Franz Schmid

CELL THERAPY

A new dimension of medicine

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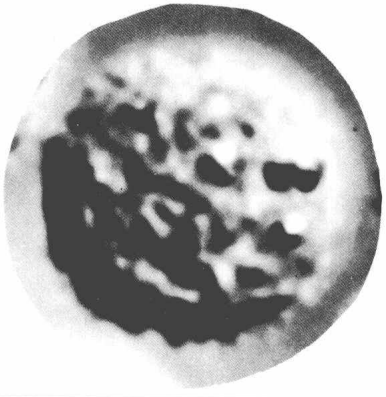
Franz Schmid

Cell Therapy



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341 illustrations
of which 164 in colour
59 tables

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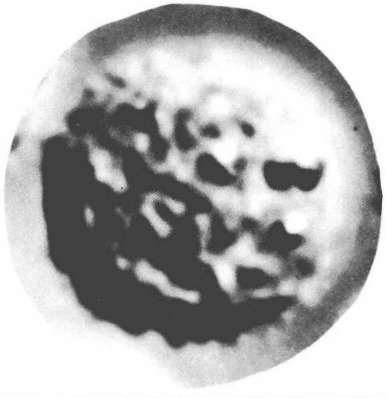

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CLINIC AND PRACTICE

Preface

Cell Therapy – a new dimension of medicine

The living organism, as a part of the universe, is embedded in the magnitude of the latter's dimensions. Within the wide boundaries of the electron mass of 10^{-31} to the cosmic dimension 10^{17}, life takes up only a small span of 10^{-5} to 10^{1}, thus only 6 out of 48 dimensions. Life begins at the organizational stage of the single cell and ends in the domain of the multicellular «organism» state. Life is characterized by the capability of the cells to transform the continuous energy and material losses of lifeless nature into new energies and structures. A cellular state deriving from these principles stands in reciprocal harmony with its lifeless environment and is described as healthy. Loss of utilization or deficiency of material of lifeless nature leads to defective functioning of the cellular state, to disease.

The paramount objective of medical treatment should be the restoration of the functional capability of the cells and of their functional associates, the tissues and organs. Medicine today orientates itself towards scientifically registerable symptoms or those deducible by means of technical aids (microscope, electron microscope, biochemical data, electronic recordings). It is thereby neglecting all dimensional areas below and above the so-called objective detection methods and in so doing it defines its limits. Thought levels below the visible correlations with nature, such as in homeopathy, or above them, such as in the embedment of life in earthly and cosmic relations in anthroposophy, lead a reluctant, patient marginal existence in the medical conception of the majority.

It may be that the brilliant idea P. NIEHANS put into practice 50 years ago of making young cells available to diseased or aging organs was erroneous. The idea was, nevertheless, rewarded with practical success. We know today that the implanted cells are decomposed in order of magnitude under microscopic observation, but it is precisely by these easily transportable and incorporable particles that important building substances for the repair of cellular and subcellular defects are supplied to the diseased organism. Moreover, the repair of cellular defects opens the possibility of a new materialization of the elementary functions of life, the utilization of the materials and energies of the environment. Whereupon, not only are symptoms eliminated, but the opportunity exists of producing afresh the fundamental principle of life, and with it health.

The evolution of life embraces a semicircle consisting of maturing, maturity and aging. Disabilities, disorders and diseases increase with the distance from the middle of this semicircle in the direction to the beginning and end of the biological existence. The main field for a therapy aimed at repairing the biological potential therefore lies inevitably in the first and the last decades of life. In the course of practical and clinical experiences the following areas of indications have crystallized:

I. Congenital and infantile developmental disturbances

1. Metabolic disorders
2. Chromosome aberrations
3. Insufficiencies and depressions in the blood-forming system
4. Immunologic deficiencies
5. Infantile disturbancies of the central nervous system

II. Degenerative changes caused by old age

6. General devitalization
7. Degenerative manifestations
   a) in the cardiovascular system
   b) in the central nervous system
   c) in the connective tissue
   d) in the digestive tract
   e) in the skin

III. Defective functioning of organs or organ systems arising from constitutional causes or disease

8. Chronic organic diseases of the heart, circulatory system, of the liver, joints
9. Defective functioning of the endocrine system
10. Hereditary degenerative diseases of the central nervous systems

IV. Concomitant tumour therapy

Within this group of indications the documented experimental values in respect of the strength of testimony range between single observations of uncommon diseases and statistical substantiations of up to thousandfold observations.

The implantation treatment with fetal or joung cell suspensions which has taken its place in medical history under the term «Cell Therapy» operates by way of the following therapeutic factors:

1. The rapidly growing intrinsic content of the fetal and young tissues of *biochemical substrates and enzymes.*
2. The fetal tissues' own composition of *minerals and trace elements.*
3. The fetal tissues' own *biological development power* which leads to rapid tissue growth.

Whilst biochemical substances (1) and elements (2) are analyzed in great detail, the biological development power is not measurable with scientific parameters. We know that roots, street pavements and stonework can lift, but we are not a position to interpret and to measure this power. In the therapeutical concept, it plays a big role since it alone makes possible the precondition for the application of the elements and the utilization of enzymes and substrates for new structures.

Away from the indicated connections with microcosm (elements, trace elements, elementary particles) and macrocosm (solar energy, cosmic radiation), cell therapy should always be a wholistic medicine. This means that necessary measures in the conduct of life, nutrition, physiotherapy, psychotherapy and medical treatment must be incorporated insofar as they are required in the individual situation. No form of therapy is a one and only redeeming religion. The «monosymptom – monosubstance» claim of pharmacotherapy is one of the most disastrous dogmatizing efforts of our time.

Cell therapy provides a body, under suitable application, with the opportunity of transforming the elementary function of life, the utilization of environmental energies and materials into new energies and structures. This step in a new dimension in medicine leads, in the longer aspect, from a «medicine for disease» to a «medicine for health», i.e. the therapeutic efforts are not focussed on the elimination of single symptoms of disease but serve in the restoration of the vital elementary functions of an organism.

FOUNDATIONS

The cell as a biological elementary unit

From R. HOOKE's discovery (1663) disclosing more than 300 years ago that the bark of the cork-oak consisted of elements similar to honeycombs, all along to modern cell biology a fascinating way leads into ever deeper fields of knowledge. Owing to the «rimmed» cavities seen in the microscopie section, the structures were called «cells». This observation was not introduced into the scientific standard knowledge until the middle of the 19th century. M. SCHLEIDEN (1838) stated that the cell was the basic unit of all plant structures, TH. SCHWANN extended this axiom to animals and plants. With R. VIRCHOW's cell research and his formulation that all life came from cells, cell morphology began to influence and to largely characterize human-medical thinking.

However, nearly another century went by before deeper dimensions were reached from the «little clot protoplasm» or from the «simultaneous existence of nucleus and cellular plasma». The picture of the cell, from historical and modern angles, reflects the technical potentialities of cell research. The structures watched in the light microscope had possessed the mental conceptions for nearly 300 years till the electron microscope opened morphologically new dimensions, till molecular biology and genetics accomplished the step from the mere contemplation of form (structure) to function. This process paralleled the discovery of subcellular structures and elements of organization, which, necessarily, raised the question of their significance (= function within the biological order). Though we believe to have a good conceptual power about the cell, most of the questions of functional interplay within and between the cells are obscure. What we do have, optically, is nothing but a skeleton of structures made visible by chemical influences (colouring) or physical processes (electron-microscopical sections). These methods provide conceptions of structures and space arrangements constituting just the rough brickwork of a house that only allows suppositions about its life and installations. Observations in vivo and cytochemical methods, therefore, help to explain the function of the elementary

organization unit of life, namely of the cell.

The *ground plan* of the cell reflects the phylogenetic order. From the most primitive cells, the mycoplasmacateae, the evolution goes via the bacteria, blue algae, the higher plant cells to the complex system of the cells with membrane barriers and complete organelle fitments in multi-cellular and higher organized organisms. The further evolution will probably not continue through variations of the cytoorganelles but will depend on a further differentiation of the interrelations between the cells.

The obligatory building elements of the higher cells include:

1. *Nucleus*
2. *Nucleolus*
3. *Nuclear membrane*
4. *Nucleopores*
5. *Endoplasmatic Reticulum (Ergastoplasm)*
6. *Ribosomes*
7. *Golgi-apparatus*
8. *Vesiculae*
9. *Vacuoles*
10. *Granules of secretion*
11. *Lysosomes*
12. *Mitochondria*
13. *Centriol*
14. *Microtubuli*
15. *Cell membrane (Plasmalemm)*
16. *Desmosomes*
17. *Basic plasma (matrix)*

The form and function of the cell organelles are subject to functionally determined variations of a uniform building principle. The task in the functional unit cell can just be sketched in the scope of this survey.

The *nucleus* consists of chromatin containing DNA, the *nucleolus* constitutes a ball consisting of RNA (ribonucleic acid) in the nucleus. The *nuclear membrane* consists of 2 leaves, the outer lined with ribosomes and going over into the *endoplasmatic reticulum;* it is interrupted by nucleopores. The so-called *perinuclear space* is between the two membranes.

The *Golgi-apparatus* has various forms, consists of membranes, forms *sacculi, double membranes, vacuoles* and *vesiculae;* it serves for tasks of synthesis and controls and eliminates products of synthesis, which are conveyed on by vesiculae, vacuoles and secretion granules and eventually are eliminated through the cell membrane. The Golgi-apparatus and the endoplasmatic reticulum are connected by the *Gerl complex.*

The protein synthesis takes place on the ribosomes of the *endoplasmatic reticulum.* The density and dimensions of this system (referred to also as *ergastoplasm*) of tubular membranes reflects the synthetizing activity of the cell (see fig. 2).

Mitochondria are elliptic, spheric, rod-shaped and filiform structures 0.3–5 μm in length; thanks to their enzymes, they provide the energy for the cell, and therefore are also called energy stations or transformers. According to the activity of metabolism, a cell consequently contains more or fewer mitochondria.

The *microtubuli* and *fibrillary structural elements* are referred to as «metaplasm». Microtubuli have a diameter of 200–300 Å, are of different length and traverse the cytoplasm, but are chiefly oriented in the direction of centriol.

The *centriol* is near the nucleus, mostly in the middle of the cell, at the concave side of the Golgi-apparatus; this area is also called *centrosphere.* Nine groups about 0.5 μ in length of three mictrotubuli (triplets) form a cylinder of some 0.25 μ in diameter. The cylinder is surrounded by spherical satellites. The centriol contains extrachromosomal DNA, determines and controls cell division and –

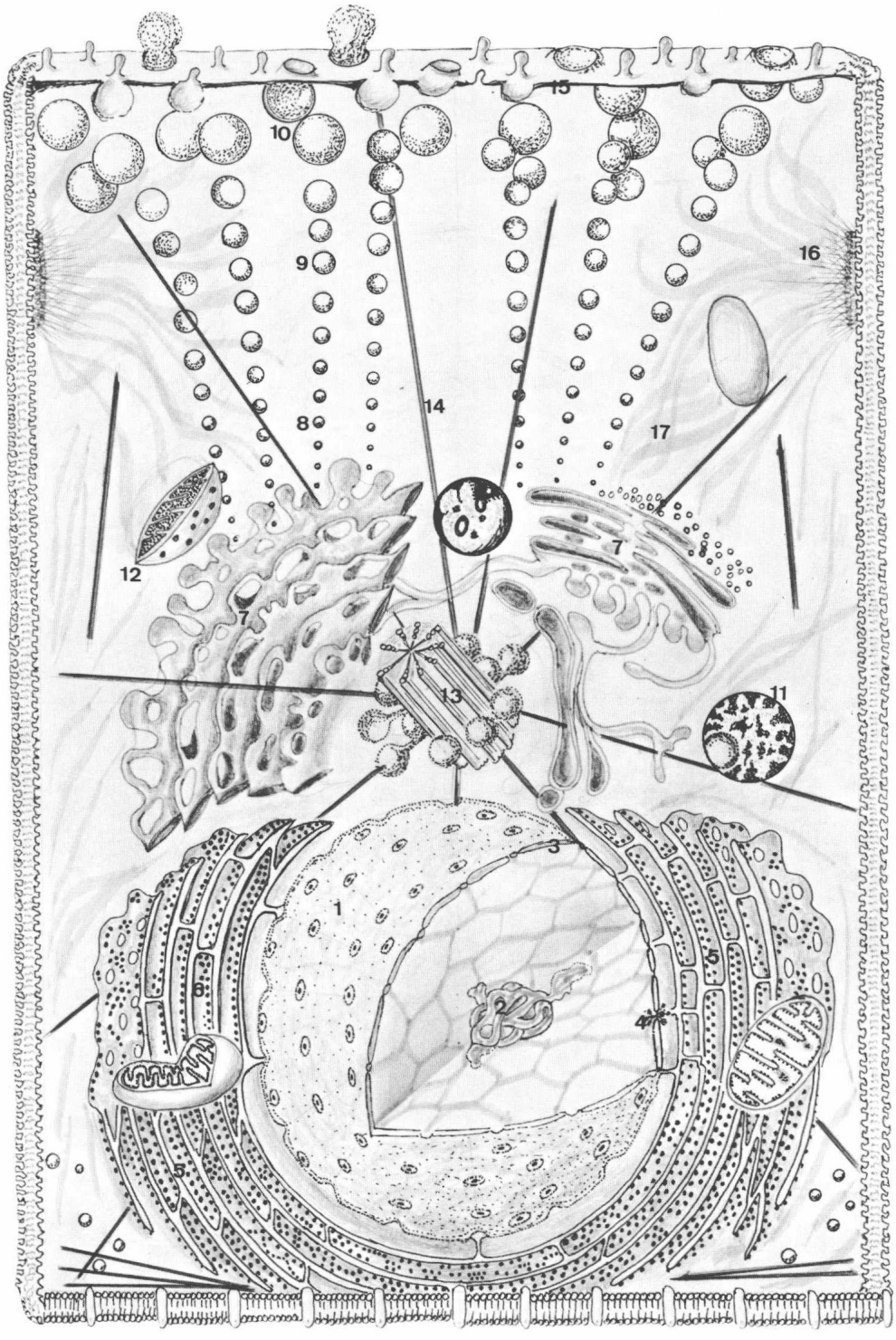

Fig. 1:
Idealized scheme of a *polar cell*

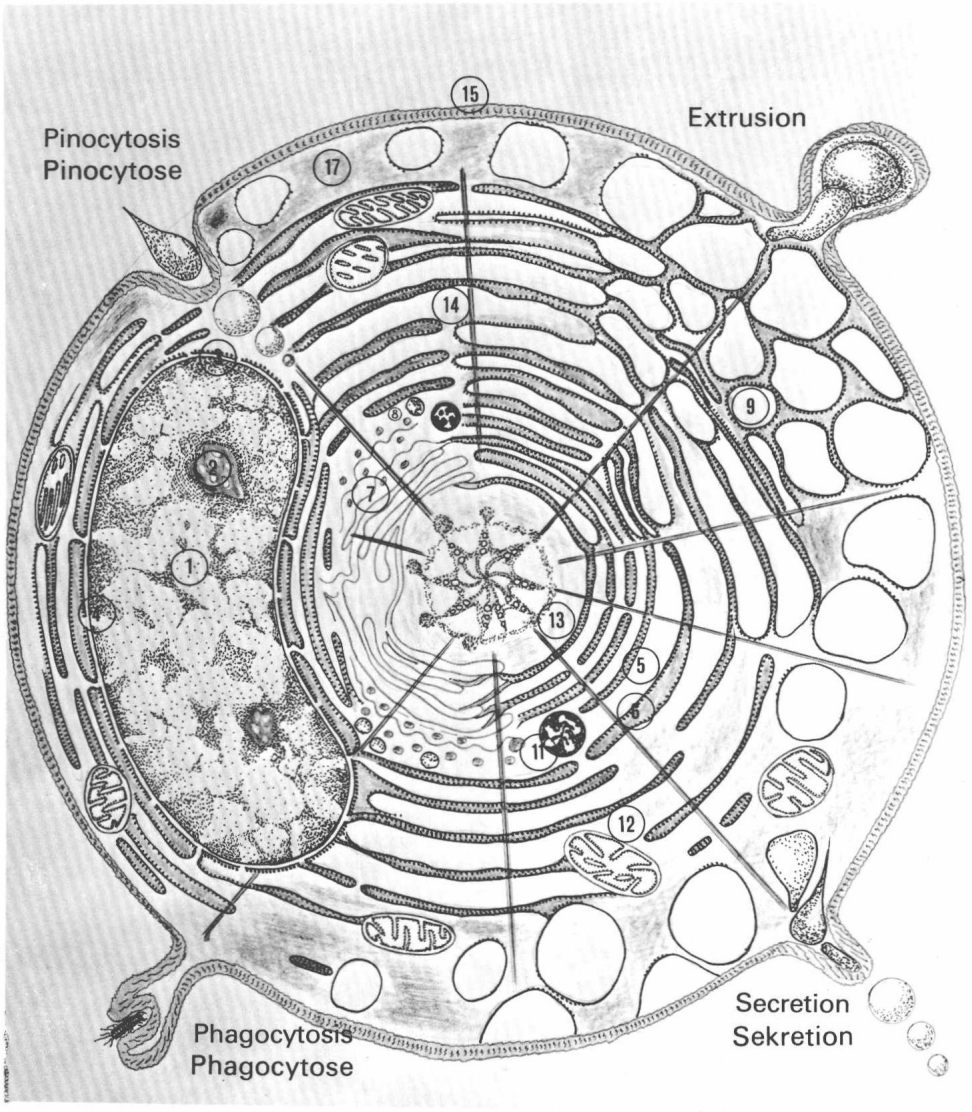

Fig. 2:
Idealized scheme of an *unpolar cell*, immunocyte in the stage of synthesis.

1. *Nucleus*
2. *Nucleolus*
3. *Nuclear membrane*
4. *Nucleopores*
5. *Endoplasmatic reticulum (ergastoplasm)*
6. *Ribosomes*
7. *Golgi-apparatus*
8. *Vesiculae*
9. *Vacuoles*
11. *Lysosomes*
12. *Mitochondria*
13. *Centriol*
14. *Microtubuli*
15. *Cell membrane (Plasmalemm)*
17. *Basic plasma (matrix)*

like the mitochondria – is considered as semi-autonomous in the cell organization.

Lysosomes are spherical to oval, of various density and serve for the intracellular digestion – perhaps also for «autocleaning».

The *cell membrane* (Plasmalemm) consists of 3 layers, has an average thickness of 75–100 Å, and is semipermeable; it regulates the interrelations with the extracellular space and can take up into the cell liquid (pinocytosis) or solid particles (phagocytosis) by advancing and retiring movements (fig. 2). The cell membrane contains enzymes and receptors to recognize foreign substances, hormones and other cells.

Desmosomes are organelles specialized as suctorial discs serving for the cohesion of cells; this clinging function appears from clusters of tonofibrils. Depending on whether the cell moves single in the liquid medium or is bound in the tissue, it is an unpolar (radiary) or polar cell.

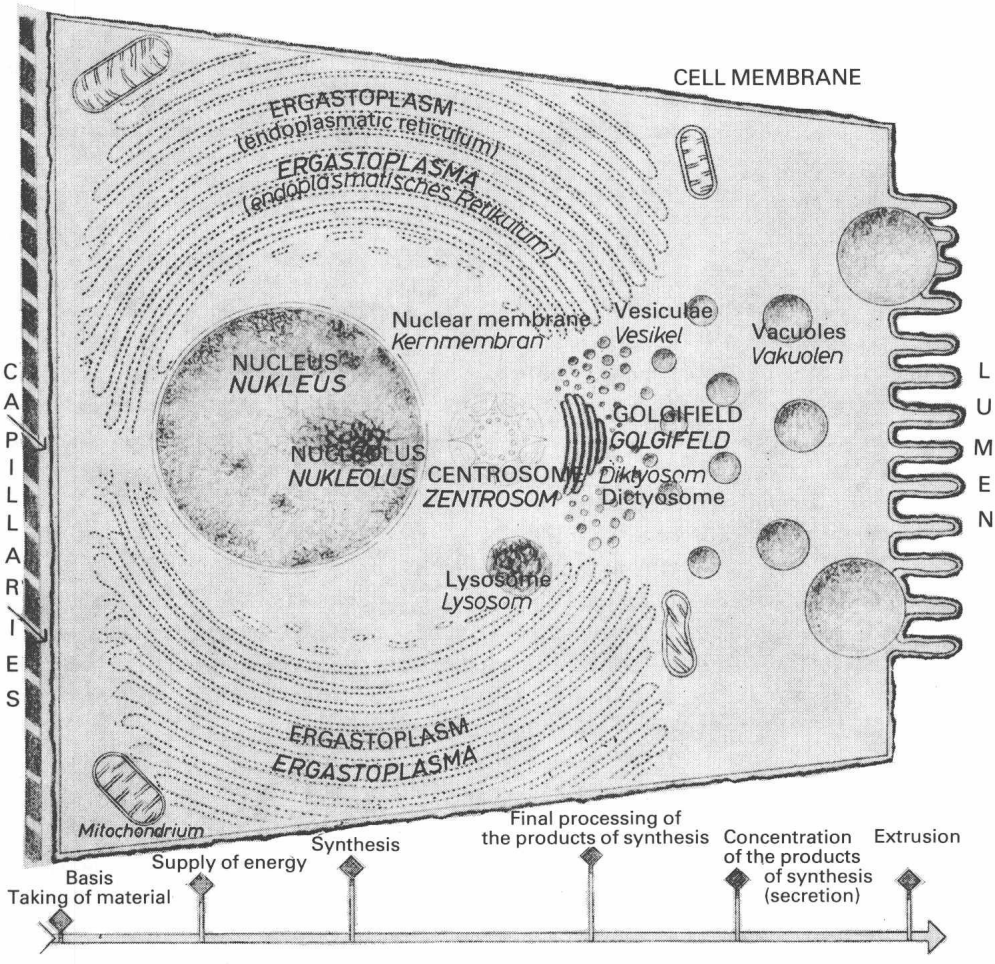

Fig. 3:
Functional scheme of a polar cell (e. g. pancreatic cell)