comparison with that of the normal newborn level, to 148 mg percent, and esterified cholesterol was elevated to 110 mg percent. Serum polysaccharides and hexosamine levels were within the normal range.

Absolute and relative increase in gamma globulin and albumin with increase in the albumin-globulin ratio and some depression of total protein was reported in examination of cord blood plasma by moving-boundary electrophoresis (*12*). Recently Rafstedt and Swahn, using paper electrophoresis, reported values for serum proteins in newborn infants that were characterized by marked elevation of albumin with low values for alpha and beta globulins (*13*). These discrepancies may be attributable to differences in method of protein-staining of the paper strips as well as their subsequent quantitative evaluation; perhaps they are attributable to differences in prenatal diets. Values for lipoproteins reported here also differ from those of Rafstedt and Swahn who, using Sudan black, noted a relative increase in alpha-lipoprotein, depression of beta lipoprotein, and no alteration of the "chylomicron" fraction (corresponding to the O-fraction). Glycoproteins determined by paper electrophoresis have not been reported previously in newborn infants. A much lowered content of lipids, polysaccharides, and glucosamine has been observed in cord blood by others, who reported values similar to those obtained in this study (*10, 13, 14*).

The present study indicates the differences between newborns and adults in distribution patterns and levels of serum proteins, lipoproteins, and glycoproteins as determined by paper electrophoresis and correlates these with low levels of serum proteins, lipids, and carbohydrates as determined by chemical analysis.

EZRA SOHAR, ELAINE T. BOSSAK, CHUN-I WANG, DAVID ADLERSBERG
Departments of Medicine and *Chemistry,*
Mount Sinai Hospital, New York

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12 September 1955

Photosynthetic Luminescence and Photoinduced Absorption Spectrum Changes in Chlorella

In an attempt to identify the compounds responsible for the light-induced luminescence in photosynthetic organisms (*1, 2*), we have examined photoinduced spectral changes in *Chlorella* by a variety of techniques. The present communication reports a number of new absorption bands that appear on illumination of *Chlorella* in addition to those described by Duysens (*3*), Lundegårdh (*4*), and Witt (*5*). These results demonstrate that the magnitude and even the sign of the spectral changes depend on the temporal relationship between illumination and measurement. It has also been shown that the changes in the absorption spectrum are not due to a single component but rather to several compounds and that the time sequence and the light-intensity dependence of the spectral changes have a striking relationship to luminescence time curves and intensity dependence, respectively. In Fig. 1 are shown the changes in luminescence with time and of the 525-mμ absorption measured concurrently.

In Fig. 2 are illustrated the spectral changes observed in *Chlorella* when a flow system with long illumination is used. Note that these changes are opposite in sign to those observed by Duysens and Lundegårdh at 480, 525 and 555 mμ, respectively. In addition, note the new bands at 648 and 660 mμ.

Figure 3 illustrates the light-intensity dependence of the absorption-spectrum changes at 525 mμ and luminescence measured concurrently. In this case, short illumination periods (0.1 sec) were employed and the changes are of the same sign as Duysens'.

These results strongly suggest that the component with an absorption maximum at about 520 mμ is a reactant in green plant luminescence. Since, for independent reasons, it is believed that photosynthetic luminescence is a direct reversal of the first photochemical reactions in photosynthesis, the absorption spectra presumably represent the spectra of these first stable intermediates.

The chemical nature of the 520-mμ absorbing compound is uncertain as is that of the 648-mμ absorbing component. However, it is known that pure chlorophyll in organic solution exhibits a light-produced maximum at about 520 mμ (*6, 7*) and that a similar band appears in the Krasnovskii reaction (*8*). It has recently been shown that chlorophyll itself will chemiluminesce in the presence of oxygen, base, and aldehyde (*9*). For the afore-mentioned reasons, it may well be that the first stable products in photosynthesis are modified chlorophyll molecules. Finally, the time course and converse bleaching and deepening of this absorption—depending on when it is observed—indicates that the reacting molecule is in dynamic chemical equilibrium with later steps in the photosynthetic sequence, as has similarly been shown for the luminescence substrates. These and other experiments

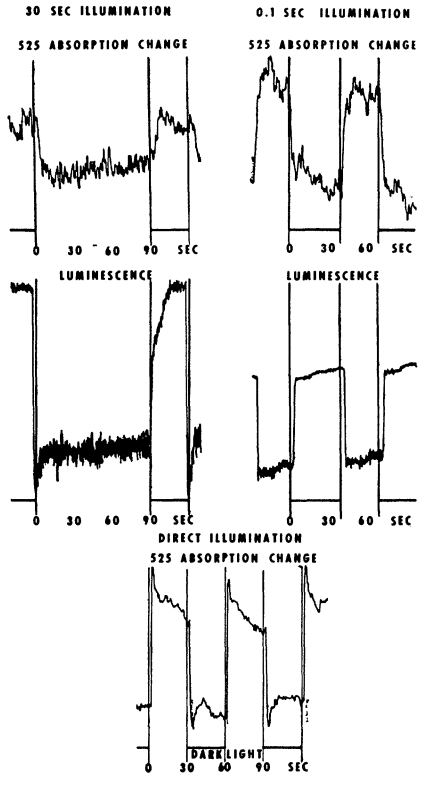

Fig. 1. Time course of luminescence and 525-mμ absorption change measured concurrently. For illumination times of 0.1 sec and 30 sec, a flow system was used with measurements about 1.5 sec after illumination. (Top left) 525-mμ absorption change 1.5 sec after illumination; sample illuminated in flow system for 30 sec beginning at zero time; light extinguished at 90 sec. (Center left) Luminescence under the same conditions. (Upper right) 525-mμ absorption change 1.5 sec after illumination; sample illuminated for 0.1 sec in flow system beginning at 30-sec mark; light extinguished at 60 sec. (Center right) Luminescence under the same conditions. (Bottom) 525-mμ absorption change during illumination; light on at 0 and 60 sec; light extinguished at 30 and 90 sec; increased absorption, up; increased luminescence, down.

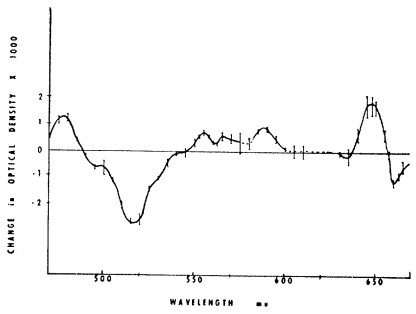

Fig. 2. Absorption spectrum changes in *Chlorella* produced by prior illumination. Spectrum measured with a difference spectrophotometer about 1.5 sec after illumination of 30-sec duration.

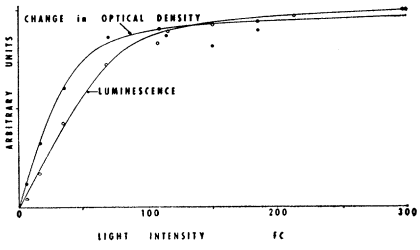

Fig. 3. Luminescence and 525-mμ absorption measured concurrently as a function of illumination intensity. Optical density and luminescence measured 1.5 sec after illumination for about 0.1 sec in a flow system.

to be reported fully elsewhere strongly suggest that chlorophyll itself participates directly both in the photochemical and later steps in photosynthesis as a chemical reagent rather than simply as a light-trapping agent (*10*).

BERNARD L. STREHLER
Department of Biochemistry, University of Chicago, Chicago, Illinois
VICTORIA H. LYNCH
Department of Plant Biology, Carnegie Institution of Washington, Stanford, California

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Carbon Dioxide Sorption by Yeast

The sorption of carbon dioxide by some relatively dry food products, such as milk powder (*1*) and the nut meats (*2*) has been reported. A similar phenomenon occurs during the exposure of granular, dry yeast. We have noted that the uptake of carbon dioxide is equally as great with fresh preparations of active dry yeast as it is with yeast in which fermentative activity has been destroyed by heat treatment.

When dry yeast is sealed into an ordinary can in an atmosphere of carbon dioxide, the degree of sorption is high enough to cause deformation and collapse of the can. Pressure measurements in a comparable closed system using relatively large amounts of yeast in proportion to the volume of carbon dioxide have shown a minimum sorption capacity of about 0.3 ml/g of yeast after 5 days of contact. Indications have been obtained, however, that this value may increase considerably in a system in which the sorption mechanism is not required to operate against a self-induced reduced pressure.

For the study reviewed in this report, measurements were made in a Warburg microrespirometer in which the reduced pressure could be equalized by venting the apparatus. These experiments demonstrated a continuous but progressively decreasing rate of uptake of carbon dioxide by dry yeast during a period of 10 days. At this time the volume of carbon dioxide that had been taken up by 0.5 g of yeast in an 18-ml test system was at least 3.0 ml.

The afore-mentioned experiment was repeated with radioactive carbon dioxide (*3*) in an attempt to determine the nature of the sorption process. Fractionation of the yeast after prolonged exposure to the labeled carbon dioxide was attempted to detect the yeast components responsible for the uptake of the gas.

This approach failed in its original purpose. It was found that in each of the two trials made, the degree of radioactivity of the yeast after removal from the test system was very much lower than would be expected on the basis of the measurements of uptake volume. Less than 1 percent of the expected radioactivity was found in the yeast following a 15-minute air sweeping that was given the yeast immediately preceding the first count-rate determination. Apparently this flushing of the excess carbon dioxide also causes an extremely rapid loss of sorbed gas from the yeast. Failure to remove the interstitial carbon dioxide would yield count rates that would obviously not be a measure of the sorbed gas.

Table 1. Loss of labeled carbon dioxide from dry yeast on exposure to ordinary atmosphere.

Time after first count-rate determination (hr)	Proportion of original activity remaining in yeast (%)
1	85
2	76
3	69
4	62
5	58
24	48
72	6
96	3
240	2

The further observation that the radioactivity of the yeast after removal from the test system was decreasing rapidly precluded consideration of fractionation of the yeast. As shown in Table 1, the steady diffusion of labeled carbon dioxide from the yeast on exposure to the ordinary atmosphere suggests that carbon dioxide forms no stable addition or reaction complex with any constituent of yeast.

These findings suggest that only a transient association exists between the yeast and the carbon dioxide. The extent of this association is governed by the relative proportion of yeast to gas in the test system and by the time of contact or exposure.

JOSEPH AMSZ, JR.
ROBERT F. DALE
HENRY J. PEPPLER
Research Department, Red Star Yeast and Products Company, Milwaukee, Wisconsin

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Pseudotuberculosis in Experimental Animals

In our experience 3 years ago, about 2 percent of the mice purchased from a commercial breeder succumbed to pseudotuberculosis (*1*) while in quarantine prior to use. *Corynebacterium pseudotuberculosis murium* was readily isolated from the lesions. When subjected to sublethal total body x-radiation (350 r) 65 to 75 percent of the animals with latent infection died with active pseudotuberculosis (*2*). Recently it has been found that