

heben lassen, wenn energiereiche Metabolite zugeführt werden oder wenn energieliefernde Stoffwechselprozesse künstlich stimuliert werden³.

Summary. When fluoride-ions or monoiodoacetate is added to the ambient medium, there occur in fish larvae after 12 h, and in eels after 24 h, in some places, solid

epidermal proliferations. The effect of glycolysis inhibitors on epidermal mitotic activity might be due to an impairment of energy metabolism as it is nullified by a simultaneous application of inorganic diphosphate or by doubled O₂ partial pressure of 320 mm Hg.

N. PETERS und H. WILKE

*Institut für Hydrobiologie und Fischereiwissenschaft
der Universität Hamburg,
Olbersweg 24, D-2 Hamburg-Altona (Deutschland),
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Paired Cisternae, the Characteristic Feature of Foetal Cells

The cells in the various organs of fetuses are generally more prominent in mitotic activities and less differentiated in specific character than those of adults. The present paper concerns a particular membranous intracytoplasmic structure, which has only infrequently been observed in cultured tumor cells^{1–3} but never found in normal adult cells. The finding will be described as a feature characteristic of immature fetal cells.

Materials and methods. Materials used were the tissues of various endocrine and hematopoietic organs of 10 human fetuses, obtained by spontaneous or legal abortion, in 20–30 weeks of gestation. The youngest fetus was 350 g in weight, 20 cm in crown to heel length, and the oldest 1,100 g and 35 cm. Small tissue specimens of the pituitary gland, thyroid gland, adrenal gland, kidney, testis, liver, spleen and bone marrow, taken within 15 minutes post-mortem, were fixed in a mixture of 2% glutaraldehyde and 2% formaldehyde and then in 1% osmium tetroxide with

sucrose added. They were embedded in Epon 812 after Luft's technique. Ultrathin sections cut by a Porter-Blum ultramicrotome were doubly stained with uranyl acetate and Reynold's lead. Photographs were taken with a JEM-100 B electron microscope.

Results. Cells in active proliferation, e.g., immature erythroblasts⁴ had peculiar intracytoplasmic structures composed of 4 closely spaced parallel membranes (Figures 1A, 2A).

The inner 2 membranes were arranged face to face with a space of constant width of 100 Å–300 Å and of high electron density between them and had no ribosomes on

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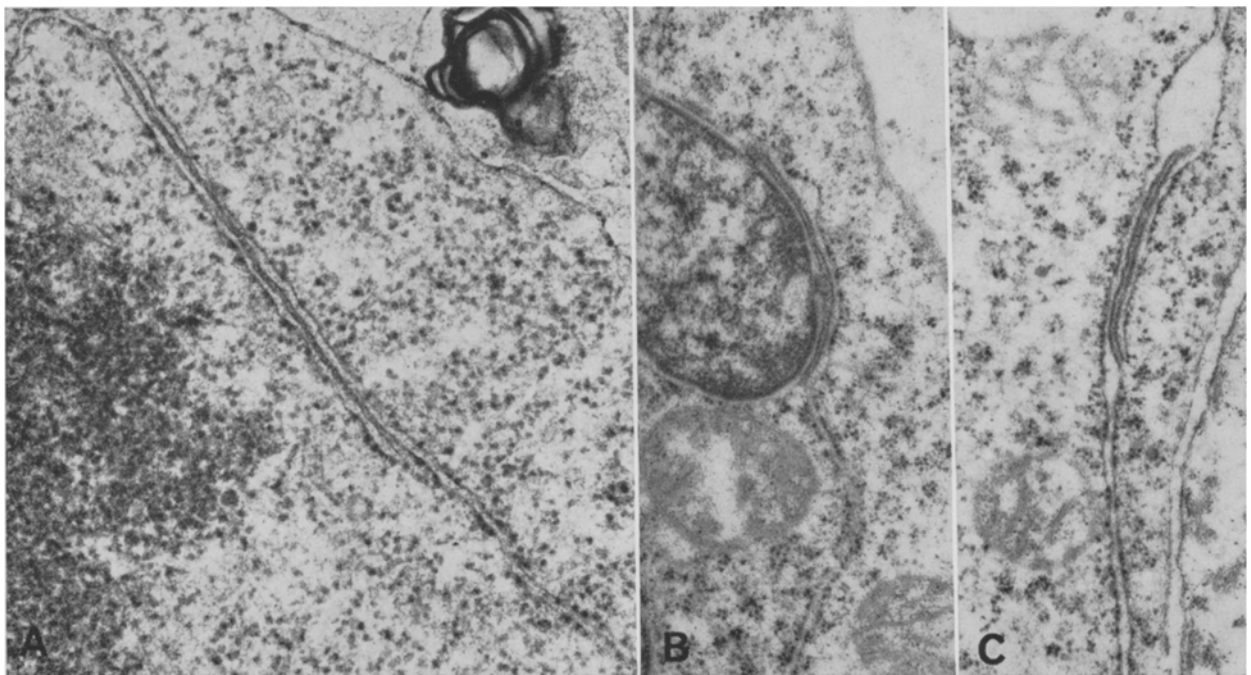


Fig. 1. Paired cisternae in foetal erythroblasts. A) A typical paired cisternae in the mitotic cells. The inner 2 membranes were agranular and arranged face to face with a space of constant width of 100 Å and of high electron density. B) Similar feature between the nuclear envelop and an endoplasmic reticulum. C) Invagination of inner agranular membrane into a cisterna of rough surfaced endoplasmic reticulum.

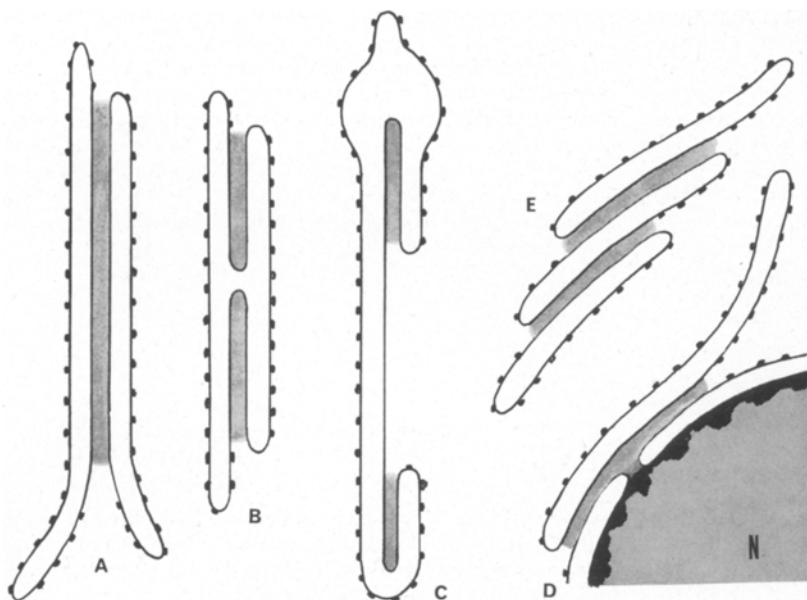


Fig. 2. Schematic representation of various patterns of paired cisternae.

their surface, while the outer 2 membranes were variable in distance from the inner ones and had ribosomes on their outer surface, as rough surfaced endoplasmic reticulum does.

This structure seems to make a back-to-back connection of two flattened cisternae of endoplasmic reticulum, but a similar feature was also present between a cisterna of endoplasmic reticulum and nuclear envelope (Figures 1B, 2D).

At the end of the structure, the unit split into cisternae of rough surfaced endoplasmic reticulum but direct connection between the inner 2 membranes were sometimes encountered (Figure 2B). As a rare instance, inner agranular membranes were recognized as an infolding or invagination of rough surfaced endoplasmic reticulum into a cisternal lumina (Figures 1C, 2C). Generally, long folded structures were found in the mitotic cells to encircle the nucleus and occasionally made triplet cisternae (Figure 2E). But short straight ones were observed in the cells of the interphase.

Beside the immature erythroblasts, these membranous structures were found in the epithelial cells of the pituitary gland, thyroid gland, renal tubules and Sertoli cells and spermatogonien. Therefore, these structures were regarded to be universally characteristic of foetal cells.

Discussion. The unusual arrangement of 2 cisternae (paired cisternae) was infrequently observed in tumor cells^{5,6} and cultured cells, e.g., HeLa cells, K.B. cells² and melanoma cells³ and in PHA-stimulated lymphocytes⁷, while it has not been described in normal adult tissues. The finding seemed to be common in undifferentiated, actively proliferating cells.

The formation of these paired cisternae can be attributed to 1. a duplication of the nuclear envelope during mitosis and its remnants, 2. a special way of reproduction for endoplasmic reticulum, or 3. secondary communication of 2 endoplasmic reticulum. In the mitotic phase, paired cisternae appeared more frequently and especially long ones encircled the nucleus. On the other hand, they were short, straight and less frequent in the interphase. This fact indicates an intimate relationship of this structure with nuclear mitosis.

At the end of the structure, closely situated agranular inner membranes separate from each other, and each of

them forms individual cisterna of rough surfaced endoplasmic reticulum. The finding suggests that the structure takes part in the formation of new endoplasmic reticulum. On the other hand, the space between the inner agranular membranes was always constant in width and moderately high in electron density. Therefore, the structure could be regarded as a secondary communication of endoplasmic reticulum in a way similar to that of the tight junction or allied structures of cell membranes.

Despite the progress of electron microscopic techniques, the reproductive mechanism of endoplasmic reticulum remained uncertain. If the membranous structure, as described in the present report, takes a role in reproduction of new endoplasmic reticulum, the investigation of foetal cells deserves special attention in the morphogenetic study of this structure.

The resemblance of a certain property of the foetal cells to that of cultured malignant cells could supply some information on the meaning of undifferentiation and malignancy.

Zusammenfassung. Die eigenartigen intrazytoplasmatischen membranösen Strukturen wurden in verschiedenen fötalen Zellen gefunden. Die einheitliche Struktur ist durch 2 innere agranuläre und 2 äussere granuläre Membranen charakterisiert. Diese gepaarten Membranen wurden als eine Stufe für den spezifischen Produktionsprozess von neuem endoplasmischem Retikulum in fötalen Zellen aufgefasst.

T. FUKUDA

Department of Pathology,
Tohoku University School of Medicine,
Seiryō-Machi, Sendai (Japan), 3 August 1971.

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