by the fetus is allegedly excreted by the mother. Balance studies show a positive nitrogen balance during pregnancy(13). From the present data, it is seen that the human fetus could produce as much as 3 g of urea daily. This amount of nitrogen would be within the normal daily variation of nitrogen excretion of the mother and thus nitrogen balance studies would not reflect the contribution of the fetus to maternal nitrogen excretion.

Summary. The detoxication of ammonia in homogenates of liver from fetal and adult human beings has been studied. Amount of urea synthesized in a day for each case has been calculated from the rate-limiting step of the urea cycle. Similar data are presented for glutamine synthetase and glutamic acid dehydrogenase. Values for human beings have been compared to similar values for the rat, and differences have been discussed.

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Experimental Steatorrhea Induced in Man by Bile Acid Sequestrant.* (26275)

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Bile acids are believed necessary for efficient digestion and absorption of dietary fat. An agent capable of binding bile acids in the gut might be expected to cause steatorrhea. In the present study, steatorrhea was induced experimentally in a series of otherwise healthy human subjects by means of a bile acid sequestrant (MK-135). This agent is the chloride salt of a basic anion exchange resin which binds bile acids *in vitro* and which, when administered orally, forms an insoluble, nonabsorbable complex with bile acids in the intestinal lumen(1,2).

Methods. Sixteen healthy adults aged 24-32 served as subjects. Effect of MK-135‡ administration on fecal fat excretion was determined in 4 subjects, and influence of this agent upon absorption and fecal excretion of I^{131}-labeled triolein or I^{131}-labeled oleic acid was measured in 12 subjects. *Fat balance studies.* To insure constant intake, 4 subjects were maintained on formula-type diets providing 40 calories/kg body weight/day for 5-6 weeks. Formula derived 40% of calories from fat (corn oil in two subjects, butter in one, and coconut oil in one), 43% from carbohydrate (dextrose) and 17% from

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TABLE I. Effect of Administration of Bile Acid Sequestrant (MK-135) on Daily Mean Fecal Fat Excretion (g/Day) in 4 Subjects Maintained on Constant Formula-Type Diets.

Subject	Dose of MK-135, g/day*	Period I Control (10-16 days)	Period II Experimental (11-18 days)	Period III Control (10-16 days)
1	15	1.1 ± .3†	2.2 ± .9	1.0 ± .5
2	15	.6 ± .1	1.0 ± .4	1.0 ± 1.3
3	30	3.0 ± .8	12.7 ± 1.7	2.9 ± .9
4	30	2.0 ± .4	10.2 ± 1.1	2.0 ± .3

* Given during experimental period only. † Stand. error.

TABLE II. Mean Values for Blood and Fecal Radioactivity Following Ingestion of I^{131}-Labeled Triolein (5 Subjects), and I^{131}-Oleic Acid (7 Subjects), before and during Administration of Bile Acid Sequestrant (MK-135).

	% of dose/liter of blood				% of dose in feces (48hr)
	2 hr	4 hr	6 hr	8 hr	
	Subjects (5) given I^{131}-triolein				
Control	.5 ± .3*	2.1 ± .2	2.5 ± .6	1.9 ± .4	2.1 ± .8
During MK-135, 30 g/day	.3 ± .1	.6 ± .1	.6 ± .1	.6 ± .1	21.5 ± 6.1
	Subjects (7) given I^{131}-oleic acid				
Control	1.2 ± .3	2.1 ± .1	1.9 ± .1	1.7 ± .3	6.2 ± 1.5
During MK-135, 30 g/day	1.4 ± .3	2.1 ± .2	1.8 ± .1	1.4 ± .1	7.6 ± 1.1

* Stand. error. $p < .01$.

protein (Casec§). During experimental periods lasting 11-18 days, MK-135 was administered 4 times daily as liquid suspension (0.25 g resin/ml). Two subjects received 15 g and two, 30 g of resin/day. Each experimental period was preceded and followed by control periods lasting 10-16 days. Feces were collected in 24-hour lots and aliquot samples analyzed for total fat content by method of Van de Kamer *et al.*(3). *Fat absorption studies.* Five subjects were given a standard dose of I^{131}-labeled triolein. Radioactivity was measured over an 8-hour period in blood samples and over a 48-hour period in feces. Subjects were then given 30 g day of resin in divided doses for one week while on regular diet. On last day of resin administration, I^{131}-triolein test was repeated. Similar studies were done in 7 additional subjects except that a standard dose of I^{131}-labeled oleic acid was administered during control and experimental periods. All subjects were studied while in postabsorptive state, and had received 0.5 ml Lugol's solution 14 hours before each administration of radioactive material. First meal of day was allowed not earlier than 4 hours after ingestion of radioactive material.

§ A fat-poor form of casein kindly supplied by Mead-Johnson and Co., Evansville, Ind.

Results. In 2 subjects maintained on constant dietary intake and receiving 15 g/day of resin, there was no significant difference in daily fecal excretion of fat when experimental periods were compared with control periods. In contrast, steatorrhea occurred in 2 subjects receiving 30 g/day of resin (Table I). The gross character of the steatorrhea was evident by inspection as well as by chemical analysis of feces. All subjects noted borborygmi, increased frequency and greater bulk of stools during the experimental period. In 5 subjects maintained on regular diet and given I^{131}-labeled triolein before and during 30 g/day resin treatment, there was depression of level of blood radioactivity over the 8-hour sampling period, and significant increase in fecal radioactivity during period of resin administration ($p<0.01$) (Table II). In contrast, in 7 subjects maintained on regular diet and given I^{131}-labeled oleic acid, there was no significant difference in radioactivity of blood and feces between control and experimental periods (Table II).

Discussion. Gross steatorrhea in otherwise healthy subjects was induced by administration of bile acid sequestrant in appropriate dosage. Such steatorrhea was associated with deficient digestion and absorption of ingested triglyceride as shown by fat balance studies and I^{131}-triolein studies. In contrast, there was no interference with absorption of I^{131}-oleic acid during period of resin administration. These studies suggest that the mechanism of resin-induced steatorrhea is related to exclusion of bile acids from participation in hydrolytic digestion of dietary triglyceride.

Malabsorption has been reported following administration of neomycin(4), and trimethyl hexadecyl ammonium stearate(5). In the former type large doses of neomycin were required and steatorrhea was inconsistent. In the latter, chemical used was very toxic to animals, producing moderate to severe damage of intestinal villi. In contrast, use of MK-135 appears to be an innocuous and effective method for induction of steatorrhea in man.

Summary. Gross steatorrhea has been induced experimentally in healthy human subjects by administration of a resin capable of sequestering bile acids in the intestinal lumen. This agent (MK-135) inhibited absorption of I^{131}-labeled triolein but not I^{131}-labeled oleic acid. In contrast to certain other forms of experimental malabsorption, MK-135-induced steatorrhea appears to be predictable and innocuous.

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Antiphage Activity of Human Cholera Sera. (26276)

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Although Doorenbos and Cossery(1) have reported on the inactivation of cholera phage by rabbit antisera, a search in pertinent literature failed to find evidence of studies concerned with the anticholeraphage activity of human sera. It was believed, therefore, that such an investigation of the sera from cholera patients might yield significant results.

Materials and procedures. One hundred seventy-seven sera collected during the 1958-1960 cholera epidemic in Thailand and preserved in the frozen state at −20°C were used. There were 37 pairs of sera from cholera patients. One sample was drawn during the first or second day of the disease, while the other was collected 12 to 24 days later. Eighteen paired sera were obtained from symptomless carriers of *V. comma*; 20 from contacts who had no clinical signs of cholera and from whose stools *V. comma* was not isolated; and 30 from patients with acute shigellosis or salmonellosis. All were collected in 12 to 25 day intervals. Thirty-five unpaired sera were from apparently healthy soldiers of the Royal Thai Army. Approximately 90% of all sera, including those from bacteriologically proven cases of cholera, came from individuals who were recently vaccinated against cholera.

A bacteriophage, isolated from a canal in Bangkok, which belonged to the first group according to the classification of Mukerjee