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ANNOTATED
BIBLIOGRAPHY ON
NUTRIENT
ABSORPTION AND
DIARRHOEA -
MALNUTRITION
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No. 1 Annotated Bibliography on Nutrient Absorption and
Diarrhoea-Malnutrition Cycle

Specialized Bibliography Series No. 1

ANNOTATED BIBLIOGRAPHY ON NUTRIENT ABSORPTION
AND DIARRHOEA-MALNUTRITION CYCLE



INTERNATIONAL CENTRE FOR
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EDITOR-IN-CHIEF:

Dr Ayesha Molla

ABSTRACTOR:

Iftekharaul Islam

SCIENTIFIC EDITOR:

Naomi Rock Novak

MANAGING EDITOR:

M S I Khan

COMPILATION AND DOCUMENTATION:

M S I Khan, Iftekharaul Islam,
M A Matin and Mostaque A Chowdhury

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International Centre for Diarrhoeal Disease Research, Bangladesh
G P O Box 128, Dhaka 2, Bangladesh

Cable: Cholera Dhaka; Telex: 65612 ICDD BJ
Telephone: 600171-600178 (PABX)

CONTENTS

Preface	i
User's guide	ii
Introduction	iii
Bibliography	1
Subject section	
Carbohydrate malabsorption	1
Malabsorption of other nutrient	3
Author section	11

PREFACE

The Specialized Bibliography Series is part of the larger effort to establish an information network in the field of diarrhoeal diseases research -- an effort being carried out by the International Diarrhoeal Disease Information Service and Documentation Centre (DISC), run by the ICDDR,B. The present issue, the first of the Series, includes citations of 125 papers (90 abstracted) on absorption of nutrients in diarrhoea. This is a subject of current importance, and the reason for selecting the topic is explained in the introduction by Dr Ayesha Molla, an ICDDR,B nutrition scientist. A number of bibliographies under this Series, covering currently important diarrhoeal diseases topics, are under preparation, and will be published shortly.

This work is not an exhaustive bibliography on the topic. The bibliography was compiled from our limited resources, and unintentional omissions may have occurred.

We believe this bibliography will contribute towards generating greater interest and awareness in this field, and will facilitate user access to knowledge of the problems. Copies of articles abstracted here are available from DISC to interested persons/organizations. We will consider this attempt successful if the bibliography helps diarrhoeal diseases researchers and practitioners. Suggestions for improvement of a future edition will be appreciated.

K M S Aziz, PhD

USER'S GUIDE

The Specialized Bibliography Series includes papers and publications -- current as well as back materials -- from sources worldwide.

The bibliography is divided into subject and author sections. In the subject section, citations are arranged under main and sub-headings, following basically the Medical Subject Headings of the Index Medicus of the National Library of Medicine, USA. Citations are arranged alphabetically by first author under the appropriate main headings/subheadings. The sequential number in the subject section sometimes is followed by a sign (+), indicating that an abstract of the cited paper appears in the author section.

The author section contains citations arranged alphabetically by first author and then by paper title. Normally, an abstract is appended with the citation. If this has not been done, the citation has not been annotated in this bibliography. Co-authors' names also appear in alphabetical order along with a cross-reference to the first author (e.g., Aziz KMA, see Koster FT). This will facilitate a search by co-authors' names.

Efforts have been made to present abstracts with all available information regarding the study's nature and objective, methods used, and major findings and conclusions.

The bibliography is in English. A title in parentheses indicates that the paper is in another language.

INTRODUCTION

Nutrient absorption in children with malnutrition and diarrhoeal disease needs special attention as, in developing countries, diarrhoeal diseases and malnutrition are common in those who already are malnourished. Diarrhoea was found to be prolonged and severe in malnourished children, though malnutrition per se may or may not be responsible for increased diarrhoeal disease incidence. Absorption of various nutrients (macro or micro) is impaired by various mechanisms, i.e., morphological abnormalities of the intestinal epithelium, mucosal enzyme deficiencies, impaired absorptive capacity of the intestinal mucosa, reduced intestinal motility, pancreatic and bile salt insufficiency and bacterial overgrowth in the small bowel. However, it is a controversial issue; and it is difficult to conclude whether the associated malabsorption is due to accompanied malnutrition or to such underlying causes as systemic infection or intestinal bacterial overgrowth. Increasing concerns are being expressed on prevention of malnutrition and diarrhoea. This has led to a current increased awareness of and emphasis on the problem among practitioners around the world. To determine an effective means of intervening in the diarrhoea-malnutrition cycle prevailing in developing countries, it is extremely important to understand the crucial problems where children are concerned. Nutrient malabsorption is a critical problem for children beset by sub-optimal dietary conditions in which nutritional deficiencies are extreme. In such children, lack of intestinal absorption further aggravates already existing malnutrition. Impaired absorption of diverse nutrients are interrelated. For example, fat malabsorption influences absorption of fat-soluble vitamins. Blindness can be precipitated in nutritionally deprived and thus vulnerable children due to malabsorption of vitamin A.

The problem of carbohydrate malabsorption associated with diarrhoeal disease in children demands special concentration. In developing countries, carbohydrate malabsorption mostly is due to a disaccharidase deficiency, mainly of lactase. A controversy arises because, on the one hand, in the literature, diarrhoea always has been associated with feeding of lactose or lactose-containing food, such as milk. However, on the other hand, this conflicts with the findings in countries such as Guatemala and Jamaica, where severely malnourished children were treated successfully with milk formulae. Thus, further research is needed to discover the significance of lactose malabsorption in developing countries where by and large milk-containing foods are beyond the purchasing reach of the target group. New means must be sought to determine the best ways of rehabilitating these children.

Breast feeding and its protective role in reducing infectious diseases is a universally important research subject. Previous research has shown that continuation of breast feeding during diarrhoea is extremely important -- as this is the sole source of energy during the diseased condition, and because breast milk possibly is being completely absorbed. More research must be done, to emphasize the importance of continued breast feeding during diarrhoea and other diseases in children.

In view of the vital nutritional implications of nutrient malabsorption in children with diarrhoeal diseases, new scientific work is needed to answer many important questions -- in order to effectively intervene in the diarrhoea-malnutrition cycle

Thus, we believe it is imperative to amass, in a single place, all previous knowledge published worldwide and directly related to diarrhoeal diseases research. Thus, this annotated bibliography aims to summarize and list the important works which, hopefully, both will provide scientists with a quick glimpse into what is available, and will provide the spark for new research in the field. Finally, we hope this effort will further contribute to understanding of the critical issue of nutrient absorption in diarrhoeal children.

Aysha Molla, PhD

NUTRIENT ABSORPTION AND DIARRHOEA-MALNUTRITION CYCLE

CARBOHYDRATE MALABSORPTION

- 001 + Einstein LP, Mackay DM, Rosenberg IH. Pediatric xylose malabsorption in East Pakistan: correlation with age, growth retardation, and weaning diarrhea. *Am J Clin Nutr* 1972 Nov;25(11):1230-3
- 002 + Gracey M, Burke V. Sugar-induced diarrhoea in children. *Arch Dis Child* 1973 May;48(261):331-6
- 003 + Rodriguez-de-Curet H, Lugo-de-Rivera C, Torres-Pinedo R. Studies on infant diarrhea. IV. Sugar transit and absorption in small intestine after a feeding. *Gastroenterology* 1970 Sep;59(3):396-403
- 004 Sugar-induced diarrhea in children (editorial). *Can Med Assoc J* 1973;109:343

COMPLICATIONS

- 005 Lindquist B, Meeuwisse GW. Chronic diarrhoea caused by monosaccharide malabsorption. *Acta Paediatr (Stockholm)* 1962;51:674-85
- 006 Pacht M. [Chronic diarrhea in infants caused by malabsorption of sugars]. *Dapim Refuim* 1966;25:152-8

DIAGNOSIS

- 007 + Brown KH, Khatun M, Ahmed MG. Relationship of the xylose absorption status of children in Bangladesh to their absorption of macronutrients from local diets. *Am J Clin Nutr* 1981 Aug;34(8):1540-7
- 008 + Chandra RK, Pawa RR, Ghai OP. Sugar intolerance in malnourished infants and children. *Br Med J* 1968 Dec 7;4(5631):611-3
- 009 + Espinos D, Aboin J, Cotarelo A. [Value of the lactose absorption curve in clinical medicine]. *Rev Clin Esp* 1967;107(1):17-21
- 010 + Gardiner AJ, Tarlow MJ, Sutherland IT, Sammons HG. Lactose malabsorption during gastroenteritis, assessed by the hydrogen breath test. *Arch Dis Child* 1981 May;56(5):364-7
- 011 + Hermier M, Pignal, Flandrois C, Baltassat P, Beufrere P, Descos B. [Breath test study of sucrose absorption in infants with acute diarrhea]. *Arch Fr Pediatr* 1982 Jun-Jul;39(6):371-4
- 012 + Lifshitz F, Coello-Ramirez P, Gutierrez-Topete G, Cornado-Cornet MC. Carbohydrate intolerance in infants with diarrhea. *J Pediatr* 1971 Nov;79(5):760-7

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

- 013 + Lifshitz F, Coello-Ramirez P, Contreras-Gutierrez ML. The response of infants to carbohydrate oral loads after recovery from diarrhea. *J Pediatr* 1971 Oct;79(4):612-7
- 014 + Mavromichalis J, Evans N, McNeish AS, Bryden AS, Davies HA, Flewett TH. Intestinal damage in rotavirus and adenovirus gastroenteritis assessed by D-xylose malabsorption. *Arch Dis Child* 1977 Jul;52(7):589-91
- 015 Posada OR, Kurdian M. [Study of the absorption of orally administered glucose in chronic diarrhea and in gastroectomized patients]. *Prensa Med Argent* 1965;52:1967-70
- 016 + Varavithya W, Valyasevi A, Charuchinda S. Lactose malabsorption in Thai infants. *J Pediatr* 1971 Apr;78(4):710-5
- 017 + Widiarto, Sebodo T, Irawan, Widayat, Ismangoen. Sucrose tolerance test in children with diarrhoea. *Paediatr Indones* 1982 Jul-Aug;22(6-7):126-31

DIET THERAPY

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ENZYMOLOGY

- 019 + Jarrett EC, Holman GH. Chronic diarrhea in infancy with resultant disaccharide malabsorption. *J Med Assoc Georgia* 1966 May;55:170-3

ETIOLOGY

- 020 + Bowie MD. Effect of lactose-induced diarrhoea on absorption of nitrogen and fat. *Arch Dis Child* 1975 May;50(5):363-6
- 021 + Brown KH, Black RE, Parry L. The effect of diarrhea on incidence of lactose malabsorption among Bangladeshi children (letter). *Am J Clin Nutr* 1980 Oct; 33(10):2226-7
- 022 Chipail A, Schneer JH, Dragan S. [Intestinal malabsorption of disaccharides in diarrhea in infants]. *Rev Med Chir Soc Med Nat Iasi* 1971;75:855-60
- 023 + Sack DA, Rhoads M, Molla A, Molla AM, Wahed MA. Carbohydrate malabsorption in infant with rotavirus diarrhea. *Am J Clin Nutr* 1982 Dec;36(6):1112-8
- 024 + Srivastava VK, Anand VK, Murthy PS, Prabhu KM. Sugar intolerance in acute gastroenteritis in infancy and childhood. *Indian Pediatr* 1984 Jun;21(6): 485-9

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

- 025 Vega-Franco L, Jimenez E, Galindo E. [Disaccharide malabsorption in infants with acute diarrhea]. *Bol Med Hosp Infant Mex* 1974;31:761-9

METABOLISM

- 026 + Abraham JM, Levin B, Oberholzer VG, Russell A. Glucose-galactose malabsorption. *Arch Dis Child* 1967;42:592-7
- 027 Jarnum S, Kristensen M. Lactose malabsorption and lactose-induced enteric loss of protein in regional enteritis. *Nuclearmedizin* 1967:223-9

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- 028 + Brown KH, Parry L, Khatun M, Ahmed MG. Lactose malabsorption in Bangladesh village children: relation with age, history of recent diarrhea, nutritional status, and breast feeding. *Am J Clin Nutr* 1979 Sep;32(3):1962-9
- 029 + Davidson GP, Goodwin D, Robb TA. Incidence and duration of lactose malabsorption in children hospitalized with acute enteritis: study in a well-nourished urban population. *J Pediatr* 1984 Oct;105(4):587-90

MALABSORPTION OF OTHER NUTRIENTS

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- 031 + Chen LC, Huq E, Huffman SL. A prospective study of the risk of diarrhoeal diseases according to the nutritional status of children. *Am J Epidemiol* 1981 Aug;114(2):284-92
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- 034 + Fuentes A, Hertrampf E, Barrera G, Heresi G, Jarpa S, Uaury R. Nutrition evaluation of the hospitalized pediatric patient. *Rev Chil Pediatr* 1981 Sep-Oct;52(5):387-95
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Nutrient Absorption and Diarrhoea-Malnutrition Cycle

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- 040 + Tomkins AM. Folate malnutrition in tropical diarrhoeas. *Trans R Soc Trop Med Hyg* 1979;73(5):498-502
- 041 + Tontisirin K, Valyasevi A. Protein energy malnutrition related to diarrhea in Thai children. *J Nutr Sci Vitaminol* 1981;27:513-30

BLOOD

- 042 Araya M, Silink SJ, Nobile S, Walker-Smith JA. Blood vitamin levels in children with gastroenteritis. *Aust NZ J Med* 1975 Jun;5(3):239-50
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COMPLICATIONS

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- 045 + Black RE, Brown KH, Becker S. Malnutrition is a determining factor in diarrheal duration, but not incidence, among young children in a longitudinal study in rural Bangladesh. *Am J Clin Nutr* 1984 Jan;39(1):87-94
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Nutrient Absorption and Diarrhoea-Malnutrition Cycle

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- 058 + Lindenbaum J. Malabsorption during and after recovery from acute intestinal infection. *Br Med J* 1965 Aug 7;2(5457):326-9
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- 060 + Molla A, Molla AM, Sarker SA, Khatun M. Whole-gut transit time and its relationship to absorption of macronutrients during diarrhoea and after recovery. *Scand J Gastroenterol* 1983 May;18(4):537-43
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- 064 + Taylor RH, Waterman S. Single intubation test for investigation of malabsorption and diarrhoea. *Gut* 1983;24:680-2

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- 069 + Kanaaneh H. The relationships of bottle feeding to malnutrition and gastroenteritis in a pre-industrial setting. *J Trop Pediatr Environ Child Health* 1972 Dec;18(3):302-6
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- 076 + Gyr K, Felsenfeld O, Wolf RH. Intestinal absorption, exocrine pancreatic function and response to Vibrio cholerae infection in protein deficient patas monkeys (Erythrocebus patas). *Trans R Soc Trop Med Hyg* 1975 Jun 31; 69(2):247-50
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Nutrient Absorption and Diarrhoea-Malnutrition Cycle

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- 089 + Jones TC, Dean AG, Parker GW. Seasonal gastroenteritis and malabsorption at an American military base in the Philippines. II. Malabsorption following the acute illness. *Am J Epidemiol* 1972 Feb;95(2):128-39
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Nutrient Absorption and Diarrhoea-Malnutrition Cycle

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Nutrient Absorption and Diarrhoea-Malnutrition Cycle

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AUTHOR SECTION

Abdullaev SKh see Iushchuk ND

Aboin J see Espinos D

Abraham JM, Levin B, Oberholzer VG, Russell A. Glucose-galactose malabsorption. Arch Dis Child 1967;42:592-7

Thirteen cases of glucose-galactose malabsorption previously were reported from various parts of the world; this paper reports the first such case from the U.K. A female infant, who developed severe diarrhoea on breast-feeding, failed to absorb glucose and galactose, but had normal fructose absorption. When fructose was substituted for other carbohydrates in the feed, diarrhoea stopped with subsequent thriving. Disaccharidase activity in the jejunal mucosa was normal. Parenterally administered glucose and galactose were normally metabolized. Renal tubular glucose reabsorption also was normal ($Tm_g=282$ mg/min. 1.73 sq.m.). There was no rise in plasma insulin levels following oral glucose. A vitamin deficiency rash cleared with pantothenic acid supplementation. A lack of this vitamin probably causes skin lesions in children on synthetic foods. The father was lactose intolerant, with a low lactase activity of his jejunal mucosa. This was thought to be incidental, as this is a fairly common acquired defect in adults. However, the mother developed no signs of intolerance from similar glucose and galactose doses.

Abry M see Vachon A

Agarkhedkar SR see Bhaye SA

Ahmed MG see Brown KH

Alvarado J, Vargas W, Diaz N, Viteri FE. Vitamin B₁₂ absorption in protein-calorie malnourished children and during recovery: influence of protein depletion and of diarrhea. Am J Clin Nutr 1973 Jun;26(6):595-9

57. Co-vitamin B₁₂ absorption was studied by a Schilling test in 25 children hospitalized in Guatemala with severe protein-calorie malnutrition (PCM). In 10 children the simultaneous intrinsic factor's effect was evaluated, and absorption studies were repeated after 12 days of a therapeutic diet. Ten fully-recovered children served as controls.

The mean \pm SD urinary excretion of Co-B₁₂ as a percent of dose, with and without intrinsic factor, respectively, were 8.4 ± 7.3 and 12.3 ± 9.5 . Thus, in severe PCM, vitamin B₁₂ absorption is low, and does not improve with intrinsic factor administration. The 24-h urinary radioactivity rose with nutritional repletion. Children studied 12 days after consuming the therapeutic diet already had significantly higher urinary excretion of ⁵⁷Co-B₁₂ (17.0 ± 10.1) than they had had upon admission ($p < 0.05$). A further rise ($p < 0.01$) was seen in the fully-recovered

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

children (31.4 ± 9.7). Values obtained in fully-recovered children were similar to those seen in children with pernicious anemia to whom intrinsic factor is given.

In severely malnourished children and during their early recovery, diarrhoea produces a marked drop in vitamin B₁₂ absorption; but children without diarrhoea in the same stage will absorb sub-normal amounts of B₁₂. Vitamin B₁₂ absorption correlates with the creatinine index ($r = 0.493$), suggesting that the degree of protein depletion influences vitamin B₁₂ absorption. The results might be important in exploring the possible role of terminal ileum in the altered bile salt metabolism in PCM and diarrhoea.

Alvarez EL see Vega-Franco L

Ammon HV see Townsend WF

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Araya M, Silink SJ, Nobile S, Walker-Smith JA. Blood vitamin levels in children with gastroenteritis. *Aust NZ J Med* 1975 Jun;5(3):239-50

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Bartelheimer H, Dulce, Kloos K, Loeschke A, Pezold FA, Ritter U, Ruebe. [Enteritis and sprue-malabsorption syndrome]. *Deutsch Med J* 1961;12:255-9

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Becker S see Black RE

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Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Bhave SA, Pandit AN, Agarkhedkar SR. Protracted diarrhea and its management. Indian Pediatr 1983 Mar;20(3):173-8

The study had two aims: to evaluate diets in chronic diarrhoea; and to establish a methodology for diarrhoea management, within the framework of facilities easily available in India. Of 569 diarrhoea cases hospitalized in a children's ward over 20 months, 56 (10%) had protracted diarrhoea, 2 had diarrhoea from birth, and in the others diarrhoea had started acutely. Associated illnesses and abnormalities were present in 18 (32.14%). Definitive causes could be established only in 26/56 (47.7%). Of these, 20 were due to secondary disaccharide intolerance. Three diets were evaluated for dietetic management. The results: chicken-based and rice/dal-based diets were significantly better than a calcium caseinate-based diet. Overall mortality was 23.2%. Achievement of a positive nutritional balance in diarrhoea management is stressed.

Black RE, Brown KH, Becker S. Malnutrition is a determining factor in diarrheal duration, but not incidence, among young children in a longitudinal study in rural Bangladesh. Am J Clin Nutr 1984;39:87-94

Diarrhoea and malnutrition are common in developing country young children, and a reciprocal relationship has been postulated with diarrhoea leading to malnutrition and malnutrition predisposing to diarrhoea. To investigate the importance of malnutrition as a diarrhoea-determining factor, data were analyzed from a longitudinal community-based study done at two rural villages in the ICDDR,B's Matlab field research area. A total of 197 children aged 2-48-months, classified by nutritional status according to a variety of anthropometric indicators, were evaluated prospectively for diarrhoea incidence, duration and etiology. For those below 24 months, the mean diarrhoea duration in the lowest weight-for-length group (less than 80% of the National Centre for Health Statistics standard) was 56% longer than the duration for children who were at least 90% of the standard. However, children of differing nutritional status had similar diarrhoeal incidences. Diarrhoea duration, including that associated with enterotoxigenic Escherichia coli and Shigella, increased progressively as nutritional status indicators worsened. Diarrhoeal duration and incidence for those over 24 months did not vary with nutritional status. It is suggested that nutritional interventions alone are unlikely to reduce high diarrhoea incidence, but that efforts to improve nutritional status may positively affect diarrhoea duration and its unfavourable nutritional consequences.

Black RE see Brown KH

Boda M see Varkonyi A

Bolanos O see Tripathy K

Booth CC. Diarrhoea due to intestinal malabsorption. Proc R Soc Med 1963 Dec;56 (12):1068-70

Intestinal malabsorption causes two main problems: (1) diarrhoea associated with steatorrhea that results from fat malabsorption; and (2) malnutrition caused by impaired absorption of essential nutrients. Patients with malabsorption therefore may present with diarrhoea, nutritional deficiencies or both. This paper summarizes briefly the types of malabsorption and nutritional deficiencies that occur in patients with idiopathic steatorrhea, surgical conditions associated with malabsorption, pancreatic disease and chronic tropical sprue. Of 55 patients hospita-

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

lized with idiopathic steatorrhoea, 26 had diarrhoea. There was little or no diarrhoea in 21 other patients who had nutritional deficiencies. Three main surgical conditions cause malabsorption: intestinal resection, blind loop syndrome and Crohn's disease. These conditions most frequently involve the distal small intestine, and cause total malabsorption of vitamin B₁₂, and partial fat and protein malabsorption. The striking feature of pancreatic disease is that malabsorption may cause little diarrhoea, even when pancreatic secretion is completely absent. Tropical sprue -- a type of intestinal malabsorption associated with nutritional deficiencies -- occurs in tropical areas, such as India, Burma, Malaysia, Hong Kong, Indonesia, and certain West Indian islands.

Bowie MD. Effect of lactose-induced diarrhoea on absorption of nitrogen and fat. Arch Dis Child 1975 May;50(5):363-6

Nitrogen and fat absorption and nitrogen retention were studied in 20 children with kwashiorkor. Given milk, 13 had lactose malabsorption and severe diarrhoea. Fat absorption was unaffected by lactose-induced diarrhoea, but nitrogen absorption was impaired in both lactose absorbers and malabsorbers. Children tolerating lactose showed better nitrogen absorption on the disaccharide-free diet, compared with the initial period on milk ($p < 0.02$). In non-absorbers, there was a significant improvement when diets were changed from milk to disaccharide-free formula ($p < 0.02$), and deterioration ($p < 0.001$) when milk was reintroduced. Nitrogen retention was unaffected and progressively dropped as protein repletion occurred. Milk and milk products should continue to be used in programs aimed at eliminating malnutrition.

Bowie MD see Mann MD

Brasitus TA. Parasites and malabsorption. Clin Gastroenterol 1983 May;12(2):495-510

Association of intestinal parasites (both protozoa and helminths) with nutrient malabsorption is reviewed. It appears that giardiasis, coccidiosis, cryptosporidiosis, strongyloidiasis, capillariasis and perhaps Plasmodium falciparum malaria are the only parasitic diseases which cause malabsorption of many nutrients. Diphyllobothrium latum and Ascaris lumbricoides interfere, with respectively, vitamin B₁₂ and vitamin A absorption. In view of the increasing use of immunosuppressive therapy, it is likely that malabsorption due to intestinal parasites may become even more evident in the future.

Brooke OG, Wheeler EF. High energy feeding in protein-energy malnutrition. Arch Dis Child 1976;51:968-71

Milk-based liquid formula feed with a high fat content was used to rehabilitate 25 seriously malnourished children, aged 0.5 to 2.75 years, at the Tropical Metabolism Research Unit, Mona, Jamaica. The diet consisted of milk enriched with arachis oil, to give a theoretical energy yield of 565 kJ/100 ml (135 kcal). The mixture had 9% protein. This high-fat diet produced accelerated growth of lean, as well as adipose tissues; and resulted in rapid nutritional rehabilitation in the first 7 weeks in all patients. Such diets are easy to prepare and relatively cheap. Fat's high efficiency as an energy source means that conventional load volumes still can provide large energy intakes, thereby shortening the recovery period. The cheapest locally available milk powders and oils can be used, but it is important to preserve the correct balance between energy and protein.

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Brown KH, Gilman RH, Khatun M, Ahmed MG. Absorption of macronutrients from a rice-vegetable diet before and after treatment of ascariasis in children. *Am J Clin Nutr* 1980 Sep;33(3):1975-82

To define further the impact of roundworms on children's intestinal absorptive function, the apparent absorption of nitrogen (N), fat and total energy from a rice and vegetable diet was measured in 13 children (aged 3-7 years) of similar nutritional status but infected with varying *Ascaris lumbricoides* loads. Apparent N absorption initially was 57.2% in heavily-infected subjects, and was 64.1% in subjects with light infections ($0.05 < p < 0.1$). After piperazine therapy there was a significant improvement in apparent N absorption ($p < 0.02$), apparent N retention ($p < 0.05$) and apparent fat absorption ($p < 0.05$) for the group as a whole, particularly for those with heavy infections. Neither carbohydrate absorption nor xylose excretion changed significantly in either group. Total energy absorption, after treatment, improved slightly in both groups, most noticeably in the heavily-infected. However, the changes were insignificant. Treatment and eradication of ascariasis may be nutritionally advantageous for children with heavy worm burdens and marginal protein availability.

Brown KH, Black RE, Parry L. The effect of diarrhea on incidence of lactose malabsorption among Bangladeshi children (letter). *Am J Clin Nutr* 1980 Oct;33(10):2226-7

Lactose malabsorption (LM) previously was studied among Bangladeshi village children. The effect of acute diarrhoea of various etiologies on incidence and duration of malabsorption was studied in a second set of Bangladeshi children, aged 3-19 months. Between day 5 and 19 after diarrhoea onset, a lactose-breath hydrogen test (L-BHT) was performed, feeding a 10% aqueous solution of lactose (2 g/kg). Only data from those subjects with a single agent recovered from the initial stool examination and no new pathogens identified on the absorption study day are presented.

Depending on etiologic agent, at least 30-50% of subjects malabsorbed the test sugar after acute diarrhoea. Among the 26 subjects with initial rotavirus infection, whose stools were re-examined on the L-BHT day, there was significantly more LM among the 15 individuals still excreting the virus than among those negative for rotavirus at the time of the second study (60 versus 9%, $\chi^2 = 4.97$, $p < 0.05$). Follow-up studies of subjects originally diagnosed as malabsorbers showed marked improvement in LM rate by 1 month after diarrhoea onset. The proportion of children diagnosed as lactose malabsorbers only on the basis of clinical signs was much greater than had been observed in the previous field study (56 versus 8%, $\chi^2 = 39.9$, $p < 0.005$). Thus, the L-BHT is not a reliable diagnostic test immediately after acute diarrhoea. Further LM investigations after acute diarrhoea should use diagnostic techniques other than L-BHT.

Brown KH, Parry L, Khatun M, Ahmed MG. Lactose malabsorption in Bangladeshi village children: relation with age, history of recent diarrhea, nutritional status, and breast feeding. *Am J Clin Nutr* 1979 Sep;32(3):1962-9

The prevalence of lactose malabsorption (LM) among Bangladeshi village children was determined, using the recently-developed breath hydrogen test. Initial hospital-based comparison studies in 79 children and adults showed general agreement between the breath hydrogen test and a modified lactose tolerance test in 74.4% of subjects. A total of 234 children, stratified by age, nutritional status

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

and history of recent diarrhoea, were studied. The age-related prevalences of LM indicated that at least 80% of all children older than 36 months mal-absorbed lactose. All infants under 6 months absorbed the sugar completely, and children aged 6-37 months showed intermediate LM rates. There was greater LM frequency in association with recent diarrhoea in all younger age groups, and LM prevalence was significantly higher among those in the 7-18 month group with a positive history of diarrhoea. A greater proportion of children in some age groups evidenced malabsorption in association with acute under-nutrition. Among weanlings, breast-fed children experienced significantly less LM than did fully weaned children of similar age and nutritional status ($p < 0.007$).

Brown KH, Khatun M, Ahmed MG. Relationship of the xylose absorption status of children in Bangladesh to their absorption of macronutrients from local diets. *Am J Clin Nutr* 1981 Aug;34(8):1540-7

The results of xylose absorption tests from 31 asymptomatic Bangladeshi male children (aged 3-7) were compared with their ability to absorb macronutrients from cereal-vegetable diets, as determined by metabolic balance studies. Diet group I had 21 subjects and 10 were in diet group II. Xylose test results ranged from 9.8-37.0% excretion of the ingested dose, while 17 (55%) children excreted less than 20%. Although xylose excretion values improved significantly during hospitalization of both study groups ($p < 0.05$), the magnitude of improvement was small in group I. Nevertheless, the apparent macronutrient absorption during 7-day balance studies ranged from 89.8-97.7% of intake for carbohydrates, 81.7-98.7% for fats, and 47.3-78.9% for nitrogen. There was a statistically significant correlation between xylose test results and apparent carbohydrate absorption for group II only ($r = 0.76$, $p < 0.05$), but not between the xylose results and other indicators of intestinal function or nutritional status.

Diminished xylose absorption, recognized commonly among asymptomatic residents of the tropics, does not necessarily indicate impaired macronutrient absorption from the customary diet. Therefore, tropical enteropathy may not have major nutritional significance for those with manifestations of the syndrome. Compared to nutrient balance studies, the xylose excretion test is excessively sensitive as an indicator of intestinal dysfunction. Specific individuals and diets should be studied directly, to determine nutrient absorption from the customary diet.

Brown KH see Black RE

Bryden AS see Mavromichalis J

Burke V see Gracey M

Cattan D see Guerou H

Chandra RK, Pawa RR, Ghai OP. Sugar intolerance in malnourished infants and children. *Br Med J* 1968 Dec 7;4:611-3

Carbohydrate tolerance tests were done in 100 malnourished Indian children, aged 3 months to 5 years, using lactose, sucrose and maltose. Fifty children showing a stool pH below 6 were studied further. Carbohydrate-loading tests demonstrated intolerance to lactose in 39. Of these, 25 were intolerant to sucrose and 15 to

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

maltose. D-xylose absorption was reduced in all of 16 children who showed poor glucose and galactose absorption. Steatorrhoea, with daily fecal fat excretion exceeding 6 g, was detected in 7 of 18 children tested. After three months of diet therapy with a high-calorie protein-rich diet low in disaccharide sugars, all children showed nutritional recovery. This reversed the abnormalities in all but four, in whom a primary enzymatic deficiency was considered on the basis of persistent lactose intolerance and a positive family history.

Charritat JL see Goutet JM

Charuchinda S see Varavithya W

Chen LC, Huq E, Huffman SL. A prospective study of the risk of diarrhoeal diseases, according to the nutritional status of children. *Am J Epidemiol* 1981 Aug;114(2): 284-92

The aim of this study was to re-examine the hypothesis that protein-calorie malnutrition increases the incidence of diarrhoeal diseases. The study was undertaken in Matlab where the International Centre for Diarrhoeal Disease Research, Bangladesh was maintaining a longitudinal demographic-epidemiologic surveillance system and diarrhoeal disease health services. The prospective epidemiologic field data collected from this area was utilized to examine the effect of child malnutrition on the subsequent risk of diarrhoea among preschool children in rural Bangladesh. A total of 2019 children 12-23 months of age was classified according to weight-for-age, weight-for-height and height-for-age as a percentage of the Harvard median standard. Over a prospective period of 24 months, diarrhoeal hospitalization rates among the children were matched to the initial anthropometric assessment. No differences were observed in diarrhoeal hospitalization rates according to initial nutritional status. Another group of 207 children under 5 years of age were classified according to weight-for-age, and after the nutritional assessment, their diarrhoeal attack rate was followed prospectively for one year. Again, no differences in field diarrhoeal attack rates between varying nutrition status categories were observed. The nutritional status of the 207 children was then defined as monthly growth velocity (kg change in body weight, percent change of initial body weight, and percent change of weight-for-age) and the diarrhoeal attack rate for the subsequent one month period was observed, but again no difference in attack rates was noted between nutritional groups. The results of the study suggested that the nutritional status of children exerts little influence on subsequent diarrhoeal incidence. The impact of diarrhoea in predisposing and exacerbating malnutrition might be the more important of the bidirectional interactions. It was further concluded that the predominant effect of malnutrition on diarrhoea might be through disease duration and mortality, rather than through disease incidence.

Chen LC see Hoyle B

Chipail A, Schmeer JH, Dragan S. [Intestinal malabsorption of disaccharides in diarrhea in infants]. *Rev Med Chir Soc Med Nat Iasi* 1971;75:855-60

Christopher NL, Bayless TM. Role of the small bowel and colon in lactose-induced diarrhea. *Gastroenterology* 1971 May;60(5):845-52

The net fluid movement in the small bowel and colon in response to an oral lactose load was determined by intraluminal intubation in 5 lactase-deficient and 2 normal

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

adults. The major net fluid secretion in lactase-deficient individuals occurred in the stomach, duodenum and jejunum. The test solution had been diluted approximately 5-fold when it reached mid-ileum. This was significantly different ($p < 0.05$) from the results with normal subjects. The fluid response was similar to that seen with an osmotically equivalent amount of mannitol. The response to an osmotic stimulus was the same as occurred in the control subjects fed mannitol. Ileal contents were neutral or alkaline, and the osmolality had decreased by 50% to approximately 300 mOsm/kg after lactose feeding. In the colon, there was interference with net fluid absorption when lactose was fed by mouth to lactase-deficient subjects, or was perfused into 4 subjects' ileocecal regions. In each subject, with both methods, absorption was greater from mannitol than from lactose solution. Lactose did not result in net fluid secretion in the colon. Stools were acid, and the osmolality had risen to 379 mOsm/kg, presumably due to bacterial fermentation of undigested lactose. Lactose-induced diarrhoea in lactase-deficient subjects results, in large part, from the combination of net fluid secretion by the small intestine in response to an osmotic load, and from interference with net fluid absorption in the small bowel and colon. The products of lactose fermentation might play a role in the decreased colonic absorption.

Chung AW. Effect of oral feeding at different levels on absorption of food stuffs in infantile diarrhea. *J Pediatr* 1948;33:1-13

Chung AW, Viscorova B. Effect of early oral feeding versus early oral starvation on course of infantile diarrhea. *J Pediatr* 1948;33:14-22

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Coello-Ramirez P see Lifshitz F

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Cook GC. Jejunal absorption rates of glucose and glycine in post-infective tropical malabsorption. *Trans R Soc Trop Med Hyg* 1981;75(3):378-84

In a prospective study, jejunal absorption rates of glucose (from a 200 mmol/L solution) and glycine (from a 100 mmol/L solution) were measured in 19 men, aged 22-59 hospitalized in London. Nine patients had clinical evidence of post-infective tropical malabsorption (TM group); while 10 others had trivial symptoms, and had visited the tropics (control group). All were of northern European origin. Seven and one, respectively, in the two groups had *Giardia lamblia* infections. The mean glucose absorption rate was impaired significantly in TM patients ($p < 0.01$); the mean rate for glycine also was depressed, but not significantly. *G. lamblia* presence did not affect the malabsorption severity of either glucose or glycine, although the numbers studied were small. There was no association between absorption rate and jejunal morphology; none had severe mucosal damage on dissecting microscopy, as was confirmed by histological examination.

Cooke RE see Gruskay FL

Cornado-Cornet MC see Lifshitz F

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Cosh DG see Thomas MP

Cotarelo A see Espinos D

Cotte J see Vachon A

Crane RK. Na⁺-dependent transport in the intestine and other animal tissues. Fed Proc 1965 Sep-Oct;24(5 Pt. 1):1000-6

The mechanism of Na⁺-dependent transport in the intestine and other animal tissues is discussed, with a comprehensive literature review on the possible involvement of sodium in the transmembrane movement of organic substrates.

Curlin GT see Koster FT

Curotto B see Moreno R

Darwin K see Matulesy PF

Datta SN see Luwang NC

David VH, Lisewski G, Marx I. [On problems of absorption disorders in chronic enteritis. A contribution to the malabsorption syndrome]. Deutsch Gesundh 1967 Mar 2;22:385-95

Chronic enteritis is histologically characterized by a broadening or fusion of the small intestinal villi, with a simultaneous infiltration of the villous stroma by plasma cells, lymphocytes and occasionally by eosinophils. Electron microscopy revealed changes in endoplasmic reticulum, mitochondriae and Golgi field, and modifications of both brush-border microvilli and of epithelial cells' terminal web. The digestive-resorptive surface of the epithelial cells of the top of the villi, which normally is considerably enlarged by microvilli development, may be reduced to values below 10% in chronic enteritis. At the same time, the enzymatic activities of the disaccharidases, peptidases, etc., are decreased. In most cases, the changes are only fociform, their degree varying in individual cells.

The histologic and electron-microscopic findings in chronic enteritis are very similar to those of the primary and secondary malabsorption syndrome, constituting a special case of secondary malabsorption. Invariably, the plasma membrane of the epithelial cell microvilli, responsible for the digestive-resorptive process, is the decisive region. It is of lesser importance for the clinical and morphological picture of the malabsorption syndrome, whether the latter is primarily or secondarily affected by an injury. The clinical picture of non-specific chronic enteritis depends on the injury's quantitative extent.

Davidson GP, Goodwin D, Robb TA. Incidence and duration of lactose malabsorption in children hospitalized with acute enteritis: study in a well-nourished urban population. J Pediatr 1984 Oct;105(4):587-90

To determine the prevalence and duration of lactose malabsorption (LM), 178 breath-hydrogen tests (BHT) were performed after an oral lactose load (2 g/kg, maximum 20 g, in 100 mL water) was given to 104 children aged 2 weeks-5½ years, hospitalized for acute enteritis in Adelaide, Australia. Of 52 children showing

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

evidence of LM, 33 were clinically-intolerant. Thirty-six were lactose tolerant, and 16 initially were not H₂ producers. LM duration was assessed at 2-week intervals in 32 of 33 patients receiving a lactose-free diet. Seventeen (53%) were tolerant by 2 weeks, and a total of 26 (81%) by 4 weeks. Two remained lactose intolerant after 20 weeks. Of 19 children who had breath H₂ evidence of LM but tolerated a normal diet, 9 recovered by 2 weeks, 2 others by 4 weeks, while the remaining 8 were lost to follow-up. The average recovery rate was 4-8 weeks in children under 6 months, 2-4 weeks in 6-18-month-olds, and \leq 2 weeks in children older than 18 months. Antibiotics did not influence development of either biochemical or clinical LM. Five of the 16 who did not produce H₂ were clinically lactose-intolerant on initial testing, with 4 of them younger than 6 months. Lactose intolerance occurred equally at all ages, and the percentage of lactose malabsorbers who were clinically lactose intolerant, was constant in children of different ages. Microorganisms were isolated from 46% and rotavirus was the commonest (52% of isolates). LM was extremely common in rotavirus enteritis (88%), and 60% were clinically lactose-intolerant. Only 1 of the 25 rotavirus patients had no evidence of LM. The data do not suggest that all children with acute enteritis need a lactose-free diet. However, especially in children with rotavirus enteritis, lactose elimination (probably for at least 4 weeks) must be considered if symptoms recur during normal diet reintroduction. BHT is a reliable guide to LM: no patients were lactose-intolerant with a normal lactose BHT. The lactose BHT also can detect bacterial contamination of the small intestine, which may be an important cause of continuing diarrhoea in young children....

Davies HA see Mavromichalis J

Dean AG, Jones TC. Seasonal gastroenteritis and malabsorption at an American military base in the Philippines. I. Clinical and epidemiologic investigations of the acute illness. *Am J Epidemiol* 1972;95(2):111-27

Seasonal epidemics of acute gastroenteritis affecting 5,000-6,000 of 36,000 Americans occur annually at Clark Air Base. This report describes the clinical aspects and epidemiology of the 1969 outbreak. The acute illness described by 823 enlisted men was characterized by sudden onset of non-bloody diarrhoea, abdominal cramps, nausea and malaise. Headache, chills, vomiting, myalgia and fever were less common. Twenty-two percent of the patients had symptoms for over 2 weeks, often with accompanying intestinal malabsorption. The epidemic occurred during the hottest season of the year, preceding heavy rains. This might indicate involvement of a temperature-sensitive causative agent or vector. The disease incidence was uniform on and off base and among men, women and children. The failure to find an elevated secondary attack rate in the family study might indicate that the disease was not transmitted from person to person. Among the Americans, previous attacks or higher rank (greater age) were not protective, but local Filipinos working on the base had a significantly lower incidence. The illness was not confined to new arrivals. Sources of meals, recent trips, and consumption of water, soft drinks, milk and locally made beer did not seem causally related. The water supply appeared to have been well chlorinated and free of coliform bacteria. No microbiologic cause for the epidemic was found, but it is suggested that a water-borne, temperature-dependent agent may be responsible. Two hypothetical possibilities -- toxin producing blue-green algae and bacteriophage -- are discussed.

Dean AG see Jones TC

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Deb BC, Sircar BK, Sengupta PG, Mondal S, Gupta DN, Ghosh S, Pal SC. Long-term impact of oral rehydration in diarrhoea on nutrition of children in Calcutta slums. *Indian J Med Res* 1983 Dec;78:808-13

A group of 383 children aged below 5 in two typical urban slums in Calcutta, India was studied for 3 years (1977-80), to determine at a community level the impact of diarrhoea on overall nutritional progress. The two areas were comparable in economic conditions, mothers' education and water supply, while there was a big difference in sanitary latrine facilities. In one area, 181 children received prompt oral rehydration therapy (ORT) and feeding advice as soon as diarrhoea began. This group's nutritional progress after three years was not significantly different from that of the control children. Observations were similar even when the nutritional gains in diarrhoeal children only were analyzed separately. However, when treated promptly with ORT and given feeding advice, 31.6% of children nutritionally deficient initially, showed statistically significant nutritional gains ($p < 0.01$ for weight and $p < 0.05$ for height), compared to the controls. Compared to nutritionally normal children, diarrhoea incidence was higher in malnourished children in both areas.

Dechavanne see Vachon A

Denis P, Colin R, Le Grix A, Pasquis P, Geffroy Y, Lefrancois R. [Changes in calorie intake and functions of energy expenditure in patients presenting with diarrhea]. *C R Soc Biol* 1976 May 25;170:1099-1102

Energy expenditures of diarrhoeic patients with intraperitoneal or intraluminal suppuration, who were fed either normally (Group II) or intravenously (Group III), were compared, using the non-protein RQ method. Five non-suppurative diarrhoeic patients fed enterally served as controls (Group I). Carbohydrate, protein and fat intakes were not significantly different among the 3 groups. Group II patients metabolized carbohydrates significantly less ($p < 0.01$) and fats significantly more ($p < 0.01$) than did Groups I and III patients. Carbohydrate and fat expenditure in both groups were not significantly different. There is a possible problem with carbohydrate absorption in suppurative diarrhoeic patients. Preferably, such patient should be fed parenterally.

Dervichian M see Gouerou H

Descos B see Hermier M

Diaz N see Alvarado J

Diver-Haber A see Jonas A

Diwedi P see Kumar V

Dossetor JFB, Whittle HC. Protein-losing enteropathy and malabsorption in acute measles enteritis. *Br Med J* 1975 Jun 14;5971(2):592-3

Protein loss from gut and kidney was measured, and lactose and xylose absorption were studied in 28 underweight children (8 months to 4 years) with acute measles enteritis. Gastrointestinal protein loss, xylose and lactose absorption were abnormal. The protein loss was equivalent to a mean absolute albumin loss of 1.68 ± 0.21 g/day. The mean one-hour blood xylose level was 0.93 ± 0.38 mmol/L (14.0 ± 5.7 mg/

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

100 ml) in the acute stage and 1.71 ± 0.43 mmol/L (25.6 ± 6.5 mg/100 ml) after recovery ($p < 0.01$). Lactose intolerance tests were performed in 17 patients with acute measles. Four children, 3 of whom were weaned, were intolerant to lactose; they had diarrhoea during the test with reducing substances in the stools. One died, but the remaining 3 had become lactose tolerant when retested after recovery. Fecal protein loss and malabsorption may contribute significantly to the development of malnutrition after measles.

Dragan S see Chipail A

Dulce see Bartelheimer H

Duque E see Tripathy K

Edkins S see Nelson R

Einstein LP, Mackay DM, Rosenberg IH. Pediatric xylose malabsorption in East Pakistan: correlation with age, growth retardation, and weanling diarrhea. *Am J Clin Nutr* 1972 Nov;25:1230-3

To estimate prevalence, growth implications and possible etiology of xylose malabsorption, 149 asymptomatic Bangladeshi male infants and young children were tested. The malabsorption syndrome was environmentally acquired, since the absorption levels of those under six months approximated the levels of normal American infants of the same age. By age 2, Bangladeshi xylose absorption dropped to what it had been shortly after birth, or about two-thirds that of American values for the same age. This trend continued to age 5. Xylose malabsorption was associated with growth retardation and increased incidence of severe weanling diarrhoea. Diarrhoea incidence was significantly high ($p < 0.04$) in severely growth-retarded children, in the 2nd year of life. The live-born sibling death rate was three times higher ($p < 0.005$) in families of children who excreted less than 10%, than in those whose children excreted more than 20% of their xylose dose.

el Lozy M see Khalil M

Espinos D, Abain J, Cotarelo A. [Value of the lactose absorption curve in clinical medicine]. *Rev Clin Esp* 1967;107:17-21

Blood sugar changes after ingestion of 100 g lactose were studied. The absorption curve was flat, and the highest level did never surpass 20 mg% over the basal value in 14 diarrhoea patients and in others with clear milk-intolerance. These pathological results were compared with those from 17 normal subjects, to observe the relation between the flat lactose-absorption curve and specific disaccharidase deficiency in the intestinal mucosa. There was a clear deficit of intestinal lactase in two cases of idiopathic steatorrhoea. The test is simple, and has diagnostic and therapeutic advantages.

Evans N see Mavromichalis J

Fellingham SA see Prinsloo JG

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Felsenfeld O see Gyr K

Flandrois C see Hermier M

Flewett TH see Mavromichalis J

Fraley JK see Jalili F

Fuentes A, Hertrampf E, Barrera G, Heresi G, Jarpa S, Uauy R. [Nutrition evaluation of the hospitalized pediatric patient]. *Rev Chil Pediatr* 1981 Sep-Oct;52(5): 387-95

To find out if prolonged hospitalization is related to deterioration of nutritional status of pediatric patients, a nutritional survey was carried out among 215 patients (113 males) aged 2 months to 16 years. Fifty-eight were surgical and 157 medical patients. Data on anthropometric indicators of nutritional status, such as, weight(W), height(H), arm circumference (AC) and tricep skinfold (TS) were obtained on admission and, once again, during the study. The values were expressed as percentages of the reference standard (NCHS-USA) for age (A). On admission, 25% had normal W/A, but, at the time of study, only 19% were in this range. W/A was less than 90% in 67% of medical and 66% of surgical patients. In both groups, 29% had a low H/A. W/A was diminished in 42% of medical and in 15% of surgical patients. Low W/H was more common in the females. AC was below normal in 65% of medical and in 43% of surgical patients, while 73% of surgical patients had TS below 90% of the standard. Weight changes in children under age 2 were analyzed in relation to hospitalization length. It was found that 72% of patients were losing weight and the rest were gaining at rates below those expected for their ages. Thus, there was a high prevalence of marasmic energy protein malnutrition. Hospitalization length was related to a deterioration of nutritional status, and patients predominantly presented signs of depletion of fat and muscle compartments.

Galian A see Guerou H

Galindo E see Vega-Franco L

Garcia B see Mata LJ

Gardiner AJ, Tarlow MJ, Sutherland IT, Sammons HG. Lactose malabsorption during gastroenteritis, assessed by the hydrogen breath test. *Arch Dis Child* 1981 May; 56(5):364-7

Thirty-eight infants and young children (mean age 0.68 year) with gastroenteritis were investigated for lactose malabsorption. A 10% aqueous lactose solution was administered to each patient at a dose of 0.5 or 2.0 g/kg body weight. After that, breath hydrogen was measured, and patients were observed for clinical evidence of lactose intolerance. Only one patient, given 2.0 g/kg lactose, had clinical intolerance. His breath hydrogen excretion, however, was negative. Three of 18 patients given 0.5 g/kg lactose, and eight of 20 given 2.0 g/kg lactose had positive breath hydrogen tests. None of these patients had lactose intolerance symptoms. No significant differences in age, sex, race, symptom duration, nutritional status, or the presence of a stool pathogen were observed between those with a positive breath hydrogen response, and those in whom it was negative. The preva-

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

lence of clinically significant lactose intolerance during gastroenteritis in Birmingham was much lower than that reported from tropical countries. The hydrogen breath test was not suggested to be an appropriate technique for detecting lactose intolerance.

Gebesh WV. [State of the digestive function of the intestine in acute dysentery reconvalescents]. *Vrach Delo* 1981;(2):110-2

Results of a complex examination of 118 acute dysentery reconvalescents are described and analysed. The follow-up period was one year. The subjects showed regular changes in the activity of lactase, saccharase, amylase, alkaline phosphatase and glycylglycine-dipeptidase.

Geffroy Y see Denis P

Ghai OP see Chandra RK

Ghosh S see Deb BC

Gilman RH see Brown KH

Goldstein F see Kaplan SM

Gomez MA see Römer H

Goodwin D see Davidson GP

Gouerou H, Redelsperger P-Y, Galian A, Dervichian M, Pappo E, Cattan D. [Chronic ulcerative jejunoileitis with malabsorption]. *Gastroenterol Clin Biol* 1977 Jun-Jul;1(6-7):561-70

The case of a 61-year-old female patient suffering from chronic ulcerative jejunoileitis with malabsorption is reported. Villous atrophy was limited to the areas close to ulcerations. In this patient, malabsorption was not improved by a gluten-free diet. The topography of the mucosal atrophy and the inefficiency of a gluten-free diet provide arguments to distinguish jejunoileitis with malabsorption from celiac disease.

Goutet JM, Charritat JL, Polonovski C. [Value of a new feeding formula in common acute diarrhea in infancy]. *Ann Pediatr* 1981 Sep;28(7):521-4

A new antidiarrhoeal feeding formula (HN25) was tried in 45 infants (below age 2-and-a-half) who had been hospitalized with acute diarrhoea due to various causes. The formula was remarkably effective in 39 patients in whom the stools improved quickly. The adequate calorie content of HN25 (405/100 g) led to satisfactory anabolism, even during the diarrhoea episode. This product also can be used in infants with irritable bowel syndrome and in gastroesophageal reflux, since the reconstituted formula is thick.

Gracey M. Chronic diarrhoea in protein-energy malnutrition. *Paediatr Indones* 1981 Nov-Dec;21(11-12):235-9

Gracey M, Burke V. Sugar-induced diarrhoea in children. *Arch Dis Child* 1973 May;48(261):331-6

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

This paper reviews the current knowledge of disorders of carbohydrate digestion and absorption in children. Practical rather than theoretical aspects are emphasized. Types of carbohydrate malabsorption, symptoms, and diagnosis of sugar intolerance and treatment of individual types of malabsorption are discussed. Application of this knowledge promises to be beneficial to children throughout the world, because these disorders are common and potentially lethal, but eminently treatable.

Gruskay FL, Cooke RE. The gastrointestinal absorption of unaltered protein in normal infants and in infants recovering from diarrhea. *Pediatrics* 1955 Dec;16(6):763-8

Gastrointestinal absorption of unaltered proteins previously had not been proven by quantitative techniques. Therefore knowledge was lacking of the actual levels of circulating foreign proteins absorbed in health and disease. Utilizing an exact quantitative immunochemical technique, serum egg albumin levels were quantified, after purified egg albumin was given orally to 21 infants (1-13 months) recovering from diarrhoea, and to 19 age-matched controls. In patients, serum egg albumin was significantly higher ($p < 0.001$), possibly due to 3 mechanisms: reduced destruction, decreased excretion, or increased absorption of the unaltered protein. It is believed that the slight permeability of the normal gastrointestinal tract to whole protein (in this study 0.02% of the ingested dose) is markedly increased during diarrhoea in children (0.10% of the ingested dose). The study indicates that diarrhoeic infants may be more susceptible to sensitization, due to increased gastrointestinal permeability. Hypoallergenic food is recommended in the diarrhoea-recovery phase.

Gruttner R see Lucking T

Gupta AP. Practical implications of milk intolerance in diarrhea (letter). *Indian Pediatr* 1982 Jul;19(7):643

Gupta DN see Deb BC

Gutierrez-Topete G see Lifshitz F

Gyr K, Felsenfeld O, Wolf RH. Intestinal absorption, exocrine pancreatic function and response to *Vibrio cholerae* infection in protein deficient patas monkeys (*Erythrocebus patas*). *Trans R Soc Trop Med Hyg* 1975 Jun 31;69(2):247-50

The relationship of intestinal and exocrine pancreatic function to *Vibrio cholerae* infection is reported. Six patas monkeys (*Erythrocebus patas*) were fed a protein-free diet. Sixteen animals of the same species received a standard monkey diet. In protein-depleted patas, folic acid absorption decreased by 50.7%, while D-xylose absorption did not change significantly. Exocrine pancreatic function decreased in 5 of the 6 patas. The mean concentration of trypsin dropped by 72.6%, lipase by 64.4%, and amylase by 94.8%. Animals with reduced folic acid absorption and pancreatic enzyme production developed a longer lasting diarrhoea and excreted the microorganisms for a longer time when challenged with *V. cholerae*. Serological test results did not differ significantly, except that the agglutination test showed a higher titer 2 weeks after challenge in protein-depleted patas.

Haque A see Koster FT

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Heizer WD, Warshaw AL, Waldmann TA, Laster L. Protein-losing gastroenteropathy and malabsorption associated with factitious diarrhea. *Ann Intern Med* 1968 Apr; 68(4):839-52

Two cases of factitious diarrhoea, one due to excessive ingestion of phenolphthalein and the other to bisacodyl, are presented. These two emotionally disturbed females also had protein-losing gastroenteropathy, an abnormality not previously described in association with factitious diarrhoea. In addition to a mild malabsorption syndrome and other metabolic abnormalities, each patient had an unusual manifestation of cathartic-induced diarrhoea, namely hypoalbuminemia. Studies with ⁵¹Cr-albumin demonstrated excessive plasma protein loss into the gastrointestinal tract as a pathophysiological factor of hypoalbuminemia. When the cathartic ingestion was stopped, the protein-losing gastroenteropathy and many of the other abnormalities were reversed; and the clinical condition began to improve dramatically. Within a week of stopping cathartic ingestion, each patient developed persistent edema that subsided after restricting sodium intake. Each patient suffered prolonged, chronic debilitation, underwent repeated hospitalizations, and was subjected to exploratory laparotomy for unexplained diarrhoea. These case histories emphasize the importance of including factitious diarrhoea in diarrhoea's differential diagnosis, and of taking appropriate measures to establish its presence.

Heresi G see Fuentes A

Hermier M, Pignal N, Flandrois C, Baltassat P, Beaufrere P, Descos B. [Breath test study of sucrose absorption in infants with acute diarrhoea]. *Arch Fr Pediatr* 1982 Jun-Jul;39(6):371-4

Sucrose absorption was studied by a breath hydrogen test in 41 infants with acute diarrhoea. Malabsorption was demonstrated in 8 of 28 cases studied after oral treatment with a 40% sucrose solution. In 36 infants, a sucrose loading test (1 g/kg) was done between the 3rd and 7th days of diarrhoea; malabsorption was present in 9 cases. Malabsorption was transitory in all children. This frequency of sucrose malabsorption during acute diarrhoea is not sufficient to prevent the therapeutic use of sucrose solution. But the results differ from the usual lack of sucrose malabsorption in chronic diarrhoea, even, as shown here, in children with complete villous atrophy.

Hertrampf E see Fuentes A

Heywood P see Shield JM

Hill ID see Mann MD

Hillemand B see Schrub JC

Holman GH see Jarrett EC

Hoyle B, Yunus M, Chen LC. Breast-feeding and food intake among children with acute diarrheal disease. *Am J Clin Nutr* 1980 Oct;33(10):2365-71

Patterns of breast feeding and food intake among children were examined, to quantify reduced intake during diarrhoea and to assess possible means of promoting such intake. The 24-h food and breast milk intakes were measured in 41 children

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

aged 6-35 months, hospitalized for acute diarrhoea in a Bangladesh rural treatment unit. Study children were assigned to 3 groups: healthy control (11 children), routine diarrhoea therapy (15), and routine diarrhoea therapy plus intensive health education to emphasize breast feeding and food intake during illness (15). The energy and protein intake of 15, group-2 children averaged 75 kcal/kg and 0.96 g/kg respectively. The energy and protein consumption of 15 in the third group averaged respectively; 60.9 kcal/kg and 0.70 g/kg. These intake levels were significantly lower ($p < 0.05$) than the 129.9 kcal/kg and 1.89 g/kg observed among healthy controls. There was no difference in intake between the two diarrhoea groups. Child anorexia was identified as a critical impediment to more adequate nutrient intake during diarrhoea. Anorexia was not overcome with intensive educational efforts. However, breast milk was the most important nutrient source, for the breast-fed children, as most of the energy was supplied via breast milk among the diarrhoeal children.

Huffman SL see Chen LC

Huq E see Chen LC

Hussaini Y see Matulesky PF

Irawan see Widiarto

Islam A see Molla A

Ismangoen see Soehadi

Ismangoen see Soeprapto

Ismangoen see Widiarto

Iushchuk ND, Abdullaev SKh. [Absorptive function of the small intestine in salmonellosis in children]. *Pediatr* 1981 Jul;(7):23-4

Jackson D, Walker-Smith JA, Phillips AD. Macromolecular absorption by histologically normal and abnormal small intestinal mucosa in childhood: an in vitro study using organ culture. *J Pediatr Gastroenterol Nutr* 1983 May;2(2):235-47

Jahan F see Molla A

Jalan KN. Recurrent acute diarrhoea syndrome of the Ganges delta associated with malabsorption (abstract). In: Rahaman MM, Aziz KMS, Rahman S, eds. Proceedings of the First Asian Conference on Diarrhoeal Disease, 16-20 February 1981. Dacca: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982:201

Acute diarrhoea due to enterotoxigenic bacteria, particularly Escherichia coli, is well-established. However, chronic colonization of distal small bowel by enterotoxigenic bacteria has not been reported. A group of patients who, clinically, had recurrent watery diarrhoea or liquid stool with intervening periods of constipation were studied. These patients had two or more standard parameters of malabsorption. They were intubated, and small bowel fluids were sampled at various levels for microbiological studies. The results and their relevance were discussed.

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Jalili F, Fraley JK, Smith EO, Nichols VN, Klein ER, Mintz AA, Nichols BL. Malnutrition in infants with acute diarrheal syndrome. *J Pediatr Gastroenterol Nutr* 1982;1(2):19-22

Jarnum S, Kristensen M. Lactose malabsorption and lactose-induced enteric loss of protein in regional enteritis. *Nuclearmedizin* 1967:223-9

Jarpa S see Fuentes A

Jarrett EC, Holman GH. Chronic diarrhea in infancy with resultant disaccharide malabsorption. *J Med Assoc Georgia* 1966 May;55:170-3

This paper presents two chronic diarrhoea cases (Negro male and female infants) with intestinal disaccharidase deficiencies implied by abnormal disaccharide tolerance tests. The related literature are briefly reviewed, revealing that the disaccharide splitting enzymes are localized in the brush border of the small bowel's lining cells. Diagnosis and treatment methods are discussed, including a simple test for fecal reducing sugar determination.

Jimenez E see Vega-Franco L

Jonas A, Avigad S, Diver-Haber A, Katznelson D. Disturbed fat absorption following infectious gastroenteritis in children. *J Pediatr* 1979 Sep;95(3):366-72

Fat absorption was studied in 10 patients aged 1.5-7 months, recovering from acute infectious gastroenteritis who failed to gain weight despite adequate caloric intake. Six infants served as controls: 3 who were restudied after clinical improvement, and 3 who had no gastrointestinal symptoms but had failed to thrive. Fat balance studies done during ingestion of a liquid formula containing long-chain fatty acids demonstrated significant degrees of steatorrhea. Mean coefficient of fat absorption was 70.6 ± 10.7 in patients, and 90.3 ± 2.4 in the controls ($p < 0.001$). A test meal was instilled intragastrically. This showed a marked deficiency of duodenal bile acid concentration and of fat incorporation into the micellar phase in patients. Fecal bile acid excretion was significantly increased ($p < 0.01$) in patients (mean 33.9 ± 11.6 $\mu\text{M}/\text{kg}/\text{day}$) compared to controls (mean 13.5 ± 3.1 $\mu\text{M}/\text{kg}/\text{day}$). Bacterial overgrowth and abnormalities of the small intestinal mucosa were not constant. Ileal dysfunction and bile acid loss are possible causes of disturbed fat assimilation following acute gastroenteritis in children. Fat absorption therefore should be carefully assessed before instituting therapy with the bile acid sequestering agent, cholestyramine.

Jones TC, Dean AG, Parker GW. Seasonal gastroenteritis and malabsorption at an American military base in the Philippines. II. Malabsorption following the acute illness. *Am J Epidemiol* 1972 Feb;95(2):128-39

The clinical and epidemiological relationship between acute diarrhoea and prolonged malabsorption was studied during two gastroenteritis epidemics (March-July of both 1968, and 1969) at Clark Air Base, the Philippines. The symptoms and clinical laboratory abnormalities of 234 patients (190 in 1968 and 44 in 1969) were recorded during acute gastroenteritis and for varying periods thereafter. The acute illness subsided in 1-5 days, but in 22% of patients it was followed by prolonged symptoms of fatigue, nausea, abdominal discomfort, loose stools and weight loss. Xylose absorption was abnormal in 54% of the 79 patients tested during the first few days of illness. Lactose tolerance, intestinal lactase and sucrase levels, and intestinal morphology

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

were normal or slightly altered at this stage. After the first week, intestinal absorption tests usually were abnormal in patients with persistent symptoms and also, less frequently in those who had become asymptomatic after the acute illness. The prolonged illness resembled tropical sprue, and appeared to respond to tetracycline and folic acid therapy. No epidemiologic differences were found between patients who recovered quickly from acute gastroenteritis, and those who had prolonged symptoms, except that the latter group was slightly older. Acute gastroenteritis and sprue-like illness are clinical variations of the same basic disease process and may share a common etiology. The epidemics provide a unique opportunity to study the etiology of tropical sprue, its racial incidence and its relationship to acute gastroenteritis.

Jones TC see Dean AG

Joske RA see King MJ

Kanaaneh H. The relationship of bottle feeding to malnutrition and gastroenteritis in a pre-industrial setting. *J Trop Pediatr Environ Child Health* 1972 Dec; 18(3):302-6

In 610 infants aged 6-30 months in three Israeli villages the relationship of bottle feeding to malnutrition and gastroenteritis was studied retrospectively. The infants were grouped by feeding practices. Weights at 6 months and incidence of hospitalization for gastroenteritis during the first 6 months of life were compared. Weight at age 6 months was related directly to length of breast feeding and inversely to length of bottle feeding. There was a significant weight difference ($p < 0.001$) for both sexes between the exclusively breast-fed and the mostly bottle-fed groups. Malnutrition incidences also differed significantly ($p < 0.001$). Infants supplemented with fresh cow's milk or powdered milk fed from a cup had significantly lower gastroenteritis hospitalization incidences than did infants supplemented with powdered milk fed from a bottle. It is suggested that in such pre-industrial and rural communities, infants should be breast-fed without supplementation for their first 6 months.

Kaplan SM, Goldstein F, Kowlessar OD. Eosinophilic gastroenteritis. Report of a case with malabsorption and protein-losing enteropathy. *Gastroenterology* 1970 Apr; 58(4):540-5

Karim AKMM see Sarker SA

Katznelson D see Jonas A

Kecharovska J see Vlaski R

Kent TH see Lindenbaum J

Khalil M, Aref MK, Malek ATA, Moghazy M, el Lozy M. The effect of diarrhoea on low density beta lipoproteins and cholesterol in protein calorie malnutrition. *J Trop Med Hyg* 1973 Mar; 76:71-4

Correlation of malnutrition severity, or any associated clinical features especially diarrhoea, with beta lipoprotein or cholesterol levels was examined in 20 infants

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

with kwashiorkor, 20 with marasmus and 22 well-nourished controls (11 with acute diarrhoea and 11 without). Levels of beta lipoproteins were significantly lower in kwashiorkor than in either well-nourished or marasmic children, while these levels did not differ significantly in the latter two groups. Cholesterol was significantly lower in both marasmic and kwashiorkor infants than in the well-nourished, and the values for the kwashiorkor group were significantly lower than those for the marasmus group. In all 3 groups, cholesterol and beta lipoprotein levels were highly correlated with each other. The correlation coefficients were 0.94, 0.88 and 0.97 in, respectively, control, kwashiorkor and marasmus groups. Diarrhoea lowered beta lipoprotein and cholesterol levels in malnourished infants, but not in the well-nourished. It appears that this lowering required more than one factor. Thus, in marasmus these levels were normal, while in kwashiorkor, with its liver lesions, they were low. In both cases, diarrhoea caused an additional lowering due to a synergistic effect.

Kharat'ian AM, Volovoi VL. [Disorders of intestinal absorption of vitamin B 12 in chronic enterocolitis (clinico-bacteriological and radiological study)]. *Ter Arkh* 1969;41:28-33

Khatun M see Brown KH

Khatun M see Molla A

King MJ, Joske RA. Acute enteritis with temporary intestinal malabsorption. *Br Med J* 1960 Apr 30;1(5182):1324-7

Two cases are reported which provide evidence that severe acute enteritis in adults may be followed by a transient intestinal malabsorption phase before recovery. A man aged 66 developed acute bacillary dysentery. Treatment was begun on admission: I.V. fluid, electrolyte replacement and parenteral tetracycline 250 mg six hourly. After the acute episode, the man had impaired absorption of fat, carbohydrate, protein and vitamin B₁₂. This was accompanied by diarrhoea and weight loss (from 68 kg to 62.6 kg in 2 weeks). Both clinical and laboratory abnormalities returned to normal during the succeeding 5 months, and he since has remained well. The second case was a 75-year-old male with hypokalemic neuropathy after an acute episode of dysentery. He was treated with I.V. and electrolytes with added potassium chloride. Fecal potassium was grossly elevated. There was reduced absorption of fat, protein, carbohydrate and vitamin B₁₂. After the acute episode, progressive clinical and laboratory improvement was observed. Severe acute enteritis in these two patients caused enough damage to the small bowel to result in a temporary phase of malabsorption before eventual recovery occurred. Since mucosal regeneration in the small bowel is rapid, and since prolonged defects of function followed an acute episode, it is suggested that mucosal integrity also is insufficient for normal small bowel function.

Kinzie JL see Townsend WF

Kissin C see Vachon A

Klen ER see Jalili F

Klein RE see Martorell R

Kloos K see Bartelheimer H

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Koster FT, Curlin GT, Aziz KMA, Haque A. Synergistic impact of measles and diarrhoea on nutrition and mortality in Bangladesh. Bull WHO 1981;59(6):901-8

The efficacy of recent efforts to improve the delivery of available vaccines, especially in developing countries, can be aided by surveys that identify populations suffering unduly high morbidity and mortality due to a particular disease. To explore the role of diarrhoea in contributing to measles-associated morbidity and mortality, a prospective household surveillance was done on 5,775 children under age 10 in rural Bangladesh. Diarrhoea was monitored weekly and nutritional status bi-monthly. Measles was diagnosed clinically in most cases, and serologically in some, during an epidemic. A special team interviewed parents to identify symptoms of death. The case fatality rate for measles was 3.7 percent among all children of which prolonged diarrhoea was the most important cause of death. Children < age 4 with prolonged diarrhoea and measles had the greatest weight loss, and failed to achieve "catch-up" growth. Thus, measles and diarrhoea interacted synergistically to increase mortality and the irreversible effects of nutritional deprivation. It is suggested that nutritional intervention programs should be aimed at children under age 4 convalescing from measles. This information should provide further impetus to an extensive measles vaccination program in Bangladesh.

Kowlessar OD see Kaplan SM

Kristensen M see Jarnum S

Kromal RA see Mata LJ

Kruger H see Prinsloo JG

Kumar V, Clements C, Marwah K, Diwedi P. Maternal beliefs regarding diet during acute diarrhoea. Indian J Pediatr 1981 Sep-Oct;48(394):599-603

An attempt was made to learn prevalent maternal beliefs among rural and urban mothers in North India, regarding preferences and restrictions of foods and fluids during acute childhood diarrhoea. Used were six randomly chosen rural villages, from each of which 100 mothers with children below age 3 were randomly selected for interview. Also, 200 urban mothers with children below age 3 were chosen from among visitors to a medical research institute at Chandigarh. Although malnutrition was perceived as a diarrhoea complication by 68% of the mothers interviewed (no differences amongst urban and rural groups), food restriction was practised by 98% of the 800 mothers. Harmful beliefs, such as lack of recognition of dehydration, were found in 89% of mothers. Commonly excluded foods were chapatis (bread); pulses (lentils), certain fruits and vegetables, meat and eggs. Milk administration was restricted by 70.8% of mothers, while tea was restricted by 25.1% and water by 4.5%. The mothers placed reliance on khichari (cooked rice/pulse combination), moong dal (a lentil), banana and wheat porridge. Fluids, such as herbal tea, were considered appropriate by 31.5% of mothers, mint water by 16.6% and buttermilk by 13.2%. Considered helpful were a number of home remedies, including such herb/spices as fennel, cardamon, harad and ajwain, boiled in water singly or in combination, and administered in small amount in a concentrated form. Thus, it was found important to introduce an appropriate health education program concerning foods and fluids during treatment of diarrhoea, to prevent dehydration and malnutrition.

Kurdian M see Posada OR

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Kuzmanovska D see Vlaski R

Lacassie Y see Moreno R

Laster L see Heizer WD

Lefrancois R see Denis P

Le Grix A see Denis P

Levin B see Abraham JM

Lev R see Thomas E

Lifshitz F, Coello-Ramirez P, Gutierrez-Topete G, Cornado-Cornet MC. Carbohydrate intolerance in infants with diarrhea. *J Pediatr* 1971 Nov;79(5):760-7

This report describes simple bedside examinations that determined reducing substances and pH in multiple fresh stool specimens of 332 infants hospitalized with severe diarrhoea in Mexico from December 1967 to January 1969. Lactose intolerance was considered to be present when stool had a carbohydrate level of more than 0.25%, and/or a pH of less than 6.0. By these criteria, 255 (77%) infants had lactose intolerance. All but 2 of the 77 lactose-tolerant patients recovered uneventfully within 3 weeks while receiving a milk formula. Of 195 infants with mild lactose intolerance (< 30% positive stools) 111, and of 60 with severe intolerance (> 30% positive stools) 16 had spontaneous recoveries while receiving a milk formula. Thirty-nine mildly intolerant patients required treatment before 3 weeks, and 27.5% of the 156 infants remaining on milk formula and loose stools for more than 3 weeks. Among the severely intolerant patients, 22 were treated before 3 weeks of diarrhoea and 62% of the remaining 38 had loose stools for more than 3 weeks. With dietary treatment, a prompt favorable response was elicited. Lactose intolerance was positively correlated with increasing malnutrition severity, but not with previous gastroenteritis episodes, presence of enteropathogens, or associated infections. Antibiotic therapy increased stool pH toward alkalinity. The acid-stool proportion in patients treated with and without antibiotics, was, respectively, 17.3% and 32.5% ($p < 0.05$). Antibiotic therapy did not modify carbohydrate excretion.

Lifshitz F, Coello-Ramirez P, Contreras-Gutierrez ML. The response of infants to carbohydrate oral loads after recovery from diarrhea. *J Pediatr* 1971 Oct;79(4):612-7

The capacity to tolerate carbohydrate oral loads was tested in 46 infants after recovery from severe diarrhoea at a Mexican hospital. During the acute stage, all were glucose-tolerant, 8 were lactose-tolerant, 20 were intolerant to lactose, and 18 intolerant to all disaccharides. When carbohydrate was included in oral feedings during diarrhoea, the 38 intolerant patients had a stool pH under 6.0 and a carbohydrate content over 0.25%. Patients with carbohydrate malabsorption during diarrhoea continued to have carbohydrate intolerance in the first week after recovery from diarrhoea. This impairment disappeared within 2 months. No patient demonstrated a glucose metabolism impairment. Diarrhoea induction and excretion of feces with an acid pH, reducing substances, and glucose were the bases for diagnosing carbohydrate intolerance. The elevation in blood reducing

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

sugar levels induced by carbohydrate oral loads was variable, and was not correlated to the stool pattern in response to the tolerance test. Dietary treatment of diarrhoeal infants is discussed.

Lindenbaum J, Kent TH, Sprinz H. Malabsorption and jejunitis in American corps volunteers in Pakistan. *Ann Intern Med* 1966;65:1201-9

Lindenbaum J. Malabsorption during and after recovery from acute intestinal infection. *Br Med J* 1965 Aug 7;2:326-9

Xylose, folic acid and vitamin B₁₂ absorption during and after recovery from acute intestinal infections were studied in 95 patients (7-65 years), hospitalized for acute diarrhoea of less than 2 weeks in the then-East Pakistan (now Bangladesh). The 5-h urinary excretion of D-xylose after a 25-g oral dose, as well as plasma xylose levels at 2 h, were measured by the Roe and Rice method. During infection with a variety of organisms, 90% of patients had widespread, moderate-to-severe impairment of absorptive function. Despite the milder degree of clinical illness and dehydration and much less voluminous stool output impairment of xylose absorption was greater in this group of acute gastroenteritis patients, than in acute cholera patients. Mean xylose absorptions in the two groups were significantly different ($p < 0.01$). Malabsorption also was common during the first week after clinical recovery from infection. In most individuals, the impairment was transient. However, some showed continued malabsorption, weeks or months after the acute infection. Vitamin B₁₂ absorption after the end of diarrhoea was impaired in 77% of cases, but was unrelated to bacteriological diagnosis. Folic acid absorption, as measured by *Streptococcus faecalis* serum levels, was normal after the end of diarrhoea in 93%. The possible relation of these findings to the prevalence of sub-clinical malabsorption in the country is discussed.

Lindenbaum J. Subclinical malabsorption in East Pakistan. *East Pak Med J* 1965; 9:72-5

Lindquist B, Meeuwisse GW. Chronic diarrhoea caused by monosaccharide malabsorption. *Acta Paediatr (Stockholm)* 1962;51:674-85

Linevsky YV. [Disorders of dipeptidase activity of the small intestine in chronic enteritis and their treatment]. *Klin Med (Mosk)* 1977;55:54-8

The glycyl-l-leucine dipeptidase activity of biopsied mucosa homogenates from the small intestine's antral portion was studied in 169 chronic enteritis patients during the disease exacerbation period, and in 122 of them after 3-4-days' treatment. The small intestine's dipeptidase formation was depressed, both in the presence and absence of morphological changes in its mucosa detectable by photo-optical microscopy. Compared to photo-optical microscopy, studying small intestine dipeptidase production is the most sensitive test to diagnose chronic enteritis. Complex treatment of chronic enteritis stimulated dipeptidase production. Nerobol produced a stimulating effect on small intestine dipeptidase production. Prednisolone, enterceptol and furazolidone produced no such effect.

Lisewski G see David VH

Lloyd-Still JD. Chronic diarrhea of childhood and the misuse of elimination diets. *J Pediatr* 1979 Jul;95(1):103

Present dietary practices to treat chronic recurrent diarrhoea and any side effects

Nurient Absorption and Diarrhoea-Malnutrition Cycle

or long-term health complications of dietary manipulations were prospectively studied in 108 children referred for outpatient evaluation. Most of the children did not have a serious underlying disorder. Elimination diets (milk-free, egg-free, wheat-free) were widely prescribed for chronic diarrhoea treatment and were given for longer intervals than originally recommended. Elimination diets sometimes resulted in inadequate caloric intake and failure to thrive. Wheat (gluten)-free diets were prescribed for more than one month in 64 (59%) children without a specific diagnosis having been made. Thus, elimination diets frequently are misused, and prolonged adherence to such diets may result in nutritional damage. Indiscriminate use of wheat-free diets to treat chronic diarrhoea may mask the diagnosis of celiac disease and may partly explain the low incidence of this disorder in the United States.

Loeb H, Mozin MJ. Prevention of chronic diarrhea: nutritional implication. *J. Pediatr Gastroenterol Nutr* 1983;2(Suppl 1):S328-34

Loeschke A see Bartelheimer H

Lopez A see Romer H

Lotero H see Tripathy K

Luckey TD, Maier BR. A holistic approach to the interruption of the diarrhea-malabsorption-malnutrition cycle. *Am J Clin Nutr* 1972 Jun;25(6):612-4

The holistic view of infantile diarrhoea suggests that poor environmental management provides an excess of potentially-harmful inocula to certain human beings vulnerable to the start to the diarrhoea-malabsorption-malnutrition cycle. Possible remedies are suggested. The authors maintain that environmental management is neither more nor less important than nutrition; and that these might be correlated with positive inoculation and maintenance of balanced intestinal microflora as a natural defense mechanism. Antimicrobial and anti-diarrhoeal drugs should be used to break the cycle; followed by good diet and oral inoculation with 3-4 species of microorganisms essential to the human gut microbic defense balance. Subtle habit changes should be encouraged. Public health funds should be used for laboratory and field studies, to determine if the above parameters can be used in concert to break the disease-malnutrition cycle. Such studies should be carefully designed and controlled, to demonstrate the best method(s) of progressing toward a better-nourished, more productive population.

Lucking T, Gruttner R. [Chronic diarrhea and severe malabsorption syndrome in infancy following infection with dyspepsia coli]. *Monatsschr Kinderheilk* 1973; 121:376-9

Lugo-de-Rivera C, Rodriguez H, Torres-Pinedo R. Studies on the mechanism of sugar malabsorption in infantile infectious diarrhea. *Am J Clin Nutr* 1972 Nov;25(11): 1248-53

The mechanism of sugar transport and absorption in the normal and diseased intestine was examined. Studies on intestinal transit and absorption of different sugars in diarrhoea were published serially earlier. Using the results obtained in the earlier studies, this paper outlines the mechanism of sugar malabsorption in infantile infectious diarrhoea. Evidence points overwhelmingly to the existence of a permeability defect in diarrhoea; and it is plausible that such a defect might be located externally rather than internally to the brush border. A physical

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

obstruction to the flux of materials from human to brush border would provide a common mechanism for both the sugar hydrolytic and transport defects, and for the universality of diarrhoeal absorptive impairment. It is possible that the obstacle to absorption is removed by the sustained high flow of perfusate used in the experiments, leaving the hydrolytic and transport sites fully exposed.

Lugo-de-Rivera C see Rodriguez-de-Curet H

Luwang NC, Datta SN. Association between diarrhoeal disease and undernutrition in pre-school children. *Indian J Med Sci* 1982 Feb;36(2):29-30

McCahan JF see Thomas E

Mackay DM see Einstein LP

McNeish AS see Mavromichalis J

Mahalanabis D. Nitrogen balance during recovery from secretory diarrhea of cholera in children. *Am J Clin Nutr* 1981 Aug;34(2):1548-51

This paper describes, apparently for the first time, the nitrogen balance in children during recovery from acute diarrhoea due to a defined etiology. Studied were 6 males aged 12-24 months weighing (on recovery) 6.29-9.86 kg, with bacteriologically confirmed cholera. They initially presented with dehydration and base deficit acidosis due to acute watery diarrhoea. Nitrogen balance promptly improved with milk feeding, even before diarrhoea was fully controlled and irrespective of the disease's clinical severity. There was no adverse effect upon stool volume and systemic acid base status when milk feeding was introduced. Nitrogen loss in the stool was small, indicating good protein absorption even during the acute diarrhoea phase. The negative nitrogen balance that occurred was due primarily to reduced intake. Early feeding and liberal intake appear to produce a more favorable impact than does cautious food introduction. The common practice of restricting food during recovery from acute diarrhoea is inappropriate in cholera; and careful studies are needed to define an optimum convalescent diet.

Maier BR see Luckey TD

Malek ATA see Khalil M

Mann MD, Hill ID, Peat GM, Bowie MD. Protein and fat absorption in prolonged diarrhoea in infancy. *Arch Dis Child* 1982 Apr;57(4):268-73

¹⁵N-yeast protein absorption, nitrogen and fat retention, stool reducing substances, and lactate concentrations were measured in 22 infants aged 3 weeks to 1 year who had severe diarrhoea for 7 days. Seven infants received a full-cream cow's milk formula, 7 a soy-based formula with sucrose, and 8 a casein-based low-lactose formula with glucose. All infants had a distinct, sharp, symmetrical stool ¹⁵N peak, 1½-18 h after ingesting ¹⁵N. Stool losses of nitrogen and fat were large, and an appreciable proportion appeared to be endogenous. Apparent nitrogen absorption was very poor, falling rapidly with increasing stool weight. Nitrogen and energy supply might have been a limiting factor in tissue repair, if stool weight exceeded 30 g/kg body weight a day. These results differ from those in

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

older children with kwashiorkor complicated by diarrhoea of similar severity. The continuing wastage of essential nutrients in the presence of impaired absorption makes it unlikely that an adequate oral food intake can be achieved in infants with severe diarrhoea.

Martorell R, Yarbrough C, Yarbrough S, Klein RE. The impact of ordinary illnesses on the dietary intakes of malnourished children. *Am J Clin Nutr* 1980 Feb;33:345-50

Quantitative estimates of common morbidity symptoms' dietary effects are provided in this paper on rural Guatemalan children. The data come from a longitudinal study (1970-'77) of malnutrition and mental development in four small villages. Only data from communities receiving a low calorie supplement were used to test the hypothesis that illness reduces home dietary intake. The symptoms studied were the common cold and diarrhoeal diseases, the two most important causes of morbidity in developing countries. In all but one comparison, intakes were higher when no selected common symptoms were present than when they were. The differences were statistically significant ($p < 0.05$) in 5 of 12 occasions for boys and in 9 of 12 for girls. When the sexes were pooled, all but one of the age-specific comparisons were statistically significant ($p < 0.5$). Over all ages, the presence of selected common symptoms was associated with an average reduction in daily intake of nearly 20%, equivalent to 175 kcal and 4.8 g protein. Effects were of similar magnitude for diarrhoea and for apathy, but were lower for respiratory infections: namely 61 kcal and 1.0 g protein. It is concluded that common illnesses are an important cause of low dietary intakes in Guatemalan children. Certain kinds of health interventions might prove more cost-effective than such traditional approaches as food supplementation.

Marwah K see Kumar V

Marx I see David VH

Mata LJ, Kromal RA, Urrutia JJ, Garcia B. Effect of infection on food intake and the nutritional state: perspectives as viewed from the village. *Am J Clin Nutr* 1977 Aug;30(8):1215-27

Data from a prospective study of a Guatemalan village population revealed an exceedingly high infection rate which may affect nutrition and growth from gestation onward. Maternal morbidity was higher and fetal antigenic stimulation was more frequent than in industrial societies. Infection was common in young children and, although a great many infections were silent, morbidity rates were extremely high, particularly during the protracted weaning period (6-24 months). Intestinal disorders, mainly diarrhoea, were most common, reaching a peak (87/100 person-months) in 18-to-23-month-olds. Infectious disease was an important cause of anorexia and reduced calorie intake, followed by weight loss, arrest in height, and impaired physical growth. Also, it was a common precipitating factor of severe malnutrition and death. Dietary data of fully-weaned children did not reveal a deficit in protein intake. Most children, however, had very low calorie intakes. Morbidity and calorie intake, and, less markedly, morbidity and protein intake, were inversely correlated. The probability values for calories and rates of diarrhoeal, respiratory and total illnesses in the second year of life were significant. Infection was the most important isolated factor causing malnutrition. Since food supplementation programs, particularly proteins, have failed in many countries, there may be a need to reorient health and nutrition policies.

Mathieu M see Vachon A

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Matulesy PF, Rachmad, Sulaiman Z, Hussaini Y, Darwin K, Rachmat A. The influences of environmental factors and nutritional status of the underfives to diarrhoeal diseases in Bogor, West Java, Indonesia. *Southeast Asian J Trop Med Public Health* 1982 Sep;13(3):401-4

Mavromichalis J, Evans N, McNeish AS, Bryden AS, Davies HA, Flewett TH. Intestinal damage in rotavirus and adenovirus gastroenteritis assessed by D-xylose malabsorption. *Arch Dis Child* 1977 Jul;52(7):589-91

The absorption of D-xylose infused into the duodenum was assessed in 15 infants (2-16 months) with acute gastroenteritis. Eight patients were excreting rotavirus in their stools, and in 6 of them virus particles also were found in the intestinal aspirate. Blood-xylose levels were low in these 6 (range 0.15-0.78 mmol/L). Normal levels (>1.26 mmol/L) were obtained in the absence of virus particles in the small intestine in other 6 patients, 3 of them had adenovirus or rotavirus in stools. Three infants with adenovirus in the small intestinal juice and ill with acute gastroenteritis also had low blood-xylose (0.4-0.85 mmol/L). This finding supports earlier epidemiological studies implicating adenovirus as a causative agent in acute infantile gastroenteritis. The association between virus in the small intestine and xylose malabsorption may indicate mucosal damage. There was no formal proof of this, because jejunal biopsy was not performed.

Mayoral LG see Tripathy K

Meeuwisse GW see Lindquist B

Mintz AA see Jalili F

Moenginah PA see Soehadi

Moenginah PA see Soeprapto

Moghazy M see Khalil M

Molla A, Islam A, Molla AM, Jahan F. Change in serum vitamin A concentration after an oral dose in children with acute diarrhea. *J Pediatr* 1983 Dec;103(6):1000-2

The efficacy of oral vitamin A during acute diarrhoea was evaluated, by measuring the changes in serum vitamin A, retinol binding protein, and pre-albumin concentrations, 4 h after an orally administered dose of water-miscible vitamin A was given, both during acute diarrhoea and 2 weeks after recovery. Thirteen hospitalized patients (3 with *Vibrio cholerae*, 2 with enterotoxigenic *Escherichia coli*, 1 with both *Shigella* and *ETEC* and 7 with no specific organism) aged 3-9 years were studied at the ICDDR,B, Dhaka. Patients admitted with various eye signs (61%) showed clinical improvement after the vitamin A dose (7,500 IU/kg) was given during acute diarrhoea. Vision was restored to normal within a few days, although one patient with corneal ulceration developed opacities and retained only partial vision. Serum concentrations of vitamin A, retinol binding protein and pre-albumin increased significantly 4 h after administration of vitamin A during the acute diarrhoea period. The mean relative dose response during both the acute and recovery stages was more than 60%, indicating that the study children's hepatic vitamin A stores were < 10 µg/g liver. In acute diarrhoea of different causes, prompt vitamin A administration is highly desirable and effective in preventing blindness, in developing countries where diarrhoea and malnutrition are prevalent.

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Molla A, Molla AM, Rahim A, Sarker SA, Mozaffar Z, Rahaman M. Intake and absorption of nutrients in children with cholera and rotavirus infection during acute diarrhoea and after recovery. *Nutr Res* 1982;2:233-42

The effect of diarrhoea on nutrient intake was studied in male children under 5 years of age, including 19 with cholera and 13 with rotavirus at the metabolic study unit of the International Centre for Diarrhoeal Disease Research, Bangladesh. The co-efficients of absorption of fat, nitrogen and calories were calculated during the acute and the recovery stages of the disease. The study diet was designed with modifications to keep the meal very much familiar and natural to the habitual diets of the children. The d-xylose test, for comparison with the absorption of nutrients, was performed on the second day of the study. The serum xylose was measured by the Roe and Rice method and fat by the van de Kamer procedure. For calorie estimation an adiabatic bomb calorimeter was used. Compared to the recovery period, in the acute stage, nitrogen, fat and calorie intake was reduced by 44%, 32% and 36% in cholera, and 22%, 10% and 27% in rotavirus patients, respectively. The co-efficient of absorption of nitrogen during the acute stages of both cholera and rotavirus was equally affected, being only 44 and 45% of the ingested amount, respectively. In the acute stage, the rotavirus patients absorbed significantly less fat (44%) and calories (55%) than the cholera patients (72 and 82%, respectively). During recovery, the rotavirus patients absorbed a lesser amount of all the nutrients than the cholera patients, suggesting a more prolonged malabsorption in rotavirus than in cholera. Early feeding of these diarrhoeal patients did not seem to make the diarrhoea worse. It was found that substantial absorption takes place during the acute stage of cholera and rotavirus, and normal intake of food should therefore be encouraged.

Molla A, Molla AM, Sarker SA, Khatun M. Whole-gut transit time and its relationship to absorption of macronutrients during diarrhoea and after recovery. *Scand J Gastroenterol* 1983 May;18(4):537-43

By using a charcoal marker fed with a meal, whole-gut transit time (TT) was determined in 68 children aged up to 5 years (29 cholera, 17 rotavirus, 13 enterotoxigenic *Escherichia coli*, and 9 *Shigella*), during acute stages of diarrhoea and 2 weeks after recovery. Absorption of calories, fats, proteins and carbohydrates contained in a normal Bangladeshi diet was studied for 72 h after the first appearance of the charcoal marker in the stool, both during the acute and recovery stages of diarrhoea. The time interval between feeding the charcoal marker and its first appearance in the stool was taken as the TT. Mean TT varied from 5.5 to 7.3 h during the acute stage, and from 14.1 to 15.5 h during the recovery period, for diarrhoea of all etiologies. As expected, the TT increase was significant ($p < 0.001$). Correlation co-efficients were calculated between TT and nutrient absorption co-efficients in both diarrhoea stages for all etiologies. No significant relationship was found. This suggests that the nutrient absorption mechanism is independent of whole-gut transit time. From the 1st to the 3rd days of the study in the acute stage, calorie intake increased steadily in all patients except for the *Shigella* group, and stool output decreased steadily in all four groups. It was concluded that, to reduce malnutrition following diarrhoea, food intake should be encouraged, even during acute diarrhoea stages when whole-gut TT is shorter, since sufficient absorption does occur.

Molla A see Molla AM

Molla A see Sack DA

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Molla AM, Molla A, Sarker SA, Rahaman MM. Food intake during and after recovery from diarrhea in children. In: Chen LC, Scrimshaw NS, eds. Diarrhea and malnutrition: interactions, mechanisms, and interventions. New York: Plenum, 1983:113-23

This chapter reviews the available data on food intake during diarrhoea and the impact of diarrhoea on child growth, and presents the results of an ICDDR,B study. The objectives were to (1) quantitatively estimate nutrient intake during acute diarrhoea of various etiologies and after recovery; (2) assess nutrient intake patterns in acute and convalescent stages of diarrhoea and after recovery; and (3) study the impact of food intake on stool volume during diarrhoea. Nutrient intake was measured in 63 under-five children (29 with *Vibrio cholerae*, 15 with rotavirus, 13 with *Escherichia coli* and 6 with *Shigella*) during diarrhoea's acute phase and 2 and 8 weeks after recovery. The conclusions were: (1) among hospitalized patients, food intake is reduced by about 30% during diarrhoea, irrespective of etiology; (2) feeding, including breast feeding, should be continued, even in the acute phase; and (3) food has no apparent deleterious effect on diarrhoea volume or duration, but this requires further study.

Molla AM see Molla A

Molla AM see Sack DA

Molla AM see Sarker SA

Mondal S see Deb BC

Moreno R, Curotto B, Seebach C, Lacassie Y. [Chromosomal studies in infants with severe protein-calorie malnutrition]. Rev Chil Pediatr 1982 Sep-Oct;53(5):416-8

Mozaffar Z see Molla A

Mozin MJ see Loeb H

Murphy GM see Nelson R

Murthy PS see Srivastava VK

Musfiroh S see Soehadi

Nelson R, Murphy GM, Edkins S, Richardson JM, Anderson CM. A new procedure for the study of malabsorption and chronic diarrhoea of undetermined aetiology in infancy and childhood. Gut 1973 May;14(3):427

A comprehensive test of pancreatic function, bile salt metabolism, and small intestinal bacterial flora, that requires a single duodenal intubation, has been developed. Intubation of duodenum and stomach was performed after a fast of more than 5 h. Duodenal fluid was collected for 30 min fasting, for 30 min after intravenous pancreozymin, and for a further 30 min after secretion. Two hours after pancreozymin, a test meal of measured composition, containing 1 g fat/kg body weight was instilled directly into the stomach. Duodenal contents then were collected for 60 min. This procedure was applied to patients with malabsorption and diarrhoea of unknown etiology. Results were presented and their clinical value discussed.

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Nelwan see Soeprapto

Nichols BI see Jalili F

Nichols VN see Jalili F

Nobile S see Araya M

Noerhayati S see Soehadi

Oberholzer VG see Abraham JM

O'Brien W. Intestinal malabsorption in acute infection with Strongyloides stercoralis. Trans R Soc Trop Med Hyg 1975;69(1):69-77

An acute malabsorption syndrome in 7 young soldiers (18-26 years) on active service in Borneo is described, and reasons are given for ascribing it to early infection with Strongyloides stercoralis. The syndrome was characterized by diarrhoea, steatorrhoea, normal absorption of D-xylose and a high eosinophilia. Steatorrhoea was severe in 3 (fecal fats: 25-42 g per day) and mild or moderate in 4 (fecal fats: 7-13 g per day). The height of eosinophilia, the response to dithiazanine therapy, and the lack of response to anti-hookworm drugs suggested that S. stercoralis infection caused steatorrhoea. The malabsorption perhaps was mediated through a Type I hypersensitivity reaction.

Okeahialam TC. Giardiasis in protein energy malnutrition. East Afr Med J 1982 Nov;59(11):765-70

Giardiasis occurs commonly among the poor, in whom malnutrition prevalence is likely to be high. Sixty-eight children (39 males) aged 6 months-2½ years, hospitalized in Nigeria with protein-energy malnutrition and diarrhoea, were studied for giardiasis. Forty-one had marasmus and 27 had kwashiorkor. Stools of 16 (59%) kwashiorkor and 19 (46%) marasmus patients showed Giardia lamblia trophozoites. Single dose ornidazole (Tiberal) therapy cured the patients, as shown by diarrhoea control, rise in stool pH, decreased stool reducing sugar, and subsequent weight gain. Giardiasis contributes to diarrhoea in protein-energy malnutrition, probably by producing intestinal microvillous changes and the resultant disaccharidase deficiency. This infestation needs early treatment among malnourished children, to accelerate recovery.

Pacht M. [Chronic diarrhea in infants caused by malabsorption of sugars]. Dapim Refuim 1966;25:152-8

Pal SC see Deb BC

Pandit AN see Bhawe SA

Panzram G, Pense G. [Diarrhea, steatorrhea and malabsorption syndrome in Diabetes mellitus]. Deutsch Gesundh 1961;16:2057-61

Pappo E see Gouerou H

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Parker GW see Jones TC

Parry L see Brown KH

Pasquis P see Denis P

Pawa RR see Chandra RK

Peat GM see Mann MD

Pense G see Panzram G

Perozo-Ruggeri G see Römer H

Pezold FA see Bartelheimer H

Phillips AD see Jackson D

Phillips SF. Relationship of diarrhea to maldigestion and malabsorption: Mayo Clin Proc 1973 Sep;48(9):660-2

Pignal N see Hermier M

Pitchumoni CS see Thomas E

Polonovski C see Goutet JM

Posada OR, Kurdian M. [Study of the absorption of orally administered glucose in chronic diarrhea and in gastroectomized patients]. Prensa Med Argent 1965;52:1967-70

Prabhu KM see Srivastava VK

Pretorius PJ see Prinsloo JG

Prinsloo JG, Wittmann W, Pretorius PJ, Kruger H, Fellingham SA. Effect of different sugars on diarrhoea of acute kwashiorkor. Arch Dis Child 1969 Oct;44(237):593-9

In Pretoria, South Africa, the effect of different dietary sugars on diarrhoea in kwashiorkor patients was tested over 13 days in 6 groups of 20 patients each (Bantu males, 9-36 months). Five groups received a basic casein formula, with 6.3% of either glucose, sucrose, dextrin-maltose, lactose, or no sugar. Group 6 received cow's milk (4.8% lactose). Initially, diarrhoea was most severe and lactic acid secretion highest in lactose recipients. Diarrhoea improved in all groups. However, at the end of the experiment, diarrhoea incidence and abnormal lactic acid excretion in the lactose group remained high, while diarrhoea in patients on cow's milk (4.8% lactose) was considerably less severe, though lactic acid excretion still was high and unpredictable. It seemed there was a threshold for lactose tolerance and that tolerance improved during initiation of cure. There were no significant differences between stool weights and lactic acid excretion in the other groups, in the beginning or at the end. Initiation of cure, whether judged clinically or by disappearance of edema, weight change, or albumin regeneration, did not differ among the groups. Intestinal biopsies and disaccharidase assays done in 33 patients showed a depression of all enzyme activities, especially of lactase. In general, acute kwashiorkor patients in Pretoria tolerated milk sufficiently well for initiation of cure, and a lactose-free formula was not indicated routinely.

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

For individual patients, however, it may be necessary to exclude lactose, and substitute sucrose, which is well-tolerated, easily available and cheap.

Rachmad see Matulesy PF

Rachmat A see Matulesy PF

Rahaman MM, Wahed MA. Direct nutrient loss in diarrhea. In: Chen LC, Scrimshaw NS, eds. Diarrhea and malnutrition: interactions, mechanisms, and interventions. New York: Plenum, 1983:155-60

This paper describes the use of alpha-1 anti-trypsin as a marker protein derived from serum to assess the diagnosis of protein-losing enteropathies and in the measurement of protein loss in diarrhoeal disease. Hypotheses to explain the different pathogeneses of the serum protein losses observed in diarrhea due to E.coli, V. cholerae, Shigella and rotavirus are offered.

Rahaman MM see Molla A

Rahaman MM see Molla AM

Rahaman MM see Sarker SA

Rahim A see Molla A

Redelsperger P-Y see Gouerou H

Rhoads M see Sack DA

Richardson JM see Nelson R

Ritter U see Bartelheimer H

Robb TA see Davidson GP

Rocha JM da. [Disaccharidase disorders]. Bol Inst Puericult 1963 Apr;20(1):311-22

Literature on disaccharide hydrolyzing enzyme deficiencies has been reviewed. In addition to observations on clinical symptoms - weight standstill, foamy diarrhoea, acid stools - disaccharide loading tests are suggested for diagnosis. For definitive diagnosis and to exclude alimentary allergy, enzymatic activity is searched for in a fragment of intestinal mucosa obtained by oral biopsy. The helminths affect the integrity of intestinal cell wall, localized in the brush borders of the villous. Thus, all helminthiasis accompanied by diarrhoea, principally strongyloidiasis, contributes to malabsorption including disaccharide malabsorption.

Rodríguez-de-Curet H, Lugo-de-Rivera C, Torres-Pinedo R. Studies on infant diarrhea. IV. Sugar transit and absorption in small intestine after a feeding. Gastroenterology 1970 Sep;59(3):396-403

An earlier study showed that infants with acute diarrhoea have impaired glucose absorption. This study of composition changes of a feeding containing one of four sugars determines whether malabsorption of other sugars occurred to the same degree,

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

and examines rapid transit in the small intestine. Twenty-two infants (22 days-6 months) were studied once during acute diarrhoea, and 15 of them once or twice after recovery. The method was intubation and hourly collection of intestinal contents, following ingestion of a milk-like mixture containing either 0.4 M glucose, 0.4 M fructose, 0.2 M lactose, or 0.2 M maltose. During acute diarrhoea the following results were obtained: i) delay in gastric emptying and increase in transit time in the intestinal segment studied; ii) Significant malabsorption of the four sugars with minimal impairment for glucose and maximal for lactose; iii) better absorption for glucose than for fructose; and iv) definite impairment of lactase hydrolysis. The limitations of intestinal intubation in infants are discussed, and a method to evaluate absorptive function in the undisturbed state by calculating the absorption fraction is presented. Sugar malabsorption in the presence of rapid transit time suggests that alteration of transport processes and/or of the small intestinal mucosa's permeability characteristics are probably the most important factors in the pathogenesis of acute infantile diarrhoea. The finding of better absorption for glucose than for fructose suggests that permeability is altered to a greater degree than are the active transport processes. Labile lactase activity in the small intestine suggests that lactase deficiency appears very early during disease development.

Rodriguez H see Lugo-de-Rivera C

Römer H, Urbach R, Gomez MA, Lopez A, Perozo-Ruggeri G, Vegas ME. Moderate and severe protein energy malnutrition in childhood: effects of jejunal mucosal morphology and disaccharidase activities. *J Pediatr Gastroenterol Nutr* 1983 Aug; 2(3):459-64

The enzymatic activities of maltase, sucrase and lactase were determined in jejunal biopsies from 24 children (13 boys and 11 girls) with gastrointestinal symptoms and different degrees of protein energy malnutrition (PEM). The study examines whether disaccharidase activities were related to the extent of malnutrition or concomitant small intestinal mucosal injury. Lactase activities in children with marasmic kwashiorkor and second and third degree malnutrition showed dramatic ($p < 0.001$) reduction, compared to the controls. Even in patients with moderate (first degree) PEM, lactase activities were significantly ($p < 0.05$) lower. The decrease in lactase activity seemed to depend on malnutrition severity. In contrast, maltase and sucrase activities were decreased only in second and third degree PEM, while no significant changes were observed in first degree and marasmic kwashiorkor. Histologically, all PEM children had grade I to II mucosal injury, which did not correlate with the degree of malnutrition. PEM affects each of the disaccharidases of the jejunal mucosa differently; with lactase being most sensitive to PEM and reflecting most closely the degree of PEM. In contrast, the morphological changes showed no correlation with the degree of PEM.

Romo G see Vega-Franco L

Rosenberg IH, Solomons NW, Schneider RE. Malabsorption associated with diarrhea and intestinal infections. *Am J Clin Nutr* 1977 Aug;30(8):1248-53

An episode of diarrhoea causes weight loss and temporary cessation of growth in infants and children. Diarrhoea is accompanied by malabsorption of sugars, nitrogen, fats, and micronutrients. This review article examines the regularities with which diarrhoeal diseases of different etiologies produce malabsorption; and the possible mechanisms whereby infectious diarrhoea may produce a transient, but significant malabsorption syndrome. Also discussed are possible nutritional

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

implications of malabsorption in diarrhoea. The nutritional costs of malabsorption may pose a major threat if diarrhoea becomes chronic or recurrent. The hydrogen breath test for carbohydrate malabsorption does not require intubation or blood drawing. This test can be used in children to help clarify the importance of carbohydrate intolerance in the duration and perpetuation of acute diarrhoea and intestinal bacterial overgrowth.

Rosenberg IH see Einstein LP

Ruebe see Bartelheimer H

Russell A see Abraham JM

Sack DA, Rhoads M, Molla A, Molla AM, Wahed MA. Carbohydrate malabsorption in infants with rotavirus diarrhea. *Am J Clin Nutr* 1982 Dec;36(6):1112-8

Rotavirus diarrhoea patients were studied, to determine the association between carbohydrate malabsorption during diarrhoea and the degree of acidosis and severity of purging. Unlike enterotoxigenic diarrhoea, in which the metabolic acidosis is due to bicarbonate loss in an alkaline stool, rotavirus patients develop a metabolic acidosis, while passing an acid stool with little detectable bicarbonate. Also unlike in enterotoxigenic diarrhoea, rotavirus stool contains large quantities of reducing substances, suggesting significant carbohydrate malabsorption. The findings are consistent with the hypothesis that carbohydrate malabsorption is an important secondary, pathophysiological mechanism in the rotavirus diarrhoea syndrome. This rotavirus diarrhoea model helps explain the electrolyte and acid base pattern of rotavirus stool, and stresses the importance of further nutrition balance studies, to determine the optimal dietary management of rotavirus diarrhoea patients.

Sammons HG see Gardiner AJ

Sanghavi NG see Shah CP

Sarker SA, Molla AM, Karim AKMM, Rahaman MM. Calorie intake in childhood diarrhoea. *Nutr Rep Int* 1982 Oct;26(4):581-90

Calorie intake during acute diarrhoea and after recovery was studied longitudinally. Studied were 36 children aged 1-4 years hospitalized with diarrhoea. Equal numbers (12) had cholera, rotavirus and enterotoxigenic *E.coli*. In the acute stage, the mean calorie intake was 71 Kcal/kg/day for the cholera patients, 80 Kcal/kg/day for *E.coli* and 63 Kcal/kg/day for the rotavirus patients. After stoppage of diarrhoea (early convalescent stage) the intake improved to 128 Kcal/kg/day, for cholera, 126 Kcal/kg/day for *E.coli*, and the intake in these patients in the late convalescent stage (two weeks after hospital discharge) was 115 and 114 Kcal/kg/day, respectively. Rotavirus patients showed a slower improvement rate. Their calorie intake was 84 Kcal/kg/day and 100 Kcal/kg/day in the early and late convalescent stages, respectively. The results suggest that anorexia may be an important factor in reducing food intake during the acute diarrhoeal stage. Low calorie intake during this stage could be compensated for by higher convalescent stage intake, both for cholera and *E.coli* patients. Rotavirus patients seem to have a prolonged period of low intake of food following diarrhoea.

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Sarker SA, Molla AM, Rahaman MM. Impact of supplementary food on intake of breast milk in diarrhoea. *Lancet* 1983 Dec 10;2(8363):1349-51

Since no quantitative information was available on breast milk intake and the impact of supplementary food on it, a study on this pattern is reported. Breast milk intake during the acute and early convalescent stage of diarrhoea (7 days) and a fortnight after hospital discharge (late convalescent stage) was monitored in 33 breast-fed children aged 8-24 months. Of these patients, 16 were exclusively breast-fed and 17 were partially weaned at the time they were hospitalized with diarrhoea and vomiting. On admission, weaning food was introduced to the exclusively breast-fed children, whose breast milk intake in the acute stage made up slightly more than half their total calorie intake of 70 ± 4 Kcal/kg/day. Their total calorie intake increased to 91 ± 5 and 103 ± 5 Kcal/kg/day, respectively, in the early and late convalescent stages. However, the proportion made up by breast milk dropped to about a quarter. The breast milk intake of the partially weaned children constituted nearly half their total calorie intake of 72 ± 5 Kcal/kg/day, and about a fifth of their total calorie intake of 94 ± 5 and 104 ± 5 Kcal/kg/day, respectively, during the early and late convalescent stages. It was concluded that breast milk makes up 54% of total calorie intake in exclusively breast-fed and 40% in partially-weaned children during acute diarrhoea. Exclusively breast-fed children easily accept supplementary feeds, without any adverse effect, even during the acute diarrhoea stage. Therefore, attention should be given to increasing the intake of high-calorie food supplements, to prevent the diarrhoea-malnutrition cycle.

Sarker SA see Molla A

Sarker SA see Molla AM

Savage JP see Thomas MP

Schneer JH see Chipail A

Schneider RE, Viteri FE. Luminal events of lipid absorption in protein-calorie malnourished children; relationship with nutritional recovery and diarrhea. I. Capacity of the duodenal content to achieve micellar solubilization of lipids. *Am J Clin Nutr* 1974 Aug;27:777-87

Fat absorption and the duodenal content's capacity to achieve lipid micellar solubilization were longitudinally studied in 18 severely protein-calorie malnourished (PCM) Guatemalan children with or without diarrhoea on admission and at different recovery stages. The relationships among lipid micellar solubilization, pancreatic exocrine function, and bile acid concentration in duodenal aspirates also were studied. Four healthy children served as controls. Micellar lipid and fat absorption were abnormally low in PCM children; with nutritional recovery, both improved, reaching normal values. Diarrhoea hampered this improvement and was associated with larger amounts of duodenal aspirates in 90 min and higher dilutions of the emulsion. Stepwise regression analysis revealed that bile acids, especially conjugated bile acids (CBA), explained 44% of micellar lipid variability, while such factors as pancreatic lipase activity and dilution played a minimal role (8% and less than 1%, respectively). Increased free bile acid (FBA) concentrations also were observed in all diarrhoea patients, regardless of nutritional status. As the CBA concentration increases, so does micellar lipid. FBA showed a discrete but opposite trend. Micellar lipid decreased almost exponentially as the FBA/CBA ratio increased. Increased FBA could constitute a clear handicap to

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

intestinal function and, when coupled with a low or borderline CBA concentration, may limit further the duodenal content's capacity to solubilize lipids. Thus a decreased CBA and an elevated FBA/CBA ratio play important roles in decreasing micellar lipid absorption in children with PCM or diarrhoea.

Schneider RE, Viteri FE. Luminal events of lipid absorption in protein-calorie malnourished children; relationship with nutritional recovery and diarrhea. II. Alterations in bile acid content of duodenal aspirates. *Am J Clin Nutr* 1974 Aug; 27:788-96

Changes in conjugated and free bile acids (CBA and FBA) in duodenal aspirates were studied in 18 protein-calorie malnourished (PCM) Guatemalan children and in 4 healthy controls. Duodenal aspirates from PCM and diarrhoeic children presented quantitative and qualitative alterations in their bile acid contents: decreased CBA and increased primary and secondary FBA. In the absence of diarrhoea, PCM was associated with relatively uniform CBA decrements, increasing to normal levels with nutritional recovery; primary and secondary FBA did not change significantly with recovery. Diarrhoea's effect on bile acid composition varied depending on a patient's nutritional status: a) In recovered children with diarrhoea, all CBAs, especially the taurine conjugates, were decreased; the glycine/taurine ratios were above 1:4 in most patients. All FBAs -- most significantly, cholic and lithocholic acids -- were greatly elevated in recovered children with diarrhoea. The FBA/CBA ratios also were high. b) In PCM children, the degree of CBA decrements during diarrhoea was similar in taurine and glycine conjugates, the glycine/taurine ratio remaining within normal limits. The primary and secondary FBA levels were similar in malnourished children with and without diarrhoea. The changes in bile acids are believed to be due to the inter-action of malnutrition, diarrhoea, and an increased gastrointestinal flora. Besides their common effect in lowering CBA, diarrhoea and PCM had other, dissimilar effects on patients' bile composition. A theory to explain the bile acid events also is proposed.

Schneider RE see Rosenberg IH

Schrub JC, Hillemand B, Clabant Y. [Malabsorption disorders and diarrhea in the diabetic]. *Sem Hop Paris* 1969;45:3173-9

Sebodo T see Widiarto

Seebach C see Moreno R

Sengupta PG see Deb BC

Shah BR see Shah CP

Shah CP, Shah BR, Sanghavi NG, Shah NB. Malabsorption in chronic diarrhoea. *Indian Pract* 1972 Dec;25(12):537-41

This prospective study assesses the etiological pattern of chronic diarrhoea with particular reference to malnutrition, in 80 patients hospitalized at Baroda, India. Eighteen (22%) had primary malabsorption, 16 (20%) had intestinal tuberculosis and 7 had nutritional diarrhoea with normal absorption. Etiology was obscure in 9. In 67 (84%) there was overall malnutrition, in 59% clinical avitaminosis, and in 53% hypoalbuminemia. In 13, malabsorption was associated with other diseases, i.e., intestinal tuberculosis (8), diabetes mellitus (2), ulcerative colitis (1), ankylos-tomiasis (1), and thyrotoxicosis (1).

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Shah NB see Shah CP

Shield JM, Smith D, Heywood P. The prevalence of alimentary helminthiasis and its association with nutritional status in children under five years old in the highlands of Papua New Guinea. *Papua New Guinea Med J* 1981 Mar;24(1):40-4

Intestinal helminth infections were quantified to assess their significance in child morbidity and nutritional status. Helminth egg counts of fecal samples from 137 apparently healthy children aged under 5 revealed that 78% were infected with one or more of *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm (probably *Necator americanus*). Most children 12 months or older had some helminths. The youngest with a positive egg count was 6 months old. Many infections were of low intensity; 70-89% of subjects had less than 2,000 eggs/g feces of any one species. *Ascaris* incidence was relatively low, with no malnutrition association. There was a statistically significant association between moderate-high hookworm egg count and malnutrition. Compared with studies elsewhere, the results indicate the geographical variation of the relationship between growth and alimentary helminth prevalence. It is suggested that longitudinal intervention studies might determine any cause-effect relationship between helminth presence and growth retardation.

Silink SJ see Araya M

Sircar BK see Deb BC

Smith D see Shield JM

Smith EO see Jalili F

Soehadi, Soeprapto, Moenginah PA, Ismangoen, Noerhayati S, Musfiroh S. Giardiasis in protein-calorie malnutrition at Gadjah Mada Hospital, Yogyakarta. *Paediatr Indones* 1980 Feb;20(1-2):7-13

The correlation of giardiasis with protein-calorie malnutrition (PCM) was examined in 41 children older than 1 year hospitalized in Indonesia for PCM. Twenty-four had a body weight more than 60% of the Harvard standard (group I); while 17 had less than 60% (group II). Stools were positive for *Giardia lamblia* in 16 (39.02%), 5 in the first group and 11 in the second. The difference between the groups was significant ($p < 0.05$), indicating that the lower the nutritional status, the higher the risk for *Giardia lamblia* infection. The lipiodol absorption test in giardiasis patients revealed that 2 (40%) of the first group and 9 (81.82%) of the second group had fat malabsorption. Two patients positive for *G. lamblia* did not have diarrhoea. To break the diarrhoea/malabsorption/PCM cycles all PCM cases should be examined for *G. lamblia* in their stools, and, if positive, they should be treated with metronidazole.

Soenarto Y see Soeprapto

Soeprapto, Soenarto Y, Nelwan, Moenginah PA, Ismangoen. Feeding children with diarrhea. *J Trop Pediatr Environ Child Health* 1979 Aug;25(4):97-100

The value of early, rapid re-feeding as a means of interrupting the diarrhoea-malnutrition cycle was studied. Forty diarrhoeal infants, aged 4-24 months were randomly assigned to two groups. One received rapid, early and adequate re-feeding while in the other group, food was re-introduced slowly, according to the classic

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

schedule. Those given rapid, early re-feeding had a weight gain eight times greater (49 g: 6 g per day) than did the other group ($p < 0.01$). There was a clear association between calorie intake and daily weight gain, and the difference was significant ($p < 0.05$). The mean of time to reach the normal diet or hospital stay was 5 days in the rapidly-fed group and 10 days in the other group ($p < 0.05$). Diarrhoea duration was equal (3 days) in both groups. The authors recommend early, rapid and full re-feeding by day five for all acute diarrhoea cases.

Soeprapto see Soehadi

Solomons NW see Rosenberg IH

Sprinz H see Lindenbaum J

Srivastava VK, Anand VK, Murthy PS, Prabhu KM. Sugar intolerance in acute gastroenteritis in infancy and childhood. *Indian Pediatr* 1984 Jun;21(6):485-9

Transient sugar intolerance is a frequent complication of acute gastroenteritis in infants and children, but this had been studied mostly in chronic diarrhoea. Sugar intolerance, therefore, was studied in 87 patients (1 month-12 years) hospitalized in India with acute gastroenteritis. Fifty age and sex matched children hospitalized with illnesses other than gastroenteritis served as controls. Twenty-six (29.8%) gastroenteritis patients had sugar intolerance. Twenty-three (83.3%) of them were 1-12-month-olds. Grade IV protein-energy malnutrition was found in 34.6% of sugar intolerant cases. Mean stool pH in sugar intolerant and tolerant cases, respectively, were 5.307 and 6.9; the difference was significant ($p < 0.001$). Sugar intolerance cases had a longer hospital stay (9.68 days versus 2.65 days in sugar tolerant cases; $p < 0.001$). Severe dehydration was significantly associated with sugar intolerance. Lactose was the commonest offending sugar, as determined by paper chromatography of stool filtrates.

Sugar-induced diarrhea in children [editorial]. *Can Med Assoc J* 1973;109:343

Sulaiman Z see Matulesy PF

Sutanto AH. Cow's milk protein-sensitive enteropathy. Clinical and histological features in infants. *Paediatr Indones* 1982 Mar-Apr;22(3-4):65-9

Cow's milk is the most common recognized cause of food allergy in children. In this review paper, the clinical and histological features of cow's milk protein-sensitive enteropathy (CMPSE) in infants is discussed. Cow's milk protein intolerance (CMPI) is caused by an intolerance to cow's milk protein, without reference to its etiology or pathogenesis. The principal proteins in cow's milk are casein, beta lactoglobulin, alpha lactalbumin and immunoglobulins. Of these proteins, beta lactoglobulins are thought to be the most damaging to the small intestine. The enteropathy caused by CMPI is thought to be due either to a local cell-mediated immuno-mechanism, or to a direct chemical effect on an already damaged mucosa. Symptom of CMPI are acute vomiting, diarrhoea, shock, dehydration and electrolyte imbalance. However, a chronic form of CMPI shows abnormal stools, failure to thrive, rectal bleeding and intestinal colics. Histological changes in the stomach and small intestine were observed in CMPSE. In the stomach degeneration of the surface epithelium and marked infiltration of the lamina propria were found common; and the small intestine mucosa frequently exhibited a patchy enteropathy, with reduced mucosal thickness, villus height and villus cells: crypt cell ratio and a moderate

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

increase in intra-epithelial eosinophils, lymphocytes and plasma cells. These abnormal mucosal findings were confirmed by estimating pre-challenge alkaline phosphatase levels and one hour blood xylose levels. It has been shown that the assay of immunoglobulin (IgE and IgM) and complement levels in the serum and duodenal juice are not useful for the diagnosis of CMPSE. No immunological process has been found effective for CMPSE.

Sutherland IT see Gardiner AJ

Szabo I see Varkonyi A

Tarlow MJ see Gardiner AJ

Taylor RH, Waterman S. Single intubation test for investigation of malabsorption and diarrhoea. *Gut* 1983;24:680-2

Investigating patients with diarrhoea and malabsorption often requires a number of tests involving upper gastrointestinal tract intubation. This report describes a one-session multi-purpose intubation method for studying diarrhoea and malabsorption. It enables tests for bacterial colonization, infestation, and luminal cytology of the small intestine to be combined with a pancreatic exocrine function test and a jejunal biopsy during the same intubation. This technique was well-tolerated by more than 500 patients aged 11-89, investigated during five previous years. The technique has proved acceptable, reliable, diagnostically valuable and convenient for out-patients. In addition, it saves investigation time and reduces the number of invasive procedures required.

Thomas E, Lev R, McCahan JF, Pitchumoni CS. Eosinophilic gastroenteritis with malabsorption, extensive villous atrophy, recurrent hemorrhage and chronic pulmonary fibrosis. *Am J Med Sci* 1975;269:259-65

Thomas MP, Cosh DG, Savage JP. The use of a defined formula diet in infants with a "sick gut". *Aust Paediatr J* 1982 Jun;18(2):92-101

A low osmolar modular defined formula diet was used successfully to treat 46 patients for a total treatment time of more than 15 years. At the commencement of treatment, patients varied in age from neonates to adolescents (up to 13 years). Thirty-eight patients were aged below 1 year, and this group accounted for 82% of total treatment time. The formula diet consisted of protein; fat (medium chain triglycerides and safflower oil, 4:3); carbohydrate as a glucose polymer; electrolytes (sodium, potassium, calcium, magnesium, phosphorus, chloride, and bicarbonate equivalent); vitamins; trace elements (iron, copper, manganese, zinc, fluorine, and iodine), and flavorings. The diet was unique in that each constituent could be varied independent of any other, thus giving maximum management flexibility. The diet was well-tolerated when the gastrointestinal tract was unable to tolerate other nutrients. It also would support normal growth and development over lengthy periods, and might lessen the need for more invasive, potentially dangerous parenteral nutrition. It also is useful in combined enteral-parenteral nutrition and for oral hyperalimentation.

Tomkins A. Nutritional status and severity of diarrhoea among pre-school children in rural Nigeria. *Lancet* 1981 Apr 18;1(8225):860

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

The influence of pre-existing malnutrition on diarrhoeal severity was investigated, by assessing attack-rates and diarrhoea durations in 343 children aged 6-32 months, during a 3-month-long rainy season. Children's nutritional status was assessed by weight/age, height/age and weight/height. Thus 123 children were underweight, 98 were stunted and 41 were wasted. During the study period, as a group, there were 1.4 diarrhoea attacks per child, and the children spent 10.5% of that time with diarrhoea. Diarrhoea frequency was not significantly greater in underweight (< 75% weight/age) or stunted (< 90% height/age) children. However, those who were wasted (< 80% weight/height) had 47% more episodes than did the well-nourished (1.90 compared with 1.29 attacks $p < 0.02$). Pre-existing malnutrition affected diarrhoea duration, which was 33% longer in underweight children (11.3% in the underweight vs. 8.5% in the well-nourished; $p < 0.01$), 37% longer in stunted children (10.8% vs. 7.9%; $p < 0.01$), and, most strikingly, 79% longer in wasted children (13.6% vs. 7.6%; $p < 0.001$). Nutritional status relates more to diarrhoea duration than to number of attacks. Wasted children particularly are at risk of more frequent, more protracted diarrhoea episodes.

Tomkins AM. Folate malnutrition in tropical diarrhoeas. *Trans R Soc Trop Med Hyg* 1979;73(5):498-502

Literature on folate malnutrition has been reviewed with special reference to tropical diarrhoeas. Discussed in particular is the development of folate deficiency in tropical malabsorption, how this affects intestinal mucosa, and the relationship between folate deficiency and pediatric gastroenteritis. There is little published information on the value of folic acid therapy in improving malnourished children with chronic diarrhoea. The relevance of folate deficiency in diarrhoea and malnutrition requires further consideration.

Tontisirin K, Valyasevi A. Protein energy malnutrition related to diarrhea in Thai children. *J Nutr Sci Vitaminol* 1981;27:513-20

In 1981, Thailand had a population of approximately 47 million of which 80-85% were living in rural areas and 41% were children aged under 14 years. A survey was directed towards the identification of protein-energy malnutrition (PEM), which was a major public health problem, affecting the physical growth, mental development, learning ability and immune response to infections of Thai infants and children. It was found that for some infants PEM had already been occurring during the intrauterine period. The average birth weights of male and female newborn infants in different hospitals of Bangkok were compared to those in the rural village of a relatively poor province. The average birth weight and length of newborn infants born in two hospitals of the province were lower than that of infants born at the hospital of Bangkok, but higher than that of infants born in the rural villages. Although breastfeeding was recognized as the best and most proper method of infant feeding, it was found that the practice of breastfeeding was highest in the rural areas and had been declining constantly during the first 1½ years of life from the rural villages to the semi-rural and urban areas of Bangkok. In the urban slum area the prevalence of PEM based on weight for age was strikingly high among infants aged under 6 months, and among the preschool children throughout the country PEM was prevalent in 56%. The causes were identified as poor maternal health and nutrition, false food beliefs and practices, too early introduction of supplementary foods to infants, diets low in protein and fat, unhygienic preparation and handling of food, and intercurrent infections and infestations such as diarrhoea, pneumonia, and intestinal parasites. It was also shown that diarrhoeal disease had been for many years the first or second leading cause of death in Thai infants. In the pediatric units of most hospitals of the country, diarrhoeal disease in infants has accounted for 20-35% of hospital admissions and was responsible for 20-30% of total deaths in this age group. The inter-

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

relationship between PEM and diarrhoea in infants and children was well recognized as the most critical health problem of the developing countries and attempts to improve the nutritional status of infants and children by alleviating PEM and diarrhoea were suggested.

Torres-Pinedo R see Lugo-de-Rivera C

Torres-Pinedo R see Rodriguez-de-Curet H

Townsend WF, Walter LG, Kinzie JL, Ammon HV. Effect of cholera toxin on ileal water and solute transport after resection of the proximal small intestine in the rat. *Gut* 1981 Nov;22(11):953-7

Tripathy K, Duque E, Bolanos O, Lotero H, Mayoral LG. Malabsorption syndrome in ascariasis. *Am J Clin Nutr* 1972 Nov;25(11):1276-81

The effect of *Ascaris lumbricoides* infection on intestinal absorption was studied in 5 children (3-7-year-olds) admitted to a metabolic unit. Absorption studies and peroral jejunal biopsies were performed before and immediately after de-worming. In addition, pre-and post-treatment jejunal biopsy samples were obtained from 2 other children while they received de-worming treatment at home. Four of the five patients had a moderate decrease in fecal nitrogen excretion; the mean reduction represented 6.5% of dietary nitrogen (33.5% before and 27.0% after treatment, $p < 0.01$). Four children had steatorrhoea; de-worming resulted in a mean reduction of fecal fat from 9.9% to 2.3% of dietary fat ($p < 0.001$). Three children demonstrated an impaired D-xylose excretion (less than 1.2 g in a 5-h urine excretion following a 5-g oral dose). When retested 2-3 days after de-worming, only one child was found normal. The jejunal biopsy was abnormal in all 7 children. The abnormalities were: broadening and shortening of villi, elongation of crypts, decreased villus-crypt ratio, and round cell infiltration of the lamina propria. Most abnormalities reverted to normal soon after de-worming. The results strongly suggest a cause-effect relationship between *Ascaris* infection and intestinal lesions in children.

Uauy R see Fuentes A

Urbach R see Römer H

Urrutia JJ see Mata LJ

Vachon A, Cotte J, Abry M, Dechavanne, Kissin C, Mathieu M. [Disaccharidases of the jejunal mucosa in intestinal malabsorption and diarrheas of the adult]. *J Med Lyon* 1970 Sep 5;51:1533-43

30 diarrhoea patients, with and without intestinal malabsorption, were studied to find out the correlations between disaccharidase ratio and the pathological condition of jejunal mucosa, and the correlation between enzymatic activity and the noted clinical symptoms. At the time of histological injury to the mucosa (villous atrophy, in particular), a reduction of enzyme activity was seen. However, when villous atrophy disappeared by medical treatment,

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

enzyme levels increased. Lactase appears to be the frailest of the disaccharidases, and the slowest to reach a normal level after cure. In normal jejunal mucosa, it was noted that an isolated fall in lactase activity is not unusual. In such cases, chemical intolerance to milk is not obvious -- but the lactose test (Dunphy) is sensitive to lactose intolerance. Moreover, in two cases, the association of very slight lactase activity with lactose intolerance and osteomalacia with frank hypocalcemia, seems to confirm the part played by lactose in calcium absorption.

Valyasevi A see Tontisirin K

Valyasevi A see Varavithya W

Varavithya W, Valyasevi A, Charuchinda S. Lactose malabsorption in Thai infants. *J Pediatr* 1971 Apr;78(4):710-5

The effect of malnutrition and/or diarrhoea on lactose absorption was determined in 41 Thai infants below age 2. Fifteen (7 male) had protein-calorie malnutrition without diarrhoea and 26 (15 male) had diarrhoea. Abnormal lactose tolerance was found in 60% of infants with malnutrition alone and in 69% of infants with malnutrition and diarrhoea. Only 22% of "normal" Thai children showed this abnormality. Follow-up studies of 4 malnourished infants with diarrhoea showed that lactose malabsorption persisted for 3 months in 2 infants and for more than 5 months in another 2. Despite abnormal tolerance and persistent loose stools, 3 of 4 infants gained weight fairly well on a proprietary milk formula and regular diet (rice, green vegetables, eggs and meat). Chronic diarrhoea and malnutrition could cause acquired lactase deficiency, and if it continues for a long time following diarrhoea, it could contribute to a vicious diarrhea/malnutrition cycle. A non-lactose milk formula and/or other lactose-free foods probably would be the feedings of choice in infants with recurrent diarrhoea and malnutrition.

Vargas W see Alvarado J

Varkonyi A, Boda M, Szabo I. The importance of cow's milk protein intolerance in chronic diarrhoea of children. *Acta Pediatr Hung* 1983;24(2):169-74

Vega-Franco L, Jimenez E, Galindo E. [Disaccharide malabsorption in infants with acute diarrhea]. *BoI Med Hosp Infat Mex* 1974;31:761-9

Vega-Franco L. [Intestinal absorption in children with giardiasis]. *BoI Med Hosp Infant Mex* 1983 Nov;40(11):598-603

Vega-Franco L, Alvarez EL, Romo G, Bernal RM. [Protein absorption in children with giardiasis]. *BoI Med Hosp Infant Mex* 1982 Jan;39(1):19-22

Vegas ME see Römer H

Viscorova B see Chung AW

Viteri FE see Alvarado J

Viteri FE see Schneider RE

Vlaski R, Kuzmanovska D, Kecharovska J, Andreevska M. [Lambliia giardia, a cause for malabsorption syndrome in childhood (author's transl)]. *God Zb Med Fakskopje* 1979 Jan;25:254-51

Nutrient Absorption and Diarrhoea-Malnutrition Cycle

Volovoi VL see Kharat'ian AM

Wahed MA see Rahaman MM

Wahed MA see Sack DA

Waidmann TA see Heizer WD

Walker-Smith JA see Araya M

Walker-Smith JA. Cow's milk intolerance as a cause of postenteritis diarrhoea. *J Pediatr Gastroenterol Nutr* 1982;1(2):163-73

Walker-Smith JA see Jackson D

Walter LG see Townsend WF

Warshaw AL see Heizer WD

Waterman S see Taylor RH

Wheeler EF see Brooke OG

Whittle HC see Dossetor JFB

Widayat see Widiarto

Widiarto, Sebodo T, Irawan, Widayat, Ismangoen. Sucrose tolerance test in children with diarrhoea. *Paediatr Indones* 1982 Jul-Aug;22:126-31

To learn more about sucrose intolerance in children with acute gastroenteritis, 30 children aged 1.5-18 months with acute diarrhoea were tested on their 3rd hospital day in Indonesia. No oral antibiotics were given. Sucrose malabsorption was diagnosed if (i) the children developed meteorism, vomiting and diarrhoea, (ii) the increase in blood sugar was less than 40 mg%, and (iii) stool pH was less than 6. Ten children (33.33%) had increased blood sugar (over 40 mg%) and one of them developed diarrhoea. Among the other 20 (66.67%), the increase was less than 40 mg%, and one developed diarrhoea. Only one patient from the first group had a stool pH less than 6. The other nine and all 20 from the second group had a stool pH above 6. A less than 40 mg% increase in blood sugar was suggested to be a sign of sucrose malabsorption.

Wittmann W see Prinsloo JG

Wolf RH see Gyr K

Yarbrough C see Martorell R

Yarbrough S see Martorell R

Yunus M see Hoyle B