2-DEOXYGLUCOSE UPTAKE BY FLOUNDER (PSEUDOPLEURONECTES AMERICANUS) ERYTHROCYTES

George W. Booz and Arnost Kleinzeller
Department of Physiology, University of Pennsylvania, PA 19104

Anoxia enhances glucose uptake by flounder erythrocytes by increasing its V_{max} (Booz et al., Bull. MDIBL 28:47,1989). Using the same experimental techniques, further studies were undertaken with 2-deoxyglucose (dGlc) which is phosphorylated but not further metabolized. The media concentration of dGlc was 2 mM, which is the K_m for glucose uptake in these cells. Unless otherwise stated, data are shown as mean ± SE for N fish.

The time course for the effect of anoxia on dGlc uptake and phosphorylation was examined (1 fish). The results are shown in Table 1. Total dGlc was increased by anoxia after 1 h; free (non-phosphorylated) dGlc in the cells was increased after 2 h, but remained below the media 2dGlc for the 4 h under study. In 7 of 8 fish, 2 h of anoxia increased total dGlc from 2.20 ± 0.53 mM to 3.64 ± 0.61 mM ($P<0.01$). With 2 h of anoxia, however, no change was noted in the free to total ratio of cell dGlc (0.22 ± 0.05 for control, 0.17 ± 0.03 for anoxia, N=8). These data suggest that transport and phosphorylation of dGlc occur in tandem, and both are increased by anoxia.

Table 1 Time course of intracellular dGlc uptake (media dGlc, 2 mM)

	Control, mM		Anoxia, mM	
h	free	total	free	total
1	0.30 ± 0.03	1.82 ± 0.00	0.26 ± 0.03	2.07 ± 0.03*
2	0.48 ± 0.03	2.59 ± 0.04	0.97 ± 0.03*	4.16 ± 0.16*
4	0.54 ± 0.10	3.72 ± 0.14	1.28 ± 0.22*	5.11 ± 0.16*

Means ± SD (3 determinations, 1 fish); * $P<0.05$ vs. respective control.

Aerobic and anoxic dGlc uptake showed no difference in sensitivity to inhibition by 0.05 mM phloretin, 0.01 mM cytochalazin B, or a 10-fold excess of glucose, galactose, or mannose. N-Carbobenzoxy-glycyl-L-phenylalaninamide, which interferes with the insulin-enhanced, but not basal glucose uptake in adipocytes (Aiello et al., Biochemistry 25:3944, 1986), inhited both aerobic and anoxic dGlc uptake. These results suggest that dGlc uptake under aerobic and anoxic conditions is catalyzed by the same carrier.

Since both hexose uptake and intracellular phosphorylation are coordinately regulated in these cells, flounder erythrocytes might be of value in understanding the regulation of hexose uptake in more complex cells, e.g. muscle.

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