white, red, and blue lights were similar or the same. The rates of dark respiration after periods of used lights were also very similar. Therefore if there was no effect of light quality on respiration, one could expect a similar rate of CO_2 production under illumination with light qualities used, since also the ability for photosynthetic reabsorption of respiratory CO_2[9] would be similar or the same. The rate of photorespiration, however, was not the same. Under blue light the rate of CO_2 evolution was by about 3–4 times higher compared with that under white or red lights respectively. The concentration of CO_2 at CO_2-compensation points was about 2.5 times higher under blue light than under red or white. It is noteworthy that the rate of photorespiration in blue light considerably exceeded the rate of dark respiration, whereas under red or white lights the rate of photorespiration was by about 2.5–3 times lower compared with that in darkness.

The data showed a clear enhancement effect of blue light on the evolution of CO_2 in the plants used. Recent reports[10,11] showed that the enhancement effect of blue light was also observed when respiration was measured by oxygen uptake and when algae was the plant material. It is assumed that the flavin[10] or carotenoids[11] are the photoactive pigments involved in this phenomenon. In our previous work[5], we have suggested a close relationship between photosynthesis and photorespiration. It is possible to propose that the enhancement effect of blue light on CO_2 evolution may be mediated through the photosynthetic apparatus by synthetizing some substrate or substrates utilized by photorespiration, for example the glycolic acid[12].

It has been observed that synthesis of glycolic acid was stimulated under short-wave light[13]. Another question which can arise from the results presented in the Table is that of a photosynthetic reabsorption of respiratory CO_2. If the rate of evolution of CO_2 in light represents a remnant of respiratory CO_2 which is not reabsorbed by chloroplasts, one can expect that at a similar rate of apparent CO_2 uptake under white, red or blue lights, the rate of CO_2 evolution must also be similar. The data presented here indicate, however, that the reabsorption of respiratory CO_2 in light could not be a simple reason for the change in rate of CO_2 evolution in light as compared with that in darkness. The alternative argument might be assumed that the blue light has an effect on the resistances for the diffusion process of CO_2 from and into the sites of CO_2 absorption and evolution in leaves. However, this would be rather difficult to understand, since the rates of apparent CO_2 uptake under light qualities applied were similar when the same plant material was investigated[14,15].

Zusammenfassung. In isolierten Sprossen der Fichte *Picea glauca* Moench/Voss ergab Belichtung mit blauem Licht ähnliche CO_2-Assimilationsgeschwindigkeit wie mit weissem oder rotem Licht. Die Geschwindigkeit der Photorespiration hingegen war bei blauem Licht ca. 3–4mal so gross wie bei weissem oder rotem Licht.

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[15] The financial support for this work came from the Committee on Extra-Mural Research Projects, Department of Forestry, Ottawa, Ont.
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Electron Spin Resonance Investigations on Ferricytochrome *c* Compounds

The electron spin resonance method gives information concerning the electronic structure of paramagnetic metal complexes, such as hemoproteins[1–6]. We have measured the electron spin resonance absorption of ferricytochrome *c* from the horse heart. Recently Dickerson and coworkers[7] published X-ray diffraction results on horse heart cytochrome *c* showing that only 1 coordination position of the iron is occupied by a histidyl residue and the other probably by the methionyl residue in position 80 of the amino acid chain. All ferrihemoproteins are octahedral d^5 iron complexes. This octahedron is almost distorted so that we expected electron spin resonance spectra with an axial symmetry or lower. Our measurements were made on frozen solutions. The concentration of ferricytochrome *c* was 2 m*M* and the temperature was 77 °K.

First ferricytochrome *c* itself was investigated at different pH values. In the neutral pH range, a broad absorption line appears which involves 3 *g* values: $g_1 = 3.0$; $g_2 = 2.26$; $g_3 = 2.0$. This electron spin resonance spectrum corresponds to a low spin state of the porphyrin bound iron. Gordy and Rexroad[8] investigated commercial ferricytochrome *c* in the solid state at a temperature of 4.2 °K. They found beside the absorptions about the *g* value 2 an absorption peak at $g = 5.9$; but they explained this weak resonance as an impurity of hemoglobin in their sample of ferricytochrome *c*.

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At strong alkaline pH ferricytochrome *c* is also a low-spin complex. This spectrum shows 3 *g* values: $g_1 = 2.73$; $g_2 = 2.14$; $g_3 = 1.77$. But the individual lines are much sharpened. A strong acid ferricytochrome *c* solution (pH 0.7) shows 2 absorption centres. One has a *g* value near 6 and the other near 2. The absorption with the *g* value 6.3 originates from a high-spin state. Such an absorption is also typical for other hemoproteins in the high-spin state[3,9]. The absorption at $g = 2.1$ may originate from some low-spin state content. Therefore acid ferricytochrome *c* is not a pure high-spin complex but a thermal equilibrium between the high-spin and the low-spin state. This result is in accordance with the magnetic susceptibility of this compound measured by Boeri, Ehrenberg, Paul and Theorell[10]. Ferricytochrome *c* compounds as well as azide and cyanide compounds give electron spin resonance spectra with 3 *g* values nearby 2 which are typical for low-spin complexes. The *g* values for the azide compound from ferricytochrome *c* are $g_1 = 2.77$; $g_2 = 2.27$; $g_3 = 1.85$ and the *g* values for the cyanide compound are $g_1 = 3.04$; $g_2 = 2.30$; $g_3 = 2.01$. It is of interest that the azide ligand reacts better with ferricytochrome *c* at a neutral pH than in alkaline solution. George and co-workers[11] also found that the equilibrium constant of ferricytochrome *c* azide compound enlarges in the acid range. The fluoride compound of ferricytochrome *c* gives a pure high-spin complex spectrum with a large absorption at $g = 6.1$ and a small absorption with a *g* value of 1.97. As ferricytochrome *c* possesses a large pK value and the fluoride ion is bound only in acid solution[12] the fluoride compound of ferricytochrome *c* was generated by adding KHF_2.

A comparison of the electron spin resonance spectrum of ferricytochrome *c* about pH 7 with other hemoproteins such as hemoglobin[3], peroxydase[4] and catalase[9] shows that ferricytochrome *c* is more in the low-spin state than the other hemoproteins. This can be explained by the ferrihemochromogenic binding of the fifth and sixth coordination groups of the iron which is favoured by the crevice structure of the cytochrome *c* protein in which the hem disc is placed.

Zusammenfassung. Ferricytochrom *c* aus Pferdeherz wurde bei einer Temperatur von 77 °K mit der Methode der Elektronenspinresonanz untersucht. Aus den Elektronenspinresonanzspektren ist zu entnehmen, dass Ferricytochrom *c* bei neutralem und alkalischem pH ein Low-spin-Komplex ist, bei stark saurem pH ist es dagegen ein Mischkomplex der High- und Low-spin-Form. Ferricytochrom-*c*-Fluorid ist ein reiner High-spin-Komplex; dagegen sind die Azid- und Zyanidkomplexe Low-spin-Komplexe.

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Brown Adipose Tissue in Young Mice: Activity and Role in Thermoregulation

The distribution, structure and function of brown adipose tissue has been widely studied in the last few years[1–3]. Its role in hibernation, cold acclimation and especially in the heat production of young animals has been reviewed by Hull[4].

The present study is concerned with the development of interscapular brown adipose tissue in young mice. The succinic dehydrogenase activity in this tissue was measured at different age levels. Local temperature measurements from brain, brown body and subcutis were also performed.

Material and methods. 78 young mice or fetuses, both of NMRI-strain, were used. The number of animals in each age group was 6–12. The interscapular brown fat was removed and weighed. The tissue sections (embedded in paraffin wax) were stained with hematoxylin-eosin. The activity of succinic dehydrogenase complex in tissue homogenates was measured by the method of Kun and Abood[5] as described earlier[6]. The incubation was carried out in Thunberg tubes because of the small amount of tissue (1% homogenate). The temperature of brain, brown fat (neck) and caudal part of back was measured using the 'Ellab' (Copenhagen) thermogalvanometer. The thermocouples were placed s.c., and in the brain in the hypothalamus reached through the posterior fontanella. The environmental temperature was at the beginning of the experiment 35 °C and the animals were then removed to 26 °C.

Results. Figure 1 shows the weight of interscapular brown fat and its succinic dehydrogenase activity at different age levels. The relative weight of brown fat (mg/100 g) has a maximum at birth; it then rapidly decreases and reaches a minimum in 5-day-old mice. The succinic dehydrogenase activity in the brown fat is at maximum and minimum almost simultaneously with the weight. In addition, at the age of 2 weeks it has a second maximum.

It appears from histological examination that the lipid content of the cells and the size of lipid vacuoles show the same trend as was seen in the weight of brown fat and enzyme activity. The lipid vacuoles are large and numerous at birth. At the age of 4 days they decrease in size and

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