Alcohol 65 (2017) 19–24

Contents lists available at ScienceDirect

Alcohol

journal homepage: http://www.alcoholjournal.org/

Proceedings of the 2016 annual meeting of the Fetal Alcohol Spectrum Disorders Study Group

Alexandre E. Medina [a, *], Jeffrey R. Wozniak [b], Anna Y. Klintsova [c], Derek A. Hamilton [d]

[a] Department of Pediatrics, University of Maryland, School of Medicine, Baltimore, MD, USA
[b] Department of Pediatrics, University of Minnesota, School of Medicine, Minneapolis, MN, USA
[c] Department of Psychological and Brain Sciences, University of Delaware, Newark, DE, USA
[d] Department of Psychology, University of New Mexico, Albuquerque, NM, USA

ARTICLE INFO

Article history:
Received 13 June 2017
Accepted 8 July 2017

Keywords:
Fetal Alcohol Syndrome
Conference
Rehabilitation

ABSTRACT

The 2016 Fetal Alcohol Spectrum Disorders Study Group (FASDSG) meeting was titled "Rehabilitation in FASD: Potential Interventions and Challenges". During the previous decades, studies with human subjects and animal models have improved much of our understanding of the mechanisms underlying FASD, putting the scientific community in a good position to test hypotheses that can lead to potential therapeutic interventions. During the conference, two keynote speakers addressed potential interventions used in different fields and their applicability to FASD research. The conference also included updates from several government agencies, short presentations by junior and senior investigators that showcased the latest in FASD research, and award presentations. The conference was closed by a talk by Dr. Charles Goodlett, the recipient of the 2016 Henry Rosett award.

The 2016 Fetal Alcohol Spectrum Disorders Study Group (FASDSG) annual meeting was held on June 25, in New Orleans, LA, as a satellite of the Research Society on Alcoholism meeting. Approximately 146 senior and junior investigators attended the meeting, including individuals from the United States (from 28 states), Canada, South Africa, and South Korea. The program included two keynote speaker presentations, and 13 FASt Data blitzes (one slide, 5-min presentations of original data). Most of the FASt presentations were given by graduate students and post-doctoral associates, and seven of them were supported by travel awards from the FASDSG.

In addition, two other trainees were selected to receive the Timothy A. Cudd and the Kenneth R. Warren Merit Awards. All trainees attending the meeting had the opportunity to interact with more senior researchers and clinicians at a networking lunch. Representatives from the National Institute of Alcohol Abuse and Alcoholism (NIAAA), the Interagency Coordinating Committee on Fetal Alcohol Spectrum Disorders (ICCFASD), Substance Abuse and Mental Health Services Administration (SAMHSA), and the Centers for Disease Control and Prevention (CDC) gave updates on FASD-related programs from these agencies. The highlight of the meeting was the presentation of the Rosett Award, to recognize lifetime contributions, achievement, and service in FASD research.

The theme of the 2016 meeting was "Rehabilitation in FASD: Potential Interventions and Challenges". After several decades of investigating the epidemiology and the mechanisms underlying FASD, the scientific community is in a position to evaluate potential interventions. Currently, there are approaches being tested, such as choline supplementation and behavioral interventions. This year we invited two keynote speakers to talk about two potential strategies of rehabilitation that have been applied, transcranial magnetic stimulation and sensory-motor enrichment, and to discuss different conditions that may have potential as an intervention for FASD.

Keynote presentations

The first keynote presentation was given by Dr. James "Cole" Galloway, P.T., Ph.D., Professor of Physical Therapy at the University of Delaware. His talk was titled: "Go Baby Go: Lifespan technology R&D for making brains, making buddies and getting into serious trouble!" Dr. Galloway's work aims to devise strategies and technologies to improve mobility and provide environmental enrichment in subjects with neurodevelopmental conditions such as

* Corresponding author. 655 Baltimore, St Room 13-017, Baltimore, MD 21201, USA. Fax: +1 410 328 1076.
E-mail address: amedina@som.umaryland.edu (A.E. Medina).

https://doi.org/10.1016/j.alcohol.2017.07.001
0741-8329/

cerebral palsy and Down syndrome. Dr. Galloway started his talk by addressing the importance of mobility and environmental exploration during critical periods of brain development. Children with impairments that limit their sensory experience and the ways in which they interact with their peers may have long-lasting consequences on cognition and sociability. To ameliorate neurodevelopmental problems, interventions aiming to provide sensory enrichment or to improve mobility through physical therapy sessions are often used. While these types of interventions can be important, Dr. Galloway stressed that they have the limitation of being restricted to short periods of time, instead of engaging patients in their daily routines. With this in mind, Dr. Galloway devised a series of strategies aiming to bring to patients' homes tools that can be used constantly to improve mobility and sensory experience. By doing so, this enriched environment would lead to neuronal plasticity changes that could be beneficial even to other behavioral aspects such as cognition and self-esteem. In order to improve mobility and sensory experience in children with different severities of cerebral palsy, Dr. Galloway used modified toy ride-on cars, harness-assisted mobility, and “super suits”, in collaboration with Dr. Michelle Lobo, also from the University of Delaware. Modified toy ride-on cars provide better mobility than conventional wheelchairs, can be built for a fraction of wheelchair cost, and can be used by children with minimal assistance. Harness-assisted mobility can be achieved by installing tracks throughout the patient's house, allowing the subject to be mobile in their own environment. Finally, a “supersuit” is a combination of the concept of a wearable functional exoskeleton and fashionable clothing. This work, done in collaboration with Dr. Michele Lobo, ameliorates movement problems with a solution that is inexpensive, accessible, and esthetically pleasant.

The approach proposed by Dr. Galloway may be applicable to FASD research and potential treatment strategies. There are several studies providing evidence that enriched environments can ameliorate cognitive deficits in FASD (Hamilton et al., 2014; Hannigan, Berman, & Zajac, 1993; Klintsova et al., 1998). Dr. Galloway's talk suggests that making an enriched environment as a part of the patient's daily life may produce better results.

The second keynote presentation was given by Dr. Alexander Rotenberg, M.D., Ph.D., Associate Professor of Neurology, Boston Children's Hospital, Harvard Medical School. The title of his talk was “Measures and modifications of cortical excitability by non-invasive brain stimulation”. Dr. Rotenberg started his presentation by giving an overview of the basic mechanisms and the applicability of transcranial magnetic stimulation (TMS), a non-invasive method to increase or decrease brain activity in a specific region. TMS is performed with a metal coil that generates an electric current, which in turn produces a magnetic field that can affect cortical responses in areas with a typical radius of 0.5 cm. Typically, three different types of stimulation protocols are used: a) Single pulse, b) Paired Pulse, and c) Repetitive. Single pulse (sTMS) is often used for brain mapping in pre-surgical planning or to detect thresholds for cortical excitability (Frye, Rotenberg, Ousley, & Pascual-Leone, 2008). In fact, using sTMS in selected areas of the motor cortex to calculate the amount of current necessary to produce a response in an EMG electrode, Dr. Rotenberg demonstrated how cortical excitability matures with age. Dr. Rotenberg called attention to animal studies that showed decreased myelination after developmental alcohol exposure (David & Subramaniam, 2017), and noted that it would be interesting to use the non-invasive sTMS approach to evaluate the state of the maturation of excitability and nerve conductivity in subjects with FASD. Another alteration of cortical excitability that is common in subjects with FASD is epileptic seizures (Bell et al., 2010; Nicita et al., 2014). Dr. Rotenberg presented data demonstrating the feasibility and efficacy of low frequency repetitive stimulation (0.5–1 Hz) in decreasing cortical excitability and in turn reducing seizures in different conditions (Gersner, Oberman, et al., 2016; Rotenberg et al., 2008, 2009). Interestingly, repetitive stimulation TMS (rTMS) was also used in combination with lorazepam (a commonly prescribed anticonvulsant), and it reduced the anticonvulsant dose required to suppress seizures (Gersner, Dhamne, Zangen, Pascual-Leone, & Rotenberg, 2016). What are the mechanisms underlying the positive effects of rTMS? One explanation is that low frequency rTMS protocols may induce long-term depression (LTD), a temporary but long-lasting reduction in synaptic strength that results in decrease of neuronal responses. In fact, both low frequency rTMS and LTD use similar stimulation protocols of 0.5–1 Hz (Lenz & Vlachos, 2016; Nakano, Yamada, Udagawa, & Kato, 2004; Sheng & Ertürk, 2013). In addition to changing neuronal excitability, TMS can also be used to evaluate the balance between excitation and inhibition. For instance, paired-pulse TMS (ppTMS) stimulation applied in the motor cortex results in two motor-evoked potentials (MEPs), in a way that the second MEP has a smaller amplitude than the first (Oberman et al., 2010). The decrease in amplitude is attributed to GABAergic neurotransmission, and therefore a ratio between these responses should reflect the balance between excitation/inhibition (Oberman et al., 2010). Using ppTMS, Dr. Rotenberg and colleagues showed a reduction in GABA-mediated inhibition after traumatic brain injury in a rodent model (Hsieh et al., 2016). This change of inhibition had been hypothesized to be indirectly caused by an increase in oxidative stress. According to the hypothesis, an increase in oxidative stress would result in damage to the perineuronal net that surrounds mainly inhibitory parvalbumin (PV) neurons. A decrease in the number of PV neurons would decrease inhibition, resulting in tissue that is more excitable and prone to seizures (Hsieh et al., 2016). A parallel can be drawn to FASD, since it has been reported that developmental alcohol exposure can lead to an increase in oxidative stress (Brocardo, Gil-Mohapel, & Christie, 2011), a decrease in PV neurons (Smiley et al., 2015), and the development of seizures (Bell et al., 2010; Nicita et al., 2014).

In summary, TMS has great potential as a tool for evaluating cortical excitability and suppressing seizures in neurodevelopmental disorders such as FASD.

Kenneth R. Warren Merit award

Bodnar, T., Raineki, C., & Weinberg, J. (University of British Columbia) *Effects of prenatal alcohol exposure on immune function across the lifespan.* Ms. Bodnar was awarded the Kenneth R. Warren Merit Award for work that is part of her doctoral dissertation. In her talk, she described a range of immune effects of prenatal alcohol exposure in humans and animals, including increased susceptibility to infection, abnormalities in the development and adaptability of the immune system, inflammatory diseases, susceptibility to cancers, and problems transferring immunity from mother to offspring through lactation. Research in this field and in this lab has often employed a “two-hit” model with PAE being the first hit and a later “challenge” such as chronic or acute stress representing the second hit. The first study that Ms. Bodnar presented examined female rats who were offspring of mothers exposed during gestation to ethanol, or pair-fed, or given a control diet. Environmental stressors were applied between days P31 and P41 and the rats were later injected with Complete Freund's Adjuvant to increase the likelihood of arthritis during adulthood. The PAE rats showed significantly higher rates of arthritis compared to controls or pair-fed rats and they also tended to maintain inflammation longer. Bone and cartilage cross sections revealed long-lasting inflammation and damage in the PAE rats. Ms. Bodnar presented a second study using a more acute stress paradigm (adequate or low bedding material in