compounds. Stimulation-induced release, however, was significantly reduced (Fig. 1). When other monovalent cations (cesium, rubidium, choline, or tetramethylammonium, all 2.4 meq/liter) were substituted for lithium in the perfusion medium, no differences in spontaneous or evoked release could be demonstrated. Stimulation-induced amine release from brains of rats treated with lithium in vivo intraperitoneally for 3 days (2.5 or 7.5 meq/kg) was also significantly diminished (Fig. 2). This diminution was more marked in rats that had received the higher dose.

Schildkraut *et al.* (*4*) found that lithium (1.2 meq/kg) alters the metabolism of intracisternally injected H^3-norepinephrine. There was a decrease in *O*-methylated metabolites and a concomitant increase in deaminated metabolites, suggesting that less norepinephrine was released in active form. Corrodi *et al.* (*5*), using higher doses of lithium (2.5 to 15 meq/kg), reported that prior treatment with this ion enhanced the decrease in brain norepinephrine induced by an inhibition of tyrosine hydroxylase. We have found that lithium treatment, both in vivo and in vitro at concentration of 2.4 meq/liter (a concentration comparable to that found in the brain 8 hours after intraperitoneal injection of 7.5 meq/kg), diminishes electrically induced release of both H^3-norepinephrine and H^3-serotonin from brain slices previously incubated with these amines.

These results are not in conflict. Acceleration of norepinephrine turnover, suggested by the results reported by Corrodi *et al.* (*5*), may be a consequence of increased intraneuronal destruction by monoamine oxidase. The findings of Schildkraut *et al.* (*4*) support the view that destruction by monoamine oxidase is enhanced, and our results indicate that amine release is diminished. Since newly synthesized norepinephrine is preferentially released (*12*), turnover rates may reflect primarily intraneuronal metabolism. Turnover is therefore not equivalent to synthesis (*13*), and a decrease in release could be accompanied by an increase in intraneuronal metabolism and turnover.

The ability of lithium to inhibit monoamine release from brain slices is consistent with the changes in amine metabolism previously reported and provides further support for the hypothesis that abnormal monoamine metabolism attends certain affective disorders. The effect of lithium on more than one potential neurotransmitter may account in part for the multiple psychopharmacologic actions of this agent.

RICHARD I. KATZ
THOMAS N. CHASE
IRWIN J. KOPIN

Laboratory of Clinical Science, National Institute of Mental Health, Bethesda, Maryland 20014

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Palladium Dichloride Whiskers: Preparation and Properties

Abstract. *Palladium dichloride whiskers can be prepared by reacting palladium with chlorine at temperatures above 500°C. The crystals measure 1 × 100 micrometers and are strong (5 percent elastic deformation). They may be a morphological form of one of the high-temperature polymorphs of $PdCl_2$.*

During the course of early attempts to grow palladium whiskers (*1*) by the thermal decomposition of $PdCl_2$, the growth of $PdCl_2$ whiskers was also observed. These $PdCl_2$ whiskers were insoluble in water and could be exposed to the atmosphere for days without hygroscopic attack, in contrast to Sidgwick's observation that $PdCl_2$ is quite soluble and hygroscopic (*2*).

Soulen and Chappell (*3*), using differential thermal analysis, showed that (i) crystalline transitions of $PdCl_2$ occur at 400° and 500°C and (ii) the intermediate form slowly reverts (in the order of months) to the more familiar form which consists of a very long chain at room temperature (*4*). Reconsideration of the conditions under which $PdCl_2$ whiskers can be grown strongly suggests that they may consist of one of these high-temperature polymorphs.

The apparatus used to study the growth of whiskers at high temperature is described elsewhere (*5*). Decompositions of samples (0.5 g) of $PdCl_2$ in Vycor boats with a stream of flowing argon (about 0.4 cm/sec) at 960°C usually produce a massive substrate of palladium crystals from which grow numerous clusters of palladium whiskers 1 to 10 mm long (*1*). Webb has described their exact growth conditions in greater detail (*6*).

Palladium dichloride crystals grow if the reaction boat is removed from the hot zone immediately after the thermal decomposition of liquid $PdCl_2$. Apparently, residual chlorine in the cooler, downstream end of the reaction tube reacts with the hot palladium in the reaction boat to yield masses of well-formed $PdCl_2$ whiskers and filaments. Several types of $PdCl_2$ whiskers include (i) closely connected masses of thousands of filaments and whiskers (up to 1 mm long) that cover the general area where palladium whiskers grow; (ii) large numbers of individual $PdCl_2$ whiskers (about 0.1 mm long) that grow on the sides of the palladium whiskers (Fig. 1); and (iii) numerous loose clusters of $PdCl_2$ whiskers (0.1 mm long) that are far removed from the original palladium metal.

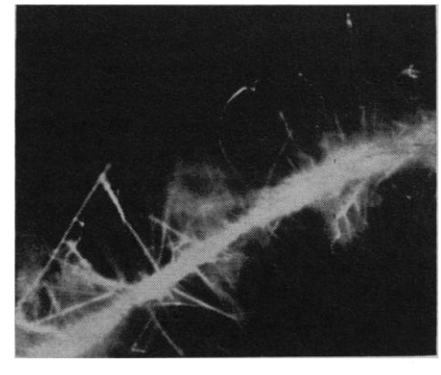

Fig. 1. Palladium dichloride whiskers (0.1 mm long) on a palladium whisker. The salt whisker under strain is withstanding an elastic deformation of about 2.5 percent.

These $PdCl_2$ whiskers have a growth rate of about 0.1 mm/sec at a temperature between 500° and 600°C. The palladium whiskers cease to incandesce from the high temperature to which they had been subjected prior to reaction with the residual or added chlorine. The $PdCl_2$ whiskers grow in a rapidly changing, relatively sharp temperature gradient below their melting point of 683°C. This gradient may serve to limit the lengths of the whiskers produced.

The reaction between palladium whiskers and chlorine, in the absence of any initial $PdCl_2$, also produces numerous $PdCl_2$ whiskers both directly on and far removed from the dark red masses of $PdCl_2$ that are rapidly produced. Thus, vapor-phase transport of $PdCl_2$ may play a major role in the nucleation and growth of $PdCl_2$ whiskers under the two sets of conditions described here.

Figure 1 shows such a $PdCl_2$ whisker about 1 μm in diameter and 50 to 100 μm long that is being bent to about 2.5 percent strain. The variation of elastic deformation between 2.5 and 6 percent suggests that these are relatively strong crystals. Sharp kinks form (failure by way of plastic deformation) when the elastic limits are exceeded. The $PdCl_2$ whiskers dissolve readily in acetone and slowly in dilute hydrochloric acid; they are rather insoluble in water. They represent one of the few examples of halide whiskers (others include sodium chloride and cesium chloride) and the only one known to form at elevated temperatures.

E. F. RIEBLING

720 Tifft Avenue,
Horseheads, New York 14845

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Rhizoid Formation in Fucus Zygotes: Dependence on Protein and Ribonucleic Acid Syntheses

Abstract. *Ribonucleic acid required for rhizoid formation in* Fucus *zygotes is synthesized several hours before the production of proteins essential for this process. The period of synthesis of these proteins coincides with the irreversible commitment of a certain cytoplasmic region to initiate events leading to a visibly polar cell.*

Zygotes (*1*) of the brown alga *Fucus* are well suited for cellular and biochemical experimentation (*2–4*). Unlike many plants, these zygotes are relatively easy to obtain and manipulate and develop free of surrounding tissue. The spherical egg has its nucleus near the center of the cell, shows an apparent random distribution of cytoplasmic inclusions as revealed by electron microscopy, and is probably radially symmetrical. No significant increase in size of the zygote occurs until about 14 hours after fertilization when a localized protuberance (rhizoid) appears. Several hours later this polar growth is separated from other parts of the cell by the first cell division, which occurs in a plane at right angles to the long axis of the rhizoid. Derivatives of the rhizoid cell form the holdfast portion of the plant, whereas the thallus cell gives rise to the main body and reproductive structures. Thus, rhizoid formation establishes a permanent polar axis in a single cell which gives rise to a two-celled embryo, each cell of which is different in structure, function, and developmental fate (*2*, *5*).

Although the synthesis of proteins and nucleic acids during development has been studied in a number of animal embryos (*6–8*) and plant seeds (*9*), such molecular events have no specific relation to differentiation of a given cell, as has been reported for an enzyme associated with cap formation in *Acetabularia* (*10*). Macromolecular requirements for rhizoid formation will give direct information on processes involved with an intracellular differentiation, which is the basis for differences between the first two cells of the embryo and the polarity of the entire organism. This report is concerned with the following questions: Is protein or RNA synthesis (or both) required for rhizoid formation and the first cell division, and, if so, when are these molecules synthesized?

Receptacles of *Fucus vesiculosus* L. were collected, iced, and stored in the dark at 4°C. To obtain gametes, receptacles were washed thoroughly and placed individually in separate dishes containing artificial seawater (ASW) (*11*) at 15°C in diffuse light. Within several hours after immersion into ASW, either sperm or egg cells were released from each receptacle. Solutions of gametes were passed through a 102 μm nylon mesh (*12*) to remove large debris and intact oogonia or antheridia, and were then mixed. Thirty minutes later, sperm cells were removed by passage of the mixed gamete solution through a series of nylon meshes. Zygotes free of sperm were washed thoroughly with filtered (Millipore, GS type, 0.22 μm) ASW containing 25 μg of streptomycin and of penicillin (1.65 unit/μg) per milliliter to reduce bacterial contamination; they were then placed in sterile plastic petri dishes (*12*) in fresh sterile medium. Development in this medium had no adverse effects upon the temporal sequence of events or in the percentage of zygotes forming rhizoids and completing the first cell division compared to controls without antibiotics. No significant bacterial contamination was evident in such a medium plated on agar broth 3 to 4 hours after the zygotes had been washed. There was no indication of bacteria embedded in the cell wall when viewed through the light or electron microscope, nor was there incorporation of labeled amino acids in the wall when autoradiography was performed. All experiments reported here were carried out at 15°C in the dark.

For experiments with inhibitors and radioactive labeling, solutions of actinomycin D (20 μg/ml) and cycloheximide (0.05 μg/ml) (*12*) were made up fresh in sterile ASW. Incorporation of a mixture of amino acids uniformly labeled with C^{14} (specific activity, 1 mc/mg) into proteins, and of uridine-5-H^3 (specific activity, 2.5 mc/mmole) into RNA (*12*) was then analyzed.

For protein determinations washed zygotes were homogenized in 10 percent trichloroacetic acid (TCA) at 2° to 4°C. The precipitate was washed once with 5 percent TCA and then incubated with fresh 5 percent TCA at 90°C for 30 minutes. The material insoluble in hot TCA was washed at room temperature as follows: 5 percent TCA, one time; 95 percent ethanol, two times; ethanol and chloroform (3 : 1), two times; ethanol and