

when $t = \infty$, these equations can be integrated to give

$$-\ln\left(l - \frac{x}{x_\infty}\right) = R\left(\frac{a+b}{ab}\right)t.$$

Thus the shape of the x, t - curve is given exactly by simple theory, and is independent of the form of R ; whether the reaction is uni-, bi-, or termolecular, or something more complicated, the x, t - curve is that for a reversible unimolecular reaction.

The reason for this particularly simple result is, of course, that the composition of the reacting mixture remains chemically unchanged throughout the

reaction, so that we get $k \frac{x}{a} f(a)\varphi(b)$ instead of $k f\left(\frac{x}{a}\right)\varphi(b)$

for the rate of the forward reaction, and a similar expression for the rate of the backward reaction. By changing a and b we can, of course, determine $f(a)$ and $\varphi(b)$, that is, determine the order of the reaction.

H. A. C. MCKAY.

(Beit Scientific Research Fellow.)

Imperial College of Science and Technology,

London, S.W.7.

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Manifold Effects of Male and Female Sex Hormones in both Sexes

IN our previous experiments¹ the hormones were usually injected into gonadectomized rats for a period of 21-23 days. This comparatively short treatment produced definite effects on the non-sexual organs (except spleen) of males, but the effects were less evident or absent in most of these organs in females.

In the present experiments, 91 castrated and 88 ovariectomized rats have been injected for a period of 2½ to 4 months with the following hormones and doses (per week): androsterone 7.5 mgm.; trans-dehydroandrosterone 7.5 mgm.; testosterone propionate 0.75-7.5 mgm.; and (in males only) testosterone 0.75-7.5 mgm., alone or simultaneously with oestradiol dipropionate, 0.018-0.200 mgm., our usual experimental technique being used¹.

The effects obtained on the organs investigated were very similar in males and females, varying as a rule only in degree. The accompanying table containing, for the sake of economy of space, the average weights of some organs only, gives examples of the changes observed in females.

Hormone injected		Actual weights of organs			
Male hormone (mgm. per week)	Oestradiol dipropionate (mgm.) per wk.	Hypophysis (mgm.)	Liver (gm.)	Heart (mgm.)	Gain in body wt. (gm.)
None (control rats) ..	none	11.9	8.31	737	165
None	0.090	98.0	7.61	623	73
None	0.200	132.2	6.77	596	13
Androsterone, 7.5 ..	none	10.8	11.39	928	199
Androsterone, 7.5 ..	0.090	48.0	8.96	723	112
Testosterone prop., 2.25	none	10.9	10.42	935	139
Testosterone prop., 2.25	0.200	60.2	7.91	621	64

Some important conclusions are obvious from the data given in this table and from the other results (not given here) obtained with females and males.

(1) While oestrogens produce *stunted growth* and decreased *fat deposition*, with the male hormones this depressing effect is absent or (with large doses of testosterone propionate) slight.

(2) Moreover, this depressing effect of oestrogens is to some extent neutralized by the simultaneous injections of male hormones (except dehydroandrosterone), thus indicating some antagonistic relation between oestrogens and male hormones (see table).

(3) Both male and female hormones accelerate the physiological involution of the *thymus*, having a co-operative effect on this organ, when injected simultaneously.

(4) The male hormones have a definite effect on *adrenals* in males, causing the hypertrophied 'castration' glands to return to or towards normal. The histological changes which occur have been discussed elsewhere (Hall and Korenchevsky²). Simultaneous injections with oestrogens in most cases prevent this restorative effect on size and weight of adrenals. In females, similar results have been obtained with androsterone, but the effects of the other hormones and of ovariectomy were indefinite.

(5) While male hormones do not produce any considerable change in weight of the *hypophysis*, certain doses of oestrogens cause a tumour-like hyperplasia of the gland (see table). When injected simultaneously, male hormones neutralize to a considerable extent (in one male rat almost to normal—14 mgm.) this hyperplastic effect of oestrogens both in males and (see table) in females. This is another important case of antagonistic relations between male and female hormones.

(6) Slight hypertrophy of *liver, kidneys, heart* and *spleen* in gonadectomized animals is produced by male hormones, while oestrogens cause either a decrease in their actual weight or no change (kidneys). This effect of oestrogens is in some organs partly dependent on the body weight, which relation, suggesting a possible stimulating effect on the kidneys, will be discussed elsewhere. When injected simultaneously the effect of male hormones on the actual weights of these organs is antagonistic to, and to some extent neutralizes, that of oestrogens in both sexes (see table).

The data presented (1) confirm a definition, previously given³, of gonadal hormones as not merely sex hormones, but as hormones also possessing manifold important effects on non-sexual organs; (2) show the co-operative and antagonistic interrelations between male and female hormones, supplementing similar results previously obtained¹ on sexual organs.

V. KORENCHEVSKY.

K. HALL.

Lister Institute of Preventive Medicine,

London.

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¹ See references: Korenchevsky, V., *Brit. Med. J.*, ii, 896 (1937).

² Hall, K., and Korenchevsky, V., *J. Physiol.*, 91, 365 (1938).

³ Korenchevsky, V., and Dennison, M., *J. Path. and Bact.*, 38, 231 (1934).

Antarctica and Glacial Ages

IN NATURE of September 17 there is an interesting discussion between Rev. W. S. Fleming and Prof. E. W. MacBride in regard to the Gondwana flora and glaciation in Antarctica in Permo-carboniferous times which requires some comment. Referring to the Permo-carboniferous ice age, Prof. MacBride suggests that a vast Gondwana continent in temperate parts of the southern hemisphere drifted south across the south pole, Australia and Antarctica, which lay at its north edge, being left behind in temperate