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Proceedings of the 32nd National Conference of the Italian Group for the Study of Neuromorphology "Gruppo Italiano per lo Studio della Neuromorfologia" G.I.S.N.

November 25-26, 2022

University of Campania, Luigi Vanvitelli
Naples, Italy

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The *European Journal of Histochemistry* was founded in 1954 by Maffo Vialli and published till 1979 under the title of *Rivista di Istochimica Normale e Patologica*, from 1980 to 1990 as *Basic and Applied Histochemistry* and in 1991 as *European Journal of Basic and Applied Histochemistry*. It is now published under the auspices of the University of Pavia, Italy.
The *European Journal of Histochemistry* is the official organ of the Italian Society of Histochemistry and a member of the journal subcommittee of the International Federation of Societies for Histochemistry and Cytochemistry (IFSHC), and has been an influential cytology journal for over 60 years, publishing research articles on functional cytology and histology in animals and plants.

The Journal publishes Original Papers, Technical Reports, Reviews, Brief Reports, Letters to the Editor, Views and Comments, and Book Reviews concerning investigations by histochemical and immunohistochemical methods, and performed with the aid of light, super-resolution and electron microscopy, cytometry and imaging techniques; attention is also given to articles on newly developed or originally applied histochemical and microscopical techniques.

Coverage extends to:
- functional cell and tissue biology in animals and plants;
- cell differentiation and death;
- cell-cell interaction and molecular trafficking;
- biology of cell development and senescence;
- nerve and muscle cell biology;
- cellular basis of diseases.

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Giuseppe Trautteur
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Proceedings of the 32nd National Conference of the Italian Group for the Study of Neuromorphology "Gruppo Italiano per lo Studio della Neuromorfologia" G.I.S.N.

A NEW ANIMAL MODEL FOR THE STUDY OF GAMING DISORDER: SEX DIFFERENCE IN BRAIN CIRCUITS

A. Casile [1,2], B. Bonaldo [2,3], S. Nasini [4], C. Cifani [1], S. Gotti [2,3], G.C. Panzica [2,3], M. Marraudino [2,3]

[1]School of Pharmacy, Pharmacology Unit, University of Camerino; [2]Neuroscience Institute Cavalieri Ottolenghi (NICO), Orbassano (TO), University of Turin; [3]Department of Neuroscience Rita Levi-Montalcini, University of Turin; [4]Laboratory of Molecular and Cellular Pharmacology, Department of Pharmacology, University of Padua, Italy

Although game is an important part of human behavioral development, recent studies show that children and adolescents who use electronic media, for more time, may experience intra- and interpersonal risk factors. Because of its strong similarity to addictive disorders and along with social anxiety and attention deficit, loss of control over gaming has been termed as "Gaming Disorder" (GD). However, the various studies conducted in recent years show several limitations, such as exposure period, duration, and gender. The purpose of this work is to validate an animal model of GD in rat, which exhibits sex differences in susceptibility, addictive behaviour, and brain activity of areas implicated in GD. We developed, for the first time, using a new apparatus provided with a touchscreen platform, a GD rat model that resembles the fundamental features of the disorder (*e.g.*, addiction, hyperactivity). After five weeks of training, male and female Wistar Kyoto (WKY) rats were assessed for: a) their attachment to the game under different condition, b) their compulsiveness during gaming, and c) the maintenance of these conditions after a period of game pause and a reward interruption. According to the multicriteria described in the literature, it was possible to identify GD-rats in 16/18 males and in 21/21 females, which obtained scores between 66 and 99%. GD-rats showed a significant increase in frequency and duration of play, and time spent in front of the screen compared to both controls and rats which have been trained but did not develop an addiction, with a greater accentuation of these behaviours in the group of GD females. Moreover, through immunohistochemical techniques, we performed several morphological investigations in the brain of these animals: we analysed whether there was a different activation in the areas of circuits involved in addiction through the immunohistochemical detection of c-Fos positivity (a marker of neuronal activity); activation of anxiety- and stress-related regions, the mesocorticolimbic reward system, and decision-making and motor learning circuits are found to be impaired in GD groups compared with CON groups. In addition, analysing the reward system, both dopamine and serotonin immunoreactivity was found modified in the VTA and DRN of GD groups.
In conclusion, we propose a rat animal model of GD that exhibit features also found in GD patients such as the development of addiction-like behaviours, sex difference in susceptibility, and changes in brain activity. The use of our animal model of GD will allow us to further study the neurological basis of the disorder while also accounting for sex differences.

SESSION VII
GLIAL CELLS AND NEUROINFLAMMATION

ACM-GFS MODULATE DNA RNA ERK SYNTHESIS IN ASTROCYTES

C. Giallongo, A. Distefano, L. Longhitano, M. Spampinato, G. Carota, D. Tibullo, G. Li Volti, R. Avola

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Astroglial conditioned media (ACM) and growth factors (GFs) influence the development and maturation of cultured Astrocytes. The present work has assessed the effect of ACM collected from 15, 30, 60 or 90 days *in vitro* (DIV) on developing (15 or 30 DIV) cultured astrocytes pre-treated with growth factors (EGF, bFGF, IGF-I or INS). The study was specifically designed to assess up and down modulation by exogenous growth factors during interactive crosstalk with endogenous growth factors, released in ACM harvested from different stages of maturation of astrocyte cultures.
Addition for 24 h of ACM obtained at 30, 60 or 90 DIV significantly reduced DNA labeling in 15 or 30 DIV astrocytes pretreated for 12 h with EGF. A slight but significant increase of DNA labelling was found in EGF- pretreated cultures at 15 or 30 DIV compared to control cultures. Addition of ACM obtained at 15 DIV induced a marked stimulation of DNA labeling in 12 h epidermal growth factor-pretreated 30 DIV cultures. This effect was more pronounced after EGF treatment. Addition of ACM to 15 DIV cultures from 30 or 60 or 90 DIV after 12 h pretreatment with EGF markedly inhibited DNA labelling. Addition for 24 h of ACM obtained at 30, 60 or 90 DIV significantly reduced DNA labeling in 15 or 30 DIV astrocytes pretreated for 12 h with bFGF. Reduction in DNA labelling was found in 15 DIV bFGF-pretreated cultures. Addition of ACM to 15 DIV cultures from 30 or 60 or 90 DIV after 12 h pretreatment with bFGF, markedly inhibited DNA labelling. Addition for 24 h of ACM obtained at 30, 60 or 90 DIV significantly reduced DNA labelling in 15 or 30 DIV astrocytes pre-treated for 12 h with INS. At 12 h INS pretreatment remarkably increased DNA labelling.
Addition of ACM to 15 DIV cultures from 30 or 60 or 90 DIV after 12 h pre-treatment with INS markedly inhibited DNA labelling. Addition for 24 h of ACM obtained at 30, 60 or 90 DIV significantly reduced DNA labelling in 15 or 30 DIV astrocytes pre-treated for 12 h with IGF- I. ACM Addition to 15 DIV cultures from 30, 60, 90 DIV after 12 h IGF-I pretreatment inhibited DNA. ACM collected from 15 or 60 or 90 DIV increased RNA labelling of 15 and 30 DIV astrocyte cultures, being the highest value that of 30 DIV cultures added with ACM from 90 DIV. The findings of increased DNA labelling after EGF or INS pre-treatment in 30 DIV cultures, followed by addition of ACM from 15 DIV cultures, suggest that these phenomena may depend on extra cellular signal-regulated kinase 1 (ERK1) activation.