

This would explain the curious replacement of chlorine by bromine in the ignition of potassium perchlorate-ammonium bromide mixtures.

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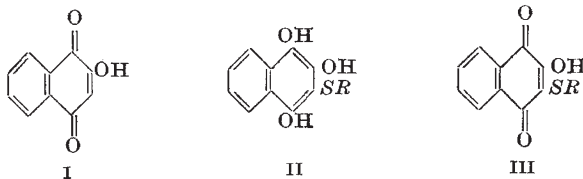
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<sup>1</sup> *Ber.*, 57, 818 (1924).

<sup>2</sup> *Ber.*, 59, 1335 (1926).

### Are Tyrosinase and Thiol Groups Present in Skin Epithelium?

WHEN an aqueous solution of 1:2:4-trihydroxynaphthalene (dihydrolawsone) is applied to the skin, immediate oxidation to the orange-yellow 2-hydroxy-1:4-naphthaquinone (lawsone) (I) occurs, presumably because of the presence in the skin of an oxidase system. This enzyme is undoubtedly a polyphenol-oxidase; but since similar application of L-tyrosine, DL-3:4-dihydroxyphenylalanine, or catechol does not lead to the production of any colour, it is extremely unlikely that the enzyme is tyrosinase. It is known<sup>2</sup> that quinones react rapidly with thiol compounds, and it does not appear unreasonable to suppose that, if human skin contains free SH-groups, these would react with the lawsone deposited *in situ* in the above manner. If the lawsone is allowed to remain on the skin for twenty-four hours, the stain can be removed almost completely by washing with soap and water. Consequently skin appears to contain very few thiol groups.



The correctness of the latter view appears to be amply justified by the following simple—but often rather ‘irritating’—experiment. The trihydroxynaphthalene is dissolved in a dilute aqueous solution of ammonium thioglycollate, and a little of this solution applied to the skin. There is usually produced a temporary ‘blackening’ together with, in some cases (according to the amount of ammonium thioglycollate used), a blister or weal. The dark colour disappears fairly rapidly; but a persistent deep-orange-coloured stain remains. This cannot be removed by washing; but removal of the epithelium removes the stain, too.

The explanation of the difference in intensity and fastness of the stain is undoubtedly as follows. The ammonium thioglycollate reduces some of the S.S bonds in the skin protein to SH groups, which then react with the oxidized trihydroxynaphthalene to give (II). This is then oxidized by the oxidase system to the quinone (III)<sup>2</sup>, which is more deeply coloured than (I) and, since the group R is part of the skin protein, is much more permanent.

It is concluded that skin probably does not contain tyrosinase and few, if any, SH groups.

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<sup>1</sup> Fieser and Fieser, “Organic Chemistry”, 738 (1944).

<sup>2</sup> Compare Burton and Stoves, *Nature*, 165, 569 (1950).

### Low-Cost Air Transport of Radioactive Substances to South Africa

THE Atomic Energy Act 1948 of the Union of South Africa gave the Atomic Energy Board the sole right to import into the Union artificially made radioactive elements. The Board has designated the South African Council for Scientific and Industrial Research as its agent in this matter, and as a result its subordinate organisation, the National Physical Laboratory, has had to consider the problem of bringing into the Union, over a distance of six thousand miles, considerable quantities of radioactive elements the lives of which are so short that air transport is the only possible method.

With beta-ray emitters such as phosphorus-32, all that is necessary is a centimetre of light-weight absorber such as wood, and the Isotope Division, Atomic Energy Research Establishment, Harwell, is using such containers, so that importation of phosphorus-32 is a simple matter.

In the case of iodine-131, however, the gamma-radiation makes it necessary to provide a fair weight of lead shielding, and in the consignments which were imported into the Union during 1949 the average weight of the returnable container used has been twenty-five pounds, with even greater weights for large orders. In the case of sodium-24, which has a very high-energy gamma-radiation, an ionization function double that of radium and a half-life of only 14.8 hr., the importation of even one or two millicuries presented an insuperable difficulty, for the cost worked out at about £70 for freight alone.

It was therefore decided, late in 1948, to attempt to devise a scheme whereby the protective effect of distance was used instead of lead. Discussions were accordingly begun with (a) the Division of Civil Aviation of the Department of Transport of the Union Government, (b) the Ministry of Civil Aviation, United Kingdom, (c) the South African Airways. Our suggestions were well received by these organisations, and the Isotopes Division of the Atomic Energy Research Establishment at Harwell supported us very vigorously at every point.

Calculation showed that, since a D.C.4 aircraft has a wing span of more than a hundred feet, the intensity of ionization from one hundred millicuries of sodium-24 carried at the tip of the wing would be so low in the cabin that sensitive X-ray film could be carried in the aircraft for more than forty hours without reaching the lowest degree of blackening which can be tolerated in such film. In addition, it was established that the process of refuelling constituted no hazard to the person who controls the operation from a point on the wing between the two engines, and that the gamma-ray dose-rate at a point on the ground immediately below the wing tip was below tolerance-level. It was finally decided to limit all loads of any type of radioactive element to one