Growth experiments were conducted in U-shaped and cylindrical tubes with a fritted disk as reported earlier[7]. 2 different temperatures (25 and 45 °C) and 2 ionic concentrations (1% ammonium carbonate, 0.65% calcium chloride, and a 5fold of these concentrations) were tested. The effect of 0.037% formaldehyde solution in the gel medium on the growth of calcite was also evaluated.

All experiments were conducted in the dark, some at 25 °C for 3 weeks and others at 45 °C for 3 days. The crystal deposits were separated from the growth medium and washed with anhydrous ethylenediamine, dried, and prepared for electron microscopic scanning. The figure shows the remarkable variation in the crystal habit and their packing characteristics under various growth conditions. The crystals were identified as calcite by infrared spectroscopy and differential thermal analysis.

With the U-tube method in which the calcium and carbonate ions diffuse against each other across a 5.5% gelatin-gel, calcium carbonate crystals grew in a well-defined zone as trigonal single crystals of calcite but only at high ionic concentrations at 25 °C (figure, *A*). However, with the cylindrical tube method involving a 20% gelatin-gel, single calcite crystals with a completely different morphology were produced using low ionic concentrations at 45 °C (figure, *B*). No polymorphic transition to the less stable aragonite or vaterite was noticed. When a 5.5% gelatin-gel at 25 °C was employed in the cylindrical tubes, the growth behavior of crystals was different from that observed in the U-tubes. For example, the crystals occurred in the upper portion of the gelatin-gel, at the interface between the gelatin-gel and the calcium chloride solution, and also within the calcium chloride solution. Unlike in the U-tube experiments, there was no well-defined crystallization zone. The appearance of different crystallization zones in the cylindrical tubes may be attributed particularly to the diffusion rate of the carbonate ions during the growth process. Obviously, different equilibrium positions with different growth rates are established.

At either low or high ionic concentrations, with or without formaldehyde, calcium carbonate precipitated as mechanically interlocking single crystals, closely packed in a repeated pattern at the gel-solution interface and inside the solution itself (figure, *C*). However, at high ionic concentrations, in the presence of formaldehyde, additional crystals were observed which were polycrystalline aggregates. These aggregates consisted of sharply terminated single crystals, packed together in a specific orientation (figure, *D*). At high ionic concentrations, but in absence of formaldehyde, highly organized structures were formed similar to natural concretions and with distinct morphological characteristics of circular ridges and reticulated surfaces, rather than sharp angles (figure, *E* and *F*).

These observations are consistent with our previous results[7] and imply that the organic gel and the environmental conditions control the evolution of the crystal habit and the pattern of aggregates.

The nucleation of calcite appears to be determined entirely by the nature of the gel substrate which provides limited sites for nucleation. Other variables, such as diffusion fluctuation depending on ionic concentrations and additives, exert a fine kinetic control on the geometry of the packing, the morphology of the building units and the macroscopic surface characteristics of the crystallites. Formaldehyde not only modifies the gel structure, but it also appears to influence the macroscopic surface of individual crystallites. By selective interfacial absorption on particular crystallographic faces, it produces polycrystalline aggregates with well-defined faces and sharp edges. On the other hand, the absence of formaldehyde apparently provides favorable conditions for the solute-solvent reaction on the crystal surface. The 2 opposite processes of dissolution and precipitation change the topography of the surface and produce structures with more rounded edges and ridged surfaces which resemble certain chambered tests of foraminifera.

The in vitro growth of organized calcite concretions simulating natural concretions may prove to be important in helping elucidate the problem of shell formation in nature. With further information on marine environment and through specially designed model experiments approximating natural conditions, distinct progress can be made in the understanding of biomineralization.

Effect of adrenalectomy and dexamethasone treatment on the monoamine oxidase activity in the thyroid gland of the rat

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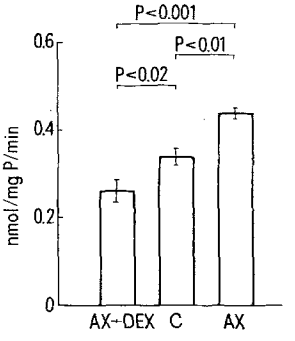
Summary. Adrenalectomy increased MAO activity in the thyroid gland of rats. The administration (200 µg/100 g daily for 7 days) to adrenalectomized rats decreased MAO activity below levels of intact controls.

Monoamine oxidase (MAO, E.C. 1.4.3.4) has been found in thyroid gland[1]. This enzyme may participate in the synthesis of thyroid hormones, because one of the products of the reaction catalyzed by MAO is hydrogen peroxide. Yet H_2O_2 together with an unknown enzymatic system in the thyroid gland is needed for oxidation of iodide to a more reactive state (I^+)[2]. Parvez et al.[3] and others[4,5] have found that corticosteroids play an important role in the regulation of the activity of MAO. This effect of corticosteroids has been studied in various tissues of several animal species, and different responses to the hormone were found depending on the organs studied. In this paper the MAO activity in the thyroid gland of adult adrenalectomized rats and the effect of dexamethasone administration on this activity is reported.

Materials and methods. Wistar albino male rats weighing approximately 250 g were used. Adrenalectomy was performed under ether anesthesia, and, to these animals, drinking water was replaced by 0.9% saline. One group of adrenalectomized rats was injected with 200 µg of dexamethasone i.p. per 100 g b.wt. during the last 7 days. Completeness of adrenalectomy was verified by inspection of the abdominal cavity. Thyroids were removed, placed

into ice-cold 0.25 moles sucrose and homogenized in a glass-Contes homogenizer. We used the assay for MAO decribed by Wurtman and Axelrod[6]. The incubation mixture consisted of 25 µl tryptamine C^{14} (6.25 nmoles, specific activity 2.7 mCi/mmole, Radiochemical Centre Amersham) 250 µl 0.1 moles potassium phosphate buffer (pH 7.4) and 25 µl of 2% tissue homogenate. The mixture for enzyme assay was incubated in a water bath at 37 °C for 20 min. The reaction was stopped by adding 0.2 ml of 2 N HCl, and the radioactive products were extracted into 10 ml of toluene. 4 ml samples of toluene extract were measured for radioactivity in 10 ml of Bray's solution by a Packard scintillation counter. Triplicate determinations and 2 series of experiments were performed.



MAO activity as C^{14}-indolacetic acid production in 0.5 mg thyroid incubated for 20 min. *AX* Adrenalectomy, *C* controls, *AX + DEX* adrenalectomized + dexamethasone treatment. Means of 10 values ± SE (results of experiments 1 and 2 were pooled). The statistical significance was calculated by the Student t-test.

Results. The activity of MAO in the thyroid gland is shown in the figure. In the adrenalectomized rats, the activity was significantly higher than in controls ($p < 0.01$). The administration of dexamethasone to adrenalectomized rats not only inhibited this increase in MAO activity, but depressed this activity well below levels found in intact controls. The differences are statistically significant.

Discussion. The data of the present study show that MAO activity in the thyroid gland is strongly influenced both by adrenalectomy and dexamethasone treatment. The effect of adrenalectomy is consistent with that on other organs, such as liver and in the heart[4, 6], where significant increases in MAO activity were found. Moreover dexamethasone administration to adrenalectomized rats decreased enzyme activity as compared to controls or adrenalectomized rats. Its increase in adrenalectomized rats, and its depression after dexamethasone, support the finding that corticosteroids which have been found to stimulate some of thyroid functions may do it through influencing MAO activity in the thyroid gland.

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Comparison of the production rates of bacteria in the rumen estimated by using labelled live and formaldehyde treated mixed bacterial cells

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Summary. The bacteria production rates in the rumen have been estimated by injecting ^{14}C- and ^{35}S-labelled mixed rumen bacteria, either live or killed by treatment with formaldehyde, into the rumen and applying isotope dilution technique. The rate of bacteria production when estimated by using either live- or dead-(protected-)labelled bacterial cells were comparable.

An experimental approach was described for the measurements of bacteria and protozoa production rates in the rumen by isotope dilution technique using ^{35}S- and ^{14}C-labelled mixed cells[1–5] and ^{14}C-Streptococcus bovis[6]. In this paper ^{14}C- or ^{35}S-labelled mixed bacterial cells of rumen origin, treated with formaldehyde to protect their being metabolized in the rumen, were used to estimate bacteria production in the rumen, and comparison was made of the growth obtained by injecting labelled mixed rumen bacterial cells used earlier[4].

Materials and methods. Animals and feeding regime. 3 male Murrah buffalo (Bos bubalis) of about $2^1/_2$ years of age with permanent rumen cannulae were used in these experiments. 2 sets of experiments were done. In the first set of experiments each animal was offered 15–20 kg green chopped maize daily and in the second set 35–40 kg berseem (Trifolium alexandrinum) was fed to each animal. The residue was weighed daily to assess their intake. The animals were kept on a pre-experimental feeding period of 4 weeks during which they received their ration once daily, and thereafter the animals received their daily ration in 12 equal amounts at 2-h-intervals for a period of 3 weeks. The residue, if any, at the end of each 2-h-interval was removed and weighed. The samples of feed offered and of residue were collected daily for analysis.

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