obviously carry information on the fertilization process: by contrast to the fertilized *Fucus* egg, the unfertilized one was found to display a transient P. D., the cytoplasm being electropositive. Both functional aspects of the membrane potential are being investigated further.

Supported by the Deutsche Forschungsgemeinschaft.

Received April 3, 1969

[1] CURTIS, A. S. G.: The Cell Surface. London: Logos 1967. — [2] JAFFE, L.: Adv. Morphogen. 7, 295 (1968). — [3] BENTRUP, F. W.: Z. Pflanzenphysiol. 59, 309 (1968). — [4] BENTRUP, F. W., T. SANDAN, and L. JAFFE: Protoplasma 64, 254 (1967).

## Molekulare Schichtung in Tropfen von Speicherfett

C. RUSKA und H. RUSKA

Institut für Biophysik und Elektronenmikroskopie der Universität Düsseldorf

Die Triglyceride innerhalb der Tropfen von gespeichertem Neutralfett im tierischen Gewebe gelten als unorientiert. Sie stellen sich elektronenmikroskopisch bei allen gebräuchlichen Fixierungsmethoden im Dünnschnitt homogen dar und unterscheiden sich dadurch sehr deutlich von den durchgehend bimolekular geschichteten Lipoiden. Das gespeicherte Neutralfett soll lediglich außen eine orientierte Phasengrenzschicht gegen Wasser besitzen. Mit der Gefrierätztechnik [1] läßt sich diese Grenzschicht an Tropfen aus frisch bereiteten Emulsionen von Olivenöl in Wasser leicht nachweisen, da sie mitunter von der unorientierten inneren Substanz des gefrorenen Öltropfens abspringt [3]. Demgegenüber fiel auf,

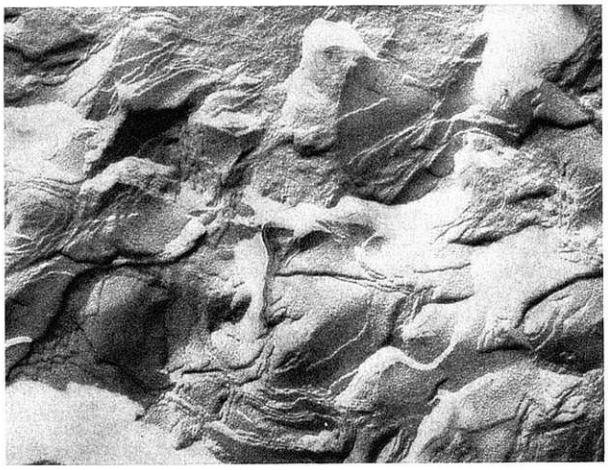

Fig. 1. Innenstruktur des Fetts einer weißen Fettzelle aus dem epididymalen Fettkörper der Ratte. 64000:1

daß die in raschem metabolischem Umsatz begriffenen, kleinen Fettpartikel in Herzmuskelzellen [2, 3] in der Regel durchgehend konzentrisch orientierte Schichten zeigen. Geschichtet sind aber auch die großen Fettkugeln im weißen Fettgewebe mit ihrem langsamen Umsatz im Stoffwechsel und einem $10^4$—$10^6$-fachen Volumen (Fig. 1).

In den chemisch unfixierten großen Fettkugeln liegen bei der Darstellung mit der Gefrierätztechnik außen 5—10 Schichten (Periode ca. 50 Å) konzentrisch. Von hier verlaufen einzelne Schichtpakete zentralwärts. Innen aber sind die meisten Schichten auffallend unregelmäßig wellen- und wirbelförmig aufeinander gelagert. Es besteht also in dem Triglycerid-Gemisch aller Tropfengrößen eine fließende lamelläre Orientierung.

Eingegangen am 31. März 1969

[1] MOOR, H., u. K. MÜHLETHALER: J. Cell Biol. 7, 603 (1963). — [2] MOOR, H., C. RUSKA u. H. RUSKA: Z. Zellforsch. 62, 581 (1964). — [3] RUSKA, C., u. H. RUSKA: Z. Zellforsch. (im Druck).

## Stability of Cytoplasmic Microtubules at Low Temperatures

WERNER W. FRANKE, SIGRID KRIEN and H. SAMEK

Division of Cell Biology, Institute of Biology II University of Freiburg i. Br.

Cytoplasmic microtubules were reported to be disintegrated [1, 2] or transformed [3] after incubating or fixing the material in the cold. The present study was undertaken in order to elucidate whether it is the low temperature or the fixing procedure which affects the cytoplasmic microtubules of plant cells. Two kinds of fixations were employed, namely the classic sequential glutaraldehyde/$OsO_5$ fixation using different aldehyde concentrations and temperatures and the simultaneous glutaraldehyde/$OsO_5$ fixation [4] with post-osmication as previously described [5]. When onion or cress root tips or pieces from bean leaves were sequentially fixed, microtubules could, in fact, be clearly recognized only in those samples that had been fixed at temperatures above ca. 10 °C. Quite different results, however, were obtained after simultaneous fixation. In this case, microtubules, 180—240 Å in diameter, were always observed in their characteristic cortical position despite the temperature of about 0 °C which is indispensable for this type of fixation. Microtubules were also present when the material had been precooled at 4—5 °C for 3 h, 3 or 4 days (Fig. 1). The diameter of the microtubules was not altered after cold treatment. This might be emphasized since TILNEY and PORTER [3] have reported that in the protozoon *Actinosphaerium* the 220 Å microtubules disappeared in the cold but a new kind of tubules measuring about 340 Å in diameter were found. Thus it is indicated that not the low temperature but rather the kind of fixation might be responsible for the disappearance of microtubules, at least in plant cells. Considering the present knowledge on

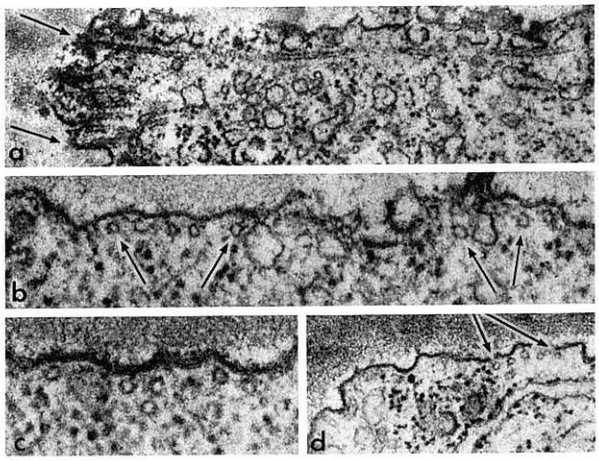


Fig. 1. a Longitudinally sectioned microtubules, cress root, simultaneously fixed in the cold after 4 days cold treatment; 45000:1. — b Same material, cross-sectioned microtubules; 80000:1. — c Onion root, same fixation, after 1 day cold treatment; 100000:1. — d Bean leaf cell after simultaneous fixation in the cold; 45000:1

microtubules, one gains the impression that there *exist several types of microtubules* with differing sensivity to cold treatment, just as there exist different classes of microtubules with respect to other properties [1]. Such a diversity of microtubular structures could explain some of the reports on the presence of microtubules in different plant and animal cells in dependence on temperature conditions (e.g. [6—9]).

Received March 31, 1969

[1] BEHNKE, O., and A. FORER: J. Cell Sci. 2, 169 (1967). — [2] BEHNKE, O.: J. Cell Biol. 34, 697 (1967). — [3] TILNEY, L. G. and K. R. PORTER: ibid. 34, 327 (1967). — [4] TRUMP, B., and R. BULGER: Lab. Invest. 15, 368 (1966). — [5] FRANKE, W. W., et al.: in preparation. — [6] O'BRIEN, T. P., and K. V. THIMANN: Protoplasma 63, 417 (1967). — [7] ECHANDIA, E. R., and R. S. PIEZZI: J. Cell Biol. 39, 491 (1968). — [8] HOLMES, K. V., and P. W. CHOPPIN: ibid. 39, 526 (1968).