Urea.—The method of Karr (1924) was applied to both urine and tungstate filtrates of plasma in appropriate dilution. The final colorimetric estimation was carried out in a Coleman junior spectrophotometer set at a wavelength of 5,000 Å.

Creatinine.—Diluted urine samples and tungstate filtrates of plasma were treated by an alkaline picrate method (W. S. S. Ladell, 1951, personal communication), the final estimation being carried out in the Coleman junior spectrophotometer set at a wavelength of 5,200 Å.

Results

From the values for plasma concentration, urine concentration, and urine flow were calculated the clearance values for the two substances by the usual formula. The results obtained are set out in the Table, together with the mean values and the standard deviations of the observations. The table also records the mean values obtained on a group of European subjects examined under the same conditions. The values for urea clearance have been divided into two groups—those obtained at urine flows less than 2 ml. a minute and those obtained at higher rates of flow. In both cases the true clearance value is recorded; the empirical standardization of the values obtained at low flows has not been employed.

Urea and Creatinine Clearance Values

Subject	Creatinine Clearance ml./min.	Urea Plasma Concentration mg./100 ml.	Urea Clearance ml./min. flows > 2 ml./min.	Urea Clearance ml./min. flows < 2 ml./min.	Urea Clearance/Creatinine Clearance
Os	121	15.0	—	52	0.43
Wm	117	13.5	44	43	0.37
Sa	141	12.7	36	50	0.31
Jo	145	10.6	36	—	0.25
Go	85	10.2	42	37	0.41
Pa	168	10.7	36	21	0.15
Ma	102	11.9	35	46	0.43
Ge	129	16.7	34	31	0.22
La	141	18.8	80	54	0.44
An	120	19.6	63	46	0.44
Mean	127	13.9	45	42	0.345
s.d.	23	3.4	16	11	
European values: Mean	122	26.7	70	54	0.48
s.d.	12	4.7	8	9	

Discussion

The value obtained for the creatinine clearance is in very good agreement with the values commonly observed in the European subject. It appears that creatinine is as adequate a method of determining the rate of glomerular filtration rate as is the more popular inulin or mannitol clearance, and if this be accepted the glomerular filtration rate in these subjects agrees well with the "world average" for this function quoted by Smith (1951). The creatinine clearance was completely unaffected by the rate of urine flow.

It will be observed that the values of urea clearance are nearly identical whether observed at high or low rates of urine flow. The African subject, therefore, fails to show the "augmentation" phenomenon which is characteristic of urea excretion in the European subject (this is supported by the values recorded in the table).

The absolute values of the urea clearance are low, being only about two-thirds of the normal standard. The average ratio of urea clearance to glomerular filtration rate at random urine flows in 37 normal subjects observed by Raaschou (1948) was 0.65 (range 0.458–0.776). Shannon and Smith (1935) obtained a value of 0.64 (range 0.59–0.67), and Blegen, Haugen, and Aas (1949) reported a mean value of 0.59. The ratio observed in this laboratory for the European subject lies at the lower extreme of the range reported by the Danish workers. This may, however, merely be a reflection of a preponderance of low rates of urine flow in the present European data. In the African

subject, even at high rates of urine flow, the clearance value is less than that observed at flows below the augmentation limit in the European subject.

It is well known that the level of dietary protein affects the rate of urea elimination, and for this reason the comparison of African with European data may not be valid. The European subjects investigated had a daily protein intake of about 100 g. (half of which was of animal origin) compared with an intake of 70 g. for the African (about one-third of which was meat). The plasma concentration of urea will, however, be conditioned by the same factor, and, since it is the clearance value which is here being considered, the effect of the lower elimination may be to some extent compensated. Although Jolliffe and Smith (1931) and Shannon, Jolliffe, and Smith (1932) have demonstrated a fall in urea clearance on low-protein diets, this fall has been accompanied by a fall in the filtration rate; in the present series there was no indication of reduced filtration rate.

The possibility that there is a real difference between the mode of urea elimination in the African and the European is the subject for further investigation, with particular reference to the secretory phase of urea elimination which has been demonstrated in the European subject (Barclay, Cooke, and Kenney 1947; Kenney *et al.*, 1950).

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FAT UTILIZATION IN ADULTS ON A DIET OF COWS' MILK

BY

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Although extensive investigations into the absorption and excretion of fat in infants, both breast-fed and on cows' milk, have been carried out by Holt *et al.* (1919a, 1919b, 1919c), we have found no reference to fat absorption by adults on a milk diet. During the course of another experiment we were required to live on a diet of cows' milk for one month, and below we record our fat absorption and excretion taken over three days of the fourth week.

The fat content of a milk diet is much higher than that of a normal mixed diet. Wollaeger *et al.* (1946) found that on normal mixed diets the amount of fat ingested by adults may be increased to 208 g. a day without gross change in the percentage absorbed, an average of 9% only of the ingested fat being excreted. Annegers *et al.* (1948) studied the effect of varying quantities of fat added to a mixed diet, and found that, within normal limits, neither the quantity nor the type of ingested fat influenced the amount of excreted fat in any individual subject. A normal fat

absorption on a milk diet is therefore to be expected. On the other hand, Holt *et al.* (1919a, 1919b) found that normal infants fed on cows' milk passed more than twice as much fat as infants who were breast-fed, and that the average utilization of dietary fat was 88.6% for cows' milk and 95.8% for breast milk. They also found that the percentage of the total fat excreted as soap was much higher in infants taking cows' milk. We therefore believe that our results are worth recording.

Methods.—The collection of faeces was carried out between carmine markers over a period of three days. The diet consisted of nothing but pasteurized cows' milk, and the intake was kept constant before and during the period of collection of faeces. Five millilitre samples of milk from all bottles drunk were collected, and the fat content of the mixed samples was estimated. The faeces were collected in screw-capped glass jars containing a small amount of formalin, and were dried over a water-bath, ground, and mixed carefully. The estimations of soap, neutral fat, and free fatty acids were carried out in duplicate, using Soxhlet apparatus by the method described by Harrison (1947).

The results are shown in Table I.

TABLE I

	W.H.H.A.	R.H.
Daily milk intake	12 pints	10 pints
Fat content of milk	3.3 g.% (w/v)	3.3 g.% (w/v)
Daily fat intake	225 g.	187.5 g.
Weight of dried faeces (3 days) ..	147 g.	131 g.
Total fat in dried faeces	28.6%	26.4%
Percentage fat as (1) Soaps	74.5%	72%
(2) Free fatty acids	13.5%	14%
(3) Neutral fat	12%	14%
Total daily weight of excreted fat ..	14 g.	11.5 g.
Fat intake absorbed	93.8%	93.9%
Total body weight. Gain or loss over one month period on milk in brackets ..	195 lb. (+5)	155 lb. (nil)
Daily calorie intake approximately ..	4,450	3,700

Discussion

Although a diet of cows' milk becomes monotonous no difficulty was experienced in continuing it for a period of one month. At times we observed minor degrees of flatulence, but general health was apparently unaffected. One of us, in fact, played competitive tennis throughout the whole period and even travelled to London for the Coronation, having to sit all day in Hyde Park drinking milk. The motions seemed to be increased in bulk, rather constipated, and of uniform consistency and colour (pale) throughout. The calorie intake was obviously adequate, and one of us (W.H.H.A.) gained 5 lb. in weight over a total period of one month on milk.

The most striking feature of the results is that fat utilization is 94% (Table II), a figure well within the usually accepted, roughly defined normal range for adults, in which the amount of fat in the stool should not exceed 10% of the ingested fat. The other feature of interest is the high percentage of the total fat excreted which appears as soap. This bears a close relation to the figures which Holt *et al.* obtained for infants fed on cows' milk. The percentage of

TABLE II

	Total Fat in Dried Faeces	Percentage as Soap	Percentage as Free Fatty Acid	Percentage as Neutral Fat	Utilization of Fat Intake
W.H.H.A.	28.6%	74.5%	13.5%	12%	94%
R.H.	26.4%	72%	14%	14%	94%
Average for normal breast-fed infants (Holt <i>et al.</i>) ..	34.5%	43.1%	36.7%	20.2%	95.8%
Average for infants fed on cows' milk (Holt <i>et al.</i>) ..	34.1%	60.5%	18.6%	12.1%	88.6%
Average for children on milk with bread and cereal (Holt <i>et al.</i>) ..	30.7%	60.9%	25.1%	14.0%	90.6%
Average for normal adults on a mixed diet containing 208 g. fat (Wollaeger <i>et al.</i>)	33.7%	—	—	—	96%

total fat in the dried faeces is just above that which is usually regarded as being within normal limits for a mixed diet of average fat content, but below the figure obtained by Wollaeger *et al.* on a mixed diet containing 208 g. of fat.

Conclusions

An investigation was made into the fat absorption and excretion in adults on a milk diet.

It was found that adults living on a high fat diet consisting of cows' milk absorb a normal proportion of their fat intake.

As in infants on cows' milk and normal children on a milk diet, a considerable proportion of the excreted fat is in the form of soap.

A milk diet for one month has no adverse influence on health.

The work of one of us (R.H.) was carried out during the tenure of a John Holt Research Fellowship and with the aid of a grant from the Royal Australasian College of Physicians. The milk fat estimations were kindly carried out by Mr. N. Heron, of the City Analyst's Department, Liverpool, and the faecal fat estimations by Mrs. E. Smith, of the Department of Tropical Medicine, Liverpool School of Tropical Medicine.

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Medical Memoranda

Intestinal Polyposis associated with Pigmentation of the Oral Mucosa

This syndrome was described by Peutz (1921) and again by Jeghers (1944), who later collected a further 22 cases from the world's literature. Of the 30 patients so far reported few proved cases have been described in the British Isles.

In view of the apparent rarity of the condition, which may yet prove to be more common than is at present supposed, two further cases are considered worth recording. The first patient, in whom the polyposis is confined to the small intestine, is exceptional in that he has been admitted to hospital on eight occasions with an intussusception and has undergone five operations for this complication. In the second patient the polyposis occurred predominantly in the large intestine, and radical surgery was possible.

CASE 1

A man aged 28 attended in March, 1948, with symptoms of recurrent partial intestinal obstruction. In 1943, when in the Forces, he had been operated on for intussusception. His son, aged 8, has pigmented lips but as yet no symptoms.

He was a dark sallow man with typical pigmentation of the lips and buccal mucosa. Barium enema revealed a chronic ileo-colic intussusception.

At laparotomy on March 15 chronic jeuno-jejunal, ileo-ileal, and ileo-colic intussusceptions were found. All three were reduced. Nine large polyps were present at intervals throughout the small intestine. No resection was carried out. He was subsequently readmitted in six attacks of acute intestinal obstruction.

At laparotomy on May 5 an ileo-colic intussusception was partially reduced. A few inches of ileum and the contained polyp required resection. Pathological examination showed a benign adenomatous polyp.