**N-3 Polyunsaturated Fatty Acids (PUFA) deficiency aggravates the loss of the protective function of astrocytes in rat brain during aging.**

I.Denis, B.Grintal, A.Latour, G.Champeil-Potokar, M.Hennebelle, E. Harbeby, P.Guesnet, S.Vancassel, JM Billard*, B. Potier, M.Lavialle.
*NuReLiCe – INRA – 78352 Jouy-en-Josas – France*
** INSERM U 894 – Paris – France*

**Background**
The unbalance between n-3 and n-6 PUFA in western diet may result in low brain DHA status that is supposed to participate to the decline of brain function with aging and to the occurrence of associated neuropathologies. However, the mechanisms linking DHA status in brain cells (neurons and astrocytes) and brain age-related disorders are still questioning.
**Objective**
We have shown that DHA regulates several functions of the astrocytes (Champeil-Potokar et al 06, Grintal et al 09). Because the neuroprotective role of astrocytes determines, in a large part, the brain resistance to age-related damages, we have investigated the possible consequences of an n-3PUFA deficiency on astroglial function in aging rats, focusing on glutamate scavenging and age-induced astrocytes hypertrophy (astrogliosis).
**Procedure**
Glutamate transport was investigated by measuring D-$^{3}$H-Aspartate uptake by freshly isolated brain homogenates and by quantifying astroglial glutamate transporters by western blotting. Astrogliosis was evaluated by immunohistological and western blotting determination of GFAP (Glial Fibrillary Acidic Protein). These parameters were compared in young (4 month-old) and old (22 month-old) rats receiving an n-3PUFA balanced or deficient diet. Their brain fatty acid status was evaluated in the main phospholipid classes.
**Results**
n-3 PUFA intakes had no influence on astroglial glutamate uptake or GFAP in young rats. Old rats exhibited a 30% reduced glutamate uptake, and a marked increase in GFAP, as compared to young ones. These age-related changes were exacerbated by n-3 PUFA deficiency: glutamate uptake was decreased by 20% and GFAP was increased by 40% in n-3 PUFA deficient old rats as compared to n-3 PUFA balanced old rats. VGLUT-1, a marker of glutamatergic transmission was also decreased in old n-3 PUFA deficient rats.
**Conclusion**
These results indicate that n-3PUFA deficiency aggravates the impairment of astroglial glutamate transport and the astrogliosis in aged rats. They suggest that a low brain DHA status contributes to the alteration of astrocyte function in the the glutamatergic circuits during aging.