PRELIMINARY AND SHORT REPORT

OXIDATIVE METABOLISM IN PERFUSED SURVIVING DOG SKIN*

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In 1954, Kjaersgaard (1) described a technic for perfusion of surviving dog skin. The saphenous artery leading to the skin of the medial aspect of the upper hind limb of a dog is cannulated and the skin area supplied by this artery is separated from the underlying tissue. The saphenous vein is likewise cannulated and the skin is excised and placed into a specially prepared perfusion box in which humidity and temperature can be controlled. Any desired solution can then be perfused through the arterial cannula and the effluent solution collected from the venous side. This method

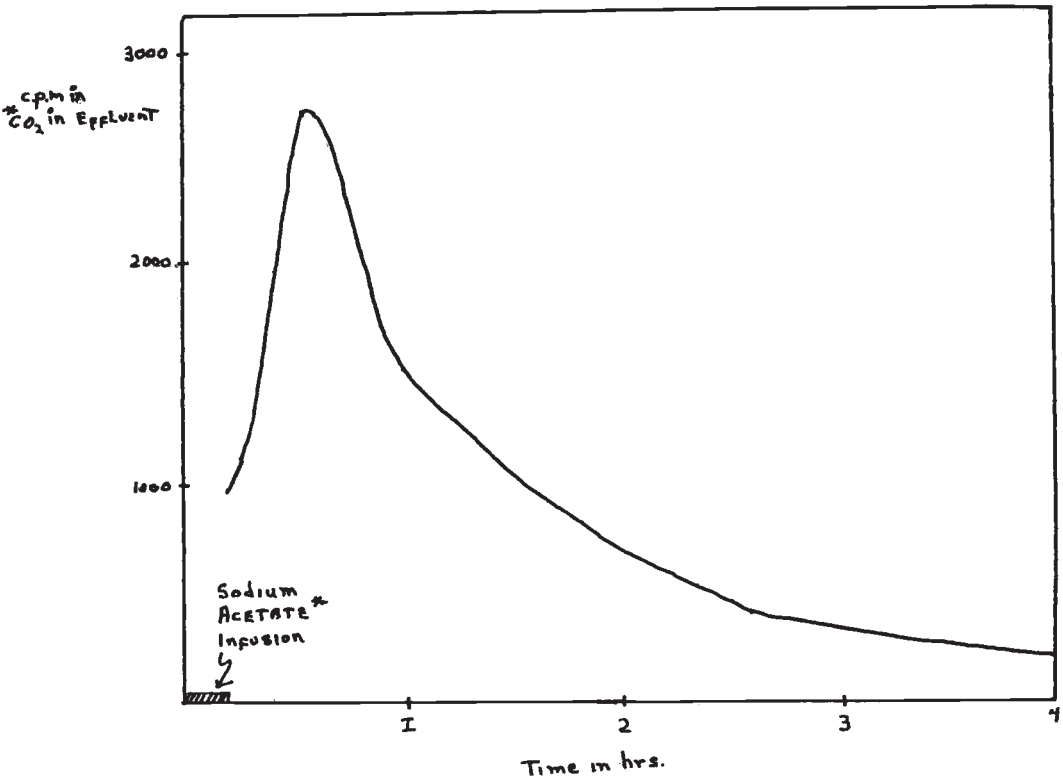

FIG. 1. Radioactive carbon dioxide in venous effluent from dog skin continuously perfused with blood which for an initial period contained radio-carbon-labelled acetate.

is applicable to three types of studies: 1. determination of the metabolism of a particular substance by analysis of the effluent venous solution for metabolic products of a material infused through the arterial end; 2. analysis of the skin itself for determination of incorporation into skin constituents of a material infused through the arterial end; and 3. analysis of the effluent blood or parts of the skin itself after surface application of a particular substance to determine its absorption through, or into, the skin.

As a study preliminary to investigation of the oxidative metabolism of dog skin, the ability of

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such skins to survive and actively metabolize was studied. Radioactive carbon (14) acetate in heparinized dog blood was perfused through the arterial end and the effluent venous blood was analyzed for radioactive carbon dioxide. Radioactive carbon dioxide appeared in the venous blood within ten minutes after starting the perfusion and reached a peak value in approximately one-half hour. Substituting non-radioactive blood at this point lead to an asymptotic decrease in the level of radioactive carbon dioxide emerging, a plateau being reached within three to four hours (Fig. 1).

Such preparations can also be seen to actively utilize oxygen by comparison of the color of the 'arterial' and 'venous' blood. The former is pink-red while the latter is a very dark red. Skin perfusions carried on for as long as 18 hours have continued to show this color change.

Skin removed from the dog and kept in cold saline under refrigeration for 24 hours can still be perfused providing the arterial end has been injected with heparin to prevent clotting. There is no apparent loss of oxidative ability under these conditions.

CONCLUSION

These results indicate that surviving dog skin retains its oxidative abilities for at least 18 hours under conditions simulating those normally occurring. Such preparations actively metabolize acetate to carbon dioxide, thereby demonstrating an intact oxidative pathway able to utilize acetate as a substrate and presumably yielding high amounts of energy from this transformation. Further studies are now being carried on to determine the intermediate steps in this pathway.

REFERENCE

1. KJAERSGAARD, A. R.: Perfusion of isolated dog skin. J. Invest. Dermat., **22:** 135–141, 1954.