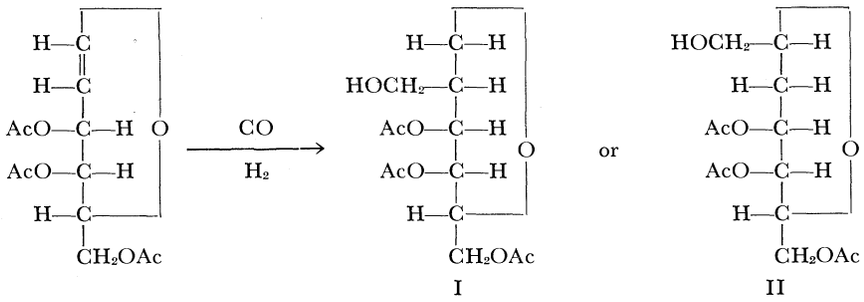

(corrected), $[\alpha]_D^{21} = +37.6°$ (0.013 g/cm³ water).

The percentage composition of compound A that was calculated for $C_7H_{14}O_5$ $[C_7H_{10}O(OH)_4]$ consisted of the following values: C, 47.23; H, 7.86; OH, 38.18. Values found on microanalysis (*9*) were: C, 47.43; H, 8.16; OH, 37.4 (±1 in duplicate).

Compound A exhibited a strong hydroxy band in the infrared spectrum. It was undoubtedly a hydroformylated (*6*) product that was subsequently reduced in the presence of the large excess of hydrogen. The formation of A from 3,4,6-tri-0-acetyl-D-galactal may be illustrated by the reaction that appears at the top of this page, where the structure of A is represented by either (I) or (II) (*10*).

In a slightly modified experiment, a solution of 12.8 g of 3,4,6-tri-0-acetyl-D-glucal (*5*) in 45 ml of benzene and 3 ml of ethyl orthoformate was heated with 0.75 g of cobalt acetate tetrahydrate (*6*) under a 1 to 1 mixture of carbon monoxide and hydrogen (combined gas pressure at room temperature was 1550 lb/in.²) at 110° to 150°C for 5 hours. When the crude product was fractionated by chromatography (*8*), using acid-washed Magnesol-Celite as adsorbent and benzene as developer, a crystalline product (B) was obtained from the upper zone (yield, 20 percent). Compound B was recrystallized twice from ethyl acetate in petroleum ether at 30° to 60°C. Determined specifications of the product were as follows: mp = 76.5° to 78°C (corrected), $[\alpha]_D^{24} = +100°$ (0.00179 g/cm³ 95-percent ethanol). After hydrolysis, B reduced Fehling's solution in 15 seconds.

The percentage composition of B that was calculated for $C_{17}O_{28}O_9$ $[C_7H_9O_4(CH_3CO)_3(OC_2H_5)_2]$ consisted of the following values: C, 54.23; H, 7.51; CH_3CO, 34.3. The calculated molecular weight was 376. Values found on microanalysis (*11*) were: C, 55.56; H, 7.07; CH_3CO, 34.0; molecular weight, 350 (cryoscopic).

The analysis of compound B agrees most closely with the theoretical analyses of the diethylacetal derivative that might be expected to be produced by the subsequent reaction of the hydroformylation product with ethyl orthoformate. The lower zone of the chromatogram yielded a mixture consisting mainly of dihydro-3,4,6-tri-0-acetyl-D-glucal (*12*). The proof of structure of the compounds is in progress.

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10. Configurations at carbon atoms No. 2 (I) and 1 (II) are not known.
11. Performed by W. Manser, Nerdstrasse 140, Zurish 37, Switzerland, and by G. Weiler and F. B. Strauss, 164 Banbury Road, Oxford, England.
12. Details of the work are being incorporated in a report that is in preparation.

30 January 1956

Increased Oxidative Effects on Irradiation in Glass

During a study on the radiation-induced flavor changes of meat fractions, we noticed a marked lack of analytic consistency in peroxide determinations in our irradiated lipid samples. Those portions of the sample that were adjacent to the walls of the glass container gave a much higher peroxide value than the portions in the center. These samples had been irradiated to 3×10^6 rep, with gamma radiation of a mixed energy spectra, in the canal of the Materials Testing Reactor, Phillips Petroleum Company, Arco, Idaho. A second series of samples irradiated in metal cans showed no such increases in the layers adjacent to the walls. We therefore ran two experiments to determine the extent of the effect of the glass during the irradiation of lipid materials (*1*).

A large sample of ether-extracted beef fat was irradiated in a 3-in. section of 3-cm Pyrex-glass tubing. The irradiation level and conditions were the same as those described in the preceding paragraph. Upon return, the sample was frozen solid with Dry Ice and pushed out of the tubing. The cylinder of lipid was sectioned to give an outer, a middle, and a core fraction. The peroxide data obtained on these fractions are given in Table 1. The peroxide determination was that of Hartman (*2*).

A second set of samples was irradiated in which ground glass was incorporated directly into the sample of lipid. The lipid used was ether-extracted pork fat. These mixtures were irradiated in cans to a level of 3×10^6 rep. The control samples were stored and handled in the same way as the experimental samples but received no irradiation. The peroxide values obtained on these samples are shown in Table 2.

It can be seen from both sets of data that there is a definite increase in the peroxide value of lipid samples irradiated in the presence of glass. Although the total effect may be slight when a large sample has been irradiated, it is of importance to be aware of the possibility of these effects. We have seen further evidence of this phenomena upon the irradi-

Table 1. Irradiation of a lipid sample in glass and metal containers.

Fraction	Milligrams of benzoyl peroxide per gram of fat	
	Glass	Metal
Outside	0.6	0.25
Middle	0.2	0.27
Core	0.05	Not sampled

Table 2. Irradiation of lipid in presence of glass.

Sample	Milligrams peroxide per gram of fat	
	Irradiated	Control
Pork fat	0.355	0.186
Pork fat + 10% w/w fine glass	0.420	0.175
Pork fat + 10% w/w coarse glass	0.500	0.188

ation of aqueous gels of plant gums and semisolid agar and amino acid suspensions.

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References and Notes

1. This paper reports research undertaken in cooperation with the Quartermaster Food and Container Institute for the U.S. Armed Forces and has been assigned number 592 by the Quartermaster Food and Container Institute in the series of papers approved for publication by the director of the Oregon Agricultural Experiment Station. The views and conclusions that are contained in this report do not necessarily reflect those of the U.S. Department of Defense.
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13 December 1955

Fate of Kidney-Tissue Homografts after Simultaneous Transplantation with Parabiosis of Albino Rats

Kidney-tissue homografts have survived in an apparently functional state when such transplantation has been performed as a reciprocal exchange of grafts between albino rat's kidneys during continuing successful parabiosis (*1*). When reciprocal exchange of kidney-tissue homografts is performed after the parabiont animals are separated, the vascularized grafts remain *in situ* but contain only a "phantom" representation of the parenchymal structures (*2*).

In another investigation of this problem (*3*), it was found that homografts of kidney tissue from nonlittermates that were transplanted to formerly successful parabiont recipients also terminated in the same manner. However, transplantation of kidney-tissue homografts between individual littermate albino rats or between albino rats in unsuccessful parabiosis (*4*) inevitably leads to necrosis and sloughing of the graft after 7 to 11 days; it is assumed that the state of successful parabiosis probably creates an environment conducive to either survival or retention of the graft. In order to determine whether continuing successful parabiosis was the dominant factor in successful kidney-tissue homografting, simultaneous parabiosis with kidney-tissue homografting was undertaken.

Forty-seven pairs of 21- to 28-day-old albino rat littermates were placed in parabiotic union (*5*), and, at the same time, while the abdominal cavities were open, a reciprocal exchange of kidney-tissue homografts between the adjacent animals was made. The 36 surviving parabiotic and homografted pairs were divided into five groups. The experimental loss of 11 pairs of the original 47 pairs fulfills the previous experience of 25 to 30 percent early deaths (*4*). The data in Table 1, therefore, reflect the minimal inflammatory reactions that were most probably obtained from the compatible pairs in each group.

Table 1. Results of simultaneous parabiosis with reciprocal kidney-tissue homografting.

Group No.	Successful parabiosis	In parabiosis (days)	Separated (days)	Host inflammation	Graft response (vascularized)
I (4 pair)	?	6–8	7–8	Heavy	Degenerating parenchyma
II (7 pair)	?	11–14	7–14	Moderate	Necrotic parenchyma
III (10 pair)	?	15–21	15–35	Moderate	Encapsulated necrotic areas
IV (8 pair)	3	22–27	21–35	Mild	Necrosis and "phantom" areas
V (7 pair)	5	28–30	28–35	Little	Degenerating parenchyma

Histological examination of the host's tissue adjacent to the bed on which the graft rested, demonstrated that the inflammatory reaction was characterized by closure of the lumen of proximal and distal tubules in the area and by a massive infiltration of lymphocytes. This effect gradually subsided, and after 28 or more days of parabiosis and subsequent separation (group V) all the tubules in this area were patent, and the lymphocyte infiltration was minimal. In all sections, at the site of contact between the host and graft, parallel vascular channels were seen which sent branches into the stroma of the graft.

The behavior of the homograft disclosed that, although some localized necrotic areas were established in group I, the slowly degenerating cells of the parenchymal structures could be clearly delineated. Homografts from groups II and III demonstrated greater degeneration and encapsulated necrotic areas with a large accumulation of connective tissue at the periphery of the graft. Group-IV homografts, after 22 to 27 days of parabiosis and 21 to 35 days of separation, showed the presence of light staining areas of tubular and glomerular structures that contained discrete cellular elements with pycnotic nuclei. The homografts in group V varied from partially degenerated and necrotic areas to encysted grafts that contained isolated fragments of tubules and glomeruli that were normal in appearance and staining.

Analysis of the results of this investigation is somewhat complicated by the uncertainty about which pairs in groups I, II, and III and part of group IV could be successfully joined in parabiosis. It has been found, on roughly 250 parabiotic unions with this strain of albino rat, that approximately 25 percent remain in successful parabiosis (*6*).

However, the findings do suggest that some enhancing factor was liberated during parabiosis for the maintenance of the homograft. Separation of the animals abrogates this favorable action. Thus, it has been shown that 7 days of parabiosis and a subsequent 7 days of separation were sufficient to destroy the grafts' viability, although the parenchymal structures were discernible and a vascular network was established. The addition of 11 to 21 days of parabiosis (groups II and III) is not sufficient to permit the survival of the homograft if the parabiotic animals were then maintained in the separated state for 7 to 35 days. Beyond 21 days of parabiosis, the homografts appear to retain some degree of parenchymal integrity, and cellular elements and pycnotic nuclei can be seen. However, the patches of necrosis and the general appearance of the graft clearly suggest that the graft is neither viable nor functional.

On the basis of the present and previously cited data, continuing and successful parabiosis permits the exchange of tissue and fluid substances that enhance the survival of kidney-tissue homografts transplanted to the kidney. Surgical separation of the homografted parabionts eliminates the further elaboration and exchange of these factors. The previous condition of parabiosis is conducive to the retention and vascularization of the homograft, even though the parenchymal structures degenerate.

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