environmental factors. It should be stressed that this combination is hypothetical, going beyond the presently available evidence. Its justification is its clinical utility.

The hypothesis takes the difficulty in maintaining attention to be the fundamental functional problem. It derives at the neurophysiological level from low central nervous system arousal levels, which can be indirectly measured when the difference from normal is sufficiently great. Low central nervous system arousal is a result of malfunction of the reticular formation in the brain stem. It results also in impaired inhibition in the cerebral cortex, giving rise to increased distractability and motor restlessness. Stimulant medication acts on the reticular formation to raise central nervous system levels.

The impaired function of the reticular formation may be a result of normal (genetic) variation in bodily functions, or of maturational delay, or of acquired damage occurring before or after birth. The possibility of this impairment of neurophysiological function occurring as a result of inadequacy of the psychological environment is allowed, but not specifically required.

Impairment of cortical inhibition interferes with the child's capacity to cope with important developmental tasks. These include: the formation of relationships and the use of feelings in the maintenance and development of relationships; the purposive use of motor activity; the achievement of the ability to store information so that it can be recalled in future. The child with impaired cortical inhibitory control does not fail totally to achieve these things, but he finds it harder. The extent to which the difficulty is manifested in symptoms depends not only on the extent of the organic disturbance but also on the interaction between the child and his environment in the course of his development.

This allows psychological factors, such as parental attitudes, an important role in determining how the child makes use of his biological equipment. The implication for treatment is that counselling, psychotherapy or training may be an important measure, but there must also be acceptance of biological realities and tolerance for individual differences.

EPIDEMIOLOGY AND NATURAL HISTORY

Estimates of the frequency of hyperactivity in school-aged children vary from 4% to 10% of the primary school group. Behaviours which cause problems to teachers and which may lead to requests for evaluation are even more common, with restlessness reported in one survey as present in 50% of boys and 28% of girls. Such figures do much to explain the concern in the United States about overmedication of supposedly hyperactive children.

Boys are more frequently affected than girls, a ratio of 9: 1 having been reported.

Until the last decade or so, conventional clinical wisdom had it that hyperactive children "grew out of" their symptoms in their early teens. This may be so as far as the activity level itself is concerned, but this is not to say that they cease to have problems. In fact, at least for the group with identifiable organic deficit or "minimal brain dysfunction", the outlook is poor. There is a high incidence of social maladjustment in particular.

Medical History

DR ANTON BREINL AND THE AUSTRALIAN INSTITUTE OF TROPICAL MEDICINE*

PART 3

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THE War of 1914-1918 really led to Breinl's downfall as a scientific investigator, and to his rebirth and metamorphosis as a clinician. Before the onset of the war, he became a naturalized citizen in May, 1914.[29] The Superintendent of the Townsville General Hospital left early for the war, and Breinl volunteered to take his place as well as acting as Director of the AITM. Breinl performed the duties of hospital superintendent, largely clinical in those days, for the greater part of the war in a purely honorary capacity. Breinl was also responsible for treating many servicemen sent from New Guinea, and later from the Jordan Valley with difficult-to-treat malaria. He had an Australia-wide reputation in the management of this disease. Nevertheless, there was a constant sniping campaign carried on by some sections of the populace against Breinl as an ex-enemy alien being in the responsible position that he held. The Hospital Board, knowing his worth, favoured Breinl, but felt that some gesture had to be made to silence the vocal minority who were against him. A referendum of the patients and staff of the hospital was held, to see how many were for or against Breinl. The vote was returned as being practically unanimous in Breinl's favour, so he remained as Acting Superintendent. Leaving no doubt that his loyalties lay with his adopted country, Breinl volunteered on three occasions during the war to place his services and those of his staff at the AITM at the disposal of

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the military authorities; however, the offer was not accepted. This is certified in a letter dated October 29, 1920, written by Mr Atlee Hunt, Secretary of the Home and Territories Department of the Commonwealth Government.[9] Doubtless this letter was solicited by Breinl because of the postwar intolerances to which he was subjected.

The war years were busy ones for Breinl, and he was always a great worker. He carried on with his research activities as well as his clinical duties. All this time he had remained single, living in Dean's boarding house on Stanton Hill, only a few hundred yards away from the AITM. Every Saturday he would have dinner with Dr and Mrs E. Humphry, who remained lifelong friends. Humphry helped him with the hospital work during the war.

On April 21, 1919, he married Miss N. D. Lambton, a nursing sister at the Townsville General Hospital. She was a skilled pianist and used to accompany him when he played the violin, and this is how they became acquainted.[30] Later in the year premature twin sons were born, both of whom became doctors. Breinl was 38 years old when he married. Such late marriages among professional people were normal for the times. Medicine is a hard taskmaster at the best of times, and was then regarded more as a vocation. It was held that the distraction of matrimony would detract from the fine honing of medical skills; in addition of course, early financial remuneration was so poor that few could afford to marry. The world doyen of physicians at the time was Sir William Osler, who did not marry until he was 42 years old. Osler spoke of the art of detachment as "the faculty of isolating yourself from the pursuits and pleasures incident to youth", there was to be no dalliance with "Amaryllis in the shade", and "they should beware the tangles of Neaera's hair."[31]

After the war, there was a period when the staff of the institute fell in numbers, with the loss of the able Priestley and Young. Breinl was just lifting it out of the effects of the war years, when he was attacked himself by formidable authorities. It is held by Mrs N. Breinl, his wife, that Dr J. H. L. Cumpston treated Breinl in an abominable manner and eventually forced his resignation from the AITM.[30] It is generally believed that the hounding of Breinl was based on the general xenophobia of the period, but it is hard to find absolute documentary proof, as many documents of the time have been destroyed; what evidence there is, is somewhat locutory. Professor H. Priestley wrote Breinl's obituary in 1944 and stated:

> He continued as Director of the Institute until October 1920, when, as a result of post-war intolerances he felt compelled to resign his position. As other opportunities for scientific research were not available in Australia, he set up in general medical practice in Townsville, and continued in this practice until just before his death. He had immediate success as a medical practitioner, but a very distinguished scientific career was cut short . . . Breinl was primarily a protozoologist, both pure and applied, and as such was held in high regard in Europe before he came to Australia . . . It is a great tragedy that Breinl felt compelled to give up active scientific research at the height of his career. Breinl was a splendid man to work with, enthusiastic, very hard working, and always ready to give the other fellow more than his share of the credit. His knowledge of protozoology in particular, and of tropical medicine generally was great, and as a laboratory technician, he was superb."[33]

Cumpston was at that time Chief of the Commonwealth Quarantine Medical Service, and a rising star in the small medical bureaucracy of those days. Cumpston was also diligent and hard working and was to play a most powerful and influential role in Australian medicine. He was a gifted administrator, and contrived to combine "width of vision with an unusual capacity for detail".[34] The writer of his obituary also said of him: "He was a hard man, but we believe that he was fair . . . He found it somewhat difficult to delegate responsibility and authority . . . It is unfortunately true that some of his staff who had to work in close association with him were far from happy, and the fault did not always lie with them." Sir Edward Ford stated that he had briefly met Breinl on a few occasions in 1937, but before this had often heard appreciative mention of him from Professor Osborne and Professor Young while working at Melbourne University. He states that Dr George Heydon, who also worked at the AITM, ascribed Breinl's retirement to "trouble" with Cumpston. Ford knew Cumpston and states that: "The action described would follow almost inevitably should a staff member persist in a stand threatening some plan he considered important." Ford also points out that Cumpston "was undoubedly the greatest Australian Health Administrator of all times, one of intellect, vision and untiring work".[35]

At the time we are concerned with, there was no Commonwealth Health Department. Health was entirely a matter for the States, with quarantine the only Commonwealth activity. The Commonwealth Department of Health was not formed until March, 1921, with Cumpston becoming the first Director-General of Health. The department was largely brought into being at the request of the Rockefeller Foundation, which wished to give aid to Australia so far as its health was concerned. Cumpston remained head of, and in fact was the department until his retirement in 1945. Before 1921 Cumpston would have been preparing for his future role, and major activities of his department-to-be would lie in the north. His main institution would be the AITM at Townsville and of course the Commonwealth was responsible for the health of Papua-New Guinea, the New Guinea part having been recently acquired as a mandate from the League of Nations. Cumpston was a great "empire builder" in his department, and took every advantage to enlarge it at the expense of the States.

Cilento states that Cumpston's plan was to establish the Commonwealth Department of Health

> . . . with far reaching potentialities in Tropical Australia and German New Guinea which was due to pass to Australian control as an integral part of the Commonwealth. Breinl had no experience in the field of diplomacy or administration (especially where there was military occupation and control), and as a former German-speaking alien would have had no chance to capture and supplant the military administrators . . . There was no place for Breinl in the new plan especially as Cumpston fully intended to ignore the North and to make the Institute mainly a routine health laboratory. Breinl was pressurized to resign and did so, bitterly resenting so poor a reward for years of excellent work.[36]

Of Cumpston, Cilento writes: "Cumpston was a remarkable organizer who fell short of personal greatness by a streak of resistance and mean spiritedness amounting to ruthlessness wherever he met resistance." Cilento states that Cumpston was against reorganizing the AITM after World War I; an epidemic of plague tipped the scales in favour of reorganization.[1] Breinl's wife holds the view that in some way Cumpston could not move the institute to Sydney until he had got rid of Breinl.[30] How pressure was put on Breinl is not exactly known, as most of the Commonwealth documents dealing with the time have disappeared. Memories were so short that, even by 1934, when the institute had been moved to Sydney in 1930, the new Director Professor Harvey Sutton asked Cumpston if he could supply details of the earlier history of the institute. Cumpston prevailed upon Mr Atlee Hunt, then retired, but formerly Secretary to the Department of External Affairs, which administered the AITM before it was transferred to the Department of Health in 1921, to write a short history of the AITM. When the Commonwealth assumed control in 1911, Atlee Hunt became Secretary to

the Committee of Management, so probably knew more about it than anybody else.[37]

When Priestley went to Sydney in 1917, he was placed on the Committee of Management of the AITM and received copies of the correspondence which eventually found their way to the School of Public Health and Tropical Medicine at the University of Sydney. Atlee Hunt had sent Priestley a copy of a letter he sent to Breinl, in his capacity as Secretary of the Home and Territories Department, written on December 10, 1919. A copy of Breinl's reply, dated December 20, 1919, was also sent. Hunt's letter states that the committee of the institute had recently reviewed the past work of the institute and carefully considered the future policy. The committee expressed its disappointment that the work of the institute since 1911 had not been more definitely organized towards its special purpose, namely, "The acquisition of such knowledge and the determination of such facts as will indicate methods of maintaining or improving the health of a working white race in tropical Australia". It is also pointed out that, after the reorganization in 1911, the purpose stated at the time was to institute "an organized enquiry without delay into the various matters likely to affect the permanent establishment of a working white race in tropical Australia". It was decided that an investigation into the life history and habits of white ants must be regarded as outside the main scope of the institute. Breinl's salary was fixed at £1,000 a year, and he was told that on expiration of his contract on June 1, 1920, it was decided to renew it on an annual basis and subject to termination with six months' notice on either side. It was also decided that the director should forward monthly reports detailing the general programmes, the work done by each officer, and the results obtained by each officer. All publications were to be submitted to the committee for approval before publication. One can sense the steel in the letter and wonder who was behind it.[9]

Breinl replied in a dignified manner to this letter, agreeing to all the conditions.[9] He also stated that he had informed Mr Hill of the decision of the committee with regard to white ants. In actual fact, at the official opening in 1913, Sir William MacGregor had stated that an investigation into white ants should be carried out. What happened to Hill's researches at the time of the ukase is not known, but certainly Hill became a great authority on the insects, and even in retirement many years later, was still working on white ants.

Breinl now had no security of tenure of his appointment, and resigned on October 30, 1920. Before his resignation he gave the opening address at the eleventh session of the Australasian Medical Congress held in Brisbane on August 27, 1920. This was the session, directed to the problems of the tropics, that was to have been held in 1917, but because of the war, was held in 1920. Breinl's conclusions were based on 11 years' work. He entitled his paper "Figures and Facts Regarding Health and Disease in Northern Australia Influencing its Permanent Settlement by a White Race". The conclusions were as follows:

> (1) From the incidence of disease, other than Tropical, North Queensland does not differ from Central or Southern Queensland.
>
> (2) Tropical Diseases with the exception of Hookworm infection are scarce and easily controlled.
>
> (3) Investigations into the physiology of the inhabitants of the Coastal areas of North Queensland, when compared with those of a temperate climate showed only a few quantitative but no qualitative changes.
>
> (4) The investigations carried out had not brought to light any facts indicating that health and disease as prevailing in North Queensland should make permanent settlement by a white race impossible.[39]

After his resignation, Breinl commenced general practice in Townsville, and immediately obtained a large practice as witness to his popularity; he remained in practice until shortly before his death. War had ruined his career as a medical scientist, but had given him the necessary training to carry on with clinical work. Like Jackson, Breinl was interested in educating nurses, and delivered the lectures on midwifery to the trainees at the Townsville General Hospital until his death. He also acted as consulting physician for North Queensland, and had a very high reputation in this regard. During a prolonged trip abroad in 1928 he engaged in postgraduate work, mainly in Vienna, and became interested in radium treatment. He conducted the Radium Clinic at the Townsville General Hospital until his death. He wrote no more papers, but kept himself well informed in scientific matters. He always regarded himself as a medical scientist, and tried to approach his practice in a scientific manner. He bore no resentment with regard to his treatment, and although he would have preferred to engage in scientific pursuits, he acknowledged that it was easier to make an adequate living in general practice. With his patients, he was very popular, as indeed he had been wherever he had worked during his life. In the late 1930s, as the result of a routine medical examination for insurance purposes, he was found to have marked hypertension and albuminuria, and by 1944, at the age of 64 years, he was dead from renal failure. As evidence of the high regard in which he was held, he was flown to Sydney by flying boat in his last illness; in the middle of the war, it was very difficult to get a place on one of those flying boats. He was able to see his two medical sons in Sydney before his death. Breinl could be described as a veritable Bayard of medicine, *sans peur et sans reproche*.

What of his institute? Dr Cumpston managed to transfer it to Sydney in 1930. For various reasons it was felt that the institute could do better work in Sydney, and the report of the Royal Commission on Health in 1926 recommended that the AITM be incorporated into the School of Public Health and Tropical Medicine of the University of Sydney.[40] Cumpston was thus able to concentrate his forces in the south-east corner of the country, where his interests mainly lay. It was here that the battle with the States for control would be, and is still being fought.

What of Jackson? He was immediate Past President of the Queensland Branch of the BMA for the third time, and was pontificating in such a way that he deserved to be taken down a peg or two. On October 3, 1927, the *Townsville Daily Bulletin* reported that, at the Hospital Authorities Conference, rather scathing remarks were made as to the selection of the site for the Townsville Tropical Institute. Jackson quoted it as an instance of the mistakes that had been made through neglect to obtain advice from the right sources. Jackson stated that

> . . . surely the function of the Institute was, among other things to [sic] afford opportunities to as many members of the medical profession to study tropical diseases as possible. A site was selected for it at Townsville, a town which had no great facilities for reaching it from any other part of the State. So far as I know the person whose advice bore most weight in this selection was a Bishop. The Bishop was probably well versed in diseases of the soul, but he knew nothing about the distribution of tropical diseases, nor of hospitalization, or equipment. What has been the result? Do any of those present this evening know of even two practitioners of medicine in the whole of Australia who have been able to avail themselves of a chance to work in the laboratories of the Institute? I do not know of one.

Dr J. S. C. Elkington, then the Director of the Division of Tropical Hygiene of the Commonwealth Department of Health, replied that Dr Jackson must have been misreported, as his own son, Dr J. Jackson, had done the course at the AITM from October to December, 1925, and that Dr Bellamy had done the course at the AITM and been awarded the diploma, and five

medical men had taken the certificate out of nine in attendance. Elkington also pointed out that Jackson had been a prominent figure in medical matters in Queensland when the site of the institute was selected in about 1908. No protest appeared to have been made by Dr Jackson at the time.

Nevertheless, Elkington agreed that Townsville was too far from the main centres of population to be the most suitable postgraduate training centre.

Siting the institute at Townsville may have been, as the French General said at the Charge of the Light Brigade, "*C'est magnifique mais ce n'est pas la guerre*". Sometimes illogical decisions in retrospect are more sensible than the more closely reasoned ones. In a way Bishop Frodsham and Professor Anderson Stuart were both right, and the fullness of time sees a complete medical school projected for Townsville in 1980.

Rockhampton, which has been described as the most Australian of Australian cities, impinges on this story in various ways. First, it was the mother city of the conquest of the Australian tropics, lying as it does just over the Tropic of Capricorn. It was proclaimed a municipality in 1860, and in the following year George Elphinstone Dalrymple led the "Kennedy men" from Rockhampton to found Bowen, and from there the settlement spread out to involve the whole north. The expedition was European apart from the detachment of native police.[41] In the early days of North Queensland, some held the genuine belief that Europeans could not survive as a working white race in the tropics; others sedulously fostered this belief for their own ends, in order to obtain cheap labour. Before the formation of the Commonwealth of Australia in 1901, there was great richness in the racial diversity of North Queensland. Apart from the numerous and embattled Aborigines, there were large numbers of Pacific Islanders and Chinese, and quite a few Indians. It is not generally recognized that at one stage there were 5,000 Japanese in North Queensland, with a Japanese Consulate at Townsville. On Thursday Island, at the height of the pearling boom, it was said that one could meet the representatives of every race on earth, including a red Indian. Many in North Queensland were in favour of the retention of this richly polyglot society, but with Federation, the vastly more populous south-east corner of the country voted almost to a man for the White Australia Policy. No time was wasted, and on December 17, 1901, the Commonwealth passed the *Pacific Islands Labourers Act*, which stipulated that no Pacific Islander should enter Australia after March 31, 1904. Every kanaka was to be deported from Queensland by the end of 1906.

These timings explain the urgency to get the AITM under way. So far as scientific proof goes, the institute had carried out by 1920 that part of its work related to proving that, so far as could be seen, the tropics did not present a threat to a working white race. However, long before this, the practical man had found out for himself the same thing by working in the tropics and seeing what happened. In 1882, the Herbert River Farmers' Association was formed, and very soon declared:

> We small settlers can explode the belief that the district only can be developed by gangs of black labour with a few white bosses. We are six who have been in the district continuously for upwards of ten years. We have done hard work from fencing to scrub-clearing, and in spite of having no trips to the South, we can physically measure ourselves with those fortunate ones who had had the advantage of recuperative trips.[42]

A Rockhampton man, William Knox D'Arcy, was the most generous benefactor of all to the AITM. The wheel now swings full circle, and again a Rockhampton man is involved. The Australian Institute of Tropical Medicine became absorbed, in 1930, into the School of Public Health and Tropical Medicine of the University of Sydney and now this latter institute is to become the Australian Institute of Health.[41] On October 9, 1973, the then Minister for Health (and Rockhampton citizen), Dr D. N. Everingham, asked Dr Sidney Sax to arrange and undertake a review of the School of Public Health and Tropical Medicine. The Committee of Review, including Professor Douglas Gordon of Brisbane, made the above recommendation on August 15, 1975. Hence, from two men, Breinl and Fielding, commencing the first institute of medical research in Australia in an iron-roofed, wooden shed in 1910, we have the clear line of succession to what will be the major medical research facility in the country.

ACKNOWLEDGEMENTS

Without the generous help of J. E. Claffey, Esq., M.B.E., B.A., B.Ec. (Sydney) this account would have been impossible. Mr Claffey joined the AITM in Townsville in 1924, went with the institute to Sydney and was eventually its Registrar. He is at present engaged in writing its history. Thanks are also due to Professor R. K. Macpherson for allowing me to use the Library of the School of Public Health and Tropical Medicine, and to Mrs S. P. McGlynn, Librarian of the same school, and Dr L. C. Rowan, of that institute, who both helped with references. Mrs M. Macgregor, Librarian of the Queensland Institute of Medical Research, helped with some important information. I also wish to thank Mrs N. Breinl and Dr John Breinl for answering my questions, and for allowing me to peruse the Breinl papers. Dr C. P. V. Evans, of the Commonwealth Department of Health, also provided important assistance, as did Mr C. C. Jenkins, Secretary of the Queensland Branch of the AMA. Thanks are due to Mrs S. Cordwell for typing the manuscript.

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Short Papers

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ALCOHOL, BLOOD AND DEXTROSTIX DO NOT MIX

DEXTROSTIX can greatly facilitate the management of diabetes by giving a rapid, bedside estimation of the blood glucose concentration. However, this technique was recently reported to have given a falsely high value in a hypoglycaemic patient whose finger was pricked while still wet from the 70% isopropanol preparative swab.[1] We have confirmed that carefully performed Dextrostix estimations are reasonably accurate in hypoglycaemia and have shown that 70% isopropanol solution can cause misleadingly high Dextrostix results.

TABLE 1
Glucose Estimations in Hypoglycaemia

Subject	Occasion	Glucose Concentration (mmol/l.) Venous Plasma (Automated Method)	Venous Blood (Dextrostix)	"Dry" Capillary Blood (Dextrostix)	"Wet" Capillary Blood (Dextrostix)
A	1	0·8	0·8	0·6	1·1
	2	2·8	2·2	2·8	3·9
	3	2·9	2·8	2·8	2·5
	4	3·2	2·8	3·3	2·8
B	1	0·3	<0·6*	1·7	1·7†
	2	2·0	2·2	2·2	2·5
	3	2·1	2·2	2·2	2·5
	4	2·3	2·2	2·8	12·2
C	1	0·7	<0·6*	1·1	1·7
	2	1·4	1·1	2·2	2·5
	3	2·5	2·2	2·8	2·8†
	4	3·1	2·5	3·3	3·6

* Reading could not be determined exactly.
† Indicates "wet" value slightly greater than similar "dry" reading in that individual.

Dextrostix venous < true glucose < Dextrostix "dry" < Dextrostix "wet" readings.
$P<5\%$ $P<5\%$ $P=5\%$

SUBJECTS, METHODS AND RESULTS

Three of the writers of this paper were given 0·1 U/kg body weight of soluble monocomponent insulin intravenously. At five-minute intervals blood was taken and the following measurements were made: (i) venous plasma glucose concentration in duplicate by an automated glucose oxidase method;[2] (ii) venous blood glucose concentration by fresh Ames Dextrostix and Eyetone reflectance meter. (iii, iv) capillary blood glucose concentration by Dextrostix and reflectance meter in blood obtained from a randomly selected finger without alcohol preparation ("dry") and from the opposite corresponding finger still wet from the 70% isopropanol preparative solution ("wet"). The order of these determinations was randomized to avoid time-related effects. The Dextrostix determinations were carried out in another room by a nursing sister who was experienced in using the reflectance meter and who did not know whether the specimen was venous blood or "wet" or "dry" capillary blood. Individual measurements are given in Table 1. The differences between these measurements were analysed by the Wilcoxon's signed ranks test.[3]

The linear regression relationship between venous plasma and "dry" capillary blood glucose measurements is shown in Figure 1. The two Dextrostix readings of venous blood glucose concentration which could not be exactly determined, the levels being too low (that is, <0·6 mmol/l.), were excluded from the mean differences and one (B_1) was excluded from the signed ranks test. Dextrostix measurements were reasonably accurate, except for one "wet" capillary blood value of 12·2 mmol/l. when the venous plasma glucose concentration was 2·3 mmol/l. The sister who determined

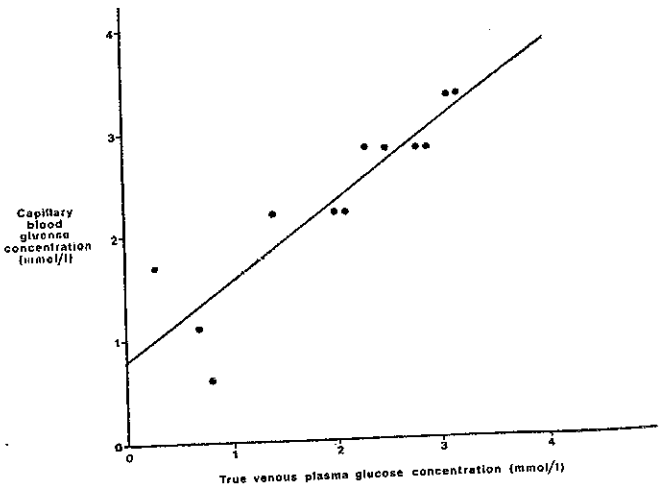

FIGURE 1: Capillary blood glucose concentration as measured by the "dry" Dextrostix method *v.* the true venous plasma glucose concentration ($y=0·76x+0·79$; $n=12$; $r=0·90$).

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