# NEUROSCIENCE IMAGING CENTER AT UNIVERSITY OF SÃO PAULO MEDICAL SCHOOL

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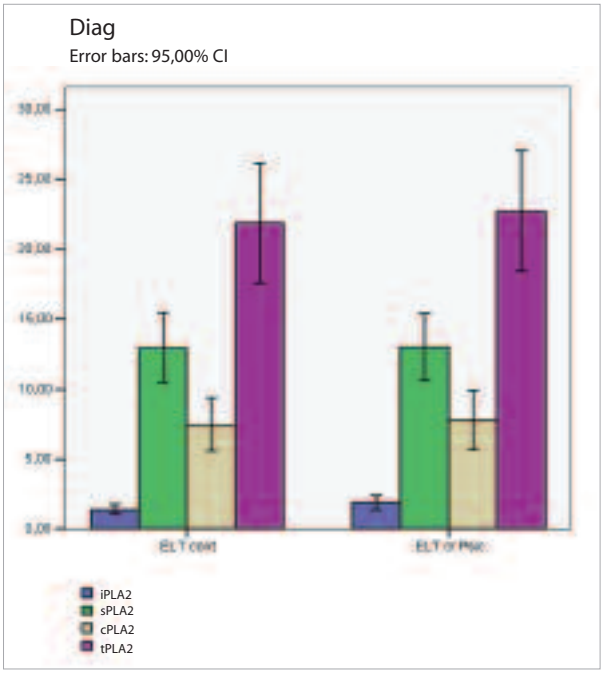


*PLA2 activity in platelets is reduced in patients with mesial temporal sclerosis with psychosis without medication (ELT c/ Psic) compared to patients with mesial temporal sclerosis without psychotic symptoms (ELT cont). iPLA2: intracellular A2 phospholipase; sPLA2: secretory or extracellular A2 phospholipase ; cPLA2: cytosolic A2 phospholipase ;tPLA2: A2 phospholipase. All results are different (iPLA2: F= 3,092, df=6, p=0,008; sPLA2: F= 5,164, df=6, p<0,001; cPLA2: F=3,431, df=6, p=0,004; tPLA2: F=4,683, df=6, p<0,001)*

Epilepsy is a complex disease in which abnormal cerebral activity is caused by increased neuronal excitability and decreased inhibition in large cerebral networks. Epilepsy can be either symptomatic (i.e. associated with a known or presumed structural brain lesion) or idiopathic (where genetic factors play a major role, and where seizures are present in an age dependent manner). Modern structural neuroimaging has allowed advances in the surgical treatment of epilepsy with improved identification of previously unrecognizable structural lesions, such as mesial temporal sclerosis and disorders of cortical development.

Recent advances in the field of genetics are starting to unravel the role of channelopathies in idiopathic epilepsies. Monogenic inheritance has been shown single gene defects in few cases of epilepsy. Polygenic inheritance is probably involved in most cases of epilepsy. Epilepsy should also be considered a complex neurobehavioral syndrome. Abnormal brain electrical activity has profound influences in cognition and behavior. Epileptic activity in the developing brain, in infantile and childhood epilepsies, may cause cognitive deterioration. In adults, cognitive dysfunction, such as language and memory problems, are known to occur in temporal lobe epilepsy associated with mesial temporal sclerosis, the commonest cause of medically refractory epilepsy in adults. Surgical treatment may aggravate cognitive deficits in temporal lobe epilepsy. On the other hand, neuropsychiatric symptoms may occur in close temporal association with seizures (ictally or peri-ictally) or as a more permanent phenomenon, in association with the disease itself (inter-ictally). The precise underlying mechanisms of such psychiatric symptoms are not yet established. The University of São Paulo Epilepsy-Neuroimaging Group proposes to carry out five research projects involving functional and structural neuroimaging aspects of cognitive and behavioral functioning in adult and pediatric epilepsy as well as aspects of genetics and neuronal interconnectivity. An integrated research team effort involving clinical neurophysiological, neuroimaging and basic sciences (genetics and mathematical models of neuronal connectivity) will allow for advances in the major fields of current epilepsy research. Below are the main highlights of this project recently started (2007).

## SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

Brain function and plasticity are dramatically influenced by physical and chemical properties of the neuronal membrane. This membrane is formed by a double-layer of phospholipids, where receptors, ion channels and other proteins involved in signal transduction are immersed. The phospholipids also act as a substrate for the synthesis of inter and intra-cellular mediators, increasing their relevance in the neurotransmission process. Phospholipid metabolism is controlled by enzymes linked to the cellular membrane. In this process, phospholipase A2 (PLA2) is a key enzyme. Increased activity of this enzyme has been found both in patients with psychosis and epilepsy, resulting in accumulation of bioactive lipids in the cellular membrane. We have measured PLA2 activity in patients with mesial temporal epilepsy with and without psychotic symtoms.

The figure on page 1 illustrates these two main steps. We will proceed with investigating phospholipids *in vivo* by using phosphorus MRS.

## MAIN PUBLICATIONS


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Rzezak P, Fuentes D, Guimarães CA, Thomé-Souza S, Kuczynski E, Li LM, et al. Frontal Lobe Dysfunction in Children with Temporal Lobe Epilepsy. *Pediatric Neurology*. **37**:176-185.

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Schaufelberger MS, Duran FLS, Lappin J, Amaro-Jr. E, et al. 2007. Grey matter abnormalities in Brazilian first episode psychosis patients. *British Journal of Psychiatry*. p.117-122

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Sato JR, Takahashi DY, Arcuri SM, Sameshima K, et al. 2007. Frequency domain connectivity identification: An application of partial directed coherence in fMRI. *Human Brain Mapping*. **12**:10.1002/hbm.205.

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