Table 2. A COMPARISON OF INDOLEACETIC ACID (IAA), INDOLEGLYCOLLIC ACID (IGA) AND INDOLEPYRUVIC ACID (IPA) ON GROWTH BY THE USE OF THE *Avena* CURVATURE TEST

Compound	Conc. (molarity)	Degrees curv.
IAA	$5{\cdot}71 \times 10^{-7}$	23
IAA	$2{\cdot}85 \times 10^{-7}$	13
IAA	$1{\cdot}42 \times 10^{-7}$	0
IGA	$5{\cdot}23 \times 10^{-6}$	0
IGA	$5{\cdot}23 \times 10^{-7}$	0
IGA	$5{\cdot}23 \times 10^{-8}$	0
IPA	$5{\cdot}15 \times 10^{-6}$ *	15
IPA	$5{\cdot}15 \times 10^{-6}$ †	15
IPA	$5{\cdot}15 \times 10^{-7}$ *	0
IPA	$5{\cdot}15 \times 10^{-7}$ †	0
IPA	$5{\cdot}15 \times 10^{-8}$ *	0

* Indolepyruvic acid put directly into hot agar.
† Agar blocks soaked in buffer containing indolepyruvic acid.

no other factors which caused growth of *Avena* first internodes or curvature of *Avena* coleoptiles. Therefore, it may be concluded that indoleacetic acid is the only biologically active spot on the indolepyruvic acid chromatogram, developed in a basic solvent, and by analogy spot *D* is indoleglycollic acid.

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PHYSIOLOGY

Effect of Thyroid Deficiency in the Ewe on Lamb Viability

THE importance of normal thyroid function in maintaining pregnancy in women has been known for some time, and thyroid medication in some cases of threatened abortion has proved successful[1,2].

Investigations of the role of the thyroid gland during pregnancy in domestic animals have given conflicting results, the most recent reporting both healthy and weak lambs from thyroidectomized ewes[3]. The ability of thyroid remnants to regenerate into normal active tissue, and also the possibility of supernumerary thyroid tissue, always casts some doubt on the actual total absence of thyroid tissue in surgically thyroidectomized ewes.

In the present investigation, 12 ewes were subjected to a sham operation in which the thyroid was left in place, and a further 12 ewes were thyroidectomized. After oestrous cycles had been recorded in both groups for several months[4], the ewes were mated and pregnancy was allowed to proceed to parturition. During pregnancy ^{131}I-uptake was determined to detect any residual thyroid tissue. A month after parturition the thyroidectomized ewes suffered severely during cold weather and 3 died and were examined *post mortem*. Later in the winter of 1962 (southern hemisphere) a further 4 thyroidectomized ewes died of general debility and infection. The remainder were slaughtered and all were thoroughly examined *post mortem*. Only one sham-operated ewe died during this period.

The results of the *post mortem* investigations of thyroid tissue, and the lambing and lamb viability data are given in Table 1.

It is apparent from these results that thyroid deficiency in the ewe has severely reduced both the pre- and post-natal viability of the lambs, despite the presence of an apparently adequate thyroid in the lamb itself; $0{\cdot}59 \pm 0{\cdot}15$ g as compared with $0{\cdot}53 \pm 0{\cdot}19$ g in lambs from sham-operated ewes.

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Evidence that Calcium activates the Contraction of Actomyosin by overcoming Substrate Inhibition

IT is believed that muscle contracts or relaxes depending on the concentration of calcium in the sarcoplasm: when the concentration rises to some required level the muscle contracts; when it falls below this level the muscle relaxes[1-4]. The sarcoplasmic reticulum, which can take up calcium actively, seems to play a major part in controlling the level of calcium available to the contractile protein[5-7].

Actomyosin, isolated from muscle as a gel, retains some of its contractile properties. When exposed to ATP and magnesium the translucent gel shrinks and becomes more dense and opaque—it 'superprecipitates'[8]. Superprecipitation, like muscular contraction, seems to need trace amounts of calcium.

However, the need for calcium in superprecipitation is apparent only at high concentrations of ATP. At low concentrations of ATP, some superprecipitation has been observed even in the presence of ethylene glycol *bis* (-amino-ethylether)-N,N^1-tetraacetic acid (EGTA), which chelates most of the calcium[9,10]. On this basis, Weber and Herz expressed the view that calcium is probably not a direct reactant in superprecipitation[9,10]. Our results support this conclusion, and show that calcium activates superprecipitation at high concentrations of Mg-ATP by inactivating an inhibitory reaction between Mg-ATP and the protein.

Superprecipitation has been measured as a decrease in protein volume, determined after centrifugation. This method is slow and is not able to give continuous measurements of a single fast reaction. A better method measures the process as an increase in optical density[11]. The procedure described briefly in the legend of Fig. 1 and in detail elsewhere[12] is rapid and reproducible; it records automatically and continuously the increase in optical density of an actomyosin suspension.

Calcium had two different effects on superprecipitation, depending on the concentration of ATP. At low concentrations of ATP, calcium decreased the extent of superprecipitation. At high concentrations of ATP, calcium

Table 1. LAMBING DATA FROM THYROIDECTOMIZED AND SHAM-OPERATED EWES

	No. of ewes	No. of lambs	Lambs dead at birth	Lambs dying within one week	Lambs surviving	Average weight of lambs (kg)
Thyroidectomized ewes lacking thyroid tissue	9	6	4	2	–	$2{\cdot}3 \pm 0{\cdot}2$*
Thyroidectomized ewes with regenerated thyroid tissue	3	4	2	–	2	$2{\cdot}3 \pm 0{\cdot}4$
Sham-operated ewes	12	8	–	1	7	$2{\cdot}5 \pm 0{\cdot}3$

* Average weight does not include the weights of two prematurely aborted lambs.