

These results, combined with decomposition experiments, which showed it to be a pyrrolidine derivative, led to the conclusion that the substance was cuscohygrine, hitherto only found accompanying coca alkaloids.

This fact was confirmed by comparison with synthetic cuscohygrine (chromatography).

Chromatographic analysis showed it to be present in the roots of the following species: *Atropa belladonna*, *Hyoscyamus niger*, *Datura stramonium*, *D. innoxia*, *D. ferox*, *D. metel*, *Scopolia lurida*, *S. sinensis*, *Physoclaina orientalis*, *P. physaloides* and *Mandragora officinalis*.

This discovery sheds a new light on the role of pyrrolidine derivatives in the biochemistry of the tropane alkaloids, which will be discussed elsewhere.

I wish to thank Prof. F. Galinovsky, University of Vienna, for providing a sample of synthetic cuscohygrine.

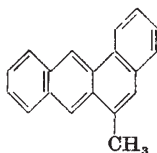
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¹ *Nature*, 173, 692 (1954).

A Novel Synthesis of 4-Methyl-1:2-Benzanthracene

OF the various alkylbenzanthracenes, 4-methyl-1:2-benzanthracene aroused considerable interest through its pronounced carcinogenic activity¹. The literature includes a few syntheses of this hydrocarbon², but these methods are laborious since they



involve numerous steps. We have now worked out a new route to this hydrocarbon in four steps starting from 2-allylcyclohexanone and tetralin, based on the method developed by Mukherji and co-workers³ for the synthesis of polycyclic aromatic hydrocarbons.

2-Allylcyclohexanone was made to react with tetralin in the presence of anhydrous aluminium chloride at 0–5° C., and 2-(β-methyl-β-(6-tetralyl)-ethyl)-cyclohexanone (boiling point 210–215°/6 mm.; η_D^{25} 1.5578) was obtained in 70 per cent yield. Reduction of this ketone with aluminium isopropoxide in isopropyl alcohol gave the corresponding carbinol (boiling point 190–195°/3 mm.; η_D^{25} 1.5585) in almost quantitative yield. This carbinol was cyclized with concentrated sulphuric acid (1.84) to the corresponding dodecahydro-1:2-benzanthracene derivative (boiling point 190–195°/6 mm.; η_D^{25} 1.5600), which was smoothly dehydrogenated with palladium-charcoal (30 per cent) at 300–320° C. for 4 hr. to give 4-methyl-1:2-benzanthracene which (purified by regeneration from its picrate) crystallized from alcohol in pale yellow needles (melting point 123–124° C.; lit. (ref. 2a) melting point 124–124.6° C.).

The picrate crystallized from alcohol as brown-red needles (melting point 148° C.; calc. for C₂₃H₁₇N₃O₇: N, 8.91; found: N, 8.68; lit. (ref. 2a) melting point 148–149° C.).

The hydrocarbon gave a trinitrobenzene derivative which crystallized from alcohol as red needles (melting point 163° C.; calc. for C₂₃H₁₇N₃O₆: N, 9.23; found: N, 9.03; lit. (ref. 2a) melting point 163–164° C.).

Details of this work will be published elsewhere. The microanalyses were carried out by Drs. G. Weiler and F. B. Strauss (Oxford).

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- ¹ Shear and Leiter, *J. Nat. Cancer Inst.*, 2, 214 (1941); *Chem. Abst.*, 1666 (1942).
² (a) Fieser and Jones, *J. Amer. Chem. Soc.*, 60, 1940 (1938). (b) Cook, *J. Chem. Soc.*, 1592 (1933). (c) Fieser and Peters, *J. Amer. Chem. Soc.*, 54, 3742 (1932).
³ Mukherji *et al.*, *J. Org. Chem.*, 17, 1202 (1952); 18, 1499 (1953); 19, 328 (1954). *Curr. Sci.*, 23, 158 (1954).

Significance of Metallic Transfer in Orthopaedic Surgery

IN an earlier communication¹ attention was directed to the transfer of metal which can occur between a screwdriver tip and a screw head during the operation of screwing, and the possible significance this might have in orthopaedic surgery was discussed. It was demonstrated by a radioactive tracer method that, whenever a screw is inserted, small fragments of metal are plucked out of the driver and remain adhering to the screw head. It was suggested that, although the amount of metal transferred is very small (about 10–100 μ gm.), the particles may form corrosion centres and cause metal ions to pass into the surrounding tissue. This may cause tissue reaction and interfere with normal physiology even in cases where no gross corrosion is observed.

In our earlier work, the presence of abnormally high concentrations of iron in the tissues surrounding buried metals was demonstrated by staining microtome sections of biopsy specimens to give the prussian blue reaction. Recently, biopsy samples of such tissue have been analysed spectroscopically for us by Dr. A. H. Gillieson, of the Atomic Energy Research Establishment, Harwell. The quantities found were compared with the normal concentration of these ions in tissue². All the samples were taken from regions adjacent to stainless steel plates and nails which had been buried in the body for three to four months. None of the cases showed visual evidence of corrosion. The results show that the tissues adjacent to parts of the metal handled with tools during its insertion are abnormally rich in the ions of its constituents. Concentrations up to five times normal were found. The tissues near unhandled parts of the buried metal, however, had ionic concentration not significantly different from normal.

These results confirm quantitatively the picture suggested by examination of the stained microtome sections of tissue, and show clearly that considerable quantities of the ions of the so-called inert metal pass into the surrounding tissues, and that this dissolution is greatest from regions which have been handled with tools during the insertion of the metal.

The amount of metallic transfer depends on the relative hardness and the specific nature of the contacting surfaces³. The effect of the hardness of the tool has recently been investigated quantitatively.