LECTURES

FROM AN INTEGRIN BINDING PROTEIN TO AN EVOLUTIONARILY CONSERVED TRANSLATION FACTOR NECESSARY FOR THE CONTROL OF METABOLISM

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eff (also known as DicER) was cloned for its capability to bind beta integrin. Rapidly, we learned that it is a factor necessary for ribosome biogenesis and translation, highly expressed in embryonic and cancer cells. eff is rate-limiting for translation under growth factors and oncogenic signalling.

2 eff acts by regulating the translational level of the metabolism of fatty acids. In general, eff reduction increases animal longevity, resistance to tumors, and high fat diet. Why are these high levels of eff maintained in vivo? We find that high levels of eff are essential in the immune system. In conclusion, we speculate that translational control acts as a form of "metabolic learning."


THEORIA GENERATIONIS: THE ANCIENT ROOTS OF THE MODERN DEVELOPMENTAL BIOLOGY

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Metaphysical concepts are present in Greeks pre-Socratic Philosophy that will form, until today, the Ariadne thread of the analysis of developmental processes. The debate between to be and to become, that opposed Parmenides vs Heraclitus, along the two subsequent millenniums, will turn to the dilemma between preformation vs epigenesis, immanence vs transcendence. Aristotelian was the first to transfer the question from Metaphysics to Physics, formulating the Thesis generationis. In the Hellenistic period, and during the Renaissance, the autopsy and experimental methods became key to the interpretation of biological processes. The criticism of the Aristotelian was already in place following the studies of Italian anatomists, but the final trespass was due to William Harvey in his De motu cordis work. Harvey was author of a second work: in his Exercitationes de generatione animalium he introduced, with his astrophil ommuniversale, the concept of ovum. In the same years, the description of the spermatogenesis of lizards was formed, and Harvey's ovum and animatization became counterparts. Both theories were to be read according to preformation and epigenetic approach. With the Enlightenment the dispute over the development process was placed in the Cartesian rationalism, and subjected to rigorous testing. Execls among others the figure of Lazzaro Spallanzani. The position of Lazzaro moved to search the maternal primus causas of the development, according to the laws of Physic and Chemistry. During this period come the experiences on prelocalisation of embryonic areas of Carl Vogt, and the mosaic egg of Roux with clear imminent evidence. A finalistic interpretation reemerged from experiences of Brissius concerning the embryonic regulation, and from those of Spemann on embryonic induction; the morphogenesises was conceived as a dialectical process between inducive power of the organizer and the specificity of the morphogenetic field. In the middle of last century two notes on Nature by Bruck and Watson were published: the millenary fight between preformation and epigenesis was finally solved; the development program is preformed in the genome, but varies in epigenetic interactions between parts of the genome itself and with the cell environment, in which the genome operates.

SEA URCHIN RESEARCH: MILESTONES, MEMORIES, AND FUTURE CHALLENGES

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The sea urchin eggs and embryos have been used for nearly two centuries as experimental models for classical and modern developmental biology. In the last decade, the groundbreaking observations independently obtained by Hertwig and Pavlov highlighted for the first time that a single sperm enters the oocyte and the male and female pronuclei fuse at fertilization. From that point on, the extensive studies of Boveri, Driesch, and Hertwig allowed conceptualization of basic biological themes, such as the chromosome theory of heredity. In the first half of the twentieth, the embryo manipulation experiments performed by Hertzsprung and Rüegg further advanced the field, introducing the concept of morphogenetic double gradient. Later on, with the flowering of molecular biology and the advent of new technologies, scientists at the caliber of Hsuin, monoclonal, and Davidson emphasized that this echinoderm also represents an excellent model for studying the molecular basis of embryogenesis. In the post-genomic era, the sea urchin embryo continued to be an unsurpassed model for determining the molecular mechanisms responsible for creating a multicellular organism, mainly because of its relative homogeneity, optical transparency, rapid synchronous development, and amenability to perform a powerful arsenal of experimental procedures. Although nowadays the carrying capacity is much lower than in years past, the sea urchin embryo is still a convenient model to study gene regulatory networks, response to environmental stresses, neurodevelopment, stem cell properties, and cancer. Undoubtedly, the breath of all this research makes clear that the sea urchin embryo could help future generations of investigators to unveil the unsolved mysteries of life.

5. Peter J and Davidson EJH. 2015; Academic press.