within a few hours after resuscitation than on the following day. This may indicate that a secondary depressive factor acts on the neurons some time after the circulatory arrest.

It is evident from these results that the brain of the young dog is much more resistant to arrest of its circulation than is that of the adult dog and this increased resistance appears to bear a reciprocal relation to the age of the animal. The increased resistance of the young brain to circulatory arrest may correlate with a lower oxygen requirement of the neurons, since Himwich, Baker and Fazekas[5] have demonstrated that the oxygen consumption of slices of infant rat brain is much smaller per unit wet weight than that of the adult and Craigie[6] has shown that the infant brain is considerably less vascular than that of the adult.

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## Effect of Hypothermia on Cerebral Metabolism.

JOSEPH F. FAZEKAS AND HAROLD E. HIMWICH.

*Department of Physiology and Pharmacology, Albany Medical College, Union University, Albany, N. Y.*

We have previously presented data[1] indicating an increased cerebral metabolism during hyperthermia. In this communication are included the changes of cerebral A:V oxygen differences resulting from hypothermia. The recent work of Smith and Fay[2] in which hypothermia has been used for the treatment of cancer lends added significance to this study.

Dogs anesthetized with pentobarbital were packed in ice. Blood samples were collected from the femoral artery and the superior longitudinal sinus at various intervals while the rectal temperature fell from approximately 38°C to 26°C. The blood samples were analyzed for oxygen[3] and glucose.[4] The velocity of the systemic circulation was estimated by the method of Robb and Weiss.[5] Nine dogs have

5 Himwich, H. E., Baker, Z., and Fazekas, J. F., *Am. J. Physiol.*, 1939, **125**, 601.

6 Craigie, E. Horne, *J. Comp. Neurol.*, 1925, **39**, 301.

1 Himwich, H. E., Bowman, K. M., Goldfarb, W., and Fazekas, J. F., *Science*, 1939, **90**.

2 Smith, L. W., and Fay, T., *J.A.M.A.*, 1939, **113**, 653.

3 Van Slyke, D. D., and Neill, J. M., *J. Biol. Chem.*, 1924, **61**, 523.

4 Hagedorn, H. E., and Jensen, B. N., *Biochem. Z.*, 1923, **135**, 46.

5 Robb, G. P., and Weiss, S., *Am. Heart J.*, 1932-3, **8**, 650.

TABLE I.

| Time | Temp. | Oxygen A Vol. % | Oxygen V Vol. % | Diff. | Sugar A Mg % | Sugar V Mg % | Diff. | Circulation Time, sec | Heart Rate | Resp. |
|---|---|---|---|---|---|---|---|---|---|---|
| 9:05 | 39.5 | 18.15 | 9.81 | 8.34 | 88 | 84 | 4 | 7 | 180 | |
| 9:34 | 39.5 | 18.24 | 10.59 | 7.65 | 99 | 83 | 16 | 6 | 170 | 16 |
| 10:25 | 33 | 18.33 | 13.13 | 5.20 | 95 | 86 | 9 | 12 | 108 | |
| 10:45 | 29 | 19.19 | 17.42 | 1.77 | 125 | 122 | 3 | 44? | 50 | 1 |

been thus examined. The results have been similar in all instances and a typical experiment is therefore presented in Table I.

It may be observed that despite a slower circulation as evidenced by a decreased heart rate and prolonged circulation time the cerebral A:V difference diminishes as the rectal temperature falls. A slower circulation rate by itself would make for a greater A:V difference with a constant cerebral metabolic rate. Obviously, then, there must have been a great diminution of cerebral metabolism as a result of the fall of temperature. The similarity of these results with those obtained during insulin hypoglycemia is striking.[6]

*Summary.* Nine dogs, subjected to hypothermia, suffered a decreased cerebral metabolism as indicated by a smaller A:V difference despite a slower blood flow.

[6] Himwich, H. E., Bowman, K. M., Wortis, J., and Fazekas, J. F., *J. Nerv. and Ment. Dis.*, 1939, **89**, 273.