TABLE II. Graft-*versus*-Host Assay in C3H Neonatally Thymectomized Mice.

Group	I.P. inj of 30 million spleen cells from	Spleen indexes*	Mean spleen index ± S.E.
C3H thymecto-mized mice	A mice	2.50—2.66—2.81—3.05—3.37—4.37	3.13 ± .27
	Non-injected	.75—.76—.95—.96—.98—1.06	.91 ± .27
C3H intact mice	A mice	1.01—1.02—1.08—1.18—1.24	1.11 ± .04
	Non-injected	.80—.91—.93—.98—1.14	.95 ± .05

* Spleen indexes were calculated by dividing relative spleen weight (mg/100 g body wt) of the injected and non-injected groups by relative spleen weight of the negative control group (syngeneic spleen cell injected mice).

C3H recipients to produce splenomegaly following the injection of spleen cells from A mice. In view of current knowledge, that much of the splenomegaly in graft-*versus*-host reaction is due to proliferation of host cells, our experiments indicate that this proliferation does not involve thymus dependent immunocompetent cells of the host. These findings stress once again the susceptibility of the neonatally thymectomized recipient mouse to the development of homologous disease after injection of homologous cells which are readily rejected by the intact recipients. The findings have important implication in efforts to design and execute replacement therapy for humans genetically or developmentally lacking in thymic system of lymphocytes.

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Alimentary Absorption of L-Arabinose and D-Xylose in Chicks.* (31755)

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While most of the previous investigations on alimentary absorption of sugars pertain to the mammalian species, Bogner(1) and Bogner and Haines(2) experimented on newly hatched and very young chicks with a view to observing the rates of absorption of several sugars and suggested that the selective absorption capacity of the chick's gut is not maximally developed until one to three days after hatching.

The aims of the present investigation were: (a) to determine the absorption rate of L-arabinose and D-xylose as compared to D-glucose; (b) to study the effect of age on the relative absorption; and (c) to observe the effects of concentration on absorption rate.

Materials and methods. The chicks used were New Hampshire × Columbian males

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TABLE I. Influence of Age on Absorption Rate of Pentoses in Chicks.*

Age in days	Body wt, g	Absorption coefficients (sugar absorbed/100 g body wt/30 min) D-glucose	L-arabinose	D-xylose	Average
		mg			
3	46.6	230 ±11†	120 ± 12	190 ± 6	185a‡
6	61.3	212 ± 8	116 ± 11	180 ± 18	178a
9	86.5	203 ± 7	120 ± 15	173 ± 6	168a
12	121.9	227 ± 7	155 ± 13	203 ± 11	195a
Avg	79.1	218a	130b (58.6)§	186c (85.5)	

* Average dose rate of each sugar was 3 mg per g body wt. Treatment values represent average of 5 chicks per treatment.
† Mean ± standard error of mean.
‡ Treatment values followed by the same letter are not significantly different ($P < .05$).
§ Absorption relative to glucose as 100.

reared on a chick starter‡ and fasted for 24 hours prior to initiation of treatment. The sugars were analyzed by the ferricyanide procedure of Hoffman(3) in a continuous analysis system.§

Alimentary absorption rates were determined essentially by the procedure of Golden and Long(4). In each case the amount of sugar absorbed was determined by the difference between the amount of sugar initially introduced in the crop and that recovered either from segments or from the entire gastrointestinal tract after 30 minutes absorption time. Rates of absorption were expressed as absorption coefficients, *viz.*, mg or μm sugar absorbed per 100 g body weight per 30 minutes.

Randomized complete block design (in time) was used. Data were statistically analyzed by analyses of variance and Duncan's multiple range test ($P < .05$) was used to report the differences among the treatment means(5).

‡ Chick starter (diet C5F) in %: ground yellow corn, 50; bleachable fancy tallow (stabilized), 5; soybean meal (solvent 44%), 32; meat and bone meal, 5; alfalfa meal (dehy., 17%), 2.5; dried whey, 1.5; fish solubles (100% equivalent dried on soybean meal), 2.0; dicalcium phosphate, 1; calcium carbonate, 0.5; iodized salt, 0.5; manganese sulfate (19.3% Mn), 0.025; vit. A (10,000 I.U./g), 0.025; vit. D (3,000 I.C.U./g), 0.025; vitamin mixture (17.6 g riboflavin, 35.2 g *d*-calcium pantothenate, 79.2 g niacin, and 88 g choline per kg), 0.0125; vit. B_{12} (13.2 mg/kg), 0.05; choline chloride (44%), 0.03; and procaine penicillin (8.8 g/kg), 0.05.

§ Autoanalyzer, Technicon Instruments Corp., Chauncey, N. Y.

Experiment 1. Ten percent (w/v) aqueous solutions of D-glucose, L-arabinose, and D-xylose were introduced into the crops of the chicks. The dose of sugars was adjusted as close as possible to 3 mg per gram body weight.

Experiment 2. Aqueous solutions of D-glucose, L-arabinose and D-xylose (each in equal volume) were introduced into the crops of 10-day-old chicks to achieve the doses of 15, 30 and 60 μm per gram body weight. After 30 minutes the gastro-intestinal tract was ligatured into 6 segments as indicated and contents in each separately analyzed for sugars.

Results and discussion. Data in Table I show the relative alimentary absorption rates of test sugars. The absorption rates of L-arabinose and D-xylose were consistently lower as compared to that of D-glucose at each age interval. L-arabinose was the least absorbed. Bogner(1) reported that the ability of the chick to absorb glucose seems to be fully developed by 3 days of age. The present results indicate that the alimentary absorption of D-glucose as well as of L-arabinose and D-xylose is not affected in chicks from 3-12 days of age.

Since there was no detectable difference in the absorption rate of sugars due to age, all age groups were averaged to arrive at more meaningful comparisons. On this basis L-arabinose and D-xylose were 58.6% and 85.5%, respectively, as well absorbed as glucose. The observed velocities at low concentration confirm finding of Bogner(1) where calculations indicate that the relative absorption of L-ara-

TABLE II. Retention and Absorption of Sugars in Gastro-Intestinal Tract as Related to Concentration of Administered Doses.*

Treatment	Body wt, g	Dose rate per g body wt, μm	% Sugar retained (30 min)						Total absorbed, %	Relative absorption, %	Absorption coefficients, sugar absorbed/100 g body wt/30 min, μm
			Oesophagus + crop + proventriculus	Gizzard	Duodenum	Small intestine: Upper ½	Small intestine: Lower ½	Rectum	Total			
D-glucose	91.3	15	5.4	11.3	3.9	3.4	1.2	0.0	25.2	74.8	100.0	1114
L-arabinose	93.7	15	7.1	17.4	3.7	6.2	5.4	4.7	44.2	55.8	74.6	831
D-xylose	96.3	15	7.1	13.2	4.5	8.3	5.4	1.7	40.2	59.8	79.9	895
$\bar{x}$	93.8	15	6.5	14.0	4.0	6.0	4.0	2.0	36.5	63.5	84.8	947[a]†
D-glucose	87.0	30	15.6	16.5	4.0	5.0	2.7	0.0	43.8	56.2	100.0	1691
L-arabinose	87.0	30	32.2	14.4	3.0	9.9	11.2	1.6	72.3	27.7	49.3	842
D-xylose	84.7	30	10.8	15.7	3.0	8.8	7.3	1.5	47.1	52.9	94.1	1580
$\bar{x}$	86.2	30	19.5	15.5	3.3	7.9	7.1	1.0	54.4	45.6	81.1	1371[b]
D-glucose	76.0	60	12.5	11.3	7.9	7.1	6.7	0.8	46.3	53.7	100.0	3183
L-arabinose	74.0	60	26.7	16.4	3.5	9.1	4.6	1.4	61.7	38.3	71.3	2264
D-xylose	75.3	60	8.5	14.3	3.0	7.5	3.8	1.4	38.5	61.5	114.5	3697
$\bar{x}$	75.1	60	15.9	14.0	4.8	7.9	5.0	1.2	48.8	51.2	95.3	3048[c]

* Treatment values represent average of 3 chicks per treatment. Age of chicks was 10 days.
† Treatment values not followed by the same letter (where indicated) are significantly different ($P < .05$).

binose and D-xylose were 45.6% and 79.7%, respectively, of D-glucose.

The observations on retention and absorption of sugars in relation to dose concentration are presented in Table II. When the dose rates were 30 and 60 μm per gram body weight, L-arabinose retained in oesophagus, crop and proventriculus was approximately 3 times as much as D-xylose and twice as much as D-glucose. Retention of sugars in the duodenum was less as compared to any other segment excepting rectum. Arabinose and xylose retained in the upper and lower half of the small intestine and rectum were higher as compared to D-glucose at the lower dose rates.

Statistical analyses revealed that both concentration of dose and kind of sugar influenced absorption. An increase in concentration of the dose correspondingly increased absorption velocity. Absorption coefficients due to all 3 doses for any given sugar when compared on an average basis indicated that rate of absorption of L-arabinose was significantly lower than either D-glucose or D-xylose, the latter 2 sugars being not consistently different from each other.

The observed high amount of L-arabinose as compared to D-glucose and D-xylose in the anterior-most segment (with the higher dose rates in the second experiment) may be related to the slower rate of its movement through the chick's alimentary tract. Certainly, a lesser portion of L-arabinose had reached the presumed area of maximal absorption. It appears that L-arabinose and D-xylose, in spite of their identical molecular size, have different rates of movement and absorption.

The relationship between the luminal concentration of glucose and the rate of absorption has been a matter of controversial opinion. In the present study the relationship of absorption rates as D-glucose > D-xylose > L-arabinose is valid only at the lower concentration of administered sugars. At the highest concentration, however, the relationship was D-xylose > D-glucose > L-arabinose. Thus it is found that at higher, but not lower concentrations, the net absorption of xylose is greater than glucose.

These data support the findings of earlier investigators(6) that the absorption rate increases with increasing luminal concentration of sugars, as contrasted to the view of others (7,8) that absorption rate is not related to concentration.

Summary. Studies were conducted to determine the alimentary absorption of L-arabinose and D-xylose in chicks during 30 minutes following dose by stomach-tube. The rates of absorption of L-arabinose and D-xylose were compared to that of D-glucose from 3-12 days of age. Absorption velocity of L-arabinose was lower than that of D-glucose and D-xylose. This age range did not influence the absorption rate of any of the test sugars. Increase in dose concentration correspondingly increased rate of absorption. The data suggest that at lower dose concentration D-glucose is absorbed more rapidly than D-xylose, but at higher concentration absorption rates of the two sugars are reversed. It is confirmed that the chick's gut possesses selective absorption capacity as early as 3 days of age.

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Inorganic Ions in Cecal Content of Gnotobiotic Rats.* (31756)

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The enlargement of the cecum and its retention of a large quantity of fluid in germfree rodents have been noted since the advent of germfree rearing technique(1). However, little work has been done in clarifying the etiology of this anomaly. It was pointed out that a diet rich in starch gave rise to further enlargement of the cecum in germfree rats, and cesarian-born, hand-fed animals tended to develop still larger ceca(2). Skelly *et al* observed that contamination of germfree mice with intestinal flora obtained from conventional counterparts induced a rapid shrinkage of the cecal size and they noted that *Clostridium difficile* was most potent in this respect (3). Gustafsson and his associates observed a high concentration of mucus in the cecum of germfree rats and by bacterial contamination they were able to show an increase in fecal excretion of mucus concomitant with the decrease of the cecal size(4). Recently Csaky proposed a hypothesis that a bioactive substance was involved in the cecal enlargement (5).

Inasmuch as inorganic ions, especially sodium and chloride, play a profound role in the intestinal absorption(6), it seems of importance to determine the concentrations of inorganic ions in the ileal and cecal contents together with other indices for the colligative property. References are made to the germfree and monocontaminated conditions.

Method. Animals. Experimental animals were germfree Lobund Wistar strain rats propagated in germfree condition for 20 generations at Lobund Laboratory. Male rats weighing between 300 g and 400 g were used. They were fed steam sterilized L-462 diet and water *ad libitum* in steel isolators with steam sterilized sawdust bedding. For the experiment pertaining to germfree condition,

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