diet. Cow's milk is accordingly richest in this vitamin when the animals are at grass.* The lower antiscorbutic value of winter milk may therefore be attributed to the cow being put on an inferior dietary, rather than to any direct action of sunlight on the diet (or on the animal itself).

CONCLUSIONS.

A noteworthy antithesis is seen to exist between the fat-soluble vitamins and the antiscorbutic vitamin. The antiscorbutic vitamin can be synthesized in complete darkness, and experiment has so far failed to connect it in any particular whatever with ultra-violet light; the fat-soluble vitamins, on the other hand, have been shown to be affected by ultra-violet light in their synthesis and activation as well as in the prevention and cure of avitaminosis. The apparent independence of vitamin C to light is in a sense surprising, in view of its special association with the plant, in the metabolism of which light plays so important a part.

The practical significance of our results is to emphasize the importance of the provision of the C factor in dietaries. While it is possible to replace the fat-soluble factors to some extent by light rays (acting either on the diet or the animal), the prevention of scurvy must—in the present state of knowledge—rest upon the provision of adequate supplies of vitamin C in the food. Of special interest is this in relation to infantile scurvy—Barlow's disease. It is worthy of note that of the numerous proprietary foods sold as substitutes for maternal feeding, we know of only a single one that can claim to contain in itself an adequate supply of the antiscorbutic factor, permitting one to dispense with food adjuncts.

SUMMARY.

The association of vitamin C with plant life suggests its possible connexion with phyto-chemical synthesis. Yet,

(1) Light was found not necessary for the synthesis of this vitamin (in germinating grain), contrary to former supposition and in distinction to vitamin A, which is said to require light for its formation in the plant;

(2) The direct exposure of an animal on a scorbutic diet to ultra-violet light did not appreciably retard the onset of scurvy;

(3) Ultra-violet light appeared to have no curative action on a scorbutic animal;

(4) Cabbage in which the C vitamin had been largely destroyed by heat was exposed to the mercury vapour lamp and tested for regeneration of the vitamin, with doubtful results;

(5) Exposure to ultra-violet light of an infants' food already rich in vitamin C gave no evidence of an augmented antiscorbutic value.

These results indicate that while the effects of fat-soluble vitamin deficiency in, for example, an infant's diet can be remedied to some extent by exposing the infant (or the food) to sunlight, if one is to prevent scurvy one must rely on an adequate amount of vitamin C in the diet.

Cow's milk may be deficient in this vitamin in winter owing to the animal's inadequate stall diet. The observed increase of infantile scurvy in late winter probably results from this cause rather than from absence of sunlight, to which it has been attributed latterly without sufficient evidence.

We wish to express our cordial thanks to Professor Sir F. G. Hopkins, F.R.S., and Professor J. C. Drummond for much kind interest and encouragement.

REFERENCES.

- ¹ Coward, K. H.: *Biochem. Journ.*, vol. 17, 1923, p. 135. ² Luce, E. M., and Maclean, I. S.: *Ibid.*, vol. 19, 1925, p. 47. ³ Hume, E. M., and Smith, H. H.: *Ibid.*, vol. 19, 1923, p. 364. ⁴ Goldblatt and Soames: *Ibid.*, vol. 19, 1923, p. 622. ⁵ Steenbock, H., and Black, A.: *Journ. Biol. Chem.*, vol. 61, 1924, p. 405. ⁶ Hess, A. F.: *Science*, September 19th, 1924. ⁷ Drummond, J. C., Rosenheim, O., and Coward, K. H.: *Abstract in Chemistry and Industry*, March 13th, 1925, p. 123. ⁸ Krizenecky, Jaroslav: *Arch. ges. physiol. (Pflüger's)*, vol. 204, 1924, p. 467. ⁹ Steenbock, H.: *Science*, September 5th, 1924, p. 745. ¹⁰ Webster, A., Hill, L., and Eidinow, A.: *Lancet*, April 12th 1924. ¹¹ Clark, Janet: *Science*, January 9th, 1925, p. 45. ¹² Honeywell, E. M., and Steenbock, H.: *Amer. Journ. of Physiol.*, vol. 70, 1924, p. 322.

* Literature quoted in the Medical Research Council Report on Accessory Food Factors, 1924, p. 72.

CYSTIC DILATATION OF THE COMMON BILE DUCT.

BY

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THE following case is of interest owing to the rarity of the condition, the difficulty of making a correct diagnosis, and the pathology of this and somewhat similar conditions.

H. F., female, aged 2 years and 3 months, was admitted to the Belgrave Hospital for Children on January 2nd, 1925; the child had been vomiting for a fortnight, and a rapidly progressing enlargement of the abdomen had been noticed for the past month. The vomiting started with occasional attacks, and she vomited about four times during the first week. This became worse, and during the week prior to admission she vomited every day, and sometimes three times a day. The vomit was independent of food, and was chiefly nocturnal. She did not complain of any abdominal pain, and was not constipated.

She was said to have had an attack of jaundice when 9 months of age, which lasted for some weeks, but had had no other illness. She was breast-fed for eight months and then given glaxo and cow's milk. She was the youngest of a family of five. Three sisters and one brother were alive and well; one sister, the fourth child, aged 4 years, had jaundice at 2½ years, which lasted four months, but is now healthy and the abdomen normal to palpation, the jaundice having apparently been of a catarrhal nature.

On admission the temperature was 97°, the pulse 116, and respirations 24. The child was fairly well nourished; there was no jaundice, but the complexion was of a rather "earthy" hue. The tongue was moist and covered with a thick white fur. The cranial nerves, heart, and lungs were normal. The abdomen was large and protuberant, and the percussion note was tympanitic all over, including the flanks. The liver could be felt two fingerbreadths below the costal margin; its edge was sharp and very hard; it was not tender. The spleen also could be felt about two fingerbreadths below the costal margin. On the right side of the abdomen a large mass extended from beneath the liver to just above the crest of the ilium; it did not appear to move on respiration; on bimanual examination the tumour was found to extend backwards into the right loin. It was thought to be a tensely cystic swelling in connexion with the right kidney, but owing to the distension of the abdomen it was difficult to palpate; it was not tender. The urine was faintly alkaline, and contained no albumin, sugar, or bile salts or pigments.

During the first week the child vomited nine times. She was not constipated, and the faeces were of a normal colour. She lost weight. A blood count showed red blood cells 5,096,000, white blood cells 7,200, haemoglobin 90 per cent., colour index 0.88. The various cells were in their normal proportions. The Wassermann reaction was negative. The vomiting, which occurred mostly at night, improved with alkalis, and during the second week three small vomits only were recorded. They consisted of partially digested food and a small quantity of bile-stained fluid. During this week weight was regained and became the same as on admission.

During this period in hospital the temperature, pulse, and respiration remained normal, but the abdomen was still very distended and the swelling in the loin was thought to have increased in size. In spite of the facts that the vomiting had stopped, that she took her food fairly well, although never very hungry, and that the bowels were open, she began again to lose weight, and it was decided to perform an exploratory laparotomy in order to ascertain the nature of the tumour.

Operation.

On January 19th one of us (R. A. R.) opened the abdomen under general anaesthesia, by an incision through the right rectus muscle, over the tumour. The tumour was found to be globular and cystic, and about four inches in diameter. It lay below and separate from the liver; the right kidney was clearly felt behind the cyst, and the duodenum lay upon and was closely adherent to its anterior surface. The liver felt hard and its surface rough, and the gall bladder, slightly distended, projected between the liver and the cyst. The cyst was explored with a needle and syringe, and clear mucoid pale yellow fluid was withdrawn. The cyst was sutured to the margins of the upper part of the abdominal wound, and a tube inserted into its cavity through a small incision, to the edge of which it was fixed by a stitch; leakage was prevented by a purse-string suture inverting the edges of the incision in the cyst around the tube. The abdominal wound was closed except for the point at the upper part where the tube emerged.

Examination of the fluid aspirated from the cyst showed that it contained no albumin, no urea, and no pancreatic ferments. It contained bile salts and bile pigments.

After-History.

The day following the operation the child seemed fairly well; there was no vomiting; the bowels were not open, but a small pale motion was passed the day following (January 21st), and on January 22nd two stools of normal colour and consistency. After this the stools were extremely pale, and contained no bile salts or bile pigment. The wound drained profusely, some days more than others, and in amounts varying from 10 to 20 ounces of thin greenish-yellow bile.

Death.

The general condition of the child meanwhile became steadily worse, and at no time after the operation was she in a fit state to attempt further operative measures. There was no vomiting and no special symptoms; the child simply became weaker and weaker. Bile in various forms by the mouth was tried, and also reduction of fats in the diet, but no improvement took place. She went steadily downhill, and died on February 10th. During the post-operative period the wound remained clean, and the temperature and pulse were not raised.

Post-mortem examination revealed a cystic swelling situated in front of the right kidney and behind the second part of the duodenum, which it had pushed forward. The swelling also extended behind the head and the greater part of the body of the pancreas. When injected with formalin to preserve it, it held 140 c.cm., and would probably have taken 20 to 40 c.cm. more. On dissection this swelling was found to consist of a cystic dilatation of the common bile duct, continued into the hepatic ducts and also into the cystic duct, where it joined the common bile duct. The walls of the cyst were about 2 mm. thick.

The whole of the extraduodenal portion of the common bile duct was involved in this cystic dilatation, and it was so closely adherent to the duodenum that no duct could be found between the cyst and the duodenum. The opening from the cyst into the duodenum consisted of a small slit-like orifice at the lower end of the sac. There was no flap of mucous membrane guarding it. After the specimen had been hardened in formalin, the patency of this orifice could not be demonstrated, but the opening into the duodenum appeared to have been very oblique. The pancreatic duct was patent and appeared normal. The gall bladder was collapsed. The liver was enlarged, hard, and definitely cirrhotic. The spleen was also enlarged and presented rather a mottled appearance.

Microscopical Examination.—The cyst wall was composed mainly of dense fibrous tissue. The inner layer was not quite so compact, and in places flattened epithelial cells could be recognized.

The liver showed a coarse cirrhosis of portal distribution; the fibrous tissue in the portal spaces was well formed and contained bile ducts, the larger of which were dilated and all of which had thickened walls. The bile ducts were lined with normal epithelium. The smaller ducts were more numerous than usual, though no actual proliferation was seen. The cirrhotic condition did not spread along the smaller bile capillaries, nor between the liver cells, though here and there detached liver cells were seen in the fibroid area.

The spleen pulp was intersected by strands of fibrous tissue, many of which appeared to have been formed by thickening of the normal trabeculae of the organ. In close relation to them the larger blood vessels lay, and from them more delicate strands of fibrous tissue spread into the spleen pulp. The blood sinuses of the spleen were moderately distended. The Malpighian corpuscles were of normal appearance.

Nearly fifty cases similar to the one described have been recorded, and possibly more might be included, as many observers have omitted doubtful or insufficiently described cases.

McWhorter,¹ in his excellent and comprehensive survey of the literature, states that cases in which there was a definite pathological condition explaining any obstruction, such as congenital atresia, pancreatitis, stone, or inflammatory stricture, were not included in his series, yet in his own case he describes the sac as containing some "bird-shot-like" stones, and the hepatic ducts as being partially filled with similar stones. He has, for instance, excluded Milner's² case, without, it seems to us, sufficient justification.

The condition is looked on by most observers as congenital, the evidence being that Heiliger³ described a similar condition in an almost mature foetus, and from the fact that most of the cases recorded have occurred in children and young subjects. The average age for the onset of symptoms would appear to be between 10 and 14 years: 12 to 14 in Waller's⁴ series, and rather younger in McWhorter's. Of the cases recorded 87 per cent. occurred in females.

In all the recorded cases there has been evidence of obstruction to the outflow of bile from the common duct into the duodenum. This has been shown:

1. *Clinically*, by the symptoms of jaundice, which has occurred in all but three cases, the jaundice either having been present at the time the patient came under observation, or a history of one or more attacks elicited.

2. *Pathologically*, by the fact that in many cases no opening from the common duct has been found at operation or autopsy, although from the patient's history an opening must have been present either at the time or very shortly before. In other cases where an opening has been found, obstruction has been demonstrated by oblique openings, valve-like folds of mucous membrane, etc.

3. *From Post-operative Recovery.*—Cases in which a primary choledocho-duodenostomy has been performed have

recovered; in other words, the obstruction has been overcome by means of a short-circuit.

In cases examined *post mortem*, some observers describe a fold of mucous membrane overlying the distal end of the common bile duct, and preventing bile from reaching the duodenum until the sac (upper portion of the bile duct) has sufficiently dilated to expose the opening. Others describe an abnormally oblique entry of the bile duct into the duodenum. Others, again, suggest that the cause of obstruction may be of the nature of an inflammatory duodenitis involving the duodenal portion of the common bile duct. Together with this obstruction it is assumed that there is a congenital weakness of the walls of the bile duct in its upper part, the cystic dilatation of the duct only involving the extraduodenal portion, and often only the upper two-thirds of the common bile duct.

It seems clear, therefore, that in all recorded cases there has been obstruction to the outflow of bile; that the obstruction is partial and intermittent; that the obstruction tends to progress—all cases not operated upon having died. While most observers take it for granted that the cyst is congenital, does it not seem far more likely that the obstruction is the congenital anomaly, and the cystic dilatation merely secondary to this, comparable to a hydronephrosis produced by chronic partial obstruction to the urinary outflow?

In no case has a diagnosis of this condition been made before operation or autopsy. This is hardly surprising since so few cases have been recorded. In nearly every case the surgeon has been unfamiliar with the condition.

In almost all the cases the symptoms have been similar, consisting of attacks of jaundice, abdominal pain, progressive enlargement of the abdomen, and a cystic swelling on the right side of the abdomen. The swelling has been variously diagnosed as a hydatid cyst of the liver, hydronephrosis, ovarian cyst, etc. The enlargement of the liver and spleen, such as occurred in our case, is by no means universal, although it occurred in Milner's case with very similar *post-mortem* findings. In some cases a biliary cirrhosis of the liver has been described. As regards treatment, where the cyst has been extirpated, its nature not having been realized at the time of operation, the mortality has been 100 per cent. The cases treated by drainage of the cyst alone have, with one or two exceptions, died. In some of these a subsequent choledocho-duodenostomy has been performed with success, but in most cases where it has been attempted it has failed.

The operation of choice is choledocho-duodenostomy at the first operation so as to provide internal drainage of the bile into the duodenum. From the position of the cyst, which lies just behind the duodenum, this should not prove too difficult an operation, provided the patient is not very young and is in good condition. The ease or difficulty of the operation may be determined in part by the thickness of the cyst wall, as in some cases it is quite a substantial structure, while in others it is so delicate that it has actually ruptured at the time of operation.

For a complete bibliography of the condition the reader is referred to the papers of McWhorter and Erik Waller, previously quoted.

We are indebted to Dr. T. H. G. Shore for the preparation and description of histological specimens.

REFERENCES.

- ¹ McWhorter: *Archives of Surgery*, vol. 8, 1924, pp. 604-626. ² Milner: *BRITISH MEDICAL JOURNAL*, 1909, i, p. 1275. ³ Heiliger, J.: *Inaug. Dissert.*, Giessen, 1910. ⁴ Erik Waller: *Annals of Surgery*, October, 1917, pp. 446-463.

TREATMENT OF HAEMORRHOIDS BY THE
GALVANO-CAUTERY.*

BY

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THE objections to the ordinary surgical methods for the cure of haemorrhoids are considerable. Among these are the damage to normal tissue, the raw surfaces left and consequent exposure to faecal infection, the lengthened process of the healing of the sloughing mucosa, the prevalence of pelvic carcinoma; the loss of time and interference with occupation; the ordeal of an operation, with

* The substance of a communication to the Harveian Society of London, October 15th, 1925.