may also contain an amorphous precipitate, or one of these with a glass. If a glass be present, it must have been fluid at the temperature of the run, for the glass conforms to the bottom of the chamber and has a flat surface which is substantially horizontal. Such a condition, which implies two liquid phases co-existing at elevated temperature, was observed at the Naval Research Laboratory (*2*). In many of the runs made at the Brush Development Company the presence of a solid glass around chunks of undissolved silica implies that a dynamic condition has been arrested: the silica is on its way into solution, and a heavy concentration of alkaline and silicic components on the bottom results from the slowness of the diffusion.

Several kinds of silica are available from which to choose a supply to nourish the growing crystal. Quartz and vitreous silica are of particular interest, since quartz is the stable crystalline form at room temperature, whereas vitreous silica is the undercooled fluid. From the relative latent heats of fusion of quartz and cristobalite (3.1 and 1.0 kcal/mol, respectively) (*7*) a modification of Clapeyron's equation[2] demonstrates that the relative solubility at the same temperature should be of the order of magnitude of 1: 22, and vitreous silica, having a higher degree of instability at room temperature than cristobalite, should show a still higher solubility. Nacken, as reported in documents referred to previously, found the solubility of the vitreous form to be about 10-fold that of quartz, the solvent being water under its own vapor pressure at about 360° C.

This difference in solubility makes the isothermal technique attractive, and Nacken and others (e.g. *1, 10*) have experimented with it. The vitreous silica goes into solution at its own surface; oriented silica molecules deposit on the surface of the crystal. The difficulties of arranging special thermal conditions or slow evaporation do not have to be considered.

Vitreous silica in hot alkaline solution has the bad habit—from the experimenter's point of view—of devitrifying unless it can go completely into solution. This long-known phenomenon (*6*) has been especially puzzling, since the end-product has been reported at different times as cristobalite and as quartz (*10*). The alteration of form, and therefore of solubility, adds complexity to the isothermal growing system, and the high solubility carries with it the danger that the solution may become so supersaturated with respect to the crystalline quartz that it lies in the "labile state" (*5, 9*), in which event microscopic bits of solid impurities or microscopic sharp edges on the walls of the vessel and elsewhere act as nuclei upon which quartz will begin to deposit.

The controlled growing of quartz may be expected to yield economies of time and material in the process of converting crystals into oscillator-plate blanks. Grade I quartz crystals are always a small percentage of the weight taken from the mines because of the prevalence of flaws and inclusions. A large cutting loss occurs because the clear stones are usually more or less twinned, optically or electrically or both, and the oscillator plates must be cut from an untwinning region. The use of untwinned seeds of specially chosen size and orientation is expected to yield synthetic crystals which can be cut into blanks with a reduction of the usual loss by about one-fifth.

[2] This is essentially the freezing-point relationship, rigorously true only for dilute solutions obeying Raoult's Law; for example, see reference *3*.

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Effect of Diethylstilbestrol on the Thyroid Glands of Chicks Receiving Thiouracil

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Thiourea, thiouracil, and related compounds are known to inhibit the secretion of thyroxin. Then, in response to the thyrotropic hormone of the anterior pituitary gland, the thyroid gland becomes hypertrophied and hyperplastic (*1, 3, 4*). Studies with radioactive iodine have shown that thiouracil prevents the thyroid gland from utilizing iodine to form thyroxin (*2*). The lighter-weight breeds of chickens, such as the Leghorns, give a greater thyroid response to thiouracil than do the heavier breeds, and the females of several varieties (Buff Minorcas, White Leghorns, New Hampshire Reds, and Buff Orpingtons) develop much larger thyroids than do the males (*4*).

This sex difference in the response of the male and female thyroid gland to thiouracil suggested the possibility that a gonadotropic hormone might influence the effects of the drug. For this purpose the synthetic estrogen-like hormone, diethylstilbestrol, was used.

Sixty one-week-old New Hampshire Red chicks were divided into four groups of 15 chicks each: Group C was the control group; Group S received stilbestrol; Group T received thiouracil; and Group TS received both thiouracil and stilbestrol. The chicks were kept in the same brooder and fed a 16% protein growing mash. The

drugs were given orally in pill form with the help of a little water from a medicine dropper whenever it was necessary to aid the chick in swallowing. The thiouracil was administered every day in a dosage of a .1-gm pill. When the body weight attained 100 gm, the dosage was increased by an additional .1 gm for each additional 100 gm of body weight. The stilbestrol was given every fourth day in .1-mg pills, and the dosage was increased in amount by .1 mg for each 100-gm increase in body weight.

The chickens were autopsied on the 23rd, 43rd, and 81st days of the experiment. Medication was stopped on the 43rd day; therefore, the birds that were autopsied on the 81st day had received the drugs for a period of 43 days, which was then followed by 38 days of recovery.

Fig. 1 shows the growth curves of the four groups of males and females. The chickens in the two groups receiving thiouracil and thiouracil plus stilbestrol ate less food, were much lighter in body weight, drank a great deal more water, had fewer and lighter-colored feathers, and were much more difficult to recognize as to their sex than the control and stilbestrol groups. In both the females and males, those receiving thiouracil and thiouracil plus stilbestrol made a marked increase in growth following the 7th week, when the drugs were discontinued.

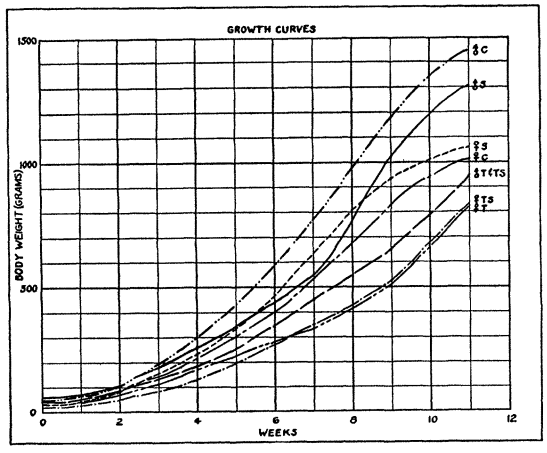

FIG. 1

Table 1 makes a comparison between control and experimental groups for both females and males on the three different days of autopsy. In each case the average weights of the thyroid glands in grams/kilogram of average body weight of the controls is taken as the standard for comparison. Thus, for the females (upper half of Table 1), on the 23rd day the weight of the thyroid glands/kilogram of body weight of the thiouracil-fed animals was 1.16 times that of the controls, and the ratio for the thiouracil plus stilbestrol group was 3.80 times that of the controls. On the 43rd day the thyroids of the T and the TS groups were 10 and 9 times heavier, respectively, than those of the control females. The third column (43 days of medication and 38 days of recovery) shows that the ratio of the weights of the thyroid glands to the body weight was 4.47 for the T group and 2.7 for the TS group, compared with the controls. This suggests a greater recovery in the females when stilbestrol is administered along with the thiouracil than when thiouracil is given alone.

TABLE 1

Ratio of ♀ thyroids (gm/1,000 gm of body weight)

	23 days	43 days	81 days (43 + 38)
Controls	1.0	1.0	1.0
Stilbestrol ...	0.65	0.9	1.03
Thiouracil ...	1.16	10.0	4.47
Thiouracil & Stilbestrol .	3.80	9.0	2.70

Ratio of ♂ thyroids (gm/1,000 gm of body weight)

	23 days	43 days	81 days (43 + 38)
Controls	1.0	1.0	1.0
Stilbestrol ...	1.1	1.5	1.5
Thiouracil ...	3.6	16.0	1.4
Thiouracil & Stilbestrol .	7.2	15.0	1.4

The lower half of Table 1 makes similar comparisons for the males. It should be noted that on the 81st day the experimental males showed a complete return to the normal ratio of grams of thyroid/kilograms of body weight.

We are unable to account for the observation that the ratio of the weight of the thyroids to body weight in the chicks receiving the stilbestrol with thiouracil were, on the 23rd day, three times as heavy in the females and twice as heavy in the males as in those which received thiouracil alone—especially so, since the relative weights of the thyroids of the animals receiving stilbestrol alone were in all cases approximately the same as those for the controls (*i.e.* 0.65, 0.9, and 1.03 for the females; and 1.1, 1.5, and 1.5 for the males).

Administration of diethylstilbestrol to chicks that received thiouracil for 43 consecutive days had no effect upon the weight of the thyroids/kilogram of body weight. Following the withdrawal of the thiouracil, either with or without stilbestrol, the males recovered completely. In the females there was a lag in the recovery from the effects of the thiouracil, and those that had received stilbestrol in addition showed a slightly greater recovery than those that had not.

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