Rock is due to factors inherent in the follicles themselves, rather than to special endocrine or general metabolic peculiarities of the breed. (Two cases with a few mosaic, black and white feathers in Rhode Island Red grafts on White Leghorn hosts are as yet unexplained. Since both of the donors died young, the purity of their own plumage cannot be vouched for.)

4. In regard to sex characteristics, on the other hand, feathers produced on the graft follow the host rather than the donor. For example, skin from a Rhode Island Red male grafted on a White Leghorn female produces feathers similar to those of a Rhode Island Red hen. Stated briefly: Feathers produced by grafts follow the breed of the donor, but the sex of the host.

5. The rate of feathering, or age of appearance of pin-feathers, which varies with different breeds, is largely influenced by the donor. Rhode Island Red skin grafted on a Leghorn develops pin-feathers more slowly than does the skin of the more precocious host, while Leghorn skin on a Rhode Island Red or Plymouth Rock produces pin-feathers earlier than the host.

[1] Especially Cole, Crew, Domm, Goodale, Morgan, Pezard, Riddle, Torrey and Horning. There is a good summary of the literature in the paper by L. V. Domm, *J. Exp. Zool.*, 1927, xlviii, 15-173; and also in the paper by Frank R. Lillie, *ibid.*, 175-196.

3701

A Formula Expressing a General Relationship Between Blood Pressure and Body Weight.

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The question of a relationship between body weight and blood pressure may be studied from the findings in large numbers of individuals of various sizes essentially normal, particularly as regards the cardiovascular system and nutritional status. Children afford the best material for such a study. In them a large range of body size is available, and arterial disease is so rare that in group studies it can safely be disregarded as a disturbing factor. Satisfactory tables of normal weight or height are at hand for the exclusion of nutritionally unsuitable cases. By utilizing group averages the effects of temporary or accidental variations in pressure, of observational error, and of individual variations in body structure or composition can all be minimized.

The following study is based on observations of about 1,000 approximately normal children, between 4 and 16 years of age, mainly from kindergartens and public schools. By plotting individual blood pressures against body weights* it was found that the points of intersection roughly followed a curve of general parabolic form. Dividing the cases into twelve groups by age (without reference to sex) average weights and corresponding systolic and diastolic pressures for each group were determined, with the results shown in Table I. The logarithms of weight when plotted against the logarithms of pressure followed an approximately straight line, from which it was inferred that the relationship between weight and pressure could be expressed by the general formula $y=ax^b$, or $S/D=aW^b$. Solving for the six pairs and averaging, the following values for b were found: $b_S=0.2055$, $b_D=0.1900$. Assuming a uniform value of 0.2 for b, the average for the constant a was found to be $a_S=51.725$, or approximately 51.7, $a_D=34.730$, or approximately 34.7. The formulas derived for systolic pressure and diastolic pressure are therefore $S=51.7\ W^{0.2}$, $D=34.7\ W^{0.2}$, and by difference $P=17.0\ W^{0.2}$, in which S is systolic pressure, D is diastolic pressure, P is pulse pressure, all in millimeters of mercury; and W is body weight in kilograms.

The actual findings (group averages) of pressure are compared in the following table with the pressures calculated from body weights.

TABLE I.

Weight	Systolic pressure				Diastolic pressure			
	Found	Calc.	Difference		Found	Calc.	Difference	
Kg.	mm.	mm.	mm.	%	mm.	mm.	mm.	%
19.5	92.5	93.7	—0.8	0.9	62.5	62.9	—0.4	0.6
20.5	94.5	94.7	—0.2	0.2	64.0	63.5	+0.5	0.8
23.0	97.0	96.9	+0.1	0.1	65.5	65.0	+0.5	0.8
25.0	99.0	98.5	+0.5	0.5	67.0	66.1	+0.9	1.3
27.5	101.0	100.4	+0.6	0.6	68.0	67.4	+0.6	0.9
29.5	102.5	101.8	+0.7	0.6	69.5	68.3	+1.2	1.7
33.0	104.0	104.2	—0.2	0.1	70.0	69.9	+0.1	0.1
37.0	106.0	106.5	—0.5	0.3	71.0	71.5	—0.5	0.7
40.0	107.5	107.1	+0.4	0.2	72.0	72.7	—0.7	1.0
43.5	110.0	110.1	—0.1	0.1	73.0	73.9	—0.9	1.2
46.5	112.0	111.5	+0.5	0.4	75.0	74.9	+0.1	0.1
53.0	115.0	114.5	+0.5	0.3	76.0	76.9	—0.9	1.2
Average			±0.43	0.36			±0.61	0.87

In the following table the expected pressures are calculated for a wider range of body weight.

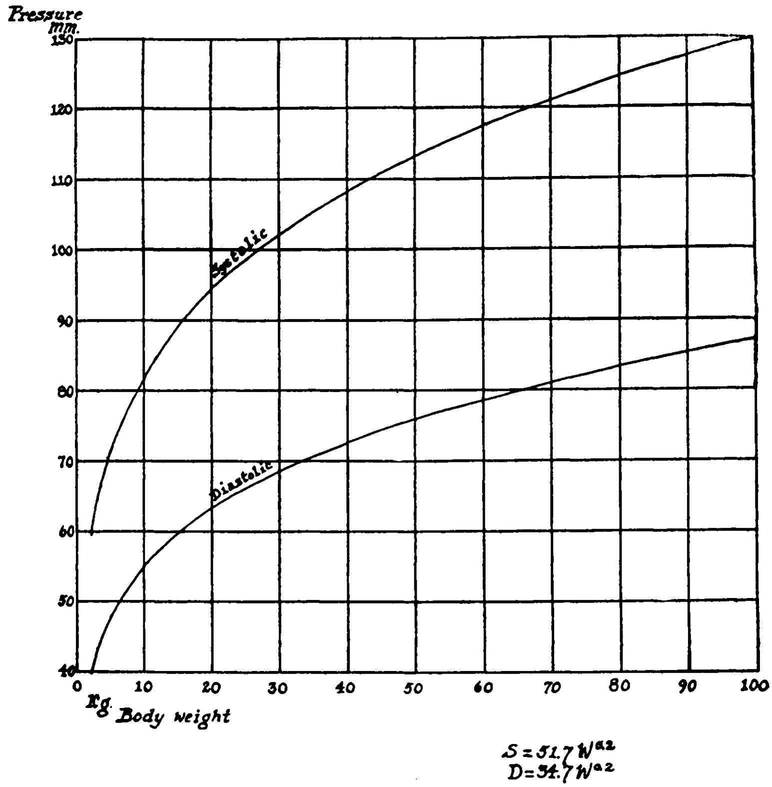
* The children were weighed clothed, but with coats and shoes removed.

TABLE II.

Weight	Systolic pressure	Diastolic pressure
kg.	mm.	mm.
2.0	59.5	39.9
3.0	64.5	43.3
3.5	66.5	44.6
4.0	68.3	45.8
5.0	71.4	47.9
10.0	82.0	55.0
20.0	94.5	63.5
30.0	102.2	68.6
40.0	108.2	72.6
50.0	113.2	75.9
60.0	117.3	78.7
70.0	121.0	81.2
80.0	124.3	83.5
90.0	127.3	85.4
100.0	130.0	87.2

The curves of the formulas are given in the accompanying graph.

Averages from the literature of some 25 observations of blood pressure in newborn infants (unfortunately nearly all by the pal-



patory method) gave a systolic pressure of 65.2 mm., and (from a smaller number of observations) a diastolic pressure of 41.6 mm. Since average birth weight is approximately 3.5 kg., the calculated pressures from the formula in newborn infants would be 66.5 mm. systolic and 44.6 mm. diastolic. The approximate average pressures in healthy adults of 70 kg. average weight are generally accepted as being 120 systolic and 80 diastolic. These are to be compared with 121.0 mm. and 81.2 mm. by the formula. The formula calls for 130 mm. systolic and 87.2 mm. diastolic at 100 kg. weight, but I have no normal data for comparison at this weight. It should be repeated that the formula postulates an average normal amount of body fat as essential to the correctness of the factors modifying body weight.

Until the normal variation has been determined the practical value of the formula as a standard of normal blood pressure in individual applications is unknown. At present it is offered merely as an expression of a general trend.

3702

Allergy Response to Tuberculosis in Guinea-Pigs Previously Treated with Tuberculin Fractions and Toxin Filtrates.

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The basis of these experiments is a study of the so-called Koch phenomenon elaborated by Krause[1] on allergy in experimental tuberculosis. The early anatomical response of the tissues of a susceptible animal inoculated for the first time with tubercle bacilli differs from that of a reinfection. In the susceptible guinea-pig a well circumscribed nodular tubercle will develop slowly after a week or more, without any of the signs of inflammation. Only later, after 3 or more weeks, does redness appear around the tubercle, associated with changes that are indicative of a progressive lesion. At this stage the animal has become allergic, *i. e.,* it begins to react in a new way because of the changes set up in the body by the tubercle bacilli. The susceptibility of the animal has been altered. If such an animal now receives an intracutaneous inoculation of tubercle bacilli, the response by the tissue is rapid and local inflammation occurs. In-