J. G. Davis

S. and A. D. Orla-Jensen and W. Sadler. Le fromage de Cheshire. III. La classification de certains organismes isolés. (Cheshire cheese. III. Classification of certain organisms isolated.) *Le Lait*, **9**, lxxxiv, 337–44, April 1929.

The object of the present study was to classify some of the rod forms of bacteria which were isolated previously and discussed in Part I (*Sci. Agric.* **9**, vi, 182, February 1929).

The methods used were those of Orla-Jensen (*The Lactic Acid Bacteria*, Copenhagen, 1919) and involved the quantitative estimations of acid produced in eighteen carbohydrates and in milk, and of the amino nitrogen produced after 6 weeks' incubation in chalk milk cultures. The type of lactic acid produced was also determined.

Culture CC 86 was identified as a strain of *Sbm. casei* which only feebly fermented lactose.

Cultures CC 54 and 12 proved to be strains of *Sbm. plantarum* but the latter were not vigorous.

Culture CC 2 in spite of its failure to conform to type in many respects was considered also to be a strain of *Sbm. plantarum*.

The number of strains studied is small, and no conclusions as to the types predominating in Cheshire cheese can be drawn. Further work on other strains is contemplated.

A. T. R. Mattick

E. Remy. Comparative studies of meat extracts and vitamin-containing yeast extracts, with special reference to their biochemical, bacteriological and serological behaviour. *Arch. Hyg.* **101**, 27–38, 1929. (*Chem. Abst.* **23**, xix, 4725, October 10, 1929.)

The meat extracts examined showed no vitamin B potency; that of the yeast extracts was high. The yeast extracts contained more organic P, lecithin P and tryptophan, but less organic S than the meat extracts. The addition of either preparation to an ordinary agar medium permitted the growth of strains of *Streptococcus viridans* and meningococcus, but appeared to inhibit the growth of strains of gonococcus, influenza bacillus and pneumococcus. The yeast protein appeared to be denatured during the preparation of the extract since its antigenic properties were lost. The colour reaction of Jendrassik for testing for the presence of vitamin B appeared to be non-specific.

CHEMISTRY (ORGANIC, INORGANIC AND PHYSICAL)

General

G. A. Richardson and L. S. Palmer. Rennin action in relation to electrokinetic phenomena. *J. Phys. Chem.* **33**, iv, 557–76, April 1929.

The isoelectric point of rennin as determined by cataphoretic method lies between the *p*H values of 6·9 and 7·0.

The addition of rennin to caseinate solutions having *p*H values between 6·1 to 6·9 reduces the rate of migration of the caseinate micellae. This indicates that rennin lowers the electrical charge on negatively charged semi-lyophilic micellae.

The addition of rennin to caseinate solution of *p*H values from 7·0 to 7·25 increases the rate of migration of the caseinate micellae. At the *p*H values of 7·5 and 7·69 no appreciable change in migration is produced.

The addition of rennin to calcium paracaseinate solutions of *p*H 6·45 does not change the velocity of migration.

Previous heating of neutral and slightly acid caseinate solutions results in an increase in the rate of migration, which indicates an increase in the charge of the protein micellae. It is well known that a greater concentration of electrolyte is necessary to cause precipitation of casein in heated than in non-heated milks. The effect of heat in this case is clearly on the calcium caseinate.

The action of rennin on heated calcium caseinate solutions is one of decreasing the velocity of migration in the electric field. Inasmuch, however, as the reduction does not reach the low level which is reached in the rennin-treated but non-heated solutions, this explains why the addition of calcium chloride to boiled natural milk facilitates its clotting with rennin.

Author's Abstract

M. Mitolo. A new colorimetric reaction for protein substances. *Boll. Soc. ital. biol. sper.* **4**, xxxvii–xxxix, 1929. (*Chem. Abst.* **23**, xiii, 3246, July 10, 1929.)

The Eschaich reagent ($Na_2S_2O_8$ + $AgNO_3$) used for the identification of phenol, was used for the identification of protein substances containing the benzene ring. It was more sensitive than the xanthoproteic and equally as sensitive as the Millon tests, except that the yellow colour appeared almost immediately with the Eschaich reagent but only after 15 to 16 hours with Millon's, when a 0·01 per cent. solution of commercial ovalbumin was tested. The test was modified so as to get a zonal reaction. Two solutions were prepared: (*a*) 100 mg. ovalbumin + 10 c.c. distilled H_2O + 5 drops NH_4OH + 0·10 g. $Na_2S_2O_8$; (*b*) 10 c.c. C_2H_5OH + 10 drops *N*. $AgNO_3$. 1 c.c. of (*b*) was poured carefully over 1 c.c. of (*a*). At the point of contact of the

two solutions a yellowish orange ring was formed. The sensitivity of the zonal reaction was equal to the Ehrlich reagent. The Eschaich reagent can, therefore, be used for the detection of protein substances containing the benzene ring, and is equal in sensitivity to the Millon or Ehrlich reaction.

H. O. Calvery. Basic amino acids. The estimation of the basic amino acids in small amounts of casein and edestin by the modified methods of Vicery and Leavenworth and other methods. *J. Biol. Chem.* **83**, iii, 631–48, September 1929.

T. E. Friedemann and A. I. Kendall. The determination of lactic acid. *J. Biol. Chem.* **82**, i, 23–43, April 1929.

Lactic acid is usually estimated by removing proteins by 4 per cent. trichloracetic acid; sugar, etc., by the copper-lime precipitation and then oxidising the acid filtrate with dilute $KMnO_4$ in a distillation apparatus, the aldehyde vapour being trapped by acid bisulphite. The bound aldehyde is liberated by $NaHCO_3$ and the free SO_2 titrates with standard iodine.

The authors have found that the percentage concentration of the oxidising agent, the acidity of the solution, the percentage concentration of $MnSO_4$ and the amount of lactic acid oxidised must be carefully controlled if the highest yield is to be obtained. A lower oxidation potential increases the yield of aldehyde by reducing the over oxidation. Thus, increasing concentrations of lactic acid and $MnSO_4$, and decreasing concentrations of MnO_2 (the oxidant) will raise the yield. Phosphoric acid (0·07 *M*) is most suitable.

Detailed data for the method and typical experimental yields from biological material are given.

J. G. Davis

K. Täufel and W. Preiss. Über die Umesterung von Neutralfetten mit Buttersäure. (Ester replacement in neutral fats by butyric acid.) *Z. Unters. Lebensm.* **58**, iv, 425–33, October 1929.

This investigation consists of attempts to introduce partial displacement of the higher fatty acids of fats by butyric acid, carried out by heating the fat with about 7·5 per cent. of its weight of butyric acid at various temperatures (range 100° to 235° C.) in the presence either of atmospheric oxygen or carbon dioxide. This was followed by maximal esterification of the freed fatty acids with glycerine, the product being finally washed with dilute sodium bicarbonate.

By this method, beef tallow (m.p. 43°) gave a fat of m.p. 37° with a R.-M. value of 32·4 (estimated butyric acid content = 5·7 per cent.). A proprietary stearin, "Candelite extra" (m.p. 51°, R.-M. 1·0) gave a product melting at 40°–41° with a R.-M. value of 49·9 (8·8 per cent. butyric acid content).

With reference to margarine manufacture from such enriched fats, it is claimed that they possess superior emulsifying properties with water and skim milk to the original fats. The presence of the butyric acid also lends a pleasant butter aroma to the product.

W. L. Davies

D. A. MacInnes and M. Dole. A glass electrode apparatus for measuring the *p*H values of very small volumes of solution. *J. Gen. Physiol.* **12**, vi, 805–11, July 1929.

A glass electrode apparatus is described with which *p*H measurements can be made with as small volumes as two drops (about 0·14 c.c.) of solution.

Author's Summary

P. L. KIRK and C. L. A. SCHMIDT. An improved technique for micro calcium analysis. *J. Biol. Chem.* **83**, ii, 311–14, August 1929.

A micro filter is described which facilitates the analysis for small amounts of calcium by the volumetric method, in that it increases the speed and accuracy of the determination and materially reduces the necessary amount of equipment. The method is shown to be suitable for blood calcium analysis, as well as for slightly larger amounts than are found in blood samples. AUTHOR'S SUMMARY

N. C. WRIGHT. Membrane equilibria and selective absorption. *Biochem. J.* **23**, iii, 352–7, 1929.

The unequal distribution of salts on either side of an artificial membrane in systems containing caseinogen, NaCl and $CaCl_2$, has been examined, and it has been found possible to explain the results quantitatively when the degree of dissociation of the protein salts and the establishment of a Donnan equilibrium are taken into account.

The influence of one ion on the distribution ratios of other ions is demonstrated, and the applications of the results in the general study of the unequal distribution of salts in living tissues are briefly discussed. AUTHOR'S SUMMARY

A. NIETHAMMER. Detection of rancidity of fat in whole seeds and fruits. *Z. Unters. Lebensm.* **57**, 358–60, 1929. (*Brit. Chem. Abst.* B, p. 727, September 13, 1929.)

The fat of seeds alters during storage; that from fresh seeds and fruits gives no Kreis or Fellenberg reaction, whereas these reactions are given by the fat from seeds stored for some years and incapable of germination.

J. PRITZKER and R. JUNGKUNZ. Quantitative Betrachtungen zur Kreisschen Verdorbenheitsreaktion. (Kreis rancidity reaction.) *Z. Unters. Lebensm.* **57**, v, 419–21, May 1929.

The conditions necessary for maximum colour formation by the coupling of epihydrinaldehyde to phloroglucinol in concentrated hydrochloric acid solution are described, together with a method for preparing the aldehyde from acrolein and hydrogen peroxide. The colour thus produced from a known amount of epihydrinaldehyde is used as a standard for the colorimetric determination of the amount of that compound present in various fats (100 g.) which have suffered oxidative deterioration. It is argued that one molecule of the aldehyde is formed from one molecule of triglyceride, on the basis of which it is calculated that 13 g. of fat are needed to give one of aldehyde. A 14-year-old sample of butterfat was found to contain 400 mg. of epihydrinaldehyde per 100 g. which, from the above data, represented the breakdown of 5 per cent. of the fat.

Other colour tests for products of oxidative action in fatty materials are discussed.

W. L. DAVIES

J. W. CROXFORD. The differential halogen absorption of oils and fats. *Analyst*, **54**, 641, pp. 445–53, August 1929.

From the investigations described, it is claimed that the bromine vapour method for determining the degree of unsaturation of a fat compares favourably with the Wijs iodine method, and is more rapid and complete. Another advantage is that the bromine vapour method can be used where only small quantities of material (0·025 g.) are available. The main drawback to the method is that with hydroxy-acids substitution occurs to some extent. The chlorine vapour method gives results which are too high, owing to substitution caused by the greater chemical activity

of chlorine. The results for oils and fats with bromine in acetic acid solution were not satisfactory, results lower than the Wijs' values being obtained possibly owing to the formation of bromhydrins.

These methods for determining the degree of unsaturation have also been applied to other organic compounds, the bromine and chlorine vapours giving results agreeing closely with theory. Maleic and fumaric acids were, however, inert to this treatment. The methods can be used for determining the amount of unsaturated compounds admixed with saturated substances.

The effect of position and combination of double bonds on halogen absorption is discussed.

W. L. Davies

Dairy Chemistry

W. H. Padmos. Über den Wert der Alkoholprobe für die Beurteilung der Milch. (Alcohol test.) *Neder. Weekbl. Zuivelbereiding-en-Handel*, **34**, 43, 1929. (*Milchw. Forsch.* **8**, iii–iv, Ref. p. 66, August 1929.)

While some consider that the alcohol test will detect all the faults occurring in milk, others consider that it plays only a subordinate rôle.

The author has undertaken numerous experiments, which point to the conclusion that the alcohol test is a convenient, quick and reliable method for determining the quality of the milk supply. It indicates whether milk is going sour, or if it is mixed with colostrum and so will not stand boiling, and in some cases it will also show whether the milk is contaminated with milk from a cow with a diseased udder. The alcohol test will not indicate whether a given milk possesses a turnip, soap or other flavour, and therefore tests for these must be made separately.

L. A. Allen

C. Bischoff. Die Geschmacksprobe und die Chlorbestimmung als wertvolle Hilfsmittel zur Erkennung pathologischer Milch. (Taste and chlorine determinations as aids to detection of pathological milk.) *Deuts. tierärztl. Wschr.* **1**, 147–51, 1929.

The milk of cows suffering from mastitis has a high chloride content (0·15 to 0·30 g. per 100 c.c.) compared with normal milk (0·06 to 0·11 g.). A quick method of chloride estimation is claimed to afford direct evidence of most cases of mastitis (75 per cent.). The salty taste of milk is evident when the chloride content is 0·13 g. chlorine and above.

A detailed method of chlorine-ion estimation is given: 10 c.c. milk are shaken with 5 c.c. 25 per cent. nitric acid and 5 c.c. of $N/10$ silver nitrate. 1 c.c. of saturated iron alum is added, and the excess silver nitrate titrated with $N/10$ ammonium thiocyanate.

W. L. Davies

V. Henriques and A. Roche. Is the iron content of milk increased by the ingestion or injection of iron salts? *Bull. Soc. Chim. biol.* **11**, 679–92, 1929. (*Brit. Chem. Abst.* A, p. 1099, September 1929.)

Daily ingestion of 0·5 g. of ferrous sulphate by women, and of 5 g. of ferrous lactate by goats does not cause any change in the iron content of the blood, which is normally 1 mg. per litre in each case. Intravenous injections of lactate in the goat likewise produces no increase.

G. D. Elsdon and J. R. Stubbs. The refraction of milks low in solids-not-fat. *Analyst*, **54**, 639, pp. 318–20, June 1929.

This paper provides further data with respect to the refraction of copper sera of milk low in solids-not-fat. The results for about 50 milk samples are given. In

all cases (except two) a low solids-not-fat corresponds with a low refraction. It is contended that this means one of two things, or possibly a combination of both; that all the low solids-not-fat are due to watering, or that milk naturally low in solids-not-fat do not give a normal refraction of 38 or more. "Appeal to cow" samples showed a refraction (under comparable conditions of acidity) around 38, with high solids-not-fat content, but the general trend with these samples was that low solids-not-fat meant a low refraction. W. L. Davies

J. Miscall, G. W. Cavanaugh and P. P. Carodemos. Copper in dairy products and its solution under various conditions. II. *J. Dairy Sci.* **12**, v, 379–84, September 1929.

The copper-dissolving power of milk increases up to 140°–145° F. and then decreases, and the solubility of copper in milk decreases with the removal of milk gases or by the addition of carbon dioxide. The presence of oxygen increases copper solubility, but the maximum at 140°–145° F. still obtains. Pasteurised milk dissolves more copper than raw milk at the same temperature. It is concluded that when milk is heated in contact with raw copper for 2 hours above 145° F. some reaction occurs in the milk serum which lowers the copper-dissolving power of milk.

W. L. Davies

Nachweis der Milcherhitzung durch Guajaktinktur. (Detection of heating of milk by tincture of guaiacum.) *Z. f. Fl. u. Milchhyg.* **39**, xix, 372–3, July 1, 1929.

This note brings to notice the availability of a portable outfit for the testing of milk by the guaiacum reaction. Details of the manipulation of the outfit, care of solutions and means of replenishing are given. The method used is that of Schroeter (*Milch. Forsch.* **6**, 533, 1928, abstracted in *J. Dairy Res.* **1**, 99, 1929). W. L. Davies

Variations in the composition of milk. *Min. Agric. Fish. Misc. Pub.* No. **65**, 1929. London, H.M.S.O.

The average percentage of fat and solids-not-fat, and the proportion of samples containing less than 3 per cent. fat and 8·5 per cent. solids-not-fat are estimated from the analyses of a large number of samples by Cranfield, Crowther, Tocher and two dairy companies. The influence of the following factors upon the percentage of fat and solids-not-fat in milk are discussed. Individuality of the cow, intervals between successive milkings, age, breed, period of lactation, influence of food, abnormal conditions, sexual excitement and variations in the composition of milk during a single milking. W. J. Wiley

Variations in the composition of milk. *Analyst*, **54**, 641, pp. 472–4, April 1929.

This is a criticism of the previously abstracted paper by the Committee of Public Analysts. It is claimed that records obtained by public analysts show that a lower proportion of samples falls below 3 per cent. fat and 8·5 per cent. solids-not-fat than is indicated by the Ministry of Agriculture and Fisheries' publication.

W. J. Wiley

H. T. Cranfield and E. R. Ling. Variation in the composition of the milk of an abnormal cow. *J. Agric. Sci.* **19**, iii, 491–9, July 1929.

The abnormal milk given by one cow over a period of three lactation periods is recorded. The solids-not-fat were consistently low. Protein, lactose, phosphate and lime were below normal, total ash was normal and soluble ash high. The cow was eventually found to be suffering from tuberculosis of the udder and lungs, but no sign of disease was apparent during the first two lactation periods recorded. It is

suggested that such abnormal milk may be a sign of incipient disease affecting the organs involved in the secretion of milk. Variations in feeding did not affect the composition of the milk.

W. J. WILEY

E. C. V. MATTICK and H. S. HALLETT. The effect of heat on milk: (*a*) on the coagulability by rennet; (*b*) on the nitrogen, phosphorus and calcium content. *J. Agric. Sci.* **19**, iii, 452–62, July 1929.

Milk which has been heated to temperatures ranging from 105°–209° F. for half an hour differs from raw milk in its reaction to rennet in all cases. There is no change in the diffusibility of the nitrogenous substances over this range of temperature, but heating to 175° F. and above for half an hour appears to reduce the diffusibility of the phosphorus content, while heating to 125° F. and above causes marked diminution in the diffusibility of the calcium compounds.

E. C. V. MATTICK

G. SCHULZE. Berechnung des Milchzuckers aus der Refraktion des Chlorcalciumsserum. (Calculation of lactose from the refraction of calcium chloride serum.) *Z. Unters. Lebensm.* **57**, v, 460–5, May 1929.

The author claims that the lactose content of normal fresh milk, even if watered, can be determined with sufficient accuracy from the refraction of a calcium chloride serum by the aid of tables which are given. The tables cannot, however, be used for abnormal milk and the lactose must then be directly determined. When dealing with individual samples the stage of lactation must be taken into account.

By comparing the lactose values as obtained by analysis with those given in the table, it is possible to decide whether a sample is adulterated or genuinely abnormal.

C. S. MILES

G. UXA. Untersuchungen über die fettfreie Trockensubstanz der Milch. (Examination of the solids-not-fat of milk.) *Milchw. Forsch.* **8**, iii–iv, 367–74, August 1929.

Inspired by the observations of Nottbohm (*Z. Unters. Lebensm.* **54**, i–ii, 1927, and *Biochem. Zeits.* **95**, 1919) the author studied the individual variations in the solids-not-fat content of the milk of five cows typical of those kept in the vicinity of Graz (S. Austria). His investigations, which lasted from January to November 1928, showed that the variations which occurred were quite similar to those observed by Nottbohm, who for three years examined market milk obtained in Hamburg and found the following average values for solids-not-fat: at the beginning of the year about 8·95 per cent., dropping in April to 8·75–8·80 per cent. and increasing in May to 8·85–8·90 per cent., in July decreasing to 8·65 per cent. and then increasing gradually to about the same value in December as in January. The average variations obtained by the author from the few cows studied was rather greater than the above, and the values throughout were about 0·47 per cent. higher. Nottbohm attributed the decrease in solids-not-fat in April to the fact that the milk was from cows most of which had calved during the two previous months, but as none of the author's cows had calved within this period and some had been in milk for a considerable time previously, the decrease could not be thus explained. The increase after April coincided with the beginning of the green-feeding of the cows, and the subsequent variations were also considered to be due to changes in the fodder during the season. The author obtained similar variations in the solids-not-fat of the milk from a herd of 38 cows which was investigated from June to July in two successive years. The average fat content of the milk from the five cows investigated decreased from 4·1 per cent. in January to 3·6 per cent. in June, after which it rose to 4·5 per cent. in September and finally in November reached 4 per cent.

G. M. MOIR

G. N. Quam. Solubility of metals in milk. *Indus. and Eng. Chem.* **21**, vii, 703–4, July 1929.

By the loss in weight method, the solubilities of nickel, tin, chromium steel, aluminium, zinc and copper in milk, at various temperatures have been evaluated. The losses in weight of aluminium, tin and steel up to a temperature of 75° C. were negligible. Nickel showed a large increase in solubility up to 70° C., after which the solubility decreased. Copper showed its maximum solubility at about 90° C. and zinc about 70° C. The break in the oxygen solubility curve at 70° C. is offered as an explanation of this phenomenon. The maximum weight losses per sq. decimetre for each metal were: nickel, 6·54 mg.; zinc, 1·78 mg.; and copper, 1·96 mg.

W. L. Davies

A. Lataix. Contribution à l'étude de la réfractométrie des lacto-sérums. (Study of the refractometry of milk serum.) *Le Lait*, **9**, lxxxv, 474–91, May 1929; lxxxvi, 612–22, June; lxxxvii, 711–23, July–August; lxxxviii, 844–58, September–October 1929.

An extensive study of the refractometry of milk serum has been made. In Part I a review of the literature is given and a large number of references cited, the majority to work of continental origin. In Part II the importance of the complete removal of the milk proteins and of the degree of dilution of the sample by the coagulant is stressed. The author bases his work on an absolute value for the refraction of milk serum, this value having been obtained (*a*) by a graphical method, and (*b*) by a method of ultrafiltration through collodion which gives the ideal serum. The coagulants giving a serum, the refractive index of which most nearly approaches this absolute value, are calcium chloride (+ 0·0003) and mercuric chloride (+ 0·0016), while acetic acid gives the greatest divergence (+ 0·0021). Part III. In order to study the effect of the variation of the various constituents of the milk serum on the refractive index, a synthetic serum was made, and the effect of the variation of its constituents determined. It was found that the lactose has the greatest influence on the refractive index. The value for distilled water at 20° C. being 1·3330, the lactose produced an increase of 0·0073 and the salts a further increase of 0·0014. Of the various salts, the citrates, the sodium chloride and the phosphates have the greatest influence, in the order given. Part IV. The author classifies the various coagulants that have been employed, describes their method of use and enumerates the advantages and disadvantages of each. Calcium chloride is recommended as the best reagent except for milk samples which are acid, for which mercuric chloride is advised. Part V. In the routine examination of milk for added water, etc., this method is very valuable, but can be used only for mixed milk, since samples from individual cows are subject to large variations. Where the refractive index is abnormal the sample may be viewed with suspicion and a confirmatory test applied. The Zeiss immersion refractometer is strongly advocated as being accurate, simple and rapid in use.

C. S. Miles

F. Olivari. Serodensimetric constant (c.s.d.) for detecting the watering of milk. *Ann. Chim. Appl.* **19**, 214–33, 1929. (*Brit. Chem. Abst.* B, p. 658, August 16, 1929.)

The serodensimetric constant is obtained by the formula

$$Q + 3{\cdot}85\,C = K,$$

where Q = the density (excess over 1000),

C = sodium chloride in parts per 1000.

This constant is stated to be more useful than the mere density in the detection of watering. For acetic serum the mean value of K is 35·1.

Dilution of milk with isotonic solutions of dextrose, glycerol, sodium bicarbonate, etc., alters the value of the serodensimetric constant, whereas the cryoscopic index remains unchanged.

J. GOLDING

E. O. WHITTIER. Buffer intensities of milk and milk constituents. I. The buffer action of casein in milk. *J. Biol. Chem.* **83**, i, 79–88, July 1929.

The Van Slyke buffer index $\frac{dB}{dpH}$ is measured from the titration curves of milk and several milk products from *p*H 4 to *p*H 7. The maximum buffering in normal milk occurs at approximately *p*H 5·50. The difference between the buffering of whole milk and of acid whey indicates that the buffer action of casein is confined to the region between *p*H 4·50 and *p*H 5·70 with a maximum at *p*H 5·20. Different preparations of casein differ in their buffer action, and differ from casein as it exists in milk. The addition of rennet to milk causes the pronounced maximum buffering at *p*H 5·50 to disappear, and it is concluded that rennet converts casein into a substance with several dissociation constants within the range of *p*K values from 4·0 to 7·5.

W. J. WILEY

H. SCHORSTEIN, G. JANDER and O. PFUNDT. The direct determination of the chlorine ion in milk with the aid of the visual conductivity titration. *Z. angew. Chem.* **42**, 335–6, 1929. (*Chem. Abst.* **23**, xii, 3029, June 20, 1929.)

It is possible to determine the Cl-ion content of milk by electrometric or conduction titrations using quinhydrone, and Pt and calomel electrodes. The chief advantage of this method is the lower time factor. Three titration curves are shown.

E. O. WHITTIER. The solubility of calcium phosphate in fresh milk. *J. Dairy Sci.* **12**, v, 405–9, September 1929.

From the empirical formula,

$$\log \frac{(Ca^{++})}{(H^{+})} = 2{\cdot}4 + 2{\cdot}2\sqrt{\mu}$$

(μ = the ionic strength, *i.e.* the sum of half the products of the molarity of each species of ion and the square of its valence), the author calculates the Ca^{++} concentration in milk serum using Van Slyke and Bosworth's analytical data. It is found that $(Ca^{++}) = 0{\cdot}00028$, and $(Ca^{++}) \times (HPO_4^{=}) = (0{\cdot}0028) \times (0{\cdot}0057) = 0{\cdot}160 \times 10^{-5}$, a value lower than the solubility product $0{\cdot}182 \times 10^{-5}$ assumed for $CaHPO_4$. In the calculation the citric acid was reduced by an amount equivalent to the calcium present, on the assumption that an unionised calcium citrate complex is formed. It is concluded that the solubility of $CaHPO_4$ in milk is affected by the citrates present.

Experimentally it was found that citrates prevented the precipitation of calcium phosphate at the *p*H and concentrations normally present in milk serum.

W. J. WILEY

F. LIPPICH. Applications of the nitrile method. II. (1) The hydrocyanic acid binding by milk, milk sugar and milk sugar-casein mixtures. (2) The hydrocyanic acid number of milk and its analytical significance. (3) Detection of watering of milk. (4) Formaldehyde binding in milk sugar and milk sugar-casein mixtures. (5) Binding of formaldehyde and determination of formaldehyde in milk. *Z. anal. Chem.* **76**, 321–35, 1929. (*Chem. Abst.* **23**, xii, p. 3029, June 20, 1929.)

HCN combines with milk sufficiently to permit the application of Lippich's nitrile method. There is, therefore, what can be called the "HCN no." of milk, which is a characteristic that can serve for the detection of watering in milk. The quantity

of HCN taken up by milk, however, varies with the time. Thus, on treating 100 c.c. of milk with 15 c.c. of 0·25 *N* KCN solution, there is taken up 0·151 milli-equivalent of HCN in 1 minute, 0·75 in 10 minutes and 1·155 in 1 hour. It is recommended to work at a temperature of 19° C. A study of the amounts of HCN taken up by casein, milk sugar and milk itself shows certain pecularities. At first the HCN is taken up to a greater extent by milk sugar than by milk itself, but as the digestion with KCN proceeds, the milk begins to absorb considerably more HCN than the sugar and, in fact, during a 10-minute period it absorbs more than the casein and the milk sugar contents would indicate when measured separately, although it seems certain that only these two constituents take part in the reaction. It is probably due to the degree of dispersion of the colloids. To carry out the determination of the HCN no., heat 20 c.c. of 0·25 *N* KCN on a water bath to 19° C. and do the same with 100 c.c. of milk. As soon as the temperature is constant, add the milk as quickly as possible to the KCN solution and count the time from this moment. After 10 minutes pour the mixture into a solution of 40 g. tartaric acid in 70 c.c. of water, wash out the flask and connect with a condenser. Connect the condenser with a receiver containing 50 c.c. of 10 per cent. KOH. Heat carefully to boiling and conduct a stream of CO_2-free air through the apparatus for 2·5 hours. Then dilute, add NH_4OH and KI and titrate as previously described. With respect to the binding of HCHO by milk, it seems certain also that milk sugar and casein alone participate; the proposal is made to have a "formaldehyde no." as a characteristic of milk. An HCN no. of about 9 and a formaldehyde no. of about 4 indicates a mixture of approximately 4 casein to 5 milk sugar in milk.

A. VAN RAALTE. The freezing point of milk. *Analyst*, **54**, 638, pp. 267–8, May 1929.

The author adds to other papers which have recently appeared in the *Analyst* his own appreciation of the value of the determination of the freezing point of milk as a method for the detection of added water. In Holland, regular use of the method has now stood the test of 30 years' experience. The freezing point of genuine fresh milk lies between − 0·54° C. and − 0·57° C. The Dutch Government has fixed the maximum for the freezing point at not higher than 0·53° C. The author concludes with the statement, "the method of the freezing point of milk therefore deserves international acceptance."

J. GOLDING

C. PORCHER. Le Lait au point de vue colloïdal. Recherches sur le mécanisme de l'action de la présure. (Milk from a colloidal standpoint. Mechanism of action of rennet.) *Le Lait*, **9**, lxxxv, 449–74, May 1929; lxxxvi, 572–612, June 1929; lxxxvii, 681–711, July–August 1929; lxxxviii, 793–816, September–October 1929.

E. O. ANDERSON and R. L. PIERCE. Some chemical changes in frozen milk occurring in storage. *Milk Dealer*, **18**, xii, 60–1, September 1929.

Supplies of raw and sterilised skim milk in pint bottles were stored for a period of six months at both + 10° F. and − 14° F. At monthly intervals bottles were withdrawn for determination of the amino-nitrogen content, free ammonia content, and the amount of precipitate formed. Little of this precipitate (which is indefinitely described as "milk protein") is formed at the lower temperature, but there is much more at the higher, and it develops at first more rapidly in the raw milk. Both the amino-nitrogen and the free ammonia figures show little difference in the effect of different storage temperatures upon the same type of milk. The former are somewhat irregular, while the latter decrease during the first two months and then increase. The authors ascribe these changes to a "slight chemical reaction."

G. M. MOIR

K. HATTORI. Supplementary experiment on the hull substance of milk fat globules. *J. Phar. Soc. Japan*, **49**, 332–6, 1929. (*Chem. Abst.* **23**, xvii, 4277, September 10, 1929.)

Hattori previously succeeded in isolating the pure hull substance (I) of milk fat globules and called it haptein (*Chem. Abst.* **19**, 2380). It is a protein but differs from casein (II) especially in its solubility in dilute NaOH. To support his view the following experiment was made. II was precipitated from fresh milk by various methods, *i.e.* by AcOH, rennin, $HgCl_2$ + HCl alum, $CaCl_2$, $CuSO_4$ (Ritthausen's method) and by dialysis. The precipitate was separated by centrifugation. By simply mixing the precipitate with H_2O, fat globules separated from the precipitate. On examination under the ultra-microscope, these globules showed a normal shape and were free from the evidence of coagulation. After repeated washing with H_2O, fat was estimated in the washings as well as in the supernatant fluid of the first centrifugate. Except for a sample precipitated with $CuSO_4$, all others gave a quantitative yield of fat. If I were composed of II, or substances similar to II, it would have been impossible to separate it from the precipitate by simply mixing with H_2O, since the latter substances would undergo irreversible changes. This is additional evidence to support the view that I is a different substance from II, which is contrary to the view of others.

K. SCHARRER. Nature of iodine compounds in milk. *Pharm. Monatsch.* **10**, 118, 1929. (*Chem. Abst.* **23**, xvii, 4277, September 10, 1929.)

Except in certain experimental samples of milk, the conclusion is drawn that the iodine regularly present in milk is, in small part, only inorganic, the far greater portion being in organic combination with constituents of the serum. The proteins carry a smaller and varying quantity of iodine. Little or no iodine is normally carried in the fat.

F. G. KOHN. Ein Kriterium zur Unterscheidung von Kuhmilch und Ziegenmilch im Rahmen der Gerberschen Acidbutyrometrie. (Differentiation of cow's and goat's milk by Gerber's acidbutyrometry.) *Z. f. Fl. u. Milchhyg.* **39**, xv, 279–81, May 1, 1929.

The character of the casein precipitate after three inversions of the butyrometer tube is used as a means of differentiating between cow's and goat's milk. Cow's milk, even with 20 per cent. added water, gives a precipitate made up of large flocks, whereas goat's milk gives a precipitate of small spherical flocks of greater total volume than that from cow's milk. The test claims superiority over the usual test whereby the amount of precipitate insoluble in 12·5 per cent. ammonia is noted.

W. L. DAVIES

B. VAN DER BURG. Accuracy of fat estimation by Gerber's method. (Trans. title.) *Off. Org. Alg. Ned. Zuivelbond*, May 8, 1929.

The fat percentages of 85 samples of milk, with a fat content varying from 2·2 to 5·8, as determined by the Gerber, Smetham, Weibull and Röse-Gottlieb methods are dealt with statistically. In twelve of the milk samples the Gerber fat values were identical with the values by other methods, in 31 samples it was 0·005 to 0·025 per cent. higher, and in 24 samples 0·005 to 0·025 per cent. lower. Fourteen samples varied ± 0·030 to ± 0·050 per cent. and 4 samples ± 0·055 to ± 0·100 per cent. Generally, therefore, the Gerber gives slightly higher results than the other methods.

W. L. DAVIES

B. VAN DER BURG, D. C. DE WAAL and W. KEESTRA. La méthode Hoyberg pour la détermination de la matière grasse du lait. (Hoyberg method for the determination of fat in milk.) *Le Lait*, **9**, lxxxv, 558–61, May 1929.

The method has been tested out thoroughly on a large number of samples of mixed and individual milks and, by comparison with the Gerber method, has been found uniformly satisfactory. The method was also satisfactory for milk preserved with bichromate. The results for fresh cream were satisfactory. The elimination of the centrifuge, the ease of reading the fat column, the use of a slightly alkaline liquid and its general simplicity are points in favour of the method, but difficulty of obtaining a supply of the proprietary liquids does not favour world-wide use of the method. W. L. DAVIES

M. LACHENSCHMID. Das Milchuntersuchungsbesteck B und C nach Dr Schönborn-Prostken. (Apparatus for testing milk.) *Z. f. Fl. u. Milchhyg.* **39**, xxii, 429–31, August 15, 1929.

The apparatus contains in compact form what is required for applying the Storch test to determine whether or not milk has been heated. The reagents are supplied in tablet form, paraphenylenediamine, and a barium compound (probably barium peroxide). The author has carried out tests with milk heated for various times (2–60 min.) at different temperatures (60°–100° C.) and also with mixtures of raw and heated milk. Milk requires to be heated to 70° C. before it will react to the test. The unreliability of the test in several respects is shown, *e.g.* raw milk, milk heated for 30 min. at 65° C., and a mixture of equal parts of raw and boiled milk give practically the same bluish-black colour. G. M. MOIR

International Commission for the standardisation of methods of analysis and the international standardisation of condensed and dried milk, etc. *Le Lait*, **9**, lxxxiv, 410–16, April 1929.

In the conference of April 25, 1928, at Brussels the following reports were read and discussed:

1. The standardisation of condensed, evaporated, dried, etc., milk. (Prof. R. BURRI, Switzerland.)

2. Suggested modifications of the importation orders of some countries regarding condensed milk containing over 40 per cent. cane sugar. (Prof. ORLA-JENSEN, Denmark.)

3. Standardisation of the methods of analysis of condensed and evaporated milk. (J. G. BLINK, Holland.) W. L. DAVIES

F. HILLIG and B. G. HARTMANN. Microscopical identification of malted milk and its flavoured products. *J. Assoc. Off. Agric. Chem.* **12**, 238–40, 1929. (*Brit. Chem. Abst.* B, p. 658, August 16, 1929.)

The microscopical appearance of various preparations is described and illustrated by photomicrographs. In genuine malted milk, the malt extract solids and milk solids are incorporated into homogeneous irregular fragments having a stippled surface. These are readily recognisable even in admixture with cocoa, sugar, etc. Mechanical mixtures of spray-dried whole milk and spray-dried malt extract are easily distinguishable from the genuine product.

C. W. BALLARD. Determination of fat in malted milk powder. *J. Amer. Pharm. Assoc.* **18**, 122, 1929. (*Brit. Chem. Abst.* B, p. 374, May 10, 1929.)

To facilitate the manipulation of the sample the reservoir of the Röhrig tube is detachable. Otherwise, the modified Röse-Gottlieb method (*Methods of Analysis, Amer. Assoc. of Official Agric. Analysts*, pp. 262 and 275) is adhered to. W. L. DAVIES

O. Högl and H. Schellenberg. Butter with an abnormally high Polenske number. *Mitt. Lebensm. Hyg.* **20**, 37–41, 1929. (*Chem. Abst.* **23**, xiv, 3518, July 20, 1929.)

Samples of butter boiled over the free flame to a dark brown colour showed an average increase of 1·5 in the Polenske number. This effect occurred only after a direct boiling of the whole butter. There was no change in the Polenske number after heating the filtered fat from the butter. Other analytical characteristics were unaffected.

N. King. Über die Struktur der Butter. (The structure of butter.) *Milchw. Forsch.* **8**, iii–iv, 423–8, August 1929.

Evidence is presented that butter is made up of fat globules and water droplets (both protected by protein films) dispersed in unprotected fat, the latter being the continuous phase. Studies of the rate of diffusion of fat-soluble dyes in the fat phase as compared with the diffusion of common salt into the water droplets have borne this out.

The hydrophilic functions of the lipoids (*e.g.* lecithin) are also recognised.

W. L. Davies

P. S. Arup. The composition of Irish winter butter. *Analyst*, **54**, 644, pp. 634–44, November 1929.

The author, by analysis of genuine samples of butter fat from creameries in the Irish Free State during November 1927 to January 1928 and November 1928 to January 1929, found low values of Reichert-Meissl value (20·4) in December of each year, 16 per cent. of the samples in the first period and 32 per cent. in the second period having values below 24. Low values are attributed partly to the fact that December coincides with the end of the lactation period in nearly all the cows, and partly to the poor feeding and housing of the cows. The Reichert-Meissl value of the samples during the same periods from agricultural colleges, where cows had more evenly spaced periods of lactation, and also superior treatment, did not fall below 26. The author also shows that a negative value in the Avé-Lallemant test is not a criterion of genuineness for butter with Reichert-Meissl values which are abnormally low or, even, up to 25·5.

A. More

W. S. Sutton. A bottle test for determining certain butter defects. *Butter and Cheese J.* **20**, xxxiii, 32–4, August 1929.

This is a test for the quick detection of a "decomposed" or "unclean" odour in butter, a defect which sometimes develops quickly in a butter of satisfactory quality, and which cannot be correlated with count and types of organisms developed on nutrient agar.

The test consists in placing 30 g. in a sterile conical flask (200 c.c.), melting and agitating the butter at 45°–50° C., and incubating at room temperature (15°–20° C.) for 7 days. The butter is examined daily for odour against a control in a similar flask sterilised by holding at 100° C. for 20 minutes.

The test is claimed to amplify the results of the plate method, and to serve as a valuable check on the results of practical grading.

W. L. Davies

H. B. Davel. A study of the standardisation of acid in cream for butter-making under South African conditions. *Transvaal Univ. Coll. Bull.* **16**, July 1929.

A series of high acid creams varying from 0·8 to 0·5 per cent. acidity have been partially neutralised down to 0·25 per cent. acidity, pasteurised (145° F. for 30 minutes) and churned into butter. The quality of this butter, judged by flavour

and aroma, for storage periods up to six months was followed by the scoring method (storage temperature from 12° to 28° F.).

It is concluded that 0·5 per cent. acidity is the maximum acidity of cream compatible with good keeping quality in butter, and that higher acidities require partial neutralisation before pasteurising and churning. Pasteurisation of cream of 0·4 per cent. acidity yielded a better-keeping product than that from the same raw cream. Pasteurisation was observed to reduce acidity by roughly 0·05 per cent.

Milk of lime as neutraliser was found to give the best results, but bicarbonate of soda was easier to manipulate for acidity control. The latter caused greater butterfat losses in the buttermilk and often flavoured the butter, although lime, used to neutralise down to 0·25 per cent. acidity, also gave the butter a bitter limy flavour.

The importance of good cream grading is stressed. W. L. Davies

E. de Conno and E. Scopinaro. The presence of mixed glycerides in butter. *Ann. Chim. Appl.* **19**, 55–6, 1929. (*Chem. Abst.* **23**, xv, 3756, August 10, 1929.)

The authors have shown the presence of two mixed glycerides in butter, stearo-palmitin and palmitostearin, both solids. They have not been able, however, to confirm the presence of a liquid glyceride (butyro-palmito olein) as deduced by J. Bell and confirmed by Bleyt and Robertson.

D. Henville and W. M. Paulley. Dyes as an indication of adulteration in butter. *Analyst*, **54**, 640, p. 413, July 1929.

The testing of butter and margarine for prohibited colouring matters led to the discovery that the colouring matter of most margarine was extractable with dilute ammonia, whereas in genuine butter samples no colour was extracted. 10 ml. of fat were shaken with 10 ml. of petroleum spirit and 10 ml. of 3 per cent. ammonia solution. The appearance of a colour in the aqueous layer is an indication of possible adulteration with margarine when butter fat is tested. By this test, 10 per cent. added margarine is easily shown.

The dye in most margarines is extractable with $N/100$ sodium hydroxide solution to give a yellow solution not decolorised by dilute acid. W. L. Davies

B. C. van B. Walter. The Schmid Bondzynski-Ratzlaff method for the determination of fat in cheese. *Chem. Weekbl.* **26**, 164, 1929. (*Chem. Abst.* **23**, xii, 3030, June 20, 1929.)

This method is claimed to be more accurate than Smetham's method. Details of manipulation and results of control tests are given. W. L. Davies

R. H. Leitch. Black discolouration in cheese. *Scot. J. Agric.* **12**, iii, 308–10, July 1929.

Prof. Leitch has found that this defect is occurring with increasing frequency in coloured cheese both in England and Scotland and refers to his previous work (*Scot. J. Agric.* **10**, ii) in which he pointed out that the colour change was due to the presence of lead in the cheese, and that a common source of infection was in the cheese vat itself, the infective agent being lead paint which is used by the manufacturers to coat the walls of the inner jacket of the vat.

His most recent work has demonstrated a further source of infection, namely, the possibility of lead being present in annatto. He thinks that it is probable that "the batch of seed or paste from which the annatto had been prepared had originally an inferior colour, and to impart the bright chocolate-red colour which is characteristic of high class annatto seed the exporter had sophisticated it with red lead." Annatto manufacturers should, therefore, be on their guard when purchasing annatto seed or annatto paste to see that the raw material is pure and unadulterated.

R. Stenhouse Williams

C. La Rotonda. Influence of *p*H on the separation of casein by the action of electrolytes. *Ann. Chim. Appl.* **19**, vii, 310–28, 1929.

The amount of casein nitrogen precipitated from 100 c.c. of milk by different procedures has been investigated. The addition to 100 c.c. of milk of 75 c.c. of differently constituted buffer mixtures of the same initial *p*H did not bring the final *p*H to the same value. For example, MacIlvaine's citric acid-Na_2HPO_4 buffer (*p*H = 2·2), precipitated 0·304 g. N at *p*H 3·5, while Clark's KHphthalate-HCl buffer (*p*H 2·2) precipitated only 0·173 g. N at *p*H 4·7. MacIlvaine's mixtures of *p*H 3 and 4 both precipitated 0·301 g. N at *p*H 3·9 and 4·3 respectively.

The addition of 6 c.c. of different acids (normal strength) to 100 c.c. of milk coagulated distinctly different amounts of casein, and the following list gives the acids in the order in which they precipitated increasing amounts: lactic (5·0), acetic (4·9), tartaric (4·7), nitric (4·4), sulphuric (4·5), hydrochloric (4·4), oxalic (4·5). This order bears some relation to the final *p*H of the mixtures indicated by the figures in brackets. The results show that casein can be coagulated by acid at other reactions than its isoelectric point and that the effect is due to the nature of the acid used. Parallel experiments were carried out upon milk which had been heated (pasteurised and boiled). More protein nitrogen was coagulated from the heated milk, especially from the most heated portions, while at the same time the differences in these amounts due to the different buffer mixtures and acids used showed a tendency to diminish.

G. M. Moir

R. B. Gode, D. R. Bahdur and L. Sahasrabuddhe. Study of the chemistry of Indian buffalo milk casein. *J. Cent. Bur. Anim. Husb. and Dairying, India*, **3**, i, 10–16, April 1929; i, 33–42, July 1929.

Casein was prepared by Van Slyke's method from Indian buffalo milk and purified by dissolving in dilute ammonia, filtering through Pasteur candles and reprecipitating with acid. It has a slightly higher carbon and lower nitrogen content than English cow casein, but after complete hydrolysis with HCl the total amino nitrogen and the diamino acids were nearly the same in both types. The buffalo casein yielded hydrolytic products with much less amide nitrogen than the cow casein, and enzymes (pepsin and trypsin) digested the former to only about half the extent to which they did the latter, on the basis of the percentage of amino-nitrogen liberated.

G. M. Moir

W. L. Davies. The testing of casein for industrial purposes. *Indus. Chem.* **5**, lii, 202–4, May 1929.

An account is given of the methods of analysis of technical casein with respect to the various uses to which the material is applied, and attention is drawn to the defects caused by various amounts of impurities in the casein. Tables of analyses and various standard specifications are included.

W. L. Davies

E. Eberhard. Der Milchzucker. (Lactose.) *Milchw. Zbl.* **58**, xiv, 245–9, July 31, 1929.

The nutritive value of lactose and the possibilities of its inclusion in the diet of infants (humanised cow's milk) are discussed. The testing of industrial lactose for use as food and specifications are given in detail, together with some chemical properties of this constituent. An index of German scientific publications dealing with lactose is given.

W. L. Davies

BIOCHEMISTRY (VITAMINS)

L. A. MAYNARD and C. M. MCCAY. The influence of a low fat diet upon fat metabolism during lactation. *J. Nutrition*, **2**, i, 67–81, September 1929.

It has been shown that, with a low fat diet, carbohydrate can be utilised as a source of fat in the milk. The authors of the present paper attempted to determine whether the substitution of carbohydrate for fat as a source of milk fat has any influence on the quantity or quality of the milk secreted.

Four cows were fed for alternate periods on a typical dairy ration and on the same ration from which most of the fat had been removed by benzine, the extracted fat being replaced by an isodynamically equivalent amount of starch. The ration for each cow was adequate for her weight and production.

On the low fat ration a marked decrease in the volume of milk secreted was obtained, but with no significant alteration in the fat content.

The fatty acids and cholesterol in the blood dropped sharply when the cows were put on to the low fat ration, returning to their previous normal values during the normal ration periods.

The iodine value of the milk fat was lower during the periods on the low fat ration, indicating a distinct change in the character of the fat secreted. It is claimed that this decrease in the iodine number indicates that the cows were using the carbohydrates of the ration, rather than their own body fat, to supply the milk fat.

Investigations are being continued partly with the object of determining the most suitable level of fat intake for maximum milk production. C. S. MILES

C. A. ELVEHJEM, H. STEENBOCK and E. B. HART. The effect of diet on the copper content of milk. *J. Biol. Chem.* **83**, i, 27–34, July 1929.

Previous work by the authors had demonstrated the importance of Cu as a supplement to Fe in the prevention of anaemia in rats kept on a diet of whole cow's milk, and led to a study of the Cu content of the milk of cows and goats, and the possibility of varying it by the addition of copper to their diet.

The normal intake of Cu in the case of three Holstein cows and two goats was determined, and Cu in the form of $CuSO_4 5H_2O$ equivalent to five times this amount in the case of the cows, and ten- and five-fold respectively in the case of goats was added to their ration. The experiments were continued for periods of 4 weeks, analyses being made on 250 c.c. samples.

The authors found that the average Cu content of milk produced by cows on a normal diet was about 0·15 mg. per litre, which was much lower than that reported by previous workers. They ascribe the higher values to Cu contamination during the process of analysis, especially from the dishes used for the ignition of the milk.

The experimental figures definitely demonstrated that the Cu content of milk could not be influenced by increasing the Cu intake within reasonable limits in the case of either cows or goats.

Examination of the milk of cows from 13 herds in different States showed only slight differences in the Cu content. E. C. V. MATTICK

P. LAVIALLE. The antiscorbutic factor. Its relations to the drying process. *Bull. sci. pharmacol.* **36**, 129–33, 1929. (*Chem. Abst.* **23**, xii, 3010, June 20, 1929.)

Adult dogs were fed with a meal prepared from biscuit powder and milk by evaporation at low temperature. The additional food was over-heated for a time. During 18 months no symptoms of scurvy appeared. A young dog, subjected to the test after weaning, developed scurvy after 6 months.

E. B. HART, *et al.* Dietary factors influencing calcium assimilation. XI. The influence of cod-liver oil upon the calcium metabolism of milking cows. XII. A study of the influence of hays cured with varying exposure to sunlight on the calcium metabolism of milking cows. *J. Biol. Chem.* **84**, i, 359–65, October 1929.

I. In the first of the above papers metabolism experiments on two cows in early lactation are reported. It is shown that the daily administration of half a pound of cod-liver oil had no influence in improving the negative calcium balance, which had been observed in the case of a third cow which received no cod-liver oil.

In order to accustom the animals to cod-liver oil administration, it had been given to them for more than a year before the experiments started.

The rations fed gave a calcium oxide intake of 1514 to 1628 g. per week and a P_2O_5 intake of 1250 g. per animal per week or a calcium phosphorus ratio of 1 : 0·49.

The potency of the cod-liver oil in vitamin D was tested by feeding it to four chicks, and by the subsequent determination of the ash in their tibiae and also by the silver nitrate test.

In order to solve the problem, whether the cod-liver oil and vitamin D had been absorbed from the intestinal tract, the authors attempted a biological assay of the ether extract of the faeces of each cow, using chicks fed with the rachitic diet.

The authors consider that two or three chicks are a sufficient number of animals for such an assay. From the results obtained with two chicks, in comparison with three chicks fed on the extract of the faeces from the two cows receiving cod-liver oil (average ash in tibiae 43 and 45 per cent.), three chicks fed on the ether extract of the control cows' faeces (ash in tibiae 35 per cent.), and with six chicks on basal ration only (ash in tibiae 35 per cent.), the authors make the following statement in their summary: "Vitamin D in the cod-liver oil was poorly, if at all, absorbed from the intestinal tract."

[No reference to the influence of cod-liver oil in depressing the percentage of the fat in the milk of the cows, or in increasing the vitamin D content of the milk fat is made.]

II. The second paper records the results of metabolism experiments on cows, in which different samples of alfalfa hay cured in Colorado were compared with alfalfa hay cured under the best sunning conditions in Wisconsin. None of these fed at a level of 10 lb. per day was able to maintain calcium equilibrium in a liberally milking cow.

It is claimed that the addition of 5 per cent. of any one of these types of hay to a rachitic rat ration gave it antirachitic properties. J. GOLDING

E. J. THERIAULT and C. T. BUTTERFIELD. I. Apparatus and technique for the study of biochemical and other oxidations in liquids. *Pub. Health Rep.* **44**, xxxviii, 2256–67, September 20, 1929.

This paper describes a procedure for the study of air oxidations in liquid media of high food concentration, from the point of view of stream pollution and microbial respiration. The apparatus is fully described, and details of the procedure for the withdrawal of samples and the maintenance of an adequate oxygen tension and the determination of the dissolved oxygen are given. The Winkles method (alkaline manganous sulphate and iodide followed by acidification and titration with thiosulphate) is used for the last; this has been modified for use in the presence of high concentrations of organic matter. J. G. DAVIS

M. Miura. The vitamin C content of commercially pasteurised milk. Antiscorbutic potency of raw cow milk and the effects of heating. *Bull. Inst. Phys. Chem. Res. Japan*, **8**, 502–5, 1929. (*Chem. Abst.* **23**, xix, 4724, October 10, 1929.)

Autoclaved milk, as used in scorbutic basal rations, contains vitamin C, sometimes in non-negligible quantities. Feeding experiments show that 40 c.c. of milk so treated supplies about one-half of the daily antiscorbutic requirement for guinea-pigs. Commercially pasteurised milk contains vitamin C in larger amounts than does autoclaved milk. Raw milk contains still more of that vitamin.

A. L. Daniels, D. Jordan and M. K. Hutton. The development of the suckling young of milk-fed rats. *J. Nutrition*, **2**, i, 19–29, September 1929.

The authors have attempted to determine whether the high mortality of the suckling young of milk-fed rats is due to a deficiency of the antineuritic vitamin. Stock-fed rats were put upon the milk diets just previous to, or just following, parturition. A number of different types of milk were tried, including raw and heated milk and superheated milk, such as dried milk, etc., in some of which considerable destruction of the antineuritic vitamin was known to have occurred. Various materials rich in this factor were added to the milk diet, in some cases as controls. The efficiency of the food was judged (1) by the average gain per rat per week between the 4th and 22nd day, and (2) by the percentage of weight gain or loss in the mother during the lactation period.

The results were not altogether conclusive, but offer little support to the view that the poor growth of the suckling young of some milk-fed rats is due to a deficiency of the antineuritic vitamin. It is suggested that this sub-normal growth may rather be due to an inability of the rat to ingest enough milk to meet its calorie requirements or to a general distaste for the food so that too little is eaten.

C. S. Miles

A. L. Daniels, M. L. Giddings and D. Jordan. The effect of heat on the antirachitic vitamin of milk. *J. Nutrition*, **1**, v, 455–66, May 1929.

The effect of the heat treatment on the "antineuritic vitamin" content of various forms of heat-treated milk has been investigated by studying the behaviour of suckling rats whose mothers were receiving high protein diets according to the method of Hartwell (*Biochem. J.* **19**, 226, 1925), the particular milk or milk preparation in question being substituted for the evaporated milk in the Hartwell ration.

The milk investigated included evaporated milk, milk dried by the spray and by the roller process, a desiccated albumen milk, boiled milk and milk pasteurised both by the open and closed methods.

The authors conclude from their investigations that there is evidence of considerable destruction of the vitamin in all superheated milk, with the exception of milk dried by the roller process; that in milk pasteurised by the open method there is some destruction, and that milk boiled quickly and cooled slowly is somewhat affected. Milk boiled quickly and cooled quickly is, on the other hand, little if at all affected, while milk pasteurised by the closed method gives no evidence of the destruction of this vitamin. They suggest that, from the results, it would appear that temperature and aeration are important factors.

C. S. Miles

R. Stenhouse Williams and E. C. V. Mattick. Raw milk, its possible importance to the health of the nation. Paper read at Certified and Grade A (T.T.) Milk Producers' Conference, April 17, 1929. *Dairyman*, **51**, ix, 493, May 1929.

The authors demonstrate by means of tables the great advances that have been made in England in the methods of handling milk.

The increase in the number of Clean Milk Competitions, and in the number of licensed farms has coincided with the development of the National Institute for Research in Dairying and, although the authors "do not claim for one instant" that this is entirely due to the work of the Institute, it is evident that the studies made and published have had no small share in this development.

The paper quotes published work on the comparative greater gain in weight of infants fed on certified milk, as compared with those fed on pasteurised milk.

Original work by one of the authors shows the effect of heating milk to various temperatures on the coagulation of the milk by rennet, and on the reduction of the diffusible calcium in milk heated to temperatures even as low as 125° F.

The need for further serious study of the true food value of raw milk is emphasised.

J. GOLDING

M. L. CLARK. Milk consumption and the growth of school children. *Lancet*, p. 1270, June 15, 1929.

The average increase in height was 0·277 in. and in weight 0·304 lb. in 7 months above the control children who did not get the extra milk. Increased liveliness and alertness and physical improvement were noted. This work was carried out on children living in the country and the figures correspond very closely with experiments in towns.

C. MADDOCK

W. E. KRAUSS. Studies in the nutritive value of milk. *J. Dairy Sci.* **12**, iii, 242–51, May 1929.

Rats fed exclusively on a whole milk diet become anaemic. The author has attempted to overcome this disease by the addition of copper and iron to the milk.

Ferrous sulphate, ferric citrate, ferric chloride and colloidal ferric oxide did not prove effective in preventing anaemia, even when 0·8 mg. (twice the recognised minimum requirement) were fed daily. The addition of a small amount of copper (0·16 mg. daily) as copper sulphate was quite effective. The addition of both copper and iron proved highly effective in preventing nutritional anaemia in rats.

A. H. BLISSETT

R. B. H. MURRAY. Live stock diseases associated with calcium deficiency. *New Zealand J. Agric.* **39**, i, 35–7, July 1929.

In a short article the author describes very concisely the various diseases of livestock which are generally attributed to a shortage of lime in the diet and, although not suggesting that calcium is a cure for all ills, maintains that a greater use of lime in the rations of livestock would cause general improvement. There is an excellent list of references.

A. H. BLISSETT

K. H. COWARD. Variations in amounts of the antirachitic vitamin in different samples of cod-liver oil, milk, and butter. *Quart. J. Pharm.* **1**, 534–8, 1928. (*Analyst*, **54**, 638, p. 302, May 1929.)

The amount of activity contained in 0·0001 mg. of a standard preparation of irradiated ergosterol is adopted as a unit of antirachitic activity in the biological assay of various samples by the method previously described by the author. Some samples of milk and butter examined by this method were almost entirely lacking in vitamin D. Two samples of high priced butter showed 0·8 to 1·0 unit per g. Four selected samples of cod-liver oil contained 50 to 150 units per g.

J. GOLDING

H. C. Sherman and H. K. Stiebling. Quantitative studies of responses to different intakes of vitamin D. *J. Biol. Chem.* **83**, iii, 497–504, September 1929.

The large numbers of experiments briefly reported in this paper afford extensive and convincing evidence in confirmation of the fact that cows' milk, as ordinarily produced (in America), contains important amounts of vitamin D.

Details of technique employed in these experiments are described and confirmed in different ways. J. Golding

E. A. Pope. Report on the nutritive values of meat meals. *New Zealand Dep. Sci. Ind. Res. Bull.* **12**, 1929.

A number of New Zealand meat meals have been analysed and tested biologically for the value of their protein concentrates by feeding to rats. They were also tested for vitamins and were found to be lacking in vitamin B.

Comparisons of the products of the dry and the wet processes of manufacture were also made by a series of similar investigations. The important point, as far as the nutritive value of the meals is concerned, depended on the nature and proportions of the raw materials and not on the methods of manufacture employed.

The meat meals are designed for pig feeding, and the reasons for selecting rats as experimental animals are set forth in the introduction to the report. J. Golding

P. Henriksen. Possible dangers of cod-liver oil. *Acta Paediat.*, June 12, 1929. (*Brit. Med. J.* pp. 354–5, August 24, 1929.)

The continued use of cod-liver oil, in doses of even such small daily amounts as 1/7 c.c. of cod-liver oil per kg. of body weight, was correlated with the morphological changes observed in the cardiac muscle. The author, after an extensive survey of the results on the body cells of vitamin A, comes to the conclusion that general cell degeneration throughout the body may be produced by large doses.

C. W. Herlitz, I. Jundell and F. Wahlgren in another paper in the same journal (*Acta Paed.*) attribute the harm done, more especially to the heart, to the antirachitic substance; they feel that the public should be warned about the danger attending the indiscriminate use of cod-liver oil and also of various forms of irradiated milk. J. Golding

O. T. Cutler. Antigenic properties of evaporated milk. *J. Amer. Med. Assoc.* **92**, 964, 1929. (*Chem. Abst.* **23**, xiv, 3517, July 20, 1929.)

The heating of cow milk in the preparation of evaporated milk does not change the antigenic capacity of the casein as determined by anaphylactic reactions. There is an alteration of whey protein during such heating, as is shown in the change in specificity whereby heated whey proteins are less reactive in animals sensitised with raw or pasteurised milk, or with antibodies, against pasteurised milk.

R. B. Bourdillon, C. Fischermann, R. G. C. Jenkins and T. A. Webster. Absorption spectrum of vitamin D. *Proc. Roy. Soc.* B, **104**, 561–83, 1929. (*Chem. Abst.* **23**, xvi, 3956, August 20, 1929.)

Three substances or groups of substances are formed in succession by the action of ultra-violet radiation on ergosterol. The first possesses great antirachitic power. The second and third product have no antirachitic power.

The purest preparations studied contain over 50 per cent. of vitamin D. Absorption spectra of the products were also studied. J. Golding

M. S. Rose. What place have aluminium, copper, manganese and zinc in normal nutrition? *J. Nutrition*, **1**, vi, 541–54, July 1929.

This is an editorial review and bibliography of the latest work on this interesting subject. Several references are made to milk.

J. Golding

A. Anderson and E. Nightingale. Test for vitamin A in margarine, butter and other fatty foods. *J. Soc. Chem. Indus.* **48**, xxiv, 139 T., June 14, 1929.

From a series of tests, instituted by the Accessory Food Factors Committee, it was concluded that the colorimetric method for the assay of vitamin A in cod-liver oil was consistent and comparable with biological findings.

The authors of this paper point out, however, that some modification of the usual technique is necessary when dealing with such materials as butter, margarine, etc., owing to the fact that these are not such potent sources of vitamin A, and also because artificial or natural colouring matter tends to upset the test.

Details of the technique which they propose are given. Briefly it entails the saponification of 10 g. of the sample, the removal of the unsaponifiable matter with ether and its decolorisation with "Norite" charcoal. The ether is allowed to evaporate, and the unsaponifiable matter is taken up in chloroform before proceeding with the colour test. It is necessary that the test itself shall be carried out as quickly as possible, and as the colour produced is not sufficiently stable to measure with the tintometer, a dilution method is used. The "dilution" figure is the amount of chloroform necessary to dissolve the unsaponifiable matter from 1 g. of the sample so that 1 c.c. of this dilution gives a just perceptible blue colour with 1 c.c. of the antimonious chloride reagent.

The authors claim that this technique has proved satisfactory as a comparative method over a large number of tests, and it has also been extended to other foodstuffs.

C. S. Miles

H. R. Kenwood. Cows' milk and the national health. *J. State Med.* **37**, ix, 512–16, September 1929.

This paper is based on the work of Corry Mann (*Med. Res. Council, Special Report Series*, No. 105, 1926) who demonstrated the great value of the addition of milk to the diet of children of school age, and that of Orr, and Leighton and Clark (*Lancet*, p. 202, January 28, 1928; pp. 40–43, January 5, 1929) who carried out somewhat similar experiments upon children in Scotland. The author then points out the value of the work of the National Milk Publicity Council in applying the knowledge that has been gained to the school children in England. He states that the work of this Council is now spread widely over the country, and refers to the fact that, in Birmingham alone during the year 1928, over 3,500,000 bottles of milk were supplied to children in the schools as a result of its efforts.

R. Stenhouse Williams

I. G. Macy and J. Outhouse. The vitamin content of milk used in infant feeding. *Amer. J. Dis. Children*, **37**, 379–400, 1929. (*Bull. Hyg.* **4**, vi, 467, June 1929.)

The importance of vitamins in infant feeding cannot be over-emphasised, since, while infant dietaries are very prone to be inadequate in these essential factors, a close correlation has been shown to exist between vitamin under-feeding and a series of ill-defined symptoms such as lowered growth rate, gastro-intestinal disturbances of various types and susceptibility to infection. The authors have continued their comparative studies on the vitamin content of raw untreated human milk and cow's milk. It has been found that average human milk contains approximately the same amount of vitamin A, but only half as much vitamin B as is found

in cow's milk. Human milk would appear to be deficient in the antirachitic factor, whereas cow's milk contains a small amount. It must be remembered, however, that the chances of vitamin loss in cow's milk are relatively great, dilution, oxidation, boiling, ageing, all tending to lower the vitamin content. Further, it seems probable that certain of the vitamins are not so completely utilised when presented to the child in the medium of cow's milk. Emphasis is laid on the definite influence of prenatal care and diet on the postnatal development of the child, and it is concluded that "the adherence of women throughout pregnancy and lactation to dietaries rich in fruit, vegetables, dairy products, glandular tissues and the like, together with the early presentation of vitamin-carrying foods to the infant, serve as the most potent factors in the production of the nutritionally stable child."

A. G. DE SANCTIS, L. O. ASHTON and O. L. STRINGFIELD. Study of the antirachitic value of irradiated powdered whole milk. *Arch. Ped.* **46**, 297–31, 1929. (*Chem. Abst.* **23**, xvi, 3956, August 20, 1929.)

A group of thirty infants was fed 100 per cent. irradiated powdered whole milk for a period of several months without the use of any other antirachitic agent. The infants apparently thrived as well as those fed on mixtures prepared from liquid cow milk; secondary anaemia did not develop; twenty-four of the infants were wholly protected from rickets; five were protected clinically but the X-ray revealed dietary disturbances in the epiphyses of their long bones; one was not protected. When a small group of babies was fed 25 per cent. irradiated powdered milk, rickets developed in 50 per cent. of the subjects. To be antirachitic, powdered whole milk must be 100 per cent. irradiated.

Irradiated milk as a cure for rickets. *Brit. J. Bio-physics.* (*Vet. Record*, **9**, xxxviii, 822, September 21, 1929.)

L. BUSSE. Höhensonnenmilch "Original Hanau," ultraviolettbestrahlt nach Dr Scholl. (Irradiated milk.) *Z. f. Fl. u. Milchhyg.* **39**, xx, 389–92, July 15, 1929.

Commencing with a short summary of the progress made in Germany since 1919, in treating rachitic cases or preventing rickets by ultra-violet irradiation, the author proceeds to discuss the irradiation of milk as a cure for and a guard against rickets. To counteract the development of an objectionable taste and smell in the milk through irradiation in contact with air, the irradiation of the milk saturated with, and in an atmosphere of, carbon dioxide (in Dr Scholl's special apparatus) is described, whereby it is claimed that the taste is not interfered with when the milk is intensively irradiated. Exclusion of atmospheric oxygen also prevents partial destruction of vitamins B and C. Such milk, tested on rachitic cases at the Frankfort University Children's Clinic, afforded positive evidence of healing in most cases in from 5 to 8 weeks with quantities of from 300 to 500 c.c. per patient per day.

The use of such irradiated milk for the prevention (prophylaxis) of rickets is considered to be the greatest advancement arising out of irradiation. The author advocates the consumption of the treated milk by the expectant mother and by infants up to 6 years of age. The general increase of power of resistance to infection and illnesses conferred on adults by consumption of such milk is discussed.

W. L. DAVIES

C. B. VAN NIEL, A. J. KLUYVER and H. G. DERX. Über das Butteraroma. *Biochem. Z.* **210**, i–iii, 234–51, July 1929.

The aroma of butter is parallel with its acetylmethylcarbinol content. *Streptococcus cremoris*, *S. citrovorus* and *S. paracitrovorus* which produce the aroma, all

produce the carbinol. Further investigation of the character of the aroma-producing constituent showed that it was diacetyl which was responsible, since the pure carbinol possessed only a faint butter aroma. The carbinol is slowly oxidised to diacetyl in the presence of atmospheric oxygen.

Biochemical investigations of a variety of organisms are described with a view to studying the conditions necessary for the formation of the aroma during cream ripening, and the explanation that micro-organisms bring about the oxidation of the carbinol to diacetyl is offered. The practical significance of these conditions for butter and margarine manufacture is discussed. A good review of the literature on this subject is given.

W. L. Davies

O. Rahn. Why does butter keep? *Butter and Cheese J.* **20**, xli, 40–1, 68, October 1929.

Rahn's theory of the structure of butter, namely, that the dispersed water droplets ($1–2 \times 10^{10}$ per g.) are connected by a water film, and that very few (about 1 per cent.) of these droplets are populated by bacteria, is applied to describe the very low bacterial action in the body of butter. Bacteria cannot migrate from one droplet to another, whereas moulds are physically capable of such penetration. The larger water droplets, formed by the wash water, will contain a few bacteria, but their food supply will be limited owing to the dilution of food ingredients by washing. Wash water must be safe to prevent infection with harmful organisms. Pasteurisation of cream still further lowers the number of droplets populated by organisms, and churning pasteurised sweet cream does away with the catalytic effect of lactic acid in bringing about the chemical deterioration of butterfat.

W. L. Davies

G. F. V. Morgan. Mottling in coloured cheese. *New Zealand J. Agric.* **38**, iv, 259–60, April 1929.

The author has described a form of mottling in Cheddar cheese apparently due to expression of white fatty whey from the curd when in press. This fault may result in the initiation of putrefaction in the affected areas, due to the localisation of albumen and lactose.

J. G. Davis

R. P. Myers. The germicidal properties of alkaline washing solutions, with special reference to the influence of hydroxyl-ion concentration, buffer index and osmotic pressure. *J. Agric. Res.* **38**, x, 521–63, May 15, 1929.

This paper details work which was carried out in order to ascertain (1) the extent of variation in germicidal action of different commercial washing powders, (2) the extent to which alkali washing solutions depend on hydroxyl-ion concentration for their germicidal action, and (3) the nature of some of the other important factors which influence germicidal action, and the means by which they may be measured.

The powders which gave high *p*H values (*i.e.* highly alkaline) were found to be distinctly more effective than those with low *p*H values: the effectiveness of the latter could be increased by the addition of NaOH. Decrease in efficiency as a result of dilution appeared to be correlated with decrease in hydroxyl-ion concentration. It should be noted that these facts do not hold for solutions containing hypochlorite, which are more effective in neutral than in alkaline solution.

Experiments were carried out to determine the relative effects of hydroxyl-ion concentration, buffer index (titratable acidity measured over a given *p*H difference), and osmotic pressure in relation to germicidal action. By keeping any two of these factors constant, the efficiency of the third could be measured. It was found that increase in any one of the three factors improved the germicidal activity; the most

effective action was obtained with solutions having a high *p*H and a high buffer index. (These would normally be accompanied by a high osmotic pressure.)

The author states that, in practice, a solution with a *p*H of at least 12 and a buffer index of at least 10, when maintained at 60° C. for 5 minutes, insures the destruction of all pathogenic organisms and provides a good margin of safety. A tentative method of measuring the approximate *p*H and buffer index is described, with a view to its application under commercial conditions. N. C. WRIGHT

C. RICHET and L. BRAUMANN. Action accélérante des sels à dose très faible sur le fermentation lactique. (Accelerating action of salts in small doses in lactic fermentation.) *C.R. Acad. Sci.* **188**, p. 1198, 1929. (*Bull. Inst. Pasteur*, **27**, XV, 680, August 15, 1929.)

Metallic salts can, in very small concentrations, stimulate a lactic acid fermentation. The authors have measured the effect of lanthanum salts on acid production; 10^{-8} g. per litre of lanthanum sulphate increases the acidity by 33 per cent. Such phenomena are common to other fermentations. J. G. DAVIS

O. RAHN. The decreasing rate of fermentation. *J. Bact.* **18**, iii, 207–26, September 1929.

The author has investigated the factors responsible for the gradual inhibition of alcoholic and lactic fermentations.

A formula for the "fermentation constant" is deduced, which gives a measure of the retardation of a fermentation by its own product.

$$Kt = \log_e \frac{2L}{2L - x},$$

where L = limiting concentration of alcohol,

x = amount of sugar decomposed,

t = time,

K = constant for the experiment.

A linear relationship exists between the rate of fermentation and the amount of fermentation product added to the culture in both alcoholic and lactic fermentations. J. G. DAVIS

H. v. EULER and E. BRUNIUS. Über die Geschwindigkeit der Oxydation des Hydrochinons durch Sauerstoff. (The velocity of oxidation of hydroquinone by oxygen.) *Z. Phys. Chem.* 1928. Haber Band.

In a study of the oxidation-reduction potential of the system quinone-hydroquinone and the effect of varying *p*H on this equilibrium, the ionic condition was governed by the concentration of the doubly charged hydroquinone anion $^{-}O.C_6H_4O^{-}$. (Case: $Ox + 2e = \text{Red}^{--}$). In alkaline solution the velocity of oxidation (*p*H 7·08–8·16) was found proportional to the concentration of this ion (also proportional to the square of the hydroxyl-ion concentration). The oxidation velocity also varied directly with oxygen pressure.

From measurements of the reaction velocity and from the known dissociation constants of hydroquinone, the specific reaction velocity due to the hydroquinone anion in oxygen saturated solution was calculated.

For the quinhydrone electrode, the formula

$$E_h = 0{\cdot}454 - 0{\cdot}0583\ p\text{H} - 0{\cdot}02915 \log [\text{hydroquinone}]/[\text{quinone}]$$

was accurate for roughly 20 per cent. on each side of that for the quinhydrone

(50 per cent. quinone, 50 per cent. hydroquinone) mixture (that is, for from 30 to 70 per cent. oxidation of hydroquinone).

In alkaline solution, cyanide had no effect on the velocity of oxidation.

W. L. DAVIES

D. OKUYAMA. Studies of tyrosinase. I. Oxidation and reduction potentials of the tyrosinase system. *J. Biochem. Japan*, **10**, 463–79, 1929. (*Chem. Abst.* **23**, xvii, 4236, September 10, 1929.)

With *p*-cresol and glycine under anaerobic conditions, tyrosinase gives a high reduction potential. Tyrosinase does not increase the reduction potential of tyrosine even in the presence of glycine, but that of catechol and hydroquinone (but not resorcinol) is increased by tyrosinase in the presence of glycine. W. L. DAVIES

P. A. LEVENE and L. W. BASS. Studies on racemisation. VIII. The action of alkali on proteins (racemisation and hydrolysis). *J. Biol. Chem.* **82**, i, 171, April 1929.

This paper reports a continuation of the authors' earlier experiments. The authors conclude that the progress of racemisation and of hydrolysis of the four proteins albumin, casein, edestin and fibrin under the influence of alkali of varying concentration, offers no evidence in favour of the theory of the keto-piperazine structure of the protein molecule. The behaviour of gelatine is somewhat different from that of the other proteins. G. M. MOIR

PHYSIOLOGY

C. E. HAYDEN. Sugar, guanidine and cholesterol in the blood of the cow in milk fever. *Cornell Vet.* **19**, iii, 285–95, July 1929.

The author estimated the sugar, guanidine and cholesterol in the blood of cows suffering from milk fever.

From his results he maintains that milk fever presents a hyperglycaemia as measured by samples of blood taken before inflation of the udder; he could find no evidence of an accumulation of toxic guanidine compounds, or of a hypocholesterinemia as a contributory cause of milk fever. E. C. V. MATTICK

P. A. FISH. The physiology of milk fever. III. The blood phosphates and calcium. *Cornell Vet.* **19**, ii, 147–60, April 1929.

While the level of the blood Ca in milking cows is identical with that in dry cows, the author finds that the inorganic phosphate in the blood of the former is lower than in that of the latter.

In eighteen cases of milk fever the blood Ca was found to be sub-normal, confirming the earlier work of Little and Wright. But the inorganic phosphate was also found to be low, comparative figures being: for dry cows 6·25, for milking cows 4·65, and for cows with milk fever 2·28 mg. of inorganic phosphate per 100 c.c.

The author claims that, whereas there is a close correlation between recovery from milk fever and the return of inorganic phosphate to normal, the Ca content of the blood may remain sub-normal. He therefore suggests that phosphate metabolism may be of more importance than Ca metabolism in the aetiology of the disease.

The hypothesis that a functional disturbance of the parathyroid glands exists in milk fever is negatived by the low inorganic phosphate content of the blood, since

parathyroidectomy, while decreasing blood Ca, causes an *increase* in the inorganic phosphate.

The relation of these facts to the observed hyperglycaemia in milk fever is discussed in the light of recent work on the function of hexose phosphate in muscle.

N. C. WRIGHT

DAIRY HUSBANDRY

T. SHAW. A grassland dairy small-holding. *J. Min. Agric.* **36**, viii, 713–25, November 1929.

This article describes the equipment of a small-holding of 25 acres, all under pasture, for milk production, and the method of management and the financial outlay and returns for the first year of operation, under a system of heavy manuring with quick-acting nitrogenous manures and intensive stocking with dairy cows.

The holding was divided into eight grazing paddocks, approximately 2 acres in each, and a meadow of 10 acres for hay. A complete manurial dressing of 30 cwt. of limestone, 4 cwt. basic slag, 2 cwt. superphosphate and 3 cwt. potash salts (20 per cent.) per acre was applied in the autumn of 1927 and, in April and May 1928, the eight paddocks were top dressed with 2 cwt. nitro-chalk per acre in a sequence that allowed a week's interval between the applications to the respective paddocks. Normally such applications would be applied earlier in the year, but circumstances associated with the erection of a cowshed and other matters of equipment made late application desirable on this occasion.

The livestock maintained comprised in all fourteen cows, one bull and two horses and, in addition, 24 tons of hay were produced for winter keep.

Close grazing was practised throughout the summer, and a system was devised whereby it was considered that the fullest use was made of the young growth of grass. The cows were allowed into a fresh paddock for only 1 hour after each milking, and after this hour they were turned into a paddock which had already been partially grazed. In this way a paddock was made to give 5 to 6 days' fresh clean grazing and an even sward was maintained; no following stock were needed.

After each grazing the droppings were spread by harrowing, and a further application of quick-acting nitrogenous manure was applied at the rate of 1 cwt. per acre, if climatic conditions were favourable. Sulphate of ammonia was applied in spring and autumn, but nitro-chalk was preferred for the summer top dressings.

The cows were milked three times daily during the summer, and this procedure was continued with the best cows during the winter; the total output of milk was 10,668 gallons or 426 gallons per acre over the holding. During the summer, cows yielding over 3 gallons daily received 4 lb. concentrates for each gallon over the third, and during winter a maintenance ration of hay was given with 3½ to 4 lb. concentrates for each gallon of milk. For two periods of about 6 and 8 weeks respectively during the summer the cows were divided into two groups; one group received a concentrate supplement containing 12 per cent. protein, and the other group one containing 22 per cent. protein, and the milk yields of the two groups remained very similar.

The labour requirements of the holding were met by one man (full time) and one boy (part time). The milk was sold at 1*s.* 2*d.* per gallon net during the summer and 1*s.* 6*d.* per gallon net during the winter. The balance sheet included in this report is admittedly incomplete in certain details, but the figures showed that after allocating a sum of £163. 2*s.* 3*d.* for wages, there remained a net profit of £121. 7*s.* 11*d.*

[The accounts for one year cannot give a complete picture of the financial possibilities of a small-holding working on this system; further, the prices received for

the milk are above the average for the country; a decrease of 2*d.* per gallon throughout the year would lessen the net profit by £78. 18*s.* 2*d.* The climatic conditions play so important a part in this type of farming that a rainfall record, month by month, would be a helpful addition to the next report on this grassland dairy small-holding.]

J. MACKINTOSH

J. E. F. JENKS. Some economic aspects of New Zealand dairy farming. *Scot. J. Agric.* **12**, iv, 376–82, October 1929.

The writer points out that the system of dairy farming that has been evolved depends for its success upon:

(*a*) Maximum utilisation of permanent pasture, which is stimulated by frequent application of artificial manures, and of the long grazing season which the equable climate permits.

(*b*) Exploitation of the reproductive capacity of the cow, so that the period of maximum milk secretion is timed to coincide with the period of maximum grass production.

(*c*) Improvement of the herds by milk recording and fat testing.

(*d*) Intensive use of machinery in order to obtain comparative independence of hired labour.

(*e*) A factory system which enables the farmer to give the whole of his energies to milk production.

From recent statistics the writer deduces that the average size of a typical New Zealand dairy farm is 200 acres, of which only 12 are cultivated. This area maintains nearly sixty cattle (twenty not milking) and about eighty other stock, chiefly sheep and pigs, and the total labour employed, including the farmer and his family, averages male 1·6, female 0·6. Although the gross annual receipts average £673 from such a farm, interest on capital and other outgoings absorb so much that there remain only £133 per annum as actual remuneration for the above labour employed. These figures are confirmed in essentials by comparison with the survey made by Fawcett (*New Zealand J. Agric.* August and October 1927) of the farms in the typical dairying district of Raglan.

The writer goes on to compare his average figures with those given by Fawcett for the Piako district, where intensive dairy farming is carried out upon land of very high fertility.

The comparison shows that even after allowing for increased outgoings (interest charges), due to the high market value of such land, it provides a very much better return for the labour required.

G. M. MOIR

E. J. FAWCETT and W. N. PATON. Live stock production in New Zealand. Review of period 1901–27. *New Zealand J. Agric.* **38**, vi, 423–33, June 1929.

This report tabulates the production from all kinds of live stock maintained primarily on New Zealand grasslands during the 26 years reviewed, and the general trend and rate of development are shown. The different grassland products—cattle, butterfat, beef, sheep, wool, mutton, lamb, etc.—are calculated and compared by a system of unit values, taking £10,000 as the unit.

From the dairying standpoint, chief interest lies in butterfat production, which is shown to have increased fivefold during the period. The total number of cows in milk or dry on January 31 each year has increased from 381,000 in 1901–2 to 1,303,000 in 1926–7, and the butterfat production per cow per annum also shows an estimated increase of from 127 lb. in 1901–2 to 198 lb. in 1926–7.

J. MACKINTOSH

Feeding the pig. *Tasmania Bull.* **4**, April 1929.

This is a small bulletin written for the practical pig farmer, and contains some useful information which all interested in pigs should know. The value of separated milk for balancing a grain ration is demonstrated, and there is useful information concerning the feeding of meat meal, potatoes and minerals. A. H. BLISSETT

Standard Herd records for quarter ended March 31, 1929. *J. Dept. Agric. Victoria, Australia*, **27**, vi, 369–84, June 1929.

The report gives a list of cows entered for the standard herd records which completed a lactation during the quarter ending March 31, 1929.

The particulars given include the name of the cow and owner, the breed, the date of calving, the number of days in the test, the yield of milk and butter, together with the age group in which each cow entered the test, and the standard requirement to qualify for a certificate. The latter were as follows:

Junior, 2-year-old (under 2½ years at time of calving), 200 lb. butterfat.
Senior, 2-year-old (between 2½ and 3 years at time of calving), 225 lb. butterfat.
Junior, 3-year-old (between 3 and 3½ years at time of calving), 250 lb. butterfat.
Senior, 3-year-old (between 3½ and 4 years at time of calving), 275 lb. butterfat.
Junior, 4-year-old (between 4 and 4½ years at time of calving), 300 lb. butterfat.
Senior, 4-year-old (between 4½ and 5 years at time of calving), 325 lb. butterfat.
Mature cow, 5 years and over at time of calving, 350 lb. butterfat.

Out of a total of 259 animals, 208 qualified for the certificate. If the cows are classified into breeds, it is found that 184 Jerseys were entered and 160 qualified, 50 Ayrshires were entered and 29 qualified, 12 Friesians were entered and 9 qualified, 11 Red Polls were entered and 9 qualified, 2 milking Shorthorns were entered and 1 qualified.

An analysis of the failures to qualify by age classes is of interest, and shows that:

Of the 104 animals entered at 3½ years or under, 5 (5 per cent.) failed to qualify.
Of the 81 animals entered over 3½ and under 5 years, 23 (28 per cent.) failed to quality.
Of the 73 mature animals of 5 years and over entered, 23 (32 per cent.) failed to qualify.

S. BARTLETT

D. J. SCHUTTE. Solids-not-fat content of cow's milk. *Farming in S. Africa*, **4**, xl, 191–3, July 1929.

The study of available records showed that the milk of commercial herds in South Africa was characterised by an unusually low solids-not-fat content. The factors contributing to this condition are discussed, that of major importance being the absence of selection and breeding in building up the herds, while minor factors, such as low plane of nutrition, drought, climatic variations, lack of balance in the rations, and the influence of grass feeding on ash and lactose content are considered.

W. L. DAVIES

S. BARTLETT. Normal day-to-day variability of yield of milk and fat of individual cows. *J. Agric. Sci.* **19**, iii, 438–51, July 1929.

This work is an analysis of the recorded yield of milk and butterfat collected in the herd of the National Institute for Research in Dairying. Individual cows are treated, some being tested at every milking and others for three complete days each month.

The extent to which the yield of milk and fat of a cow fluctuates at corresponding milkings from day to day is expressed by the calculation of the standard deviations,

and a method is suggested for estimating the errors which may occur in milk records as a result of occasional tests It is shown that in the herd examined the day-to-day variations are greatest during the first month of lactation, and also greater during the summer months (particularly May) than during the winter months

When a herd is milked at unequal night and-day intervals, it was found that slightly less day-to-day variations occurred in a 24 hours' yield if the complete day's yield consisted of a morning yield plus that of the subsequent evening, rather than an evening's yield plus that of the subsequent morning S. BARTLETT

R. B. BECKER and W D GALLUP Grain losses in feeding corn silage to dairy cows *J. Agric Res* **39**, III, 223–7, August 1929.

Experiments were conducted to gain further information of the loss which might occur in the feeding of corn silage containing whole and broken corn grain to dairy cows

Four cows were used over a 20-day feeding trial (10 days' preliminary and 10 days' experimental), and were given a daily ration consisting of 30 lb. corn silage, 10 lb alfalfa hay and a grain mixture to meet the Morrison feeding standard. The silage was made from Reid Yellow Dent corn cut in the glazed stage of maturity

It was found that 8 47 per cent by weight of the grain in the silage was voided in the manure Only 4 36 per cent of the whole kernels in the silage was recovered as whole kernels from the manure Chemical analyses showed that those whole and broken kernels had given up a small proportion of their crude protein, ether extract and ash after coming in contact with the cows' digestive juices The small loss found above may be salvaged by allowing swine or poultry access to the manure.

J. MACKINTOSH

R. R. KAY and A. C M'CANDLISH. Factors affecting the yield and quality of milk. I. The age of the cow *J. Agric Sci* **19**, II, 342–72, April 1929

The material utilised for this work was drawn from records of cows entered in the herd books of the Ayrshire Cattle Herd Book Society, and recorded by the Scottish Milk Records Association operating in three counties in the south-west of Scotland during a 20-year period 1903–22 After eliminating unsuitable records, the total number of animals ultimately used was 738, with lifetime records varying from 5 to 11 lactation periods per cow, and in all a total of 4380 lactation records were analysed In order to ascertain the effect of age on milk and fat yield, the lactation records were classified according to the age of the cow at calving, each group covering 1 year Up to the age of 7 years the number of lactation records in each age group remained about the same, but after this age the number gradually decreased, until at 13 years of age only two records were available.

The mean results are given below in respect of milk production, fat production and fat percentage

Age of cow in years	3	4	5	6	7	8
Milk production in lb	6407	6619	7049	7257	7439	7514
Fat production in lb	248 2	248 7	265 9	271 6	279 3	282 8
Fat (%)	3 87	3 76	3 77	3 74	3 75	3 76
Milk production expressed as percentage of production at 7 years	86	89	95	98	100	101

Age of cow in years	9	10	11	12	13
Milk production in lb	7722	7429	7703	7899	10095
Fat production in lb	288 2	279 5	285 9	255 2	348 1
Fat (%)	3 73	3 76	3 71	3 23	3 45
Milk production expressed as percentage of production at 7 years	104	100	104	107	135

The actual butterfat production records of each age group are compared with the requirements for recognition as Class I by the Scottish Milk Records Association; the qualifying yields at 4 years being shown to be abnormally high.

The correction factors for "age" with milk and fat production suggested for use in South-west Scotland are:

Age in years	Milk yield	Fat yield
3	1·16	1·13
4	1·12	1·12
5	1·06	1·05
6	1·03	1·03
7	1·00	1·00

The probable causes of the variation in the production of cows with age are discussed and sixty-nine references are appended. S. BARTLETT

T. A. HOLE. Progress of milk grading in England and Wales.

J. KIRKWOOD. Progress of graded milk in Scotland.

G. WILSON. Graded milk in Northern Ireland.

R. M. F. PICKEN. The grade A (T.T.) movement in Cardiff.

C. F. VAN OYEN. Production of tuberculin tested milk in Holland.

Papers read at Certified and Grade A (T.T.) Milk Producers' Conference, April 16, 1929. *Dairyman*, **51**, ix, 475–8, 480, 481, 482, May 1929.

The paper by Hole deals with the growth in the production of graded milk which has taken place in England and Wales during the last 10 years, and demonstrates that between 1924 and 1928 the number of farmers licensed for the sale of milk from tuberculin-tested cows has risen from 132 to 359, and those for the sale of milk from cows which are subject to veterinary inspection from 92 to 448.

It is to be remembered that all the expenses involved in such work are borne by the farmer.

In association with this increase in production, the numbers of shops and depots licensed for the sale of these types of milk have risen from 1216 to 3025.

The papers by Kirkwood and Wilson show that similar progress in this movement is being made both in Scotland and in Northern Ireland, and that of Dr Picken demonstrates the increase in the sales of graded milk during the last few years in Cardiff.

Prof. van Oyen's paper is concerned with similar work which he has started in Holland, and in which progress is being made. R. STENHOUSE WILLIAMS

C. H. WESTWATER. Clean milk in the Northern Counties. *J. Roy. San. Inst.* **50**, ii, 116, August 1929.

This paper was read at the Newcastle-on-Tyne sessional meeting, and deals with the educational activities in connection with clean milk production in the counties of Northumberland and Durham. J. MCCLEMONT

D. W. HENDERSON. Hygienic milk supplies. *J. Roy. San. Inst.* **50**, ii, 112–15, August 1929.

The author deals with the difficulties in the administration of the Milk and Dairies Order, and suggests that the remedy lies in the wholesale adoption of pasteurisation. Short reference is made to certain communicable diseases and to the comparative nutritive values of raw and pasteurised milk. J. MCCLEMONT

S. B. THOMAS and O. J. EVANS. The milk supply of Aberystwyth borough. *Welsh J. Agric.* **5**, 149, 1929.

A description of the scheme for the improvement and control of the Aberystwyth Milk Supply. The scheme, which has been in operation since 1926, consists essentially of the education of producers, distributors and consumers, by means of lectures and demonstrations. Regular bacteriological examinations of the milk are made and the results are analysed and discussed. J. MCCLEMONT

C. S. M. HOPKIRK. Dairy-cow diseases in New Zealand. Recent research work in New Zealand. *New Zealand J. Agric.* **38**, ii, 75–91, February 1929.

This paper gives an account of researches which are being carried out by a team of workers in New Zealand. This team is studying the causes of mastitis, abortion and temporary sterility. Their investigations of mastitis are especially concerned with the study of smooth and rough forms of streptococci, methods of diagnosis of infection, the paths by which infection may take place, and the treatment and prevention of this disease.

Work of a similar character is being conducted upon contagious abortion, and preliminary experiments are being undertaken for the study of temporary sterility which is characterised by failure to conceive from the first two services.

R. STENHOUSE WILLIAMS

Canadian dairy industry. *Dairyman*, **51**, x, 551, June 1929.

In this short review of Canadian dairying during 1928, it is stated that there was a 50 per cent. increase in milk production during 1927 when compared with 1921, and an increase of 30 per cent. in the case of butter and cheese. Preliminary figures in 1928 indicated a further increase of 4 to 5 per cent. in the case of butter and cheese, and of more than a million dollars for the export of all dairy produce.

Reduced exports of cream, butter, milk powder and condensed and dried milks were offset by larger shipments of cheese and liquid milk. Detailed figures of quantities and values are given, together with the chief importing countries. It is stated that the increased quantities of butter imported into Canada during 1928 from New Zealand and Australia are due to the growing demand for other dairy produce, and of Canadian cattle for the United States of America. Butter production in Saskatchewan, Maritimes and New Brunswick continues to expand, and the future of Canadian dairying is excellent. J. HOLMES

W. WRIGHT. The grading of imported dairy produce. *J. Brit. Dairy Farmers' Assoc.* **41**, 84, 1929.

This is a concise account of grading systems for butter and cheese. Reference is made to a voluntary scheme introduced in 1769 in Southern Ireland, and the relative merits of existing schemes are briefly discussed. The author describes in detail the present grading system in New Zealand which is based on a uniform, compulsory grading organisation, controlled by the Department of Agriculture and supplemented by an extensive educational service.

Butter and cheese for export pass through approved cold storage depots, where expert official graders award points for quality, decide the grade and carry out additional chemical and weighing tests. Certificates are issued for each grade and are accepted as trade documents by the London Provision Exchange. Importers are able to refer doubtful consignments to a New Zealand representative stationed in the importing country.

The author summarises the advantages of such a system, and suggests that the principle might usefully be adopted in the British Isles in co-operation with a complete advisory service. J. HOLMES

R. W. Littlewood. Production of clean milk. *J. Cent. Bur. Anim. Husb. and Dairying, India*, **3**, i, 4–9, April 1929.

Dairy factories in New Zealand. *New Zealand J. Agric.* **39**, i, 51, July 1929.

A tabulated statement of registered dairy factories in New Zealand on April 30, 1929, together with details of quantities of butter and cheese consigned for export to grading stores during the year ending March 31, 1929, and the number of milk or cream suppliers in the dairying districts.

There were 151 butter factories, with 43,153 suppliers, exporting 78,904 tons, and 336 cheese and dual plant factories with 12,944 suppliers exporting 82,617 tons. The chief dairying districts were Auckland, Taranaki, Wellington, Otago and Southland. In addition there were 6 milk powder, 5 casein, 2 condensed milk and 1 milk sugar factories, and whey butter was produced in small quantities at 79 centres.

J. Holmes

A survey of present methods of grading milk at condenseries, evaporated and dry milk plants. *J. Dairy Sci.* **12**, v, 374–6, September 1929.

Reports from twenty American Companies, manufacturing condensed, evaporated and dried milk indicate that the preliminary test on raw milk is the "Nose test." Questionable milk is further checked by a variety of tests which vary considerably from one factory to another.

Bacteriological standards for the finished product show a lack of uniformity, and it is suggested that a committee report on practical methods of control and standardisation.

L. J. Meanwell

Graded milks in Cardiff. *Report of the M.O.H. for the City of Cardiff for the year* 1928, pp. 74–5, 1929.

The number of licences to produce or handle graded milk in Cardiff has risen from 4 in 1923 to 43 in 1928.

It is significant that of this increase of 39 licences, 37 relate to milk from tuberculin tested herds.

95 per cent. of samples taken from producers' supplies before bottling attained graded standard, while samples taken after bottling from dealers' supplies attained the required standard in 94 per cent. of cases. These samples were evenly distributed throughout the year.

J. McClemont

R. Simpson. Graded milk nomenclature. *Vet. Record*, **9**, xxxix, 844–6, September 28, 1929.

This is a report of the discussion on graded milk nomenclature by the Section of Veterinary State Medicine at the Annual Congress of the National Veterinary Medical Association of Great Britain and Ireland. Several alternatives to the present nomenclature were put forward, and it was finally resolved to recommend that there be three grades of milk:

1. Milk from cows which have passed the tuberculin test.
2. Milk from other cows.
3. Pasteurised milk.

J. McClemont

M. J. Rosenau. Pasteurisation. *New Eng. J. Med.* **200**, 51–5, 1929. (*Bull. Hyg.* **4**, viii, 678, August 1929.)

While containing no new matter, this paper is valuable as a very clear statement of the prevailing American views upon the pasteurisation of milk by one of the most eminent American public health authorities. In brief, the argument is that

this process is effective to remove the risk of pathogenic organisms being conveyed in milk, and that it can be carried out at a temperature which does not affect to any material extent the nutritive properties of the milk. It is admitted that vitamin C is affected by pasteurisation. The argument that pasteurisation will put back the cause of clean milk and good dairy methods is met by the statement that experience has proven the fallacy of this argument. (This cannot be accepted as even true of much American experience.) Pasteurised milk must be handled carefully after treatment. It is agreed that the process should be under official supervision and that to ensure safety it needs such supervision. The pasteurisation conditions recommended are keeping milk at 142°–145° F. for not less than 30 minutes, followed by rapid chilling and the milk kept below 50° F. until delivered to the consumer.

H. Barkworth. Numerical interpretation of keeping quality estimations of milk samples. *San. J.*, pp. 270, 271, April 1929.

The test used to estimate the keeping quality of milk samples submitted by competitors in England and Wales is briefly described. Two systems of scoring are outlined whereby the duration of sweetness of the sample may be stated in quarter days or in hours.

Possible causes of disparity between bacterial count and keeping quality are mentioned. J. McClemont

Milk supply of Italy. *Amer. J. Pub. Health*, **19**, ix, 1078, September 1929.

Four Italian cities have established milk centres where all milk for consumption in these cities is sterilised.

The annual milk consumption per head is stated as 15 quarts in Italy, 90 quarts in England, 235 quarts in Germany and 265 quarts in Sweden. J. McClemont

F. J. Doan. Some factors affecting the fat clumping produced in milk and cream mixtures when homogenised. *J. Dairy Sci.* **12**, iii, 211–30, May 1929.

Homogenised milk and cream mixtures are stable emulsions, but if fat clumping has occurred they cream when diluted with skim milk or whole milk. Increase in fat content or homogeniser pressure increases fat clumping, while the use of previously heated plasma decreases clumping. Changes in acidity have little effect. The ratio of the amount of plasma solids to the amount of fat in the mixture is a limiting factor in the fat clumping phenomenon.

There is a critical ratio above which no clumping is obtained, but below which clumping is evident. W. J. Wiley

A. G. Enock. Choice of containers for retail delivery of milk. *Dairyman*, **52**, i and ii, 28–30, 86–90, September, October 1929.

A valuable contribution to the problem of retail milk distribution. The efficiency of the multi-service glass bottle and of the recently introduced types of single-service waxed paper and sulphite pulp containers are approached from various aspects, such as storage accommodation, weight, stability, hygienic features, accurate measurement, convenience in domestic use, final disposal of container, capital cost of appropriate plant and operating and delivery expenses.

The detailed costings for three typical dairy units contain much useful information, and suggest that, although under present conditions the glass bottle is the most economical proposition, much more information is required before reaching definite conclusions. The present depôt-operating costs of single-service containers

require accurate investigation, and their ultimate adoption will depend on the attitude of the general public and the ability of waxed containers to function efficiently under varying conditions of storage, handling and domestic usage.

J. HOLMES

H. H. SOMERS and B. W. SARLES. The importance of dry milk cans. *Milk Dealer*, **18**, xi, 60 and 96, August 1929.

Milk churns from three automatic washing machines were examined for dryness and tested for bacterial count. The results indicate that dry churns convey less contamination to the milk than churns which are taken from the washer in a wet condition.

J. MCCLEMONT

O. F. HUNZIKER, W. A. CORDES and B. H. NISSEN. Metals in dairy equipment. Corrosion caused by washing powders, chemical sterilisers and refrigerating brines. *J. Dairy Sci.* **12**, iii, 252–84, May 1929.

The resistance to corrosion of nineteen different metals and alloys in solutions of washing powders, chemical sterilisers and refrigerating brines has been studied. Strips of metals were immersed to half their length in the testing liquids, losses in weight, appearance of strips and the colour and precipitate in the liquids being observed.

With alkaline washing solutions, aluminium suffered intense corrosion, tinned copper and iron showing greater resistance. Nickel alloys and steels and chromium steels were practically immune to corrosion. Small amounts of silicate dissolved in the alkaline washes almost completely eliminated corrosion of aluminium and its alloys, whereas chromate treatment of the solutions lessened corrosion of tinned iron and copper.

Sodium hypochlorite was the most corrosive chemical steriliser. Aluminium suffered under alkaline conditions, but on tinned metals chloramine-T was more corrosive than an alkaline steriliser, but much less corrosive than hypochlorite. Nickel and chromium alloys were but slightly attacked. Lime water caused heavy corrosion of aluminium, zinc and galvanised iron, but had very little effect on other metals and alloys.

Nickel, nickel alloys, chromium steels, and tin showed little corrosion with neutral and alkaline sodium and calcium brines. Aluminium and its alloys resisted neutral brines, but corroded heavily in alkaline brines. Iron, zinc and galvanised iron corroded heavily in all brines. Copper and tinned metals suffered heavily, especially in alkaline brines; sodium brines generally were more corrosive than calcium brines. Chromate treatment afforded the best method of retarding corrosion, especially with aluminium, tin and zinc products.

W. L. DAVIES

F. H. MCDOWALL. Metals for dairy machinery. *New Zealand J. Agric.* **39**, ii, 114–23, August 1929.

A review of literature on the suitability of various metals and alloys for the construction of dairy plant and machinery is given, together with information gleaned by the author during his travels in Europe and the United States.

W. L. DAVIES

G. N. QUAM and S. N. QUAM. Stability of commercial sterilisers in the presence of milk. *Amer. J. Pub. Health*, **19**, vii, 737–9, July 1929.

Working with solutions containing approximately 200 parts per million of available chlorine, the stabilities of four commercial sterilisers (various hypochlorites) under the influence of rising temperature (70°–145° F.) have been studied.

With increase of time and rise in temperature a specific rate of loss of strength was found for each steriliser. Variations in stability and activity are thus to be expected for each hypochlorite solution, and care should be taken that the conditions under which solutions can be used are carefully considered. W. L. DAVIES

M. E. BARKER. Detergent properties of alkaline washing compounds. *Amer. J. Pub. Health*, **19**, vii, 751–7, July 1929.

Any detergent for use in cleaning dairy machinery or appliances should remove:
(1) Particles of dirt or milk solids held to the surface by an oily or greasy binder.
(2) The dirt or milk solids held by adsorption to the surfaces.
(3) The milk stone deposit accumulated on surfaces subjected to intense and intermittent heat applications.

A 1 per cent. solution of chemically pure crystalline tri-sodium phosphate appears to be the most efficient agent. Carbonates and bi-carbonates have but little cleansing effect, and the addition of these chemicals to crystalline tri-sodium phosphate destroys its emulsifying properties.

Working under practical conditions, it was found that a colloidal mixture of alkalis containing caustic soda was very efficient, the colloidal nature of the mixture increasing its germicidal efficiency. L. J. MEANWELL

F. J. DOAN. Mechanical stabilisation of emulsion in dairy manufacture. *Food. Indus.* **1**, 356–60, 1929. (*Chem. Abst.* **23**, xv, 3756, August 10, 1929.)

Homogenisers and other emulsion-forming equipment commonly used in ice-cream plants and creameries are described.

E. S. GUTHRIE. Determines the effects of milk on metals and glass. *Milk Dealer*, **18**, x, 72, July 1929.

A variety of metals and alloys and other materials used in dairy utensil and plant manufacture has been studied with respect to corrosion and effect on milk flavour.

No effect was observed with chromium steels, aluminium, chromium- and tin-plated metals, glass enamel, and with nickel (cold milk). Slight effect on flavour was observed with nickel steels, nickel, and poorly and thinly chromium-plated or tin-plated metals. A definitely astringent, metallic or oily flavour was produced by copper and copper alloys (brass, bronze, monel metal, nickel bronze and nickel silver) and poorly plated copper. W. L. DAVIES

F. H. MCDOWALL. Flooring materials for the dairy factory. *Butter and Cheese J.* **20**, xli, 42–3, October 1929.

Owing to the corrosive action of milk and whey, true cements are unsatisfactory for dairy floors. Ordinary bituminous floorings are too soft and are soluble in butterfat. Attention is drawn to a new useful bituminous material, "Prodorite," more resistant to acids and wear and tear. A quick-setting aluminous cement, "Ciment Fondu," claimed to be more resistant to acids than Portland cement, has been found very suitable for the laying of sectional dairy floors. Some constructional details are given. W. L. DAVIES

A. W. FARRALS and W. M. REGAN. Sterilisation of dairy utensils with humidified hot air. *Milk Plant Mo.* **18**, vii, 34–40, July 1929.

Experiments extending over a period of 2 months demonstrate that humidified hot air compares favourably with steam, as regards bactericidal efficiency and cost, for the sterilisation of dairy utensils. J. MCCLEMONT

Artificial Cream Act, 1929 (19 and 20, Geo. V).

This Act is designed to regulate the sale of reconstituted cream, made by emulsifying butter, dried skimmed milk and water. It includes, however, any article of food resembling cream and containing nothing but the ingredients of cream. Such substances may not be sold under designation "Cream" unless preceded by the word "Artificial." Receptacles used for conveying artificial cream, or containing it when it is exposed for sale, must be labelled with the words "Artificial Cream" in large legible type. Premises where the substance is manufactured or sold must be registered with the Food and Drugs Authority, and any article having the composition of cream or artificial cream which is sold on premises so registered shall be presumed to be artificial cream unless the contrary is proved. The operation of the Act dates from June 1, 1929, and extends to Scotland, but not to Northern Ireland.

L. A. ALLEN

G. M. VALENTINE. Packing butter for export. *New Zealand J. Agric.* **39**, i, 27–34, July 1929.

The necessity for care throughout the process of packing is stressed. Practical details are given of two methods of lining boxes with parchment, and the faults and advantages of the two methods are discussed. Suggestions are made for the improvement of the detailed work needed for successful weighing, packing, and finishing of butter.

D. V. DEARDEN

W. H. E. REID. Overworking butter tends to develop fishy flavour. *Butter and Cheese J.* **20**, xix, 21, 34, May 1929.

The incorporation of atmospheric oxygen in butter by overworking, together with enhanced leaching of the lecithin by the brine, accelerates the production of trimethylamine in butter. This aids the development of fishy flavour.

W. L. DAVIES

WAGNER. Um den Wassergehalt der Butter. *Molkereiztg*, **1**, p. 749, 1929.

A process for the management of butter, so as to obtain the maximum water content (16 per cent.) in the final material, is described. The principle depends on working the moisture into a very fine state of division in the butter, thus raising the water content slightly, but still giving a firm product.

W. L. DAVIES

F. H. SCHMIDT. Organisation und Bedeutung der staatlichen danischen Butterprüfungen. (Organisation and importance of Danish state butter testing.) *Milchw. Zbl.* **58**, vii, 110–14, April 15, 1929.

P. D. WATSON. The relation of the hydrogen-ion concentration to the texture of Emmenthal or Swiss cheese. *J. Dairy Sci.* **12**, iv, 289–303, July 1929.

Two sets of Emmenthal cheese, one from "ga" starter (consisting of a *bulgaricus* organism with a mycoderm) and the other from "39*a*" starter (an old strain of *Lactobacillus bulgaricus*), were compared. Determinations of *p*H (quinhydrone electrode) and lactose (colorimetrically) were made during the first 24 hours. Comparative studies of *p*H, proteolysis (total nitrogen, water-soluble nitrogen and amino nitrogen, moisture, freezing-point and texture were also made after 3·5 to 5 months). The average hydrogen-ion concentration of the "ga" cheese was 1·7 times that of the "39*a*" cheese after 3 hours and 2·1 times after 21 hours. After a few days the *p*H tended to approach the same values in both cheese (5·1 to 5·2), and then gradually diverged up to maturity. The percentage of soluble nitrogen was approximately equal for both cheese, but the percentage of amino nitrogen was much

greater in the case of the "ga" cheese. The "39*a*" cheese invariably possessed the better texture and showed a slightly higher moisture content. L. A. ALLEN

T. R. FERRIS. Method of manufacture of Blue Vinny cheese. *J. Min. Agric.* **36**, v, 402, August 1929.

Experiments have been conducted in Dorset to obtain scientific data on the manufacture of Blue Vinny cheese. An outline is given of an approved method, with typical records for October and May. D. V. DEARDEN

W. V. PRICE. A colour defect of process cheese. *J. Dairy Sci.* **12**, v, 377–8, September 1929.

The writer shows that an undesirable dark colour, which developed in occasional batches of a process (pasteurised) cheese, was due to the inclusion in them of residual cheese from a previous run which adhered to the side of the kettle. He was able under experimental conditions to reproduce the fault very exactly by incorporating sufficient amounts of this dried and discoloured material in a fresh batch. Under factory conditions, the defect has been eliminated by thoroughly cleaning the kettle between successive runs. R. H. LEITCH

J. L. SAMMIS and L. GERMAIN. Experiments on cheese composition and quality. *Butter and Cheese J.* **20**, xxxix, 13–14, 30, September 25, 1929.

The authors, impressed by the fact that little information is available on the relationship of quality in cheese to the composition of the primary milk and to the cheese made from it, give here the results of their investigations into certain aspects of the subject. By reference to the scores of many cheese of varying composition, they attempted to determine (*a*) whether a uniform percentage of water in cheese, or a uniform ratio of water to casein is necessary to secure cheese of constant quality, (*b*) the relationship of the fat content of the cheese milk to the quality of the cheese made from it.

A varying fat content in the primary milk was secured by separating a portion of it, and adding cream or skim milk as desired to the different vats. [It is doubtful if this procedure is scientifically sound, since it assumes that the solids-not-fat ratio is the same in rich and in poor milk.]

Their conclusions may be stated as follows: A wide variation is observed in the quality of cheese having the same moisture content, but made from milk of different fat percentages. Cheese made from milk rich in fat score lower, because of the higher ratio of water to casein or solids-not-fat. A uniform ratio of water to casein or solids-not-fat is essential to the attainment of good quality in cheese, whether the cheese is made from rich or from poor milk. The bacterial factor has a direct relationship to the hydrated condition of the casein: the more highly hydrated the casein, the more rapidly do changes occur during curing, and the greater is the risk of spoiling. R. H. LEITCH

P. O. VEALE. The relative values of high and low testing milk for cheese-making in New Zealand. *New Zealand Dept. Sci. and Ind. Res. Bull.* **9**, 1929.

The author of this important bulletin, which records the results obtained under factory conditions of the yield and quality of Cheddar cheese made from milk of differing fat content, is Research Chemist to the Federation of Dairy Factories, Hawera, New Zealand. The investigation, which extended for over 8 months, relates in particular to the cheese-making properties of the milk furnished by representative herds of New Zealand dairy breeds, Ayrshire, Friesian and Jersey. The Friesian herd (70 cows) supplied 472,394 lb. milk with an average fat content of 3·55 per cent.

fat; the Ayrshire herd (55 cows) supplied 260,085 lb. milk of 3·85 per cent. fat, while the Jersey herd (50 cows) provided 290,795 lb. milk of 4·75 per cent. fat. The total amount of cheese made which was graded and assessed before export from New Zealand, and again on arrival in London, was approximately 49 tons.

The analytical data communicated by the author in this bulletin are complete and instructive. They relate to the seasonal variations in the fat, casein, solids-not-fat; to the losses of fat and casein during the manufacturing process; to the yield of cheese per lb. butterfat in the milk; to the moisture content of the cheese; and to the behaviour of the cheese during curing and transport overseas.

According to the results of this investigation, the low-testing milk gave a larger yield of cheese per lb. butterfat than the high-testing milk, the difference in yield being caused by differences in the proportion of casein to fat in the milk of different breeds. Yet, during the majority of the spring and summer months, the high-testing milk showed to advantage in producing a better body and texture in the cheese. Towards the end of the season, however, the rich milk of the Jersey breed, containing now from 5·25 to 5·78 per cent. butterfat, produced cheese which were somewhat open and greasy. The author concludes that the higher limit for butterfat in cheese milk, beyond which it is difficult to produce cheese of uniform body, is 4 to 4·5 per cent.

[While the data presented in this bulletin are convincing from a chemical point of view, one might hesitate to subscribe to many of the deductions of the writer when he deals with the relation of fat to quality. All the cheese were made from raw milk, which admittedly in the case of the Ayrshire herd was faulty from a bacteriological standpoint, and which in all cases was apparently less satisfactory towards the end of the season. The author in some cases is apt to confuse the effect of bacteriological action with the influence of the fat content. The report of the London Committee that "taken as a whole the cheese was considered rather poor and disappointing in quality," and the statements of the author that "practically 50 per cent. of the cheese which was passed as 'first grade' in New Zealand was considered second rate in London," "that all the experimental cheese was made from unpasteurised milk and that two-thirds of it consisted of low testing material of high moisture content, and that this moisture favoured the development on frequent occasions not only of excess of acid with its damaging effects on the body and texture," all suggest that the controlling factor on the body texture and general quality of the experimental cheese was bacteriological, and should not be related to the fat content of the milk. The author is on firm ground when he emphasises the value of pasteurising factory milk for cheese-making. In view of these facts, we doubt whether the author's conclusion that, "in the interests of producers, a return to lower fat tests in our cheese-making milk is imperative," is warranted by the data presented.]

R. H. Leitch

P. O. Veale. The yield of cheese per pound of butterfat. *New Zealand Dept. Sci. and Indus. Res. Bull.* **13**, 1929.

In New Zealand, milk for cheese-making is paid for by factories on the basis of its fat content. This method of assessing the value of milk is easy of application, but it does not always work out to the benefit of the primary producer. The aim of the factory manager is to obtain a high "yield figure" (cheese ratio) per pound of butterfat in the milk. The author shows that this may be accomplished by "reading down" or consistently underestimating the butterfat in the producers' milk. Suppose a farmer supplying 10,000 lb. milk with a true average fat content of 4·2 per cent. were paid £750. The price he would receive would be at the rate of 1*s.* 6*d.* per lb. butterfat. But if the fat were "read down" by the factory to 4·0 per cent., and

presuming he were paid the same sum (£750), his apparent return per lb. butterfat would be 1*s*. 6·9*d*. The farmer would gain nothing by the practice, neither would he be actually defrauded, but the factory on its published statistics would gain a reputation for efficiency because of its ability to show high yield figures. Because also the fat-casein ratio has a determining influence on the yield of cheese, an increased output and a high yield figure could also be secured by the addition of freshly separated milk to a high-fat-testing cheese milk. When one considers that, in addition to these artificial means of raising or altering the yield figure, there are other variable factors, such as factory efficiency and natural variations in the composition of milk, which have a direct influence on the returns, one may reasonably conclude that the "yield figure" may mean nothing at all, and that it need not be taken as a measure of the efficiency of the factory or of the cheese-maker.

The author included in this bulletin, in addition to some speculations of his own, a large number of useful facts and figures relating to the effect of fat and moisture content on the yield of cheese.

R. H. Leitch

W. T. Price and W. Hochstrasser. Washed curd cheese. *Butter and Cheese J.* **20**, xxxix, 10–11, 22, September 25, 1929.

Washed curd cheese, a modified Cheddar product peculiar to America, owes its name to the fact that the freshly milled curd is washed or soaked in water for a period varying from 5 to 30 minutes before salting. As curd so treated absorbs additional moisture at variable rates, the authors sought to determine under factory conditions, and from experimental cheese which they made under controlled laboratory conditions, the factors governing this action.

With reference to the temperature of the water used in the treatment of the curd, it was found that the greatest gain in the weight of cheese at 2 and at 4 months occurred when the water temperature was lowest (40° F.), but the quality of the ripe cheese was best when the highest temperature (100° F.) was employed. All washed curd, however, was inferior to the product made from identical curd material not washed.

Every treatment of the curd with water, independent of the duration of the soaking period injured the flavour of the cheese, although rinsing—by which is implied a rapid irrigation of the curd with about one-quarter of its weight of water—improved to a small extent the quality of bad-flavoured or high-acid curds. The addition of lactose to the curd after washing conferred no benefit whatever. It is concluded that washed curd cheese, which satisfy the demands of a special market, are good or bad according to the quality of the curd before the water treatment, and that a curd which will not make a normal Cheddar cheese of high quality will not make a desirable washed curd cheese.

R. H. Leitch

K. Teichert. Der Altenburger Milbenkäse. (Altenburg mite cheese.) *Milchw. Zbl.* **58**, xi, 193–5, June 15, 1929.

The Altenburg mite infected cheese is little known, and no mention of it occurs in the textbooks of the milk industry.

This small cheese, weighing only 30 g., is made of goat's or cow's milk to which about 3 per cent. of salt is added. The curd is dried in a current of air until quite hard, and is then placed in earthenware jars or wooden boxes holding from 5 to 15 litres. The bottom of the container holds the mite culture. The whole is put in a dark, moderately damp place for from 4 to 6 weeks. The mites, of which *Tyroglyphus siro* is the commonest, eat into the cheese, and are said to impart to it a piquant flavour similar to that of Roquefort. Before being eaten, the cheese may be mellowed with a little beer; it is then cut into small squares and consumed with bread and

butter. Everyone cannot eat it with impunity; those not accustomed to it often suffer from digestive disturbances. This may explain why few of these cheese are now offered for sale at the weekly markets. N. B. EALES

ELTEN. Tinfoil as a packing for rindless cheese. *Chem. Z.* **53**, 586, 1929. (*Analyst*, **54**, 642, p. 552, September 1929.)

The foils examined contained 96 to 98 per cent. of tin, 2 to 4 per cent. of antimony, 0·1 to 0·2 per cent. of lead and traces of copper and iron, and were discoloured in places. The portions of the cheese in contact with the darkened portions contained 2·1 to 2·3 per cent. of tin, and had an acidity of 2·4 to 2·6, whilst the acidity of the remainder was 1·6. The importance of the use of a good valve-quality product of low acid content, particularly when the melted cheese is allowed to set in its tinfoil container, is emphasised.

The demand for cheese in London. *Empire Marketing Board*, **22**, November 1929. [The first of a series of enquiries to be carried out by the Empire Marketing Board on the retail demand for empire products.]

The investigation, carried out by interviews with 500 managers and owners of retail shops in London, extended over the period June to November in 1928. A general survey throughout the metropolitan area during 3 months preceded a more detailed survey in Lambeth and Westminster during the latter 3 months.

The enquiry embraced various types of shops and the chief varieties of cheese sold in London, and reflects the varying demand according to the class of population. Eleven tables give valuable details of the above factors.

Cheddar cheese, mild in flavour and pale in colour, dominates the London market, and although the English variety is widely sold, the somewhat cheaper Canadian and New Zealand types predominate in the denser populated areas owing to regularity of seasonal supply and quality, and cheapness.

Cheshire cheese has a somewhat seasonal demand, and is confined mainly to residential areas, whilst Stilton and Dutch cheese are widely stocked in special districts; the demand is seasonal. Among fancy cheeses Gorgonzola and Camembert are most popular, but the turnover is relatively small. Processed cheese, particularly in cartons, is increasing in popularity, but is meeting an additional demand rather than replacing other types.

It is suggested that a publicity campaign is necessary to increase the sale of English types of cheese other than Cheddar. J. HOLMES

J. C. HENING and A. C. DAHLBERG. The effects of certain salts on the physical properties of ice-cream mixes. *J. Dairy Sci.* **12**, ii, 129–39, March 1929.

As a result of studies of the effect of salts added to ice-cream mixes before pasteurisation and homogenisation, it was deduced that the relative amounts of sodium and calcium salts present in normal dairy products varied sufficiently to affect the viscosity, and hence the whipping properties of the mix. Mixes prepared from dairy products supplied from the same source were not entirely uniform. When difficult whipping was encountered, it was corrected by the addition of 0·1 per cent. sodium bicarbonate before pasteurisation. W. L. DAVIES

R. WHITAKER. A device for reducing an ice-cream mix to its basic viscosity. *J. Dairy Sci.* **12**, iii, 285–7, May 1929.

Whitaker reviews the literature, and draws attention to the conception that the high viscosity of an unagitated aged ice-cream mix is due to the combined action of the concentration and composition of the mix with a mechanical structure formed

during the ageing period; the author also points out that agitation will destroy the mechanical structure and reduce the "apparent viscosity" to a constant value known as the "basic viscosity," which is of more significance during freezing operations than the apparent viscosity which is so rapidly decreased in the freezer.

Whitaker describes a simple device for reducing an ice-cream mix to its basic viscosity in the laboratory. The main essential of the method is that a motor-driven wire screen shall revolve at 450 to 500 R.P.M. for 20 minutes in a cylinder completely filled with mix, and immersed in a water bath of any given temperature. 0° C. was found to be a very suitable temperature to work at, since it approximates to temperatures in the freezer.

F. PROCTER

G. D. TURNBOW. Newer phases of processing ice-cream. Factors which affect smoothness of product, density control, crystallisation, rate of freezing in the light of recent investigations. *Milk Plant Mo.* **18**, vi, 103–8, June 1929.

Prof. Turnbow reviews lucidly several of the more important factors involved in the processing of high quality ice-cream. After pointing out that any addition of solids produces within certain limits a smoother texture, considerable space is devoted to physical factors which affect the "density control," or the "control of overrun," in the manufacture of ice-cream. The author considers that the apparent viscosity which has been induced by gelatine in the mix is of little importance, since during freezing operations much viscosity is lost, and the basic viscosity produced is almost identical with the initial viscosity of the mix before ageing.

It is suggested that the beating or central mechanism of the dasher of the freezing machine should be capable of being disengaged during the unloading of the freezer, to prevent overrun being beaten out of the ice-cream which is unloaded last. Accurate control of swell or weight of ice-cream is impossible if ice-cream cannot be drawn from the freezer without change in this respect. Rapid freezing and high dasher speed receive favourable comment.

The method of controlling ice-cream by legislation in California is described, which is that each gallon of ice-cream must contain a certain weight of food solids, *i.e.* butterfat, milk solids-not-fat, or sugar; if the percentage of food solids in the mix is low, then the overrun must be low, but if the content of food solids in the mix is high a larger overrun is permissible.

Crystallisation of the water and lactose in the ice-cream is also considered.

F. PROCTER

W. S. MUELLER and F. C. BUTTON. The use of dehydrated egg products in the manufacture of ice-cream. *J. Dairy Sci.* **12**, iv, 320–36, July 1929.

The general plan of this investigation was to use each of the dehydrated egg products, namely yolk, albumen and whole egg, in ice-cream mixes, and to determine the effect upon each of the following: basic and apparent viscosities of the ice-cream mix, overrun, texture, flavour, and melting resistance. 1 per cent. of each egg product replaced 1 per cent. of milk solids-not-fat in mixes of both high and low contents of total solids. Cream, evaporated skim milk, sugar, milk and gelatine were the ingredients used, the entire mixes were pasteurised for 30 minutes at 145° F., viscolised, cooled, and aged for 24 hours at 36° F.

No relationship was observed between the apparent and basic viscosities and the whipping powers of the mixes, which was probably due to the low gelatine content, namely 0·3 per cent. The addition of dehydrated yolk and whole egg facilitated whipping, and enabled much more overrun to be obtained than was possible with the control mixes of those containing dehydrated albumen. It was considered that the yolk increased the whipping ability through being an excellent

emulsifying agent. The use of dehydrated egg products did not appreciably affect the resistance to melting in samples of identical overrun. Dehydrated yolk and whole egg improved the texture and palatability of the resulting ice-cream, while dehydrated albumen was injurious to texture and palatability. The dehydrated yolk and whole egg improved the ice-cream through the smooth texture produced, and the creamy consistency, the rich colour and characteristic flavour; the dehydrated yolk was more efficient than the dehydrated whole egg. F. PROCTER

W. H. MARTIN and W. J. CAULFIELD. The use of egg yolk in ice-cream. *J. Dairy Sci.* **12**, iii, 193–201, May 1929.

The authors used dehydrated egg yolk powder in the experiments, and the mixes were compounded from cream, evaporated skim milk, skim milk, sugar and gelatine, pasteurised at 145° F. for 30 minutes, homogenised at 2000 lb. pressure, cooled, and aged at 40° F. unless they were frozen immediately. A pint sample of ice-cream from each mix was taken from the freezer at approximately 95 per cent. overrun, placed in the hardening room, and later examined for body texture and flavour.

Egg yolk shortened the time required to obtain the desired overrun by 4 minutes with heavy mixes of high total solids content; as the concentration of egg yolk increased, the freezing and whipping time decreased. In the case of unaged mixes the addition of 0·4 per cent. egg yolk was equivalent to ageing for 24 hours, as judged by the reduced time necessary for whipping. The authors also found that the egg yolk should be homogenised with the mix if the maximum benefits were to be obtained. The use of egg yolk in mixes of high solids content resulted in scarcely any improvement of body or texture, but a slight increase of overrun.

With mixes of low total solids content the egg yolk did not produce such a large improvement of whipping qualities, and ageing was found to be more effectual. The ice-cream produced was poor in texture and body, but the samples increased in smoothness in direct proportion to the yolk used.

With mixes of average composition which yield a product of high quality whether eggs are present or not, the addition of egg yolk reduced the freezing time by 4 minutes with fresh mix, but only 2 minutes with aged mix; there was no distinct improvement of body or texture, and the authors doubt if it is wise practice to add egg yolk to ice-cream mixes containing more than 37 per cent. total solids.

F. PROCTER

R. W. CHAMPION. Manufacture of ice-cream in a small commercial dairy. *J. Brit. Dairy Farmers' Assoc.* **41**, 92, 1929.

An account is given of the manufacture of ice-cream in a small commercial dairy, showing that the profitable manufacture of a reliable uniform product is possible for the small dairyman. Details are given of the ingredients used, method of processing, storage, distribution and estimates of cost and return. D. V. DEARDEN

B. H. WEBB. Heat coagulation of evaporated milk as affected by mixing different grades of raw milk. *J. Dairy Sci.* **11**, vi, 471–8, November, 1928.

The author has endeavoured to ascertain to what extent the heat coagulation of evaporated milk is affected by mixing a poor milk with a larger batch of good quality milk.

The samples of milk which were being tested were mixed cold, forewarmed to 95° C. for 10 minutes, evaporated under vacuum to 18 per cent. solids-not-fat, and sterilised at 120° C. in tins until coagulation occurred. Samples were taken before forewarming on which the *p*H and the alcohol test were determined.

Milk was considered alcohol + when a precipitate occurred with equal parts of milk and 74 per cent. alcohol.

The effects of (*a*) adding poor milk to good milk; (*b*) the addition of fresh alcohol positive milk to different types of milk; (*c*) age of milk, upon the heat stability of the product obtained were studied.

It was found that there was a relationship between the *p*H of the samples, but it is doubtful if the *p*H alone was the true cause of the differences which were found to occur. R. STENHOUSE WILLIAMS

J. E. NYROP. Spray drying and the drying of dairy products. *J. Soc. Chem. Indus.* **48**, xxiv, 136–9 T., June 14, 1929.

The efficiency of various methods of spray drying is dealt with, and the advantages of atomisation chiefly in relation to a patent—Niro atomiser—are expressed. With the aid of this patent various foods have been dried successfully, and where the vitamin value of the food might be impaired by drying, the use of carbon dioxide as a drying medium has shown itself efficient.

Milk products have been dried which have excellent keeping qualities. Cream powders containing 86–92 per cent. butterfat, in which rancidity does not develop during storage, have been prepared by drying in a medium of carbon dioxide. A dehydrated butter, capable of export to the tropics, has been similarly prepared.

A new type of low temperature dryer is briefly described. A. H. BLISSETT

New process for dehydration. *Canadian Chem. and Metall.* **13**, ix, 258–9, September 1929.

A new plant recently installed at the premises of the Dee-Hy Food Products Co., Ltd., of St Mary's, Ontario, is described. In this process, in which the milk is preheated and partially condensed and then dried in a current of hot air by means of a centrifugal spray, it is claimed that the preheating vapours are at 160° F. and the drying vapours at 180° F., the particles of milk being carried in a revolving current of hot air until dried. The average size of milk grains is 100 μ and the moisture content 2 to 3 per cent. The process has been planned so as to secure maximum solubility and minimum destruction of vitamins and enzymes.

The description is not detailed enough to obtain more than a general impression.

L. A. ALLEN

S. H. MEIHUIZEN. Determination of moisture in milk powder. *Chem. Weekbl.* **26**, 417–21, 1929. (*Brit. Chem. Abst.* B, p. 867, October 25, 1929.)

Treatment with carefully dried air in the Meihuizen apparatus for 3 hours at 100° gives accurate results. With undried air low results are obtained.

T. MORAN. Recent advances in the low temperature preservation of food stuffs. *J. Soc. Chem. Indus.* **48**, xxxiv, 246–51 T., August 23, 1929.

This review describes the extent and scope of the research work already done, and that which still remains to be done, in bridging the gap between laboratory inquiry into the chemistry of the changes occurring during storage of food materials, and actual commercial engineering conditions and practice.

In food preservation, temperature is the most important single factor, and the effects of prolonged keeping at low temperature on the cells of "living" material (fruit and vegetables) and of "dead" material (animal produce) are discussed. With living material, storage at a temperature slightly above freezing point gives the maximal storage life generally, but even different varieties of apples show the existence of an optimum temperature of storage owing to the different balances of the vital processes involved.

Storage of dead tissue is more straightforward, and optimum temperatures exist

only in so far as quality and appearance of product are involved. In order to balance, *e.g.* the palatability of meat, against the action of micro-organisms (favoured by high temperature), storage at 36°–38° F. has been found satisfactory. Temperature has two functions in the preservation of dead tissue in (*a*) restricting factors inducing spoiling (micro-organisms and enzymes), and (*b*) controlling the extent of structural changes in the freezing and thawing of tissues, and these are discussed at length.

The effect of heat output of living material under practical conditions is discussed as opposed to the non-complication of the problem by dead material. The question of humidity control is discussed from the view-point that high humidity favours micro-organic growth (moulds especially), whereas low humidity leads to loss in weight through water evaporation.

Of importance to the dairy industry is the deterioration of fat by auto-oxidation. The author admits that the only factor preventing the extension of the "chilled" state of meat (as against the frozen state) is the onset of rancidity of the fat, and that the chemistry of fat rancidity is the biggest unexplored field in food preservation.

W. L. DAVIES

STATISTICS

NUMBERS OF DAIRY AND OTHER CATTLE

THE following table shows comparative figures of the dairy herd, and of other cattle, in the principal countries within the British Empire in which dairying is of major importance. The figures are in each case the latest available, but it should be noted that the estimates of livestock relate to different dates in the various countries. It should also be noted that classification of cattle into the dairy herd and other cattle is not a matter of uniform practice throughout the Empire, but the figures give a fairly accurate indication of the extent of the dairy herd and of any change in comparison with the preceding census.

Countries	Year*	Cows and heifers in milk or in calf	Other cattle	Total cattle
		000 head	000 head	000 head
England and Wales ...	1929	2713	3245	5958
	1928	*2723*	*3303*	*6026*
Scotland	1929	454	779	1233
	1928	*459*	*755*	*1214*
Northern Ireland ...	1929	264	436	670
	1928	*274*	*464*	*738*
Irish Free State ...	1929	1307	2830	4137
	1928	*1314*	*2810*	*4124*
Canada	1929	3778	5153	8931
	1928	*3792*	*5001*	*8793*
Australia	1927–28	not available		11564
	1926–27	*2348*	*9615*	*11963*
New Zealand... ...	1929	1371	2075	3446
	1928	*1352*	*1921*	*3273*
Union of South Africa	1928	not available		10478†
	1927	not available		*10412*

* Estimates relate to June 1, except New Zealand (January 1), South Africa (August 31); for Australian States estimates refer to December 31, except Victoria (March 31 following) and New South Wales (June 30 following).

† Including 6,886,000 cattle on farms owned by Europeans.

TRADE IN DAIRY PRODUCE

The following tables give details of the trade in butter and cheese of the principal countries handling these products during 1929, with comparative

figures for 1928. The particulars are based on information published by the International Institute of Agriculture, Rome, brought up to date, where necessary, from official sources.

Imports and exports of butter

Countries	Exports		Imports	
	1929	1928	1929	1928
Exporting countries	000 lb.	000 lb.	000 lb.	000 lb.
Austria	2,207	1,093	1,098	1,786
Belgium	2,875	3,713	9,559	2,899
Denmark	350,620	325,714	1,435	1,620
Estonia	27,247	24,740	—	31
Irish Free State ...	62,836	62,656	4,621	5,913
Finland	36,610	29,489	2	2
France	16,713	24,840	9,654	5,803
Hungary	1,191	425	143	542
Italy	1,711	1,779	1,909	3,534
Latvia	32,622	28,673	49	29
Lithuania	9,004	5,827	—	—
Netherlands ...	104,325	103,488	4,469	5,124
Poland	33,248	24,194	112	77
Sweden	54,983	38,658	24	95
U.S.S.R.	53,436	67,437	—	—
Argentina	36,811	44,183	—	—
India	522	571	229	161
Syria and Lebanon	2,116	1,149	238	448
Australia	102,917	112,357	4	2,566
New Zealand ...	183,639	162,353	—	—
Importing countries				
Czecho-Slovakia ...	717	1,296	836	992
Germany	337	280	296,230	279,003
Greece	—	—	1,537	1,173
Norway	1,191	86	1,351	1,532
Switzerland ...	159	150	16,649	18,060
United Kingdom ...	14,839	19,817	717,539	684,650
Canada	1,400	1,995	35,929	16,801
U.S. America ...	3,948	4,354	2,773	4,658
Ceylon	—	—	736	758
Java and Madura...	—	—	7,712	7,776
Japan	—	—	503	401
Algeria	64	42	2,317	2,496
Egypt	29	40	1,649	1,470
Tunis	18	77	717	664

Imports and exports of cheese

Countries	Exports		Imports	
	1929	1928	1929	1928
Exporting countries	000 lb.	000 lb.	000 lb.	000 lb.
Czecho-Slovakia ...	7,050	7,921	3,349	2,626
Denmark	14,513	13,417	648	864
Finland	4,837	3,633	44	40
Italy	72,292	80,467	13,982	10,205
Lithuania	1,299	1,552	11	13
Netherlands ...	211,237	203,002	1,446	1,484
Norway	1,347	904	840	1,091
Poland	3,907	3,662	1,351	1,347
Switzerland ...	69,735	62,695	3,437	3,395
Yugo-Slavia ...	4,890	4,138	370	335
Canada	92,945	114,151	2,103	1,761
Australia	5,135	9,268	597	1,001
New Zealand ...	197,552	175,537	7	2

Imports and exports of cheese (cont.)

Countries	Exports		Imports	
	1929	1928	1929	1928
	000 lb.	000 lb.	000 lb.	000 lb.
Importing countries				
Austria	2,939	2,377	5,293	6,338
Belgium	899	913	46,456	39,024
France	40,325	41,813	51,079	43,685
Germany	4,919	3,664	146,570	135,532
Greece	441	—	3,314	2,297
Hungary	40	22	545	611
Irish Free State ...	154	161	2,410	2,449
Sweden	—	—	1,420	1,501
United Kingdom ...	9,976	9,257	335,386	336,585
U.S. America ...	3,023	2,818	76,382	81,404
India	7	4	1,237	1,202
Java and Madura...	—	—	1,821	1,515
Syria and Lebanon	196	249	703	683
Algeria	194	185	8,468	8,821
Egypt	123	88	6,563	7,123
Tunis	13	46	1,695	1,429

PATENTS

R. Seligman. Apparatus for sterilising milk by the "holding" process. Brit. 302,743, September 29, 1927. *Chem. Abst.* **23**, xvii, 4279, September 10, 1929.

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P. Rüters. Flow regulator for degasifier for milk and cream. Ger. 478,003, March 14, 1928. *Chem. Abst.* **23**, xvii, 4279, September 10, 1929.

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