melanotrophin, and also has a close neural relationship with adrenal medullary tissue. There also seems to be a subtle balance between the hypothalamic/pituitary system and the pineal gland. If one of these (opposed) endocrine systems suffers a deficiency or lesion, the other will show hyperfunction. This could explain the increased HVA and VMA values in the child. We saw a similar case, but in a young man, showing increased VMA values and also operated on for a suspected pheochromocytoma, which was negative (Visser and Axt, 1975). Through morphometric techniques we proved a new clinicopathological entity, 'adrenal medullary hyperplasia', causing overproduction of catecholamines. The increased HVA values in the infant discussed were always higher than the VMA values, suggesting a combined hyperfunction of both pineal gland and adrenal medulla caused by hypopituitarism.

In conclusion, we expect that in the infant under discussion there existed (a) a lesion of the adenohypophysis, contracted in the seventh month of pregnancy by pneumonia and possible hypoxia of the mother; (b) subsequent hyperpinealism responsible for the production of HVA and VMA combined with hypertension (probably intermittent) during life; (c) (relatively) increased weight of cerebrum and heart; and (d) disturbed cortico/medullary volume ratios in the adrenals.

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References

- Lopes de Faria, J., and Sokei, E. L. (1973). Necrotic changes of the rabbit adenohypophysis following orthostatic collapse. *Beitrag zur Pathologie*, **150**, 400-405.
- Naeye, R. L. (1976). Brainstem and adrenal abnormalities in the sudden-infant-death syndrome. *American Journal of Clinical Pathology*, **66**, 527-530.
- Sinclair-Smith, C., Dinsdale, F., and Emery, J. (1976). Evidence of duration and type of illness in children found unexpectedly dead. *Archives of Disease in Childhood*, **41**, 424-429.
- Visser, J. W. (1977). Sudden infant death syndrome and its probable cause. *Journal of Clinical Pathology* (in press).
- Visser, J. W., and Axt, R. (1975). Bilateral adrenal medullary hyperplasia; a clinicopathological entity. *Journal of Clinical Pathology*, **28**, 298-304.

Dr. Kleinberg comments:

We are intrigued by Dr. Visser's suggestion that our child is in fact a 'typical SIDS child.' Such infants are usually considered to be normal, to be growing and developing normally, and are not believed to have life-threatening illness before their unexpected death. Our child presented a marked failure to thrive and his death was neither unexpected nor sudden. We recognize, of course, that many SIDS infants have disturbances of autonomic cardiovascular systems and/or sleep states, but these abnormalities have been generally uncovered in chance observations upon clinically normal infants who later succumb to SIDS. Lastly, the pathologist

commented that adrenals and pineal were unremarkable. Though the weight of the pituitary was unavailable, the brain weight was 460 g.

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Treatment of severe Asian rickets with vitamin D-fortified chupatti flour

Sir,

Vitamin D deficiency, leading to severe rickets and osteomalacia, is common among Asians in Britain (Dunnigan *et al.*, 1962; Ford *et al.*, 1972, 1976). The fortification of chupatti flour with vitamin D has been shown to raise levels of serum 25-hydroxy-vitamin D and to reduce the incidence of biochemical rickets in those consuming it (Pietrek *et al.*, 1976). We report here the successful use of the flour in a case of severe, untreated Asian rickets.

A 16-year-old Asian youth presented with a history of gradual bending of both legs which had become increasingly painful over the previous 6 months. There was moderate bowing of both tibiae. Serum Ca was 7.6 mg/100 ml (1.9 mmol/l), phosphate 3.3 mg/100 ml (1.06 mmol/l), and alkaline phosphatase 65 King Armstrong units/100 ml. Serum 25-hydroxy-vitamin D was low at 3.5 ng/ml (Belsey *et al.*, 1974). Plasma proteins, urea, and electrolytes, D-xylose absorption, and faecal fats were normal. X-rays of wrists and knees showed the typical epiphyseal and metaphyseal changes of rickets. A jejunal biopsy was normal and an iliac crest bone biopsy showed bone trabeculae with thickened osteoid seams on their surfaces consistent with the diagnosis of osteomalacia (Dr. T. Anderson). He was considered to be a typical case of adolescent Asian rickets without evidence of renal disease or malabsorption.

The patient's family was supplied for 16 months with flour fortified with 6000 units vitamin D₃ per kilogram, prepared as described previously (Pietrek *et al.*, 1976). The patient consumed 4 chupatties (about 160 g flour) daily containing approximately 1000 units vitamin D₃; about half the vitamin appears to be destroyed in cooking (Pietrek *et al.*, 1976), providing him with an effective intake of about 500 units daily.

The biochemical response to the consumption of the flour is shown in the Fig. Serum Ca and alkaline phosphatase levels returned to normal after 7 months and serum 25-hydroxy-vitamin D levels rose to a peak of 22 ng/ml after 10 months and levelled out at about 18 ng/ml. Radiological healing was complete at the end of the 16-month period and a second bone biopsy at this time showed complete histological healing.

This case report confirms that vitamin D-fortified chupatti flour is effective in the treatment of Asian rickets. Biochemical, radiological, and histological healing showed that the vitamin D preparation used retains its biological

Fig. Changes in serum calcium, phosphorus, alkaline phosphatase, and 25-hydroxy-vitamin D during the consumption of vitamin D-fortified chupatti flour.

effectiveness in flour and that a substantial proportion survives the cooking process involved in preparing chupatties. Storing the flour for up to 16 months before use did not appear to affect its potency.

Chupatti flour is consumed by the bulk of the Asian population of the United Kingdom and its use begins soon after the introduction of mixed feeds in early childhood. It provides an excellent vehicle for the selective fortification of a foodstuff consumed by the population at risk. The minority of Asians who are predominantly rice-eating or who adhere to a European diet do not in our experience develop rickets or osteomalacia outside infancy.

We have recently completed a trial of vitamin D-fortified butter in Asian subjects. Fortification to 'margarine' levels (100 units/oz) over a period of a year did not raise the serum 25-hydroxy-vitamin D levels of those consuming it; butter fortified to 400 units/oz was effective but this level of fortification is unlikely to be acceptable in a foodstuff consumed by the whole population. Milk remains an alternative, and so far untried, vehicle in the

UK but, as with butter, fortification would affect the whole population and the necessary enabling legislation permitting fortification might therefore be open to more objection and delay.

On balance, the fortification of chupatti flour with vitamin D offers the best hope of eliminating rickets and osteomalacia from the Asian population of the UK outside infancy; the procedure is cost-effective and technically feasible. The implementation of this measure for a limited period of years, with monitoring at regular intervals of serum 25-hydroxy-vitamin D levels in selected consumers seems to us worthy of trial without undue delay.

We are indebted to Spillers Ltd. and especially Mr. B. Hartley for providing vitamin D-fortified chupatti flour.

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References

- Belsey, R. E., De Luca, H. G., and Potts, J. T., Jr. (1974). A rapid assay for 25-OH-D₃ without preparative chromatography. *Journal of Clinical Endocrinology and Metabolism*, **38**, 1046-1051.
- Dunnigan, M. G., Paton, J. P. J., Haase, S., McNicol, G. W., Gardner, M. D., and Smith, C. M. (1962). Late rickets and osteomalacia in the Pakistani community in Glasgow. *Scottish Medical Journal*, **7**, 159-167.
- Ford, J. A., Colhoun, E. M., McIntosh, W. B., and Dunnigan, M. G. (1972). Rickets and osteomalacia in the Glasgow Pakistani community, 1961-71. *British Medical Journal*, **3**, 677-680.
- Ford, J. A., McIntosh, W. B., Butterfield, R., Preece, M. A., Pietrek, J., Arrowsmith, W. A., Arthurton, M. W., Turner, W., O'Riordan, J. L. H., and Dunnigan, M. G. (1976). Clinical and subclinical vitamin D deficiency in Bradford children. *Archives of Disease in Childhood*, **51**, 939-943.
- Pietrek, J., Windo, J., Preece, M. A., O'Riordan, J. L. H., Dunnigan, M. G., McIntosh, W. B., and Ford, J. A. (1976). Prevention of vitamin-D deficiency in Asians. *Lancet*, **1**, 1145-1148.

Congenital thrombocytopenia and milk allergy

Sir,

Further to the article by Whitfield and Barr regarding thrombocytopenia and milk allergy in a child with an absent radius (TAR) (*Archives*, 1976, **51**, 337), the following account of a newborn with congenital thrombocytopenic purpura and milk allergy, who was otherwise physically normal, may be of interest.

In October 1973 a term, healthy boy was born in this hospital to a mother who had mild toxæmia and long-standing idiopathic thrombocytopenic purpura. Scattered petechiae were present over his body at birth and cord