[November, 2007-11-05 - 16h20 - ROOM A]

SPC - Education and science as tools for social transformation

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Education is discussed here in its broadest sense, and not only as schooling. It is widely recognized by both government and civil society of democratic countries that education has a vital role in the development of the country. In Brazil a vast challenges remains in the curricular reform, pedagogy, and educational delivery, before education is able to play its crucial and progressive role in social transformation. The key question is whether the crisis in our education system is a calamity or a challenge in these times of social change and intense progress in science. Low quality of education is a reflex and it also reflects the disorganization observed in all levels of society, with many cases of violence, corruption and negligence of all kinds towards the public patrimony. This situation shows that the only chance to transform this process is by means of education. In this way, one of the objectives of education must be to form people with an ethical behavior and a critical thinking, which enables them to construct a new social order. In this model, the teacher‘s figure is very important, acting not only as a transmitter of knowledge, but also as a civilizing agent. Science as education can play an important role in social change. It is a difficult task to define science. Certainly science extends and enriches our lives, expands our imagination and liberates us from the bonds of ignorance and superstition. Science is not only, or especially driven by its own internal logic. The deployment of the various sciences and the paths they follow are determined by multiple factors. Another fact is that modern science is not only knowledge but also practical activity. In the last decades, science has progressed at an astounding rate. New discoveries and advancements are made every day as scientists continually probe deeper into the world around them. Can science serve social justice? The answer is yes. In our efforts to reduce disparities, we must identify and remove all of the barriers that prevent the benefits of research from reaching all of the people. It is increasingly important to develop social responsibility and new actions among scientists in order that science attends the needs of society as a whole. In this context the model of a new research institute in Brazil is discussed: IINN-ELS (International Institute for Neuroscience of Natal Edmund and Lily Safra) .

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CC - What *Trypanosoma cruzi* cellular and nuclear organization can tell us?

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The elucidation trypanosomes genome started a new era for the scientific discovery and combat of diseases caused by these flagellated parasites. The big challenge is now to discover how the new information can be used to develop effective vaccines, new drugs and to understand how diseases are established. The different cellular organization of trypanosomes reflects an adapted parasitic state, unique for each species. *Trypanosoma cruzi*, the agent of Chagas' disease, proliferates as epimastigotes in the insect gut, and as amastigotes in the mammalian cell cytosol. Trypomastigote, the non-proliferative forms derived from the replicative stages are adapted to circulate in the host tissues and invade cells. Therefore, understanding how these morphogenetic stages are produced at cellular/molecular level can help us to provide tools to combat Chagas' disease. We have been investigated the changes of the nuclear structure of different parasite stages. While proliferative forms displayed a round nucleus, with a large nucleolus and dispersed condensed chromatin regions, with variable localization according to the stage of cell cycle, the nucleus of trypomastigotes is elongated, devoid of a defined nucleolus structure, and with large portions of organized chromatin. These structures are compatible with the decreased transcriptional and replicative activity of trypomastigotes. In epimastigotes, RNA polymerase II is enriched near the spliced leader (SL) genes, adjacent to the nucleolus and distributed in multiple domains in the internal portion of the nucleus. The product of SL genes are trans-spliced to all mRNAs and must therefore, be produced in large quantities by the cell. Epimastigotes differentiate into trypomastigotes with a progressive change in the cell and nuclear structures. The transcription and RNA polymerase II concentration associated with SL genes is only reduced when the transition is complete. Based on the genome data, most of *T. cruzi* factors involved in DNA replication are similar to the ones found in eukaryotes, except for the origin replication complex, implicated in the establishment of replication origins. The trypanosome complex is similar to the one found in Archaea. *T. cruzi* replication factors are located at the nuclear periphery when DNA is replicated. Recently replicated DNA is found at the nuclear periphery dispersing through all nuclear space after cell division, as chromosomes are in continuous movement in the parasite nucleus. It is well known that chromatin plays important roles in the control of gene expression, chromosome organization and nuclear structure in eukaryotes. To understand how the chromatin is reorganized, *T. cruz*i histones and their post-translational modifications were characterized. Most of the histone H1, although known to condense chromatin, is enriched in chromatin poor regions, in transcriptionally active regions in the parasite nucleus. It is phosphorylated in a single site by cyclin-dependent kinases. Phosphorylation is maximal near mitosis, which promotes histone H1 dispersion through the entire nuclear space. The phosphorylation decreases during cytokinesis, when the histone H1 is concentrated in the nuclear interior. Other modifications were also detected in the core histones. Histone H3 is mainly methylated and histone H4 acetylated. Abundant histone H4 acetylation occurs at lysine 4, and this form of H4 is enriched in chromatin condensed regions. Acetylations at lysine 10 and 14 occur less frequently and are found in H4 at boundaries of chromatin condensed regions. These later modifications increase upon DNA replication and DNA breaks induced by irradiation, suggesting that they are important markers for chromatin reorganization. Indeed, when parasites differentiate distinct levels of these modifications are observed. We are also investigating the signals that control these nuclear and cellular modifications. As parasite differentiation occurs by changing environmental and nutritional conditions, we investigated the role of protein kinases known to detect stress variations. Among them, are protein kinases specific for the eukaryotic translation initiation factor 2, and the protein kinases inhibited by rapamycin (TOR-like). We will present the localization of these protein kinases and show how they can be related to parasite modifications.

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