

Southern Branch.

Tulane University, May 19, 1927.

3610

Cardiac Output as Influenced by Ephedrin, Homocamfin, Quinidine, Quinine, Chloral and Chloroform.

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Cardiac output per minute was determined in these experiments by the principle of Fick.¹ In most instances blood for analysis was obtained by right and left ventricular puncture, (see Bancroft, Boycott, Dunn and Peters,² and Marshall.³) In certain experiments, where chloroform was used, arterial blood was obtained from the femoral artery and venous blood through a cannula inserted into the right auricle through the external jugular vein, as suggested by Stewart⁴ for experimental determination of cardiac output.

In all but two groups of experiments determinations were made on trained unanesthetized dogs. Homocamfin and ephedrine effects were also studied in dogs whose circulation had been altered by chloral and by chloroform. Blood pressure was determined by means of sphygmomanometer and stethoscope, except in the chloroform experiments, where the carotid artery as well as the trachea was opened.

Chloral Hydrate: Eight observations were made of the effect of toxic doses on normal dogs. In six of these the output was increased by 17 to 81 per cent (average 58), blood pressure decreased an average of 32 per cent, heart rate increased an average of 35 per cent, oxygen consumption remained practically unchanged. In two experiments the output decreased 6 and 53 per cent. For this we can offer no explanation, for in subsequent observations with the same dosage the same dogs showed an increase of 44 and 81 per cent in output. Average changes are plotted as Curve 1 in the chart.

Quinidine: In two normal dogs large doses of this drug increased the output 24 and 36 per cent, blood pressure rose 11 and 28 per cent, heart rate increased 43 and 15 per cent, while the consumption of oxygen was practically unchanged in one and diminished by 17 per cent in the other. Averages are indicated by Curve 2.

Quinine: In one observation on a normal dog a large dose increased the output 40 per cent and the blood pressure 19 per cent, while heart rate and oxygen consumption were practically unchanged. (Curve 3.)

Homocamfin (Cyclosal) on Normal: In three experiments the output was decreased from 7 to 44 per cent (average 20), blood pressure increased 11 to 23 per cent (average 18), heart rate decreased moderately once and increased slightly twice, averaging an increase of 3 per cent, oxygen consumption increased twice and decreased once, averaging an increase of 2 per cent. (Curve 4.)

Ephedrin on Normal: In two experiments the output diminished 25 and 29 per cent, blood pressure increased 30 and 33 per cent, heart rate decreased 4 and 23 per cent, oxygen consumption increased 6 per cent in each instance. (Curve 5.)

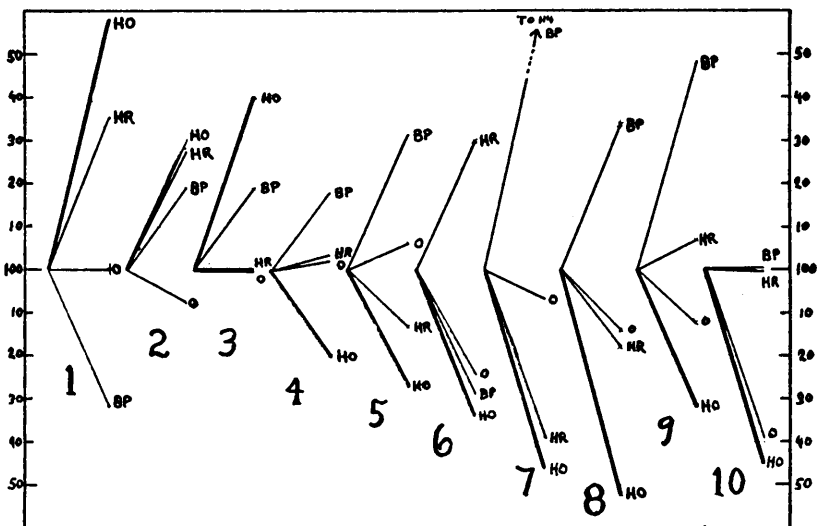


CHART 1.

Percentage Changes in Heart Output, Blood Pressure, Heart Rate, and Oxygen Consumption.

Curve 1: chloral hydrate on normal. Curve 2: quinidine on normal. Curve 3: quinine on normal. Curve 4: homocamfin on normal. Curve 5: ephedrin on normal. Curve 6: chloroform on normal. Curve 7: ephedrin following chloral hydrate. Curve 8: homocamfin following chloral hydrate. Curve 9: ephedrin following chloroform. Curve 10: homocamfin following chloroform.

Chloroform: In four experiments chloroform, in amounts not sufficient to induce muscular relaxation or abolition of reflexes, reduced the output 26 to 58 per cent (average 34), lowered blood pressure 23 to 33 per cent (average 29), increased heart rate 16 to 36 per cent (average 30); oxygen consumption was increased in one case 4 per cent, in all others reduced 20 to 45 per cent, averaging for all a reduction of 24 per cent. (Curve 6.) (This is in accord with the results of observations previously made by Blalock, as yet unpublished, but reported to us in a personal communication.)

Ephedrin after Choral: In three experiments in which choral had increased the heart output, ephedrin diminished the output 36 to 56 per cent (average 46), raised blood pressure 60 to 205 per cent (average 114), decreased the heart rate an average of 39 per cent and the oxygen consumption 6.5 per cent. (Curve 7.)

Homocamfin after Chloral: In four experiments in which the heart output had been increased by chloral, homocamfin diminished it 42 to 62 per cent (average 52), increased the blood pressure 18 to 42 per cent (average 34), decreased heart rate an average of 18 per cent, and decreased oxygen consumption an average of 14 per cent. (Curve 8.) In one experiment in which chloral had decreased the output 6 per cent, homocamfin increased it 28 per cent. In another in which chloral had decreased the output 53 per cent, homocamfin increased it 108 per cent.

Ephedrin after Chloroform: In three experiments in which the heart output had already been reduced by chloroform, ephedrin reduced it still further from 21 to 47 per cent (average 32), increased blood pressure 16 to 90 per cent (average 48), increased the heart rate twice and decreased it once, averaging an increase of 7 per cent; diminished oxygen consumption 6 to 20 per cent (average 12). (Curve 9.) In one experiment where the anesthesia was very light and the dog was constantly struggling, the heart output after ephedrin increased 42 per cent, although blood pressure and heart rate were increased as usual.

Homocamfin after Chloroform: In two experiments in which the heart output had been reduced by chloroform, homocamfin diminished it still further 43 and 50 per cent, while not changing blood pressure or heart rate materially, oxygen consumption decreased 36 and 44 per cent. (Curve 10.)

¹ Fick, *Sitzungsb. der phys. med. Gesellsch. zu Wurzburg*, 1870, xvi.

² Barcroft, Boycott, Dunn and Peters, *Quart. J. Med.*, 1919, xiii, 34.

³ Marshall, E. K., Jr., *Am. J. Physiol.*, 1926, lxxvii, 459.

⁴ Stewart, Crawford and Hastings, *J. Clin. Inv.*, 1926, iii, 435.