

of ameliorating EAE. In this study, we further analyzed the effect of FSD-C10 on oligodendrocyte formation.

Material and methods: Female adult C57BL/6 mice were immunized with MOG_{35–55} to induce chronic EAE. The study was approved by the Ethics Committee of Shanxi Datong University. Mice received 10 µl/ nostril (5 µg/µl) FSD-C10 at the entrance of the nostrils on day 3 until day 27 p.i. Mice that received the same volume of ddH₂O nasally served as EAE controls.

Results: FSD-C10 inhibited proliferation of CD4, CD68 and CD11b⁺ immune cells, caused less immune cells in brain. In contrast, FSD-C10 stimulated NG2-expressing oligodendrocyte precursor cell and GalC-expressing oligodendrocyte proliferation, causing more oligodendrocyte formation. In addition, FSD-C10 also stimulated the production of neurotrophic factors NT-3 and GDNF, shifted activated microglia from M1 to M2 phenotype and inhibited inflammatory responses in the brain.

Conclusions: These results indicate that FSD-C10 promotes oligodendrogenesis and remyelination by elevating growth factors and strengthening of the microglial neuroprotective phenotype (M2) conducive for repair. (Grant: The Department of Science and Technology, Shanxi Province of China, 2013081058; Research Project Supported by Shanxi Scholarship Council of China, 2014-7).

Keywords: oligodendrogenesis, neurotrophic factors, inflammatory responses, NG2, GalC.

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Mixed Topics 2

Establishing a human neuronal derived-iPSC model to clarify the pathogenetic mechanism for PKAN

D. Orellana Riquelme^a, P. Santambrogio^a, A. Rubio Garrido^b, C. Cancellieri^b, P. Venco^c, S. Taverna^d, V. Tiranti^c, B. Garavaglia^e, V. Broccoli^f, S. Levi^a. ^aDivision of Neuroscience Proteomic of Iron Metabolism Unit, Vita-Salute San Raffaele University, Milan, Italy; ^bDivision of Neuroscience Stem Cells and Neurogenesis Unit, Vita-Salute San Raffaele University, Milan, Italy; ^cUnit of Molecular Neurogenetics, IRCCS Foundation Neurological Inst. C. Besta, Milan, Italy; ^dDivision of Neuroscience, Vita-Salute San Raffaele University, Milan, Italy; ^eDivision of Neurogenetics, IRCCS Foundation Neurological Inst. C. Besta, Milan, Italy; ^fDivision of Neuroscience Stem Cells and Neurogenesis Unit, CNR-National Research Council Inst. of Neuroscience and San Raffaele Scientific Institute, Milan, Italy

Mutations in the *PANK2* gene, which encodes pantothenate kinase 2, underlie an autosomal recessive inborn error of coenzyme A metabolism, called pantothenate kinase-associated neurodegeneration (PKAN). PKAN is characterized by dystonia, dysarthria, rigidity, retinal degeneration and severe iron accumulation in the brain. The pathogenesis mechanism of this disorder remains largely unknown. Current models recapitulate only a subset of the pathological manifestations and lack any neurological phenotype in particular the iron deposition in the brain. Considering all of this, there is the urgency of establishing meaningful experimental models to determine the pathological events leading to the disease. Toward this aim, we have employed iPSC cell technology for generating an *in vitro* disease model. We have succeeded in generating derived-iPSC neurons from patients and relative healthy donors by using the Sendai reprogramming vectors. Cells were analyzed for mitochondrial functionality, oxidative status and iron metabolism. The derived-iPSC neurons display a reduced antioxidant defense, increased level of ROS development and abnormal electrophysiological properties respect to the control. Furthermore, PKAN derived neurons present

electron dense aggregates inside the mitochondria of a still unknown nature. In conclusion, we succeeded in obtaining a human neuronal model to study PKAN disorder and the preliminary results indicated that PKAN derived neurons present altered oxidative status, abnormal mitochondrial functionality and morphology. The financial support of Telethon (Grant n°: GGP11088) and AISNAF is gratefully acknowledged.

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Mixed Topics 2

Investigation of regulatory factors in Lipid Storage Myopathies (LSM) with triglyceride accumulation

C. Angelini, E. Tasca, V. Pegoraro. *Neuromuscular Center, IRCCS S.Camillo, Venice - Mestre, Italy*

Background: Triglycerides are massively stored in LSM, i.e. carnitine deficiency, RR-MADD and NLSM-M (ATGL deficiency), conversely, in CPT-II deficiency lipid droplets are almost absent.

Objective: We aimed to analyse factors that regulate degradation and *PPAR-gamma* pathways. The Transcription Factor-EB (TFEB), a master regulator of lysosomal biogenesis and autophagy, is induced by starvation through an autoregulatory feedback loop and exerts a global transcriptional control on lipid catabolism via *PGC1α* and *PPARα*.

Patients and methods: We selected 6 patients with LSM: 2 RR-MADD, 1 carnitine deficiency, 2 NLSM-M, 1 CPT-II deficiency. Muscle immunofluorescence for TFEB and p62 (marker of protein aggregates) and fetal myosin (marker of regeneration) and immunoblot using p62, LC3 antibodies was done.

Results: While in 2 NLSM-M patients there was a co-localized overexpression of p62 and TFEB in some atrophic fibers, some of which were regenerating, in Carnitine and CPT-II deficiency their reaction appeared normal. In regenerating fibers TFEB localized in the cytoplasm (inactive form), whereas in atrophic fibers it localized in the nuclei (active form). Vacuolated and atrophic fibers did not display p62-positive protein aggregates, indicating, together with the LC3-II and p62 immunoblot analysis, that the autophagic flux is still preserved. Furthermore, we studied plasma myo-microRNA of 3 relatives of another NLSM-M family to observe their regulatory role in muscle. Myomicro-RNAs were inversely correlated to residual muscle mass in this NLSM-M family. Mitochondrial enzymes in two subsequent muscle biopsies of the index patient were decreased revealing an essential role of ATGL in mitochondriogenesis.

Conclusion: Nutrition and autophagy are important in RR-MADD and NLSM-M, when there is a progressive wasting of muscle.

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Mixed Topics 2

Genetic profiling of Indian patients with glutaric acidemia type I

S. Muntaj^a, T.P. Kruthika-Vinod^a, A.B. Vedamurthy^b. ^aNeurochemistry, National Institute of Mental Health & Neurosciences, Bangalore, India; ^bDepartment of Biotechnology & Microbiology, Karnatak University, Dharwad, India

Background: Glutaric acidemia type I (GA-I), is an inborn error of metabolism caused due to deficiency of the enzyme Glutaryl-CoA

Dehydrogenase. There are very few studies on the genetic etiology of GA-I from India.

Objective: The objective of this study was to screen Indian patients with GA-I for commonly occurring high and low excretor mutations.

Materials and methods: The study was approved by the institutional Human Ethics Committee. Fifty confirmed GA-I patients from unrelated families were recruited based on clinical, neuroimaging and biochemical profiles. Informed consent was obtained from patients before taking blood spots on the filter paper and screened for mutations, R402W, A421V and A293T (high excretor) and R227P and V400M (low excretor) by RFLP and by direct sequencing of PCR products. Mutations screened by RFLP were further confirmed by sequencing.

Results: Among the patients, 11(22%) were found to have R402W mutation, 7(14%) were homozygous and 5(8%) were heterozygous. One(2%) had F236L and 1(2%) had R313W mutations. Novel mutations, P286S was found in 2(4%), W225X in 1(2%), H403Y in 1(2%), Y295Y in 1(2%) and 1606 G > T at 3' UTR in 1 (2%). Conversely, none of the GA-I patients had A421V, A293T, R227P and V400M mutations. No novel low excretor mutations were found.

Conclusion: From this study, it is evident that R402W and novel P286S mutations were common among GA-I patients. A421V, A293T, R227P and V400M mutations were found to be absent. In conclusion, R402W and P286S are the most prevalent mutations among GA-I patients from India.

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Mixed Topics 2

Familial, autosomal-dominant neurodegenerative parkinsonism with cognitive deterioration spanning five generations in a genetically isolated population of South-Eastern Moravia, Czech Republic

K. Mensikova^a, M. Godava^b, P. Kanovsky^a, P. Otruba^a, M. Kaiserova^a, M. Vastik^a, L. Mikulicova^a, T. Bartonikova^a, R. Vrtel^b, R. Vodicka^b, S. Kurcova^a, P. Jugas^c, J. Ovecka^d, L. Sachova^e, F. Dvorsky^f. ^aDepartment of Neurology, Palacky University Olomouc, Olomouc, Czech Republic; ^bDepartment of Medical Genetics and Fetal Medicine, Palacky University Olomouc, Olomouc, Czech Republic; ^cDepartment of Neurology, Neurology Outpatient Clinic, Veseli nad Moravou, Czech Republic; ^dGeneral Practitioner, General Practitioner, Lipov, Czech Republic; ^eGeneral Practitioner, General Practitioner, Velka nad Velickou - Javornik, Czech Republic; ^fGeneral Practitioner, General Practitioner, Velka nad Velickou, Czech Republic

Abstract

Objective: To obtain more detailed medical history information about the relatives of individuals with confirmed parkinsonism in an isolated region with a rural population in south-eastern Moravia, Czech Republic.

Background: An epidemiological study conducted over four years revealed an increased prevalence of neurodegenerative parkinsonism in a small, isolated region (10 villages, with a combined population of 8664, with approx. 2927 over 50 years of age) of south-eastern Moravia, Czech Republic.

Methods: Detailed genealogical research was performed on the families of all the subjects with confirmed parkinsonism and the pedigrees were compiled; these were further amended on the basis of information obtained through a consecutive door-to-door survey and by means of local municipal and church registers.

Results: In the first stage, three large pedigrees with a familial occurrence of parkinsonism were found; two of them originated in

one of the region's villages. In the second stage, these two pedigrees were completed into one large family tree with an apparent autosomal-dominant inheritance pattern of parkinsonism spanning generations from 1840 to the present.

Conclusions: The high prevalence of parkinsonism in the researched area is caused by the familial aggregation of parkinsonism that was found in two large family trees. This familial aggregation of parkinsonism is probably the result of the genetic isolation of the regional population due to the very low migration rate of its inhabitants to neighboring regions in the last two centuries. A detailed genetic and molecular-genetic analysis are currently underway in all probands in whom the parkinsonism symptoms were documented and in all of their blood relatives.

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Mixed Topics 2

Fasting blood glucose levels are associated with white matter hyperintensities' burden in older individuals with and without type 2 diabetes

N. Cherbuin^a, W. Wen^b, P.S. Sachdev^b, K.J. Anstey^a. ^aCentre for Research on Ageing Health and Wellbeing, Australian National University, Canberra, Australia; ^bSchool of Psychiatry, University of NSW, Sydney, Australia

Background: The occurrence of white matter hypointensities (WMH) on T2-weighted (FLAIR) MRI scans is widespread in the ageing population and known to be associated with cerebrovascular disease, cardio-metabolic pathology, and increased risk of cognitive decline and dementia. While WMH have been found to be associated with hyperglycaemia in type 2 diabetes (T2D), it is unclear whether fasting blood glucose (FBG) levels in the absence of T2D is associated with higher risk of developing WMH.

Objectives: Investigate the association between FBG and WMH burden in older individuals living in the community.

Material and methods: Participants were 401 individuals (aged 60-66 years, 48.6% female) taking part in a large longitudinal study of ageing. FBG levels and WMH measures were obtained at first assessment. T2D classification was based on self-report or a fasting glucose level ≥ 7 mmol/l. Associations were tested with multiple regression analyses while controlling for age, sex, education, smoking, and intra-cranial volume. Institutional Review Board approval was granted.

Results: Included participants comprised 276 individuals with glucose in the normal range (<5.6 mmol/l), 86 with elevated FBG but without T2D (5.6-6.9 mmol/l), and 39 with T2D. Results showed that higher FBG was associated with greater WMH burden in the whole sample in the right ($p = 0.02$) but not the left hemisphere and particularly so in the frontal and temporal lobes. Sensitivity analyses indicate that these findings were mostly driven by participants with T2D or impaired FBG levels.

Conclusion: Impaired FBG levels are associated with increased WMH burden in older community-living individuals with or without T2D.

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