ADDENDUM

We have seen another case through the courtesy of Professor G. M. Bull in which dressing dyspraxia was a prominent feature.

Case Report.—A man aged 59 was first seen in September, 1953, with oedema of the legs, ascites, and hypertension (210/120). A continuous venous hum was heard in the epigastrium (Cruveilhier-Baumgarten syndrome). A biopsy of the liver showed multiple nodular hyperplasia. He was treated with a high-protein diet and kept well until August, 1954, when his doctor reported: "Yesterday the patient became rather confused, and attempts to dress himself were unsuccessful." He was also reported to have melaena. On admission there was jaundice, and he was apathetic and disorientated. On examination there was enlargement of the liver and spleen, and ascites, and the venous hum was very marked. With treatment by low-protein diet he made a good recovery.

An annotation in the *British Medical Journal* (1954) refers to the dual role of liver damage and the effects of a porto-caval shunt in producing mental symptoms. It seems to us, however, that a third factor, not mentioned by the annotator, is important. In the first case described, alcohol and intercurrent infection, and in the second, gastrointestinal bleeding, may have played a part in precipitating the confusional episodes. One of us (Allison, 1952) has emphasized how often anoxia, dehydration, alkalaemia, the injudicious use of drugs, and electrolytic imbalance lead to psychiatric disturbances in later life. In both our cases the possible ancillary action of some such factor cannot be excluded.

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MUSCULAR DYSTROPHY OCCURRING IN IDENTICAL TWINS

BY

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Since the second half of the nineteenth century muscular dystrophy has been recognized as a hereditary disorder (Gowers, 1879 ; Erb, 1891) although there has been disagreement about the way it is inherited. Much difficulty was experienced in the classification and genetics of the many varieties described. Recently further attempts were made to introduce simpler classifications, but, owing to the variability of expression of the defective gene and the similarity of the genetic types, difficulties remain.

After studying 1,228 cases from the literature and 113 case records from the National Hospital, Queen Square, Bell (1943) divided the dystrophies into three clinical groups : group A, the pseudo-hypertrophic form characterized by the enlargement of certain muscles, wasting of others, and progressive weakness in all affected muscles ;

group B, cases with wasting and weakness of the affected muscles, no history of enlargement, and no affection of the facial muscles ; group C, all cases in which the facial muscles were affected. She considered that there were three genetic groups—recessive, dominant, and sex-linked—and that the same gene could produce any of the three clinical types. This theory was supported by Boyes *et al.* (1950), who studied the history of an English and Canadian family in which both group A and group C occurred, the family distribution indicating a simple dominant type of inheritance.

More recently Tyler and Stephens (1950, 1951) suggested making only two groups : the childhood and the facio-scapulo-humeral groups. For the first type they preferred the term "progressive muscular dystrophy of childhood" to the more usual one of "pseudo-hypertrophic muscular dystrophy," as pseudo-hypertrophy may sometimes be absent in this group and present in the second one. This illness runs a steadily progressive downhill course, terminating fatally in adolescence or young adult life. It occurs only in males and is transmitted by females, the gene being a sex-linked recessive. The facio-scapulo-humeral type is inherited as a simple dominant affecting both sexes and half the offspring with a wide variability of expression and penetration. It starts usually in young adult life and runs a very variable course. Tyler and Stephens studied a large family in Utah founded by an affected emigrant born in 1775. In six generations there have been 1,249 descendants, of whom 159 have been affected with dystrophy of the second type. A similar classification was favoured by Ramsey and McCarroll (1952).

After studying 71 cases at Massachusetts General Hospital, Brown (1951) was unable to make a rigid classification but considered that the cases fell into three main groups : group 1, cases with pseudo-hypertrophy ; group 2, cases with generalized muscular atrophy starting in the thighs ; and group 3, cases with generalized muscular atrophy starting in the scapulo-humeral muscles.

Stevenson (1953) studied all the known cases of muscular dystrophy in Northern Ireland together with their families. There were 72 cases in 51 families. He concluded that there are only two groups : (a) the pseudo-hypertrophic variety occurring in boys and transmitted as a sex-linked recessive disease. For this he suggested the clumsy but more accurate title, "Duchenne type rapidly progressive muscular dystrophy of young boys" ; (b) the second group consists of all the other types which he believed to be variants of the same condition determined by single autosomal recessive gene inheritance. For this group he suggested the term "autosomal limb-girdle muscular dystrophy."

The occurrence of a disease in twins is helpful in studying its heredity. Few twins, however, have been affected with muscular dystrophy, and so far there has been no report of the variety without hypertrophy occurring in identical twins. Stephens and Tyler (1951) described male identical twins who had the pseudo-hypertrophic form. The disease ran an identical course in each, being first recognized at the age of 6 years, causing complete incapacity at 11 years, and death, within a few months of each other, at the age of 25. No other member of this family was affected. The occurrence of progressive muscular dystrophy (without hypertrophy) in a male twin but not in the corresponding female has been reported by Milhorat and Wolff (1943) and Karnosh and LaTona (1947).

The cases reported here occurred in identical twin males who had muscular dystrophy of the autosomal limb-girdle type; one was severely affected, but the other only mildly so.

Case 1

An unmarried man aged 45 was sent to hospital to obtain an invalid chair. At the age of 18 he had noticed weakness of the legs, which was worse proximally. The weakness increased gradually during the next 13 years until after an attack of influenza at the age of 31 it became much worse and affected the shoulder muscles. Progressive weakness made him retire at the age of 38 from his work as a farm labourer with some blacksmith's duties. Deterioration continued slowly until a second attack of influenza at the age of 48, when again the weakness and atrophy increased rapidly, particularly in the legs. He has had no other illnesses.

Case 1.

Case 2.

On examination there was postural oedema of the feet but no other abnormality outside the muscular system. The gait was waddling, with marked lumbar lordosis. The buccinator muscles were weak but the other facial muscles were normal. The sterno-mastoid muscles were severely affected, being very weak and wasted. There was marked wasting of the shoulder-girdle muscles with winging of the scapulae. The deltoids were moderately weak and atrophied, as were the biceps and triceps, but the muscles of the fore-arms and hands were not so severely affected. The inter-costal and spinal muscles were weakened and wasted. There was severe weakness of all the muscles acting on the hip-joint, so that he was unable to raise his legs against gravity. The severe weakness and wasting of the legs was more marked proximally. No fasciculation was visible. Tendon jerks were diminished, commensurate with the muscular weakness. Plantar responses were flexor. There was no sensory loss. He was confined to the house, being unable to walk

more than a few yards, and this only with the aid of sticks. He could not get up from a sitting position without help, and once up could stand unsupported for only a few minutes.

Case 2

The twin brother, married but without children, was not aware that he was affected. He was able to do general farm duties without difficulty.

On examination no abnormality outside the muscular system was found. There was slight hypertrophy of the right deltoid. The legs were wasted, particularly the quadriceps, sartorius, and calf muscles. No demonstrable weak-

Case 1.

Case 2.

ness was seen. No fasciculation was visible. Knee- and ankle-jerks were slightly diminished. There was no sensory loss.

The twins were not weighed at birth, but were not full-term. The younger twin (Case 1) was born ten minutes after the other, there being one afterbirth, which came after the second twin. The parents observed that the younger twin was always a little slower than the elder, but there was no other difference between them as children. They were identical physically and were mistaken for each other even until recently. No other member of the family is known to be or to have been affected.

Discussion

In the younger, more seriously affected, twin the disorder started first in the proximal muscles of the legs. It has affected the facial muscles and has not produced any

hypertrophy. Thus the case falls into Bell's group C. In the elder twin the right deltoid is larger than the left, but this may well be work hypertrophy. His legs are the parts most affected, the facial muscles not at all. Thus his disorder falls into Bell's group B. Both cases fall into Brown's group 2, Tyler and Stephens's group 2, and Stevenson's "autosomal" limb-girdle muscular dystrophy group.

The physical characteristics of the twins were carefully examined in an attempt to establish that they were identical. There was a striking physical resemblance in spite of the marked wasting of the younger twin. The colours of their hair and eyes were the same; their height differed by only $\frac{1}{2}$ in. (1.3 cm.), whilst their biparietal, fronto-occipital, and bizygomatic diameters differed by no more than $\frac{1}{4}$ in. (6 mm.).

Their main blood groups were the same: ABO: A₁; Rh: CDe/cde; MN: M. The subgroups, done by the Blood Group Reference Laboratory, were the same:

	S	P	Lu ^a	Kell	Le ^a	Le ^b	Fy ^a
Case 1 ...	+	+	-	-	-	+	+
Case 2 ...	+	+	-	-	-	+	+

Although the fingerprints of identical twins are not the same, the fingerprints of these twins are of interest. All the impressions of the younger twin were of the type known as "ulnar loop" with the exception of the right forefinger, which was a radial loop, whereas the impressions of the elder twin were all ulnar loops except that of the left forefinger, which was the same pattern as that of the right forefinger of the younger twin—that is, radial.

These findings, although not conclusive, support the opinion of the family that the twins are identical.

It is noteworthy that the younger twin is severely incapacitated, whereas the elder is so mildly affected that he does not realize that he has the disorder. This raises the question of whether there is some environmental factor which determines the severity of the disease.

Boyes *et al.* (1950) found that in several of their cases the onset of the disease was associated with a specific environmental stress, and that a period of unusual physical strain precipitated the onset of the disease in the muscles under stress. Thus in one case the disease started in the shoulder of a woman after working long hours as a waitress carrying trays, and later affected her legs in pregnancy.

In the present cases no such explanation could be found. Both were brought up on the same farm and have lived in the same area since, the younger twin remaining at home and the elder at the age of 17 moving to the farm of an uncle only ten miles away. Their modes of life, nutrition, and work on the two farms were similar.

The two illnesses described by the younger twin as influenza caused marked deterioration on each occasion. It is possible that these illnesses were caused by a particular strain of influenza virus or some unusual type of virus which did not affect the other twin. It is more probable, however, that they were ordinary influenzal attacks, that the other twin has had similar attacks, and that some other unidentified factor has been responsible for the marked difference between the two.

Summary

Muscular dystrophy is reported as occurring in identical male twins now aged 45; in one the disease is severe and incapacitating, but in the other it is so mild that he is unaware that he is affected. No explanation can be given for this difference.

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ESSENTIAL PENTOSURIA*

BY

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Essential, or idiopathic, pentosuria is a rare condition which has been included by Garrod (1923) among the inborn errors of metabolism. Its occurrence was first described by Salkowski and Jastrowitz in 1892, but since then only about 200 cases have been recorded in the literature, and only one clinical report dealing with the condition has been published in this country—namely, that of Cammidge and Howard, which appeared in 1920 and described seven cases. The early case reports have been reviewed by Garrod (1923) and Margolis (1929a), and, more recently, Bock (1944) has summarized the features of the condition in a review of the benign meliturias. Since 1944 case reports have been added by Bloomberg *et al.* (1946), Caven (1947), and Barnes and Bloomberg (1953).

The clinical importance of pentosuria depends on the fact that it may be confused with diabetes mellitus. Nowadays, however, when chemical confirmation of a diagnosis of mild diabetes is almost a universal practice, it is more likely to be misdiagnosed as renal glycosuria.

The identification of urinary reducing substances has been greatly facilitated by the introduction of paper chromatography. In the department of clinical pathology at University College Hospital we have been applying this method to identify the reducing substance excreted in cases which appear to have a low renal threshold for glucose. In the course of 4½ years two cases of essential pentosuria have been encountered. These two cases are described here and existing knowledge of the condition is reviewed.

The following methods were used: (1) Qualitative Benedict tests (Flynn *et al.*, 1953). (2) Bial's test (Lasker, 1950). (3) Osazones (Enklewitz and Lasker, 1935a). (4) Blood sugar (Hagedorn and Jensen, 1923). (5) Urine nitrogen (micro-Kjeldahl). (6) Urine xylulose (Lasker and Enklewitz, 1933), using the factor of Greenwald (1930a) for the calculation. (7) Chromatography (Horricks and Manning, 1949), using a 3:2:1.5 *n*-butanol-pyridine-water solvent (Hough *et al.*, 1950) as well as the 4:5:1 *n*-butanol-acetic-acid-water mixture of Partridge and Westall (1948). The paraphenylenediamine reagent of Flynn *et al.* (1953) was used for showing up the sugar spots on the paper chromatograms.

*Based on a communication read at a meeting of the British Diabetic Association on July 17, 1954.