JOURNAL OF DAIRY RESEARCH

EDITED BY

J. E. FORD, Ph.D.

National Institute for Research in Dairying, Shinfield, Reading, Berkshire

J. A. B. SMITH, C.B.E. PH.D., D.Sc.

Hannah Dairy Research Institute, Ayr, Scotland

ASSISTED BY

PROF. L. F. L. CLEGG, (Canada)

SIR DAVID CUTHBERTSON, C.B.E., F.R.S.E., (Glasgow)

DR F. H. DODD, (Reading)

DR H. DONALD, F.R.S.E., (Edinburgh)

PROF. P. J. FOURIE, (South Africa)

DR T. GIBSON, (Edinburgh)

DR J. O. IRWIN, (London)

MR G. LOFTUS HILLS, (Australia)

DR L. A. MABBITT, (Reading)

DR W. A. McGILLIVRAY, (New Zealand)

DR A. ROBERTSON, o.B.E., F.R.S., (Edinburgh)

DR K. C. SEN, (India)

DR C. C. THIEL, (Reading)

DR R. WAITE, (Ayr)

DR J. C. D. WHITE, (Ayr)

VOLUME 34, 1967

CAMBRIDGE UNIVERSITY PRESS

PUBLISHED BY THE SYNDICS OF THE CAMBRIDGE UNIVERSITY PRESS

Bentley House, 200 Euston Road, London, N.W. 1 American Branch: 32 East 57th Street, New York, N.Y. 10022

Secretary
J. C. F. COLES

 ${\it Editorial~Assistant}$ MRS DOROTHY SKIDMORE

Printed in Great Britain at the University Printing House, Cambridge

Contents

No. 1 (February 1967)

| | PAGE |
|---|------|
| Original Articles | |
| Changes in the quantity and composition of mammary gland secretion in the dry period between lactations. I. The beginning of the dry period. J. V. Wheelock, A. Smith, F. H. Dodd and R. L. J. Lyster | 1 |
| Changes in the quantity and composition of mammary gland secretion in the dry period between lactations. II. The complete dry period. A. SMITH, J. V. WHEELOCK and F. H. DODD | 13 |
| Estimation by gas chromatography of 5β -pregnane- 3α , 20α -diol in the urine of normal lactating and ketosed cows. R. J. Heitzman | 21 |
| Occurrence of milk proteins in the urine of cows during an extended milking interval. R. L. J. Lyster and J. V. Wheelock | 27 |
| The production of L(+) and D(-) lactic acid in cultures of somelactic acid bacteria, with a special study of <i>Lactobacillus acidophilus</i> NCDO 2. ELLEN I. GARVIE | 31 |
| A method of detecting dissimilation of citrate by lactic acid bacteria using Streptococcus lactis var. diacetilactis NCDO 1007. ELLEN I. GARVIE . | 39 |
| The persistence of cloxacillin in the mammary gland when infused immediately after the last milking of lactation. A. Smith, F. K. Neave, F. H. Dodd, A. Jones and D. N. Gore | 47 |
| The persistence of penicillin G in the mammary gland when infused immediately after the last milking of lactation. A. Smith, F. K. Neave and A. Jones | 59 |
| Investigations on the use of the Milko-tester for routine estimation of fat content in milk. M. F. Murphy and T. C. A. McGann | 65 |
| The effect of concentrating milk on the fat retention property of the cheese curd. L. A. Mabbitt and G. C. Cheeseman | 73 |
| The C-terminal sequence of amino acid residues of κ -casein isolated from buffalo's milk. M. H. Abd El-Salam and W. Manson | 85 |
| A compound responsible for metallic flavour in dairy products. II. Theoretical consideration of the mechanism of formation of oct-1-en-3-one. R. A. WILKINSON and W. STARK | 89 |

iv Contents

No. 2 (June 1967)

| ORIGINAL ARTICLES |
|---|
| Detection of caeruloplasmin in bovine milk and blood serum. L. A. Hanson, EG. Samuelsson and Jan Holmgren |
| Acetaldehyde and diacetyl production in Streptococcus thermophilus and other lactic streptococci. VITTORIO BOTTAZZI and FRANCO DELLAGLIO |
| Identification of fatty acids from butterfat using a combined gas chromato- graph-mass spectrometer. Ragnar Ryhage |
| n-Pent-1-en-3-ol and n-pent-en-3-one in oxidized dairy products. W. Stark, J. F. Smith and D. A. Forss |
| Volatile compounds in butter oil. I. Lower boiling compounds. D. A. Forss, W. Stark and Gerda Urbach |
| Seasonal variation in deposit formation from whole milk on a heated surface. H. Burton |
| The effect of milking throughout pregnancy on milk secretion in the succeeding lactation. A. Smith, J. V. Wheelock and F. H. Dodd |
| The effect of a temporary suspension of milking in mid-lactation on milk secretion after the resumption of milking and in the following lactation. J. V. Wheelock, A. Smith and F. H. Dodd |
| The effect of equal and unequal intervals in twice-daily milking on the milk yield of ewes. M. Morag and S. Fox |
| REVIEWS OF THE PROGRESS OF DAIRY SCIENCE. Section D. Nutritive value of milk and milk products. Water-soluble vitamins in milk and milk products. Margaret E. Gregory |
| No. 3 (October 1967) ORIGINAL ARTICLES |
| Some skin characteristics in British Friesian pedigree bulls and their correlation with relative breeding value. T. NAY and HELEN JOHNSON. |
| Effects of repeated heat treatments on the levels of some vitamins of the B-complex in milk. H. Burton, J. E. Ford, J. G. Franklin and J. W. G. Porter |
| The effect on milk yield and composition of adding the calcium salts of acetic, propionic, butyric and lactic acids to the diets of dairy cows. C. C. Balch, W. H. Broster, V. W. Johnson, C. Line, J. A. F. Rook, J. D. Sutton and Valerie J. Tuck |
| Factors affecting the design of milk total solids testing schemes. M. G. O'KEEFFE |
| A suggested correction to the British Standards hydrometric method for the estimation of total solids in milk. M. G. O'KEEFFE |

Contents

| | PAGE |
|--|------|
| A milking parlour for experimental work with lactating ewes. M. Morag, J. A. C. Gibb and S. Fox | 215 |
| Thermorésistance des spores de Clostridium tyrobutyricum et Clostridium butyricum. O. Cerf, JL. Bergere et J. Hermier. | 221 |
| The effect of oxidation on the iodine values of phospholipid in milk, butter and washed-cream serum. E. G. Pont and Gwenda L. Holloway . | 231 |
| The influence of the dissolved oxygen in milk on the stability of some vitamins towards heating and during subsequent exposure to sunlight. J. E. FORD | 239 |
| The sensitivity of bovine staphylococci, streptococci and corynebacteria to cloxacillin and various other antibiotics. A. Jones, T. M. Higgs, F. K. Neave and A. Smith | 249 |
| The effect of the microbial flora on the flavour and free fatty acid composition of Cheddar cheese. B. Reiter, T. F. Fryer, A. Pickering, Helen R. Chapman, R. C. Lawrence and M. Elisabeth Sharpe | 257 |
| REVIEWS OF THE PROGRESS OF DAIRY SCIENCE. Section C. Dairy chemistry. The secretion of water and of water-soluble constituents in milk. J. A. F. ROOK and J. V. WHEELOCK | 273 |

Index of Subjects

Antibiotics, see also Cloxacillin, Penicillin G sensitivity, bovine staphylococci, streptococci, corynebacteria, 249

Ascorbic acid, milk, stability, heat processing, exposure to sunlight, 239

Bacteria, Cheddar cheese, flavour, free fatty acid composition, 257

Blood serum, caeruloplasmin detection, 103
Breeding, bull evaluation on skin structure, 183
Bulls, skin structure, correlation with relative
breeding value, 183

Butter, flavour, identification of volatile compounds, 131

Buttermilk, oxidized, identification of n-pent-1en-3-ol, n-pent-1-en-3-one, 123

Butter oil, see Dry butterfat

Caeruloplasmin, in milk, blood serum, 103

K-Casein, amino acid residues, C-terminal sequence, buffalo's milk, 85

Cheddar cheese, flavour, free fatty acid composition, microbial flora, 257

Cheesemaking, concentrating milk and fat retention of curd, 73

Citrate, dissimilation, estimation, lactic acid bacteria, 39

Clostridium butyricum, spores, heat resistance,

Cl. tyrobutyricum, spores, heat resistance, 221
Cloxacillin, sensitivity, bovine staphylococci, streptococci, corynebacteria, 249

udder disease control, dry period, 47 Corynebacteria, bovine, antibiotic sensitivity,

Dairy products, see also individual products metallic flavour, oct-1-en-3-one, 89 oxidative deterioration and caeruloplasmin, 103 oxidized, flavour, n-pent-1-en-3-ol, n-pent-1-en-3-one, 123

water-soluble vitamins, content (review), 169

Diet, calcium salts, fatty acids, addition, milk
yield and composition, 199

Disease, see Ketosis

Dry butterfat, identification of volatile compounds, 131

Dry period, mammary gland secretion, quantity, composition, 1, 13

Fatty acids, calcium salts, added to diet, milk yield and composition, 199

composition, Cheddar cheese, effect of microbial flora, 257

milk fat, identification by gas chromatographymass spectrometry, 115

Flavour, butter, identification of volatile compounds, 131

Cheddar cheese and microbial flora, 257 dairy products, oct-1-en-3-one, 89 n-pent-1-en-3-ol, n-pent-1-en-3-one, 123 lactic cultures and diacetyl-acetaldehyde ratio,

Friesian bulls, skin structure, correlation with relative breeding value, 183

Heat resistance, spores, Clostridium spp., 221 Heat treatment, milk, deposits, seasonal variation, 137

vitamin stability and dissolved oxygen content, 239

repeated heat processing, 193

Hydrometric method (B.S.I.), total solids determination, milk, suggested correction, 211

Ketosis, pregnanediol estimation, urine, 21

D(-) Lactic acid, production, lactic acid bacteria, 31

L(+) Lactic acid, production, lactic acid bacteria, 31

Lactic acid bacteria, citrate dissimilation, estimation, 39

L(+), D(-) lactic acid production, 31

Lactobacillus acidophilus, L(+), D(-) lactic acid production, 31

Milk, concentration, fat retention by rennet curd,

Milk composition, dry period, 1, 13 following suspension of milking, 151 succeeding lactation, after milking throughout pregnancy, 145

vitamins, stability, heat treatment, exposure to sunlight, influence of dissolved oxygen, 239

repeated heat processing, 193 water-soluble, content (review), 169 water-soluble constituents (review), 273

Milk deposits, on heat treatment, seasonal variation, 137

Milk fat, content, milk, and deposit formation on heat treatment, 137

calcium salts, fatty acids, added to diet, 199

estimation by Milko-tester, 65

ewes, equal and unequal milking intervals, 163

fatty acids, identification by gas chromatography-mass spectrometry, 115

phospholipids, oxidation, iodine values, milk, butter, washed-cream serum, 231

Milk Marketing Boards, compositional quality payment schemes, total solids, determination, 207, 211 Milk proteins, caeruloplasmin detection, 103 content, urine, lactating cows, 27

Milk secretion, after milking throughout pregnancy, 145

dry period, 1, 13

following suspension of milking, mid-lactation, 151

rate, equal and unequal milking intervals, ewes, 163

water and water-soluble constituents (review), 273

Milk solids, see Total solids and Solids-not-fat Milk yield, calcium salts, fatty acids, added to diet, 199

dry period, 1, 13

ewes, equal and unequal milking intervals, 163 following suspension of milking, mid-lactation, 151

skin structure, parent bull, relationship, 183 succeeding lactation, after milking throughout pregnancy, 145

Milking, interval, milk proteins content, urine, 27 milk yield, ewes, 163

suspension, mid-lactation, milk yield, composition, on resumption, in following lactation, 151

throughout pregnancy, milk secretion, succeeding lactation, 145

Milking parlour, equipment, ewes, 215

Milko-tester, estimation of fat content, milk, 65

Nutritive value, water-soluble vitamins, milk, milk products (review), 169

Oxidation, milk, dairy products and caeruloplasmin, 103

phospholipids, milk, butter, washed-cream serum, iodine values, 231

Oxygen, dissolved in milk, vitamin stability, heat treatment, exposure to sunlight, 239

Pasteurization, milk, vitamins, B-complex, content, 193

Penicillin G, sensitivity, bovine staphylococci, streptococci, corynebacteria, 249 udder disease control, dry period, 59

Phospholipids, milk, butter, washed-cream serum, oxidation, iodine values, 231

Pregnanediol, estimation, urine, normal, ketosed cows, 21

Progeny testing, bulls, value of skin structure, 183

Rennet curd, fat retention, effect of concentrating milk, 73

Sheep, milk yield, equal and unequal milking intervals, 163

milking parlour, equipment, 215

Skin structure, bulls, correlation with relative breeding value, 183

Solids-not-fat, content, milk, calcium salts, fatty acids added to diet, 199

Staphylococci, bovine, antibiotic sensitivity, 249 Sterilization, milk, vitamins, B-complex, content, 193

Streptococci, bovine, antibiotic sensitivity, 249 lactic, acetaldehyde and diacetyl production, 109

Streptococcus lactis var. diacetilactis, for estimation, citrate dissimilation, lactic acid bacteria, 39

Str. thermophilus, acetaldehyde and diacetyl production, 109

Sunlight, on milk, oxygen content and vitamin stability, 239

Total solids, determination, milk, B.S.I. hydrometric method, suggested correction, 211 design of testing schemes, 207

Udder, see also Milk secretion

disease, control, antibiotics, dry period, 47, 59
Urine, milk proteins content, lactating cows, 27
pregnanediol estimation, normal, ketosed cows,
21

Vitamin B complex, content, milk, after heat treatment, exposure to sunlight, influence of dissolved oxygen, 239 after repeated heat treatments, 193

Vitamin C, see Ascorbic acid

Vitamins, water soluble, content, milk, milk products (review), 169

Water, content, milk, udder (review), 273

Index of Authors

BALCH, C. C., 199 BERGÈRE, J.-L., 221 BOTTAZZI, VITTORIO, 109 BROSTER, W. H., 199 BURTON, H., 137, 193

CERF, O., 221 CHAPMAN, HELEN R., 257 CHEESEMAN, G. C., 73

Dellaglio, Franco, 109 Dodd, F. H., 1, 13, 47, 145, 151

EL-SALAM, M. H. ABD, 85

FORD, J. E., 193, 239 FORSS, D. A., 123, 131 FOX, S., 163, 215 FRANKLIN, J. G., 193 FRYER, T. F., 257

GARVIE, ELLEN I., 31, 39 GIBB, J. A. C., 215 GORE, D. N., 47 GREGORY, MARGARET E., 169

HANSON, L. Å., 103 HEITZMAN, R. J., 21 HERMIER, J., 221 HIGGS, T. M., 249 HOLLOWAY, GWENDA L., 231 HOLMGREN, JAN, 103

Johnson, Helen, 183 Johnson, V. W., 199 Jones, A., 47, 59, 249 Lawrence, R. C., 257 Line, C., 199 Lyster, R. L. J., 1, 27

MABBITT, L. A., 73 MCGANN, T. C. A., 65 MANSON, W., 85 MORAG, M., 163, 215 MURPHY, M. F., 65

NAY, T., 183 NEAVE, F. K., 47, 59, 249

O'KEEFFE, M. G., 207, 211

Pickering, A., 257 Pont, E. G., 231 Porter, J. W. G., 193

REITER, B., 257 ROOK, J. A. F., 199, 273 RYHAGE, RAGNAR, 115

Samuelsson, E.-G., 103 Sharpe, Elisabeth M., 257 Smith, A., 1, 13, 47, 59, 145, 151, 249 Smith, J. F., 123 Stark, W., 89, 123, 131 Sutton, J. D., 199

TUCK, VALERIE J., 199

URBACH, GERDA, 131

Wheelock, J. V., 1, 13, 27, 145, 151, 273 Wilkinson, R. A., 89

DIRECTIONS TO CONTRIBUTORS

GENERAL

The onus of preparing a paper in a form suitable for publication in the *Journal of Dairy Research* lies in the first place with the author. In their own interests authors are strongly advised to follow these directions carefully and to consult a current issue for guidance on details of layout and use of headings.

Typescripts may be sent to the Editors at any time, and submission of a paper will be held to imply that it reports unpublished original work which is not under consideration for publication elsewhere.

FORM OF PAPERS

Papers should be typed with double spacing, and the title followed by the names and initials of the authors, women supplying one Christian name. The name and postal address of the laboratory must be stated.

Papers should be divided into the following parts in the order indicated: (a) Summary, brief and self-contained; (b) Introductory paragraphs, briefly explaining the object of the work but without giving an extensive account of the literature; (c) Experimental or Methods; (d) Results; (e) Discussion and Conclusions; (f) Acknowledgements without a heading; (g) References. Only with some exceptional types of material will headings different from (c), (d) and (e) be necessary.

The spelling adopted is that of the Shorter Oxford English Dictionary. Underlining should be used only to indicate italics. Every effort should be made to avoid the use of footnotes. Proper nouns, including trade names, should be given a capital initial letter.

TABLES

Each table should be numbered and should have a heading that enables its contents to be understood without reference to the text. Tables must be typed on separate sheets and their approximate positions indicated in the text.

ILLUSTRATIONS

Line drawings, which must be originals, should be numbered as Figures and photographs as Plates, in Arabic numerals. Drawings should be in indian ink, on Bristol board or cartridge paper. However, a technique which may be more convenient to authors is to use a double-sized piece of tracing paper, or translucent graph paper faintly lined in *blue* or *grey*, folded down the centre with the drawing on one half and the other acting as a flyleaf.

Attached to every figure and plate there should be a translucent flyleaf cover on the outside of which should be written legibly: (a) title of paper and name of author; (b) figure or plate number and explanatory legend; (c) the figures and lettering, which is intended to appear on the finished block, in the correct position relative to the drawing underneath. For each paper there should also be a separate typed sheet listing figure and plate numbers with their legends, and the approximate position of illustrations should be indicated in the text.

As a rule the photographs and diagrams should be about twice the size of the finished block and not larger over-all than the sheets on which the paper itself is typed. For general guidance in preparing diagrams, it is suggested that for a figure measuring 9 in. × 6 in. all lines, axes and curves, should have a thickness of 0.4 mm, thus ——. Graph symbols in order of preference should be \bigcirc \bullet , \triangle \blacktriangle , \square \blacksquare , \times +, and for a 9 in. \times 6 in. graph the open circles should be $\frac{1}{6}$ in. in diameter. The open triangles should be large enough to contain circles $\frac{3}{32}$ in. diameter and the open squares circles of $\frac{1}{8}$ in. diameter. The crosses should have lines $\frac{1}{8}$ in. long. The block symbols should be slightly smaller than the corresponding open symbols. Scale marks on the axes should be on the inner side of each axis and should be 1 in. long.

REFERENCES

In the text references should be quoted by whichever of the following ways is appropriate: Arnold & Barnard (1900); Arnold & Barnard (1900a); Arnold & Barnard (1900a), b); (Arnold & Barnard, 1900). Where there are more than two authors all the surnames should be quoted at the first mention, but in subsequent citations only the first surname should be given thus, Brown et al. (1901). If there are six or more names et al. should be used in the first instance. Also, if the combinations of names are similar the names should be repeated each time, e.g. Brown, Smith & Allen (1954); Brown, Allen & Smith (1954).

References should be listed alphabetically at the end of the paper, title of journals being abbreviated as in the World List of Scientific Periodicals. Authors' initials should be included, and each reference should be punctuated in the typescript thus: Arnold, T. B., Barnard, R. N. & Compound, P. J. (1900). J. Dairy Res. 18, 158. References to books should include name of author, year of publication, title, town of publication and name of publisher in that order, thus, Arnold, T. B. (1900). Dairying. London: Brown and Chester.

It is the duty of the author to check all references and to ensure that the correct abbreviations are used.

SYMBOLS AND ABBREVIATIONS

The symbols and abbreviations used are those of British Standard 1991: Part 1: 1954, Letter Symbols, Signs and Abbreviations.

DESCRIPTIONS OF SOLUTIONS

Normality and molarity should be indicated thus: N-HCl, $0.1\,\text{M}$ -NaH₂PO₄. The term '%' means g/100 g solution. For ml/100 ml solution write '% (v/v)' and for g/100 ml solution write '% (w/v)'.

REPRINTS

Order forms giving quotations for reprints are sent to authors with their proofs.

Journal of Dairy Research Volume 34, Number 3, October 1967

CONTENTS

| ORIGINAL ARTICLES | |
|--|-----|
| Some skin characteristics in British Friesian pedigree bulls and their cor- | |
| relation with relative breeding value | |
| NAY, T. and JOHNSON, HELEN page | 183 |
| Effects of repeated heat treatments on the levels of some vitamins of the B-complex in milk | |
| BURTON, H., FORD, J. E., FRANKLIN, J. G. and PORTER, J. W. G. | 193 |
| The effect on milk yield and composition of adding the calcium salts of acetic, propionic, butyric and lactic acids to the diets of dairy cows BALCH, C. C., BROSTER, W. H., JOHNSON, V. W., LINE, C., ROOK, | 100 |
| J. A. F., SUTTON, J. D. and TUCK, VALERIE J. | 199 |
| Factors affecting the design of milk total solids testing schemes O'KEEFFE, M. G. | 207 |
| A suggested correction to the British Standards hydrometric method for the estimation of total solids in milk | |
| O'KEEFFE, M. G. | 211 |
| A milking parlour for experimental work with lactating ewes MORAG, M., GIBB, J. A. C. and FOX, S. | 215 |
| Thermorésistance des spores de Clostridium tyrobutyricum et Clostridium | |
| butyricum | |
| CERF, O., BERGERE, JL. et HERMIER, J. | 221 |
| The effect of oxidation on the iodine values of phospholid in milk, butter and washed-cream serum | |
| PONT, E. G. and HOLLOWAY, GWENDA L. | 231 |
| The influence of the dissolved oxygen in milk on the stability of some vitamins towards heating and during subsequent exposure to sunlight | |
| FORD, J. E. | 239 |
| The sensitivity of bovine staphylococci, streptococci and corynebacteria to cloxacillin and various other antibiotics | |
| JONES, A., HIGGS, T. M., NEAVE, F. K. and SMITH, A. | 249 |
| The effect of the microbial flora on the flavour and free fatty acid composition of Cheddar cheese | |
| REITER, B., FRYER, T. F., PICKERING, A., CHAPMAN, HELEN R., LAWRENCE, R. C. and SHARPE, M. ELISABETH | 257 |
| REVIEWS OF THE PROGRESS OF DAIRY SCIENCE. Section C. Dairy chemistry. The secretion of water and of water-soluble constituents in milk | |
| ROOK, J. A. F. and WHEELOCK, J. V. | 273 |

Printed in Great Britain at the University Printing House, Cambridge