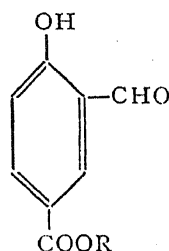


**4-HYDROXY-3-ALDEHYDO BENZOIC ACID**

DUFF AND BILLS<sup>1</sup> could not isolate any product by the action of hexamine on *p*-hydroxy benzoic acid. Recently Seshadri and Thiruvengadam<sup>2</sup> prepared 5-aldehyde of vanillic acid by this method. Hence the action of hexamine on *p*-hydroxy benzoic acid and its ethyl ester has now been reinvestigated. They yield the 3-aldehydes (I) in 30 per cent. yield. The position of the aldehyde group is established by oxidation with alkaline hydrogen peroxide to protocatechuic acid in 80 per cent. yield.



I  
a, R=H  
b, R=C<sub>2</sub>H<sub>5</sub>

*4-Hydroxy-3-aldehyde benzoic acid (I a)*

*p*-Hydroxy benzoic acid (3g.) and hexamine (12g.) were dissolved in glacial acetic acid (20 ml.) and heated on a boiling water-bath for six hours. Boiling hydrochloric acid (1:1, 30 c.c.) was then added and the heating continued for half-an-hour. The solution was diluted with water and left in refrigerator for 3-4 days. The aldehyde that separated out crystallised from dilute alcohol as pale yellow small prisms, m.p. 232-34°; yield 1g. (Found: C, 58.1; H, 3.7; C<sub>8</sub>H<sub>6</sub>O<sub>4</sub> requires C, 57.8; H, 3.6 per cent.)

*Ethyl-4-hydroxy-3 aldehyde benzoate (I b)* was prepared in the same way by the action of hexamine (12g.) on ethyl-*p*-hydroxy benzoate (3g.) in glacial acetic acid medium (20 ml.). It crystallised from hot water containing a few drops of alcohol as pale yellow long needles, m.p. 104-06°. Yield (1.1g.) (Found: C, 62.1; H, 5.2; C<sub>10</sub>H<sub>10</sub>O<sub>4</sub> requires C, 61.8; H, 5.1 per cent.) It gave a deep brown colour with ferric chloride and showed a sky-blue fluorescence in sodium carbonate solution. The 2, 4-dinitrophenyl hydrazone crystallised from glacial acetic acid and melted at 272-73°.

The ester, when hydrolysed by heating with dilute sodium hydroxide solution gave I a; m.p. 232-34° undepressed by sample obtained as above.

*Protocatechuic acid (II)*

4-Hydroxy benzoic acid-3-aldehyde (1g.)

was dissolved in sodium hydroxide (N. 10 ml.) and to the cooled yellow solution (10-15°), hydrogen peroxide (6 c.c., 6 per cent.) was added dropwise during the course of half-an-hour. It was then allowed to stand at room temperature for 3 hours with occasional shaking, acidified with dilute hydrochloric acid and the product crystallised from hot water, yield 0.8g., m.p. 194° undepressed by an authentic specimen of protocatechuic acid.

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Chemistry Dept.,  
Delhi University,  
Delhi-8, June 2, 1954.

V. K. AHLUWALIA.  
V. V. S. MURTI.

1. Duff and Bills, *J. Chem. Soc.*, 1932, 1987.
2. Seshadri and Thiruvengadam, *Proc. Ind. Acad. Sci.*, 1950, 32A, 25.

**THE ANATOMY AND MODE OF ACTION OF THE HEART OF FROG RANA TIGRINA DAUD.**

THE frog has formed the subject of a series of investigations since the beginning of modern Zoology. The European species *Rana esculanta* (Gaupp<sup>1</sup>) and *Rana temporaria* and the American species *Rana pipiens* (Holmes<sup>2</sup>) have been carefully investigated. The Indian species have not been properly worked out.

In the present study, the heart of *Rana tigrina* Daud. has been selected for detailed investigation. It is a type prescribed for study in the majority of the Indian and Pakistan Universities and also in other neighbouring countries. The study is likely to throw light on the age-old controversy about the distribution and circulation of blood in the heart and the *Truncus arteriosus*.

Some new facts noted are: (1) the arterial type of structure of pulmonary veins, (2) the presence of a new chamber, the *Recessus pulmonalis* (Sharma<sup>3</sup>), (3) the presence of valves between the anterior venae cavae and the *Sinus venosus*, (4) the extension of the *Septum atriorum* beyond the atrio-ventricular cavity into the ventricle and its attachment to valves, (5) the origin of the *Truncus arteriosus* from the *right dorsal* surface of the ventricle, (6) the division of the ventricular cavity into *five* spaces, (7) the origin and disposition of the valves, *four* and not three in number, at the opening of the ventricle into the pylangium, (8) the origin, disposition, and hinge-like attachment of the *spiral valve*, with its double hammer-headed top heavy head which addresses