reached the centre of the hæmothorax, and the coliforms present may have inactivated that which did.

The infection was responsible for the clotting of the hæmothorax.

The wood must have had exactly the same radio-translucency as blood, since the most careful subsequent scrutiny failed to show its presence in the chest radiographs.

The young human organism possesses remarkable resilience to even dramatic traumata of bacterial, dynamic, and structural types.

SUMMARY

A piece of wood $8^1/_2$ in. long and 1 in. in diameter passed through a boy's abdomen into the left side of his thorax without damaging any abdominal viscus, the heart, or ribs. The boy recovered completely after the stick had been removed.

I am indebted to Dr. Cameron Gibson who first attended this patient, and to Mr. F. Brian Thomas, under whose care he was at the County Hospital, Hereford, for permission to publish.

Preliminary Communication

INFLUENCE OF PHENYLALANINE INTAKE ON PHENYLKETONURIA

IN phenylketonuria phenylalanine accumulates in the blood and cerebrospinal fluid, probably because phenylalanine is not converted to a normal extent into tyrosine. On the assumption that this excessive concentration of phenylalanine (or perhaps of some breakdown product) is responsible for the mental retardation found in this condition we decided to keep a girl, aged 2 years, with phenylketonuria on a diet low in phenylalanine. She was an idiot and unable to stand, walk, or talk; she showed no interest in her food or surroundings, and spent her time groaning crying, and banging her head. The diet had to be specially prepared, because a sufficiently low phenylalanine intake could only be attained by restricting practically all the nitrogen intake to a special casein (acid) hydrolysate (Allen & Hanburys Ltd.). This was treated with activated acid-washed charcoal, which removed phenylalanine and tyrosine. Tyrosine, tryptophane, and cystine were then added in suitable amounts.

RESPONSE TO LOW-PHENYLALANINE DIET

The child was at first treated in hospital so that careful observation could be made. During a four-week preliminary period, when no phenylalanine was permitted, no definite clinical change other than loss of weight was observed. The characteristic musty smell disappeared, the levels of phenylalanine in plasma and urine fell to normal, the excretion of phenylpyruvic acid ceased, and the ferric-chloride reaction became negative (see figure).

Subsequently, presumably as the result of tissue breakdown, the biochemical abnormalities returned to some extent, along with a generalised amino-aciduria. Phenylalanine was therefore added in small amounts in the form of whole milk, a daily intake of 0·3–0·5 g. being found sufficient for normal weight gain, with greatly improved biochemical findings.

During continued outpatient treatment a gradual improvement in the child's mental state took place within the next few months: she learnt to crawl, to stand, and to climb on chairs; her eyes became brighter; her hair grew darker; and she no longer banged her head or cried continuously.

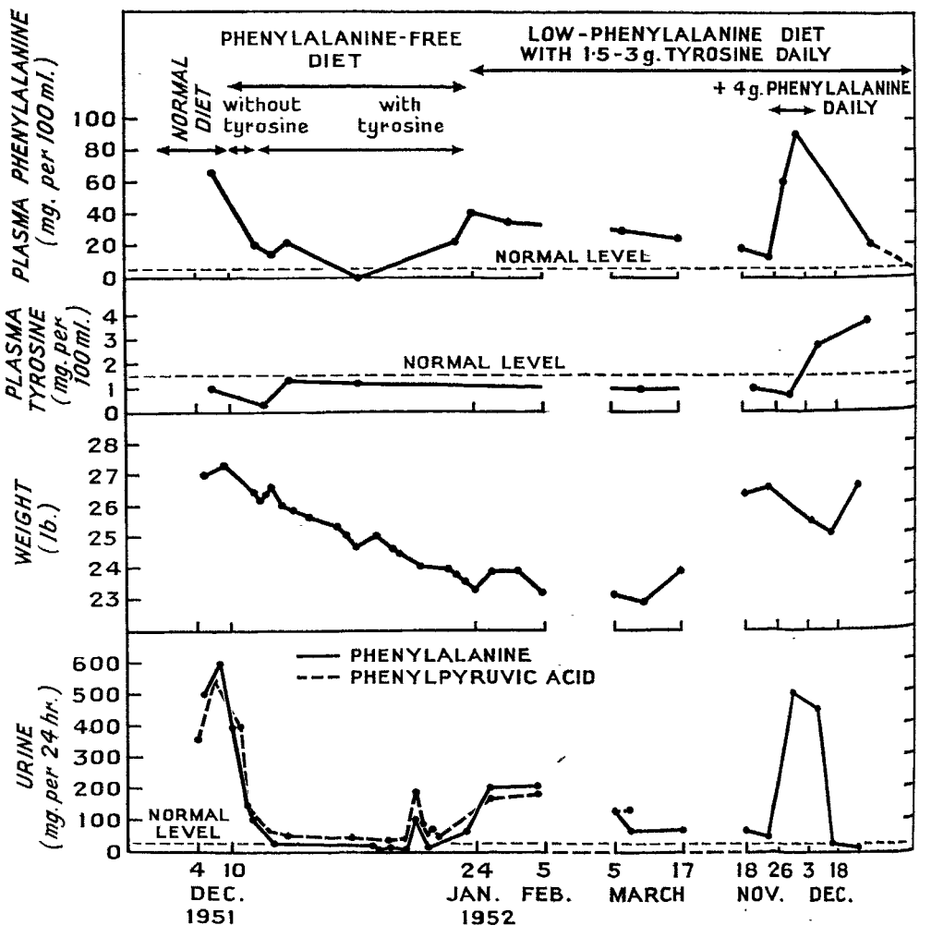
The most suitable diet so far evolved contains as source of amino-acids only the special hydrolysate, vegetables and fruit, gluten-free bread and flour being freely permitted.

RESPONSE TO ADDITIONAL PHENYLALANINE IN DIET

In view of the importance of establishing whether the clinical improvement noted (which depended at first largely on the observation of the mother) was real and due to the diet rather than to natural development, we decided to add L-phenylalanine 5 g. daily to the diet. This was added to the hydrolysate without the mother's knowledge, so that any change should be noted without bias.

A definite deterioration in the child's condition ensued, the mother reporting with distress that her daughter had lost in a few days all the ground gained in the previous ten months; that within six hours of starting the fresh supply of "food" the child had begun to cry and to bang her head as in the past, and within twenty-four hours could no longer stand and could scarcely crawl.

In view of the importance of obtaining adequate proof of the value of the special diet, at present very expensive, the mother agreed to a further similar trial in hospital, which permitted close correlation of clinical and biochemical findings and cinematographic records. After a period of observation on a low-phenylalanine diet, L-phenylalanine 4 g. daily was again added to the diet. Within twenty-four hours the patient became irritable and drowsy, lost interest in her food and



Biochemical reactions to phenylalanine-free and to low-phenylalanine diets.

surroundings, developed facial eczema, and salivated profusely. She also became ataxic and vomited repeatedly. By the sixth day she could no longer stand or crawl. The additional phenylalanine was then discontinued, and within three weeks she had almost completely recovered.

BIOCHEMICAL FINDINGS

When phenylalanine was added to the diet, the plasma-phenylalanine level rose from 13 to 91 mg. per 100 ml., and the urinary excretion of this amino-acid increased from 40 to 500 mg. per 24 hr. (see figure and table). Two weeks after the extra phenylalanine had

PHENYLALANINE AND TYROSINE LEVELS IN A PHENYLKETONURIC PATIENT AND IN A CONTROL BEFORE AND DURING A PHENYLALANINE FEEDING EXPERIMENT

—	Phenylketonuric patient		Normal control	
	Phenyl-alanine	Tyrosine	Phenyl-alanine	Tyrosine
In plasma (mg. per 100 ml.):				
Before phenylalanine feeding	13·0*	0·7	1·4	1·7
During feeding of L-phenylalanine 4 g. daily	90·5	2·7	6·1	2·9
In urine (mg. per 24 hr.):				
Before phenylalanine feeding	40*	5·3	4·2	6·4
During feeding of L-phenylalanine 4 g. daily	500	14·9	260	11·9

* On a diet low in phenylalanine.

been discontinued the urinary excretion of this amino-acid decreased to 20 mg. per 24 hr., and the plasma-phenylalanine level fell during the next few weeks to 28 and then to 19·5 mg. per 100 ml., and is now normal (1·2 mg. per 100 ml.). The ferric-chloride test, which was negative with the low-phenylalanine diet, gave a black-green reaction while the child was receiving extra phenylalanine.

We have also given phenylalanine (14 g. in four days) to a normal infant, aged 5 months, without producing any change in behaviour or any comparable rise in the plasma-phenylalanine level, which did not exceed 6·1 mg. per 100 ml. (see table).

These findings suggest that high levels of phenylalanine or of its breakdown products disturb cerebral functions and may possibly give rise to the mental retardation found in phenylketonurics.

CONCLUSION

In this child at least the beneficial effects of a low phenylalanine intake seem unequivocal, although the degree of mental development finally obtained remains to be seen after further prolonged treatment. In view of the importance of phenylketonuria as a cause of mental deficiency, further controlled trials are being made, special attention being paid to very young children, who are likely to benefit most.

We gratefully acknowledge the help and interest of Dr. W. C. Smallwood, Prof. J. M. Smellie, and Prof. J. R. Squire. Dr. L. I. Woolf first drew our attention to the technique of removing phenylalanine from casein hydrolysate and gave further valuable assistance. Messrs. Allen & Hanburys Ltd. have recently presented us with a supply of phenylalanine-free casein hydrolysate.

The methods employed will be described in a fuller account to be published in *Acta pædiatrica*.

HORST BICKEL *
M.D. Vienna, Ph.D. Birm.
JOHN GERRARD
D.M. Oxfd, M.R.C.P.
EVELYN M. HICKMANS
M.Sc., Ph.D. Birm.

Children's Hospital, Birmingham

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Reviews of Books

William Cheselden, 1688–1752

Sir ZACHARY COPE, M.D., M.S., F.R.C.S., consulting surgeon, St. Mary's Hospital, London. Edinburgh: E. & S. Livingstone. 1953. Pp. 112. 20*s*.

Cheselden was the foremost surgeon of his time and in this lively and well-illustrated book Sir Zachary Cope has provided him with a worthy biography.

Cheselden retired from the staff of St. Thomas's Hospital before Percival Pott was elected to the staff of St. Bartholomew's Hospital. His general surgical ability was great, his ophthalmic work enterprising and in some respects original, and his speed and success in cutting for the stone had no equal in pre-anæsthetic days. But he achieved something more than this, and something greater and more lasting, for his technical skill died with him. He was the first man in this country who insisted on the importance of a sound knowledge of anatomy for the medical student, and upon dissection for a knowledge of anatomy. He was the first regular and recognised teacher of anatomy in Great Britain. There had indeed been courses of anatomy before his time, but none which continued regularly with a printed syllabus and a companion textbook which became so popular that it maintained its place for more than a century.

Sir Zachary shows him in many guises. We are shown the lithotomist gradually evolving his own technique. We see him as the architect of the old Fulham (or Putney) Bridge—a wooden memorial which withstood heavy traffic for 150 years. We see him as a teacher instructing, among others, John Hunter. We see him as a superb draughtsman: his *Osteographia* has lived because of the beauty and accuracy of the pictures he drew, for its text was far less satisfying. We see him as a negotiator, responsible more than anyone else for separating the Surgeons from the Barbers.

British Medical Science and Practice

An anthology. Editor: G. F. PETRIE, M.D. London: Longmans, Green. 1953. Pp. 172. 15*s*.

THIS anthology has been sponsored by the British Council with the object of helping doctors and students abroad to follow modern trends of medicine as it is practised in Britain. It might be thought that such a compilation would be scrappy, but this interesting and impressive collection, well illustrated, well printed, and well arranged, is a credit to its editor and publishers.

The introductory section briefly surveys some of the landmarks in British medical history, as illustrated in the work of ten pioneers—Harvey, Hunter, Jenner, Bell, Bright, Addison, Simpson, Florence Nightingale, Lister, and Manson. The character of each is portrayed through excerpts taken from their own writings and from standard biographies. The small selection of aphorisms ranges from the 17th to the 20th centuries. The only living contributor, Geoffrey Keynes, holds his own in distinguished company with three apt aphorisms—for example, "Speed in a surgical operation depends not on quick movements but on the absence of unnecessary movements." The third and main part of the anthology deals with present-day medical science and rightly fills three-quarters of the book. Extracts of up to 500 words have been chosen from articles by distinguished authorities in almost every branch of medicine. An appendix gives the qualifications and experience of the contributors.

Ciba Foundation Colloquia on Endocrinology

Vol. 6. *Hormonal factors in carbohydrate metabolism*. Editor: G. E. W. WOLSTENHOLME, O.B.E., M.A., M.B., assisted by JESSIE S. FREEMAN. London: J. & A. Churchill. 1953. Pp. 350. 35*s*.

MOST of us have had trouble with the management of diabetes, and our difficulties are not all explained by poor coöperation from the patient; nor will they all be resolved by newer types of insulin. This engaging volume shows why each diabetic is an individual problem. It plunges straight into a discussion of alternative pathways of carbohydrate oxidation, and thence into localisation of enzyme systems in the liver cell; after which, Dr. C. H. Best, F.R.S., the chairman, was driven to exclaim "I'd like to bring the clinicians into this discussion, but I don't know just how to do it." Important papers