

# SFN–Winnipeg2003

## Saturday, Nov. 8 (PM) – Platform Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Saturday, Nov. 8, 2:15 PM – 2:30 PM	10.6	Slide	Morial Convention Center – Room 268	<u>J.E.Rash</u> <sup>1*</sup> ; T.Yasumura <sup>1</sup> ; K.G.V.Davidson <sup>1</sup> ; C.S.Furman <sup>1</sup> ; S.Royer <sup>1</sup> ; J.I.Nagy <sup>2</sup> ; F.E.Dudek <sup>1</sup>	Dept. Biomed. Sci, Colorado State Univ	<b>CONNEXIN-36 (CX36) BUT NOT CX26, CX29, CX30, CX32, CX43 OR CX47 IN NEURONAL GAP JUNCTIONS OF ADULT RAT HIPPOCAMPUS.</b>

## Sunday, Nov. 9 (AM) – Poster Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Sunday, Nov. 9, 11:00 AM – 12:00 PM	186.12	Poster	J7	<u>K.Stecina</u> <sup>1*</sup> ; J.Quevedo <sup>2</sup> ; D.A.McCrea <sup>1</sup>	Physiology, U of Manitoba	<b>CENTRAL MODULATION OF INHIBITION DURING THE STUMBLING CORRECTIVE REFLEX.</b>
Sunday, Nov. 9, 8:00 AM – 9:00 AM	213.1	Poster	UU50	<u>M.P.Namaka</u> *; M.J.Melanson; P.Miao; G.Wang	Fac. Pharm, Univ. Manitoba	<b>ACTIVATION OF MULTIPLE SCLEROSIS VIA THE DORSAL ROOT GANGLIA.</b>

## Sunday, Nov. 9 (PM) – Poster Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Sunday, Nov. 9, 2:00 PM – 3:00 PM	276.10	Poster	G24	<u>S.Chakrabarty</u> *; M.Lafreniere–Roula; L.M.Jordan; D.A.McCrea	Dept. Physiol, Univ. Manitoba	<b>EVIDENCE AGAINST A COMMON EXCITATORY DRIVE TO MOTONEURONS INNERVATING BIFUNCTIONAL AND SINGLE JOINT MUSCLES DURING FICTIVE LOCOMOTION IN CATS.</b>
Sunday, Nov. 9, 1:00 PM – 2:00 PM	276.13	Poster	G27	<u>M.Lafreniere–Roula</u> *; D.A.McCrea	Dept. Physiology, Univ. of Manitoba	<b>LACK OF EVIDENCE FOR CENTRALLY–GENERATED SPIKE–TRIGGERING DEPOLARIZATIONS THAT SYNCHRONIZE MOTONEURON FIRING DURING FICTIVE MOTOR BEHAVIORS IN THE CAT.</b>
Sunday, Nov. 9, 2:00 PM – 3:00 PM	277.10	Poster	G43	<u>K.C.Cowley</u> *; E.Zaporozhets; B.J.Schmidt	Dept. of Physiology, Univ. of Manitoba	<b>INFLUENCE OF THE THORACOLUMBAR REGION ON LOCOMOTOR AND NON–LOCOMOTOR RHYTHM GENERATION IN THE <i>IN VITRO</i> NEONATAL RAT SPINAL CORD.</b>
Sunday, Nov. 9, 3:00 PM – 4:00 PM	277.11	Poster	G44	<u>E.Zaporozhets</u> ; L.M.Jordan*; B.J.Schmidt	Physiology, Univ. of Manitoba	<b>NORADRENERGIC, DOPAMINERGIC AND SEROTONERGIC RECEPTOR ANTAGONISTS BLOCK BRAINSTEM–EVOKED LOCOMOTION</b>

						IN THE <i>IN VITRO</i> NEONATAL RAT SPINAL CORD.
Sunday, Nov. 9, 4:00 PM – 5:00 PM	277.12	Poster	G45	<u>B.J.Schmidt</u> *; E.Zaporozhets; L.M.Jordan	Physiology, Univ. of Manitoba	<b>BULBOSPINAL PATHWAYS ACTIVATING LOCOMOTOR-LIKE ACTIVITY IN THE <i>IN VITRO</i> NEONATAL RAT SPINAL CORD: CHEMICAL VERSUS ELECTRICAL STIMULATION OF THE BRAINSTEM.</b>
Sunday, Nov. 9, 3:00 PM – 4:00 PM	305.19	Poster	GG11	<u>C.Zamzow</u> ; R.Bose; F.E.Parkinson*	Pharmacol., Univ. Manitoba	<b>EFFECT OF INTRACELLULAR ACIDOSIS ON ADENOSINE RELEASE FROM CULTURED RAT FOREBRAIN NEURONS AND ASTROCYTES.</b>

### Monday, Nov. 10 (AM) – Platform Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Monday, Nov. 10, 9:45 AM – 10:00 AM	333.8	Slide	Morial Convention Center – Room 255	<u>D.D.Eisenstat</u> <sup>1,2,3</sup> , T.N.Le <sup>4*</sup> ; Q.Zhou <sup>1</sup> ; M.Plews <sup>1</sup>	Dept. Pediatrics, Univ. of Manitoba	<b>DIFFERENTIATION OF GABAERGIC INTERNEURONS DERIVED FROM EMBRYONIC CNS IS REGULATED BY DIRECT ACTIVATION OF GLUTAMIC ACID DECARBOXYLASE (GAD) ISOFORMS BY DLX HOMEBOX GENES.</b>

### Monday, Nov. 10 (AM) – Poster Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Monday, Nov. 10, 8:00 AM – 9:00 AM	375.5	Poster	F57	<u>A.Pereda</u> <sup>1*</sup> ; C.Castillo <sup>1</sup> ; J.O'Brien <sup>2</sup> ; J.Nagy <sup>3</sup> ; F.Bukauskas <sup>1</sup> ; K.Davidson <sup>4</sup> ; T.Yasumura <sup>4</sup> ; J.Rash <sup>4</sup>	A. Einstein C. Med.	<b>SHORT-RANGE FUNCTIONAL INTERACTION BETWEEN NMDA RECEPTORS AND CONNEXIN35-MEDIATED ELECTRICAL SYNAPSES.</b>
Monday, Nov. 10, 10:00 AM – 11:00 AM	377.3	Poster	F87	<u>D.Derjean</u> <sup>1</sup> ; S.Bertrand <sup>2</sup> ; F.Nagy <sup>2</sup> ; S.J.Shefchyk <sup>1*</sup>	Physiology, Univ. of Manitoba	<b>RAT SPINAL PARASYMPATHETIC PREGANGLIONIC NEURONS EXPRESS PLATEAU POTENTIALS.</b>

### Monday, Nov. 10 (PM) – Poster Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Monday, Nov. 10, 3:00 PM – 4:00 PM	476.23	Poster	E53	<u>C.O.Olson</u> ; X.Li; S.Lu; J.I.Nagy*	Physiology, Univ. of Manitoba	<b>CX36 DISTRIBUTION IN THE CNS AND INTERACTION WITH ZONULA OCCLUDENS PROTEIN-1 (ZO-1).</b>
Monday, Nov. 10, 3:00 PM – 4:00 PM	498.15	Poster	H103	<u>R.A.Gaunt</u> <sup>1*</sup> ; A.Prochazka <sup>2</sup> ; V.K.Mushahwar <sup>1</sup> ; J.W.Downie <sup>3</sup> ; S.J.Shefchyk <sup>4</sup>	Biomed. Engin., Univ. of Alberta	<b>INTRASPINAL MICROSTIMULATION FOR BLADDER CONTROL BEFORE AND AFTER CHRONIC SPINALIZATION.</b>
Monday, Nov. 10, 4:00	529.20	Poster	UU10	<u>M.Xue</u> <sup>1,2*</sup> ; J.Balasubramaniam <sup>1,2</sup>	Human Anat. & Cell. Sci.	<b>ACUTE INFLAMMATORY RESPONSE FOLLOWING INJECTIONS OF BLOOD,</b>

PM – 5:00  
PM

M.Del Bigio<sup>1,2</sup>

Univ.  
Manitoba

**THROMBIN, AND PLASMINOGEN INTO  
MOUSE BRAIN.**

## Tuesday, Nov. 11 (AM) – Poster Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Tuesday, Nov. 11, 8:00 AM – 9:00 AM	615.1	Poster	K11	<u>H.T.Bergen</u> <sup>1*</sup> ; <u>H.Herzog</u> <sup>2*</sup> ; <u>G.J.Cooney</u> <sup>3</sup>	Dept. Human Anat. & Cell. Sci., Univ. of Manitoba	<b>SUSCEPTIBILITY TO DEVELOP DIET-INDUCED OBESITY IS INCREASED IN NPY Y1 RECEPTOR KNOCKOUT MICE AND DECREASED IN NPY Y2/Y4 DOUBLE KNOCKOUT MICE.</b>

## Tuesday, Nov. 11 (PM) – Platform Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Tuesday, Nov. 11, 5:30 PM – 6:30 PM	N/A	Other Special Event	Morial Convention Center – Room 285	<u>K.Sale</u> *		<b>SOCIETY FOR NEUROSCIENCE BUSINESS/MEMBERS MEETING.</b>

## Wednesday, Nov. 12 (PM) – Platform Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Wednesday, Nov. 12, 1:00 PM – 1:15 PM	870.1	Slide	Morial Convention Center – Room 255	<u>T.N.Le</u> <sup>1</sup> ; <u>D.D.Eisenstat</u> <sup>2,3,4*</sup>	Dept. BioChem. & Med. Genet., Univ. Manitoba	<b>INTERNEURON MIGRATION FROM THE BASAL FOREBRAIN IS REGULATED BY DIRECT REPRESSION OF THE SEMAPHORIN RECEPTOR NEUROFILIN-2 BY DIX HOMEBOX GENES.</b>

## Wednesday, Nov. 12 (PM) – Poster Presentations

Day / Time	Prog #	Presentation Type	Location	Authors	1st Author 1st Affiliation	Title
Wednesday, Nov. 12, 4:00 PM – 5:00 PM	920.4	Poster	G32	<u>T.L.Ivanco</u> *; <u>M.J.Derksen</u>	Dept. Psychology, Univ. Manitoba	<b>MAP-2 EXPRESSION IN MOTOR CORTEX FOLLOWING SKILL LEARNING.</b>

**Program Number:** 10.6

**Day / time:** Saturday, Nov. 8, 2:15 PM – 2:30 PM

**Presentation Type:** Slide

**Presentation Location:** Morial Convention Center – Room 268

**CONNEXIN–36 (CX36) BUT NOT CX26, CX29, CX30, CX32, CX43 OR CX47 IN NEURONAL GAP JUNCTIONS OF ADULT RAT HIPPOCAMPUS.**

J.E.Rash<sup>1\*</sup>; T.Yasumura<sup>1</sup>; K.G.V.Davidson<sup>1</sup>; C.S.Furman<sup>1</sup>; S.Royer<sup>1</sup>; J.I.Nagy<sup>2</sup>; F.E.Dudek<sup>1</sup>

*1. Dept. Biomed. Sci, Colorado State Univ, Fort Collins, CO, USA. 2. Physiology, Univ. Manitoba, Winnipeg, MB, Canada*

Gap junctions and electrotonic coupling have been proposed between both principal neurons and interneurons in the hippocampus and neocortex, but limited ultrastructural evidence is available concerning the types of neurons linked by gap junctions or the connexin composition of their junctions. Nine connexins have been reported in gap junctions of the mammalian CNS, and reports from light microscopic immunocytochemistry have implicated Cx26, Cx32, Cx36, Cx43 and Cx47 in gap junctions of hippocampal neurons. We have examined neurons and glia for the presence of seven CNS connexins (Cx26, Cx29, Cx30, Cx32, Cx36, Cx43 and Cx47) using freeze–fracture replica immunogold labeling (FRIL). By FRIL, Cx29, Cx32, and Cx47 were found only in oligodendrocyte gap junctions, whereas astrocyte junctions contained only Cx26, Cx30 and Cx43, with all six of these connexins found at heterologous astrocyte–to–oligodendrocyte gap junctions. In contrast, neuronal gap junctions in CA1, CA3, hilus and dentate gyrus were labeled only for Cx36; none were labeled for any of the other connexins tested. By FRIL, gap junctions were not detected linking neurons to any other cell type. Six of seven distinctive forms of neuronal gap junctions were immunogold labeled for Cx36, including large vs. small “plaque” gap junctions consisting of regular hexagonal arrays vs. irregular clusters, large and small “reticular” gap junctions, and several forms of “meandering” gap junctions. Several were associated with glutamate receptor PSDs. We are currently devising FRIL methods for labeling and identifying types of neurons linked by gap junctions and identifying neurotransmitter receptors at these mixed synapses.

*Support Contributed By: Supported by NIH (NS38121, NS39040, NS44010, and NS44395 [to JER], MH55595 and NS16683 [to FED]) and by the Canadian Institutes of Health Research (to JIN)*

**Citation:**

J.E. Rash, T. Yasumura, K.G.V. Davidson, C.S. Furman, S. Royer, J.I. Nagy, F.E. Dudek. CONNEXIN–36 (CX36) BUT NOT CX26, CX29, CX30, CX32, CX43 OR CX47 IN NEURONAL GAP JUNCTIONS OF ADULT RAT HIPPOCAMPUS. Program No. 10.6. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 186.12

**Day / time:** Sunday, Nov. 9, 11:00 AM – 12:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # J7

**CENTRAL MODULATION OF INHIBITION DURING THE STUMBLING CORRECTIVE REFLEX.**

K.Stecina<sup>1\*</sup>; J.Quevedo<sup>2</sup>; D.A.McCrea<sup>1</sup>

*1. Physiology, U of Manitoba, Winnipeg, MB, Canada* *2. Physiol Biophys Neurosci, CINVESTAV, Mexico, Mexico*

When a cat's hind paw strikes an obstacle during the swing phase of forward walking, the stumbling corrective reaction (reflex) raises the foot in an attempt to avoid tripping. This reflex can also be elicited by stimulation of the cutaneous superficial peroneal (SP) nerve (15 shocks, 200 Hz, 2T) during the flexion phase of MLR–evoked fictive locomotion in decerebrate cats. Such stimulation results in an excitation of knee flexor and ankle extensor motoneurons and an initial inhibition of ankle flexor motoneurons. This is quickly followed by excitation of hip, knee and ankle flexors. During the swing phase of real locomotion these actions would extend the ankle to avoid further contact with the obstacle and lift the foot over the obstacle. Intracellular recordings reveal that both ankle flexors and extensors are subject to a mixture of SP–evoked excitation and inhibition often at trisynaptic latencies (>2.1ms). With the transition to the locomotor state, however, inhibitory components of SP reflexes in ankle extensor motoneurons are reduced. This central modulation of inhibition is important because in order to extend the foot during the swing phase, the depolarizing actions of SP stimulation must overcome the locomotor–related hyperpolarization of the ankle extensor motoneurons. In contrast there is no reduction in the SP–evoked inhibition of ankle flexor motoneurons during fictive locomotion. The transient suppression of ankle flexor firing produced by this SP inhibition assists foot extension during stumbling correction. The differential control of SP–evoked inhibition during locomotion indicates that there are separate populations of SP–activated inhibitory interneurons projecting to ankle flexor and extensor motoneurons. The later excitation of hip, knee and ankle flexors during stumbling correction is evoked through what we suspect to be elements of the flexor portion of the central locomotor pattern generator.

*Support Contributed By: CIHR, NIH*

Citation:

K. Stecina, J. Quevedo, D.A. McCrea. CENTRAL MODULATION OF INHIBITION DURING THE STUMBLING CORRECTIVE REFLEX. Program No. 186.12. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 213.1

**Day / time:** Sunday, Nov. 9, 8:00 AM – 9:00 AM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # UU50

**ACTIVATION OF MULTIPLE SCLEROSIS VIA THE DORSAL ROOT GANGLIA.**

M.P.Namaka\*; M.J.Melanson; P.Miao; G.Wang

*Fac. Pharm, Univ. Manitoba, Winnipeg, MB, Canada*

Multiple Sclerosis (MS) is a chronic, demyelinating autoimmune disease of the central nervous system (CNS). The majority of research has focused on the CNS with little or no attention given to the dorsal root ganglia (DRG) of the peripheral nervous system. Several key findings were found that appear to implicate the DRG in the underlying pathology of MS. Firstly, the surrounding permeable membrane allows the DRG to act as a conduit for bacteria and viruses thought to be implicated in MS. Following entry of the organism into the DRG, pathogenic myelinoclasia could develop from direct axoplasmic transport into the CNS or via a series of indirect events that involve local immune activation of resident inflammatory CD4+ Th1 cells. A second finding involves the bi-directional transport mechanisms between the DRG and CNS. Henceforth, it is possible for disease activated pathogenic Th1 cells to directly or indirectly enter the CNS via the dorsal roots or blood brain barrier respectively. The third finding is that 75% of MS patients display sensory abnormalities prior to diagnosis. As a result, early sensory manifestations may be indicative of a pre-activated stage of MS that originates from an injury response within the DRG.

The objective of this study was to determine if peripheral nerve injury (PNI) and/or disease stimulate the DRG to produce, transport, or release antigenic or pro-inflammatory substances that result in CNS targeted, CD4+ Th1 mediated immune activation. Neonatal DRG cultures from Sprague–Dawley rats were used to model the effects that PNI and infection have on T–cell activation. Results demonstrate that injury and/or disease stimulate DRG activation CD4+ Th1 cells, which can damage oligodendrocytes. This research proposes a new model for MS pathogenesis that directly implicates the DRG as a primary underlying source of disease pathology.

Citation:

M.P. Namaka, M.J. Melanson, P. Miao, G. Wang. ACTIVATION OF MULTIPLE SCLEROSIS VIA THE DORSAL ROOT GANGLIA. Program No. 213.1. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 276.10

**Day / time:** Sunday, Nov. 9, 2:00 PM – 3:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # G24

**EVIDENCE AGAINST A COMMON EXCITATORY DRIVE TO MOTONEURONS INNERVATING BIFUNCTIONAL AND SINGLE JOINT MUSCLES DURING FICTIVE LOCOMOTION IN CATS.**

**S.Chakrabarty\***; M.Lafreniere–Roula; L.M.Jordan; D.A.McCrea

*Dept. Physiol, Univ. Manitoba, Winnipeg, Manitoba, MB, Canada*

While the locomotor activity of flexor and extensor motoneurons innervating uniarticular muscles can be explained by a bipartite organization of the CPG (half centre hypothesis), a more complex organization is needed to produce the variable patterns of locomotor activity of bifunctional muscles such as posterior biceps and semitendinosus (PBSt). Perret and coworkers suggested that such motoneurons receive mixtures of excitatory input from the extensor and flexor halves of the CPG during locomotion (Symp. Soc. Exp. Biol. 37:405–422, 1983). This organization would predict that during failures of rhythmic alternation, changes in the activity of PBSt should mirror the changes in activity of flexors or extensors. To examine this prediction, we recorded from pairs of hindlimb motoneurons in adult decerebrate cats during bouts of MLR evoked fictive locomotion in which sporadic 2–5 sec deletions of rhythmic alternations occur. In the absence of deletions the activity of PBSt motoneurons was similar to that of the uniarticular limb flexors. During spontaneous deletions, rhythmic depolarizations of extensor motoneurons stopped and uniarticular flexor motoneurons became tonically active. PBSt motoneurons, however, continued to be rhythmically active with bursts similar to those occurring prior to and after the deletions. Such dissociations between changes in the activity of bifunctional and uniarticular motoneurons were seen in all 5 PBSt motoneurons (1 PBSt–PBst pair and 3 PBSt–extensor pairs) examined. Although the rhythmic activity continued in the bifunctional motoneurons, the inter–burst hyperpolarization was attenuated when there was an absence of extension. These data suggest that the rhythmic activation of bifunctionals is controlled by separate neuronal circuitry and not a simple admixture of excitatory inputs from the CPG half centres.

*Support Contributed By: CIHR*

Citation:

S. Chakrabarty, M. Lafreniere–Roula, L.M. Jordan, D.A. McCrea. EVIDENCE AGAINST A COMMON EXCITATORY DRIVE TO MOTONEURONS INNERVATING BIFUNCTIONAL AND SINGLE JOINT MUSCLES DURING FICTIVE LOCOMOTION IN CATS. Program No. 276.10. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 276.13

**Day / time:** Sunday, Nov. 9, 1:00 PM – 2:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # G27

**LACK OF EVIDENCE FOR CENTRALLY–GENERATED SPIKE–TRIGGERING DEPOLARIZATIONS THAT SYNCHRONIZE MOTONEURON FIRING DURING FICTIVE MOTOR BEHAVIORS IN THE CAT.**

M.Lafreniere–Roula\*; D.A.McCrea

*Dept. Physiology, Univ. of Manitoba, Winnipeg, MB, Canada*

The rhythmic alternation of flexor and extensor activity during locomotion and scratch is produced by centrally–generated envelopes of excitation distributed to all motoneurons in a pool, i.e. the locomotor or scratch drive potential. The question remains, however, whether there are additional, centrally generated, spike–triggering depolarizations that synchronize action potential generation in motoneurons. If this were the case, spikes in one motoneuron would be associated with depolarizations in another. To address this issue, we analyzed intracellular recordings from pairs of homonymous motoneurons during fictive scratch. The fictive scratch preparation has the advantage that it is free of both rhythmic sensory input and the potentially synchronizing effect of brainstem stimulation used to elicit fictive locomotion. To further enhance our ability to detect centrally–generated spike–triggering depolarizations, analysis was confined to the first spike in each cycle of a bout of fictive scratch. This prevented the effects of intrinsic membrane properties governing the occurrence of subsequent spikes from obscuring the detection of spike–triggering events. The first spike in one motoneuron was used to create an analysis window of the intracellular events occurring in the second motoneuron. Analysis of 2 motoneuron pairs (a PBST pair and a MG pair) has revealed that most first spikes (75% in one pair, 56% in the other) were not associated (within  $\pm 2$ ms) with either a spike or an EPSP in the second motoneuron. This suggests that the generation of even the first spikes in homonymous motoneurons during scratch does not result from a common spike triggering event but from their response (i.e. excitability) to the envelope of centrally generated depolarization.

*Support Contributed By: CIHR*

Citation:

M. Lafreniere–Roula, D.A. McCrea. LACK OF EVIDENCE FOR CENTRALLY–GENERATED SPIKE–TRIGGERING DEPOLARIZATIONS THAT SYNCHRONIZE MOTONEURON FIRING DURING FICTIVE MOTOR BEHAVIORS IN THE CAT. Program No. 276.13. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 277.10

**Day / time:** Sunday, Nov. 9, 2:00 PM – 3:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # G43

**INFLUENCE OF THE THORACOLUMBAR REGION ON LOCOMOTOR AND NON-LOCOMOTOR RHYTHM GENERATION IN THE *IN VITRO* NEONATAL RAT SPINAL CORD.**

K.C.Cowley\*; E.Zaporozhets; B.J.Schmidt

*Dept. of Physiology, Univ. of Manitoba, Winnipeg, MB, Canada*

The lower thoracic and upper lumbar region of the neonatal rat spinal cord has a major role in the generation of hindlimb stepping. Less is known about the influence of this region on locomotor pattern in the cervical cord, or whether thoracolumbar locomotor circuitry interacts with networks generating non-locomotor rhythms in the spinal cord. In this series, we monitored phase-related locomotor-like ventral root activity in the cervical and lumbar segments of the isolated neonatal rat spinal cord, elicited by whole bath application of 5-HT/NMDA. Unilateral sectioning the thoracic lateral white matter abolished cervical locomotor-related discharge on the lesioned side only, whereas contralateral cervical activity continued, phase-related to bilateral alternating lumbar discharge. Subsequent sectioning of the lateral white matter on the contralateral side, at a different level of the thoracic cord, abolished all cervical locomotor-related activity and facilitated the appearance of a low frequency, bilaterally synchronous, rhythmic pattern. This slow rhythm appears similar to one previously reported (e.g. Persegol and Viala, *Somatosens. Motor Res.* 11: 1993). In other experiments, synaptic activity was suppressed in the T11–L2 segments by selectively removing  $Ca^{2+}$  from this region of the bath; brain stem-induced locomotor activity (i.e. in response to electrical stimulation of the medulla), recorded on the L5 ventral roots, was abolished. A slow bilaterally synchronous L5 rhythm emerged and persisted even in the absence of brain stem electrical or spinal cord chemical stimulation. The rhythm also continued after thoracic cord transection. These findings suggest that the lower thoracic/upper lumbar cord promotes a locomotor-like pattern of rhythmic activity in the cervical region and suppresses networks that generate slow bilaterally synchronous motor rhythms in the cervical and lumbar cord.

*Support Contributed By: CIHR*

**Citation:**

K.C. Cowley, E. Zaporozhets, B.J. Schmidt. INFLUENCE OF THE THORACOLUMBAR REGION ON LOCOMOTOR AND NON-LOCOMOTOR RHYTHM GENERATION IN THE *IN VITRO* NEONATAL RAT SPINAL CORD. Program No. 277.10. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 277.11

**Day / time:** Sunday, Nov. 9, 3:00 PM – 4:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # G44

**NORADRENERGIC, DOPAMINERGIC AND SEROTONERGIC RECEPTOR ANTAGONISTS BLOCK BRAINSTEM–EVOKED LOCOMOTION IN THE *IN VITRO* NEONATAL RAT SPINAL CORD.**

E.Zaporozhets; L.M.Jordan\*; B.J.Schmidt

*Physiology, Univ. of Manitoba, Winnipeg, MB, Canada*

In addition to the rhythmogenic effect of bath applied excitatory amino acids, 5-HT or dopamine alone (but not noradrenaline) also induce locomotor–like activity in the in vitro neonatal rat spinal cord. Noradrenergic receptor agonists, such as clonidine, activate locomotion in the cat. These observations suggest that some bulbospinal monoaminergic projections likely have a critical, or at least modulatory, role in the activation of mammalian locomotion. However, these questions have not been directly tested in the in vitro neonatal rat spinal cord preparation. Thus, in this series we examine the effect of monoamine receptor antagonists on brain stem–induced locomotor–like activity. Brain stem–spinal cord preparations were isolated from neonatal rats (days 1–6) and a barrier was placed at the C1 level to isolate the brain stem from neurochemical manipulations performed on the spinal cord side of the bath. The ventral surface of the medulla was electrically stimulated and evoked locomotor–like discharge was monitored from lumbar ventral roots. Spinal cord application of the  $\alpha_2$  adrenoreceptor antagonist yohimbine (5  $\mu$ M), the dopamine receptor antagonist haloperidol (10  $\mu$ M), or 5-HT receptor antagonists (ketanserin and mianserin 30–100  $\mu$ M) each were effective in abolishing brain stem–evoked locomotion. These preliminary results suggest that each of these 3 monoaminergic systems is critical for the endogenous (brainstem) activation of locomotor rhythms. In addition, the observations illustrate that the role bulbospinal locomotor pathways may not be accurately predicted by the effect of whole bath application of monoamines (e.g. noradrenaline results). Ongoing experiments will attempt to exclude the possibility of non–specific receptor blockade by these antagonists and examine whether there is regional specificity within the spinal cord for the observed antagonist effects.

*Support Contributed By: NIH– NS40903–02*

**Citation:**

E. Zaporozhets, L.M. Jordan, B.J. Schmidt. NORADRENERGIC, DOPAMINERGIC AND SEROTONERGIC RECEPTOR ANTAGONISTS BLOCK BRAINSTEM–EVOKED LOCOMOTION IN THE *IN VITRO* NEONATAL RAT SPINAL CORD. Program No. 277.11. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 277.12

**Day / time:** Sunday, Nov. 9, 4:00 PM – 5:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # G45

**BULBOSPINAL PATHWAYS ACTIVATING LOCOMOTOR–LIKE ACTIVITY IN THE *IN VITRO* NEONATAL RAT SPINAL CORD: CHEMICAL VERSUS ELECTRICAL STIMULATION OF THE BRAINSTEM.**

**B.J.Schmidt\***; E.Zaporozhets; L.M.Jordan

*Physiology, Univ. of Manitoba, Winnipeg, MB, Canada*

We previously showed that propriospinal pathways in the cervicothoracic region contribute to the descending activation of locomotor–like activity in the in vitro neonatal rat spinal cord (SFN 27:297.11,2001); these experiments involved chemical activation of the brainstem using a combination of 5–HT, NMDA and bicuculline. The present series attempts to further characterize bulbospinal pathways activating locomotor–like rhythms, using a combination of bath partitions, selected spinal cord lesions, and neurochemical manipulation of propriospinal transmission. Brain stem–spinal cord preparations were isolated from rats (days 1–6) and subjected to either chemical or electrical stimulation of the brainstem. Lumbar ventral root locomotor–like rhythms induced by chemical, but not electrical, stimulation of the brainstem were abolished by bilateral ventral white matter lesions of the thoracic cord, or by application of calcium–free bath solutions or an NMDA receptor antagonist (AP5) to the cervicothoracic region. Locomotor–like activity evoked by electrical, but not chemical, stimulation of the brainstem persisted despite thoracic cord sectioning which left intact only the lateral white matter on one side. Lumbar rhythmic activity in response to brainstem electrical stimulation was better developed when hemicord lesions were made at rostral rather than caudal thoracic levels. These results suggest that a) descending activation of the locomotor network in response to chemical activation of the brainstem is critically dependent on propriospinal transmission, b) electrical stimulation recruits long direct projections that are capable of transmitting the locomotor command signal independent of propriospinal pathways and c) essential portions of the propriospinal, but not direct, locomotor command pathway travel in the ventral white matter regions.

*Support Contributed By: NIH – NS40903–02.*

Citation:

B.J. Schmidt, E. Zaporozhets, L.M. Jordan. BULBOSPINAL PATHWAYS ACTIVATING LOCOMOTOR–LIKE ACTIVITY IN THE *IN VITRO* NEONATAL RAT SPINAL CORD: CHEMICAL VERSUS ELECTRICAL STIMULATION OF THE BRAINSTEM. Program No. 277.12. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 305.19

**Day / time:** Sunday, Nov. 9, 3:00 PM – 4:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # GG11

**EFFECT OF INTRACELLULAR ACIDOSIS ON ADENOSINE RELEASE FROM CULTURED RAT FOREBRAIN NEURONS AND ASTROCYTES.**

C.Zamzow; R.Bose; F.E.Parkinson\*

*Pharmacol., Univ. Manitoba, Winnipeg, MB, Canada*

During stroke intracellular ATP is depleted and lactic acid is produced, leading to intracellular acidosis and cytotoxic edema. A compensatory event in stroke is a rapid increase in brain adenosine levels, which is neuroprotective by activating A1 receptors.

The objective of this research was to test if lowering pHi can enhance adenosine release from cultured cortical neurons or astrocytes.

Neurons and astrocytes were harvested from fetal rat Sprague Dawley cortices (E16 and E19, respectively) and cultured for 3–5 weeks *in vitro*. Cells were incubated for 1 hour with the pHi sensitive fluorescent probe BCECF–AM or with [<sup>3</sup>H]adenine to radiolabel cytosolic ATP. Cells were treated for 10 minutes with physiological buffer, 20 mM acetate buffer, or 20 mM propionate buffer ± 50 μM EIPA, a sodium/hydrogen exchanger inhibitor. Fluorescent readings were obtained every 30 sec and adenosine release was assayed from supernatant.

In neurons, acetate and propionate immediately and significantly decreased pHi from 7.2 to 7.1 and 6.9, respectively. pHi recovered after 2 min in acetate–treated neurons although remained depressed with propionate. In astrocytes, acetate and propionate transiently and significantly decreased pHi from 7.2 to 6.9 and 7.0, respectively. The addition of EIPA, maintained a reduced pHi in neurons but not astrocytes. There were no significant effects on ADO release due to either acetate or propionate (± EIPA) in either cell type.

Therefore, a decrease in pHi was not associated with significant increases in release of adenosine from neurons or astrocytes. These data indicate that acidosis *per se* is not an important stimulus for ADO release from these cells.

*Support Contributed By: Canadian Institutes of Health Research*

**Citation:**

C. Zamzow, R. Bose, F.E. Parkinson. EFFECT OF INTRACELLULAR ACIDOSIS ON ADENOSINE RELEASE FROM CULTURED RAT FOREBRAIN NEURONS AND ASTROCYTES. Program No. 305.19. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 333.8

**Day / time:** Monday, Nov. 10, 9:45 AM – 10:00 AM

**Presentation Type:** Slide

**Presentation Location:** Morial Convention Center – Room 255

**DIFFERENTIATION OF GABAERGIC INTERNEURONS DERIVED FROM EMBRYONIC CNS IS REGULATED BY DIRECT ACTIVATION OF GLUTAMIC ACID DECARBOXYLASE (GAD) ISOFORMS BY DLX HOMEODOMAIN GENES.**

D.D.Eisenstat<sup>1,2,3</sup>; T.N.Le<sup>4\*</sup>; Q.Zhou<sup>1</sup>; M.Plews<sup>1</sup>

*1. Dept. Pediatrics, 2. Anat., 3. Physiology, Univ. of Manitoba, Winnipeg, MB, Canada 4. Dept Biochem. & Med. Genet., Univ. of Manitoba, Winnipeg, MB, Canada*

Transcriptional regulation of the GABAergic system during CNS development is poorly understood. The *Dlx* gene family is expressed in the retina and ganglionic eminences (GE) of the basal forebrain. *Dlx1/Dlx2* double knockout mice die at birth. Phenotypic analysis demonstrates abnormal striatal and cortical development, including loss of migration of GABAergic inhibitory interneurons to the neocortex. We have applied ChIP (chromatin immunoprecipitation) to identify DLX homeoprotein transcriptional targets derived *in vivo* from embryonic GE and retina. Following cross-linking to enrich for protein–DNA complexes, nucleoproteins were incubated with DLX antibodies and genomic DNA (gDNA) fragment pools, including putative DLX1 or DLX2 transcriptional targets, were further characterized. PCR for the promoters of *GAD65* & *GAD67* showed that both DLX1 & 2 bind to these regulatory regions in GE at E13.5. However, only DLX2 binds to the *GAD65* promoter in retina at P0. Electromobility shift assays confirmed direct binding of DLX1 & DLX2 to the *GAD65* and *GAD67* promoters *in vitro*. Reporter assays demonstrated that both DLX1 & DLX2 activate *GAD65* and *GAD67* expression, confirming the functional significance of DLX binding to these promoter regions and consistent with aberrant expression of GABA in the *Dlx1/2* null mouse. *GAD65* and *GAD67* directly regulate the synthesis of GABA in the developing forebrain and retina. We have used ChIP to provide direct evidence for *GAD65* and *GAD67* as direct *Dlx* homeodomain targets from embryonic tissues *in situ*. These findings will facilitate our understanding of *Dlx* gene function in CNS development *in vivo*, especially regulation of GABAergic interneuron migration to the neocortex.

*Support Contributed By: CancerCare Manitoba, March of Dimes Foundation*

Citation:

D.D. Eisenstat, T.N. Le, Q. Zhou, M. Plews. DIFFERENTIATION OF GABAERGIC INTERNEURONS DERIVED FROM EMBRYONIC CNS IS REGULATED BY DIRECT ACTIVATION OF GLUTAMIC ACID DECARBOXYLASE (GAD) ISOFORMS BY DLX HOMEODOMAIN GENES. Program No. 333.8. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 375.5

**Day / time:** Monday, Nov. 10, 8:00 AM – 9:00 AM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # F57

**SHORT–RANGE FUNCTIONAL INTERACTION BETWEEN NMDA RECEPTORS AND CONNEXIN35–MEDIATED ELECTRICAL SYNAPSES.**

A.Pereda<sup>1\*</sup>; C.Castillo<sup>1</sup>; J.O'Brien<sup>2</sup>; J.Nagy<sup>3</sup>; F.Bukauskas<sup>1</sup>; K.Davidson<sup>4</sup>; T.Yasumura<sup>4</sup>; J.Rash<sup>4</sup>

*1. A. Einstein C. Med., Bronx, NY, USA2. U.T., Houston, TX, USA3. U. of Manitoba, Winnipeg, MB, Canada4. CSU, F. Collins, CO, USA*

Auditory afferents cell terminate as “Large myelinated Club endings” (LMCE) on the lateral dendrite of the goldfish Mauthner (M–) and undergo activity–dependent potentiation of both the glutamate–mediated component and the gap junction–mediated electrical component of their mixed synaptic response. Electrical transmission involves Cx35, the fish ortholog of Cx36 that mediates transmission at mammalian electrical synapses. This phenomenon is post–synaptically mediated and depends on an NMDA–R–mediated localized increase in the intracellular concentration of Ca<sup>++</sup>. Consistent with this finding, we show immunolabeling evidence by confocal and freeze–fracture immunogold labeling (FRIL) that the NR1 subunit of the NMDA–R is present at postsynaptic densities (PSD) closely associated with gap junction plaques containing Cx35 in LMCEs. Further, using simultaneous pre and postsynaptic recordings we demonstrate at single mixed electrical and chemical synapses that fast chemical transmission interacts with gap junctions within the same ending to regulate their conductance. Such localized interaction could account for the large variation in strength of electrical coupling at auditory afferent synapses terminating on the M–cell. Taken together the data suggest that there is a “critical distance” for such regulatory control of at least a few tens of nanometers (distance between a given PSD and the closest gap junction at a LMCE), but necessarily less than ~5<sup>μ</sup>m, the distance between the closest neighboring terminals on the surface of the M–cell’s lateral dendrite. The observed functional interactions may be relevant not only to mixed synapses, but also to situations in which PSDs at chemical synapses are situated close to gap junctions.

*Support Contributed By: NIH (DC03186 to AP, EY 12857 to JO and NS31027/NS39040 to JER) and the CIHR of Canada to JIN.*

**Citation:**

A. Pereda, C. Castillo, J. O'Brien, J. Nagy, F. Bukauskas, K. Davidson, T. Yasumura, J. Rash. SHORT–RANGE FUNCTIONAL INTERACTION BETWEEN NMDA RECEPTORS AND CONNEXIN35–MEDIATED ELECTRICAL SYNAPSES. Program No. 375.5. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 377.3

**Day / time:** Monday, Nov. 10, 10:00 AM – 11:00 AM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # F87

**RAT SPINAL PARASYMPATHETIC PREGANGLIONIC NEURONS EXPRESS PLATEAU POTENTIALS.**

D.Derjean<sup>1</sup>; S.Bertrand<sup>2</sup>; F.Nagy<sup>2</sup>; S.J.Shefchyk<sup>1\*</sup>

*1. Physiology, Univ. of Manitoba, Winnipeg, MB, Canada. 2. EO3581, INSERM, Bordeaux, France*

Bladder, bowel and sexual reflexes are regulated by interneurons and parasympathetic preganglionic neurons (PGNs) in the L6–S2 spinal segments. We studied the intrinsic electrophysiological properties of these neurons (including PGN 10/19 confirmed biocytin filled; interneurons 9/19) using whole–cell patch–clamping in transverse slices from rats postnatal day 14 to 21. The neurons comprised one population in terms of properties: mean input resistance  $406 \pm 27 \text{ M}\Omega$ ; membrane capacitance  $91 \pm 28 \text{ pF}$ ; evoked action potential mean amplitude  $61.4 \pm 2 \text{ mV}$ ; half–durations  $1.14 \pm 0.07 \text{ ms}$ . 40% of the AHPs had both fast and slow components. 48 % of neurons fired tonically during a depolarizing pulse, 47 % showed adaptation in firing, while firing accelerated in 5 %. Most recorded neurons expressed post–inhibitory rebound due to IH (60 %) or IT (27%). In the presence of  $25 \mu\text{M}$  DHPG, a specific group I metabotropic glutamate receptor agonist, 57 % of neurons tested ( $n=20/35$ ), including both PGN and interneurons, expressed long–lasting afterdischarges which were abolished by bath application of the antagonist, 4–CPG ( $500 \mu\text{M}$ ,  $n=3/3$ ). 3 PGNs and one interneuron produced slow membrane oscillations and burst firing in the presence of DHPG. The plateau potentials examined were TTX–resistant and sensitive to the L–type calcium channel blocker nifedipine ( $n=3/3$ ). Similar to cervical and lumbar deep dorsal horn neurons and alpha motoneurons, interneurons and parasympathetic preganglionic neurons in the L6–S2 intermediolateral region can have several patterns of firing, including the amplification or prolongation of firing associated with plateau potentials. These firing patterns are enhanced in the presence of mGluRI activation and may play a role in determining spinal autonomic output during micturition, defecation and sexual reflexes. Funded by the Canadian Institutes for Health Research<sup>1</sup>, Conseil Regional d'Aquitaine<sup>2</sup>, DGA<sup>2</sup> & Institut UPSA de la douleur<sup>2</sup>.

Citation:

D. Derjean, S. Bertrand, F. Nagy, S.J. Shefchyk. RAT SPINAL PARASYMPATHETIC PREGANGLIONIC NEURONS EXPRESS PLATEAU POTENTIALS. Program No. 377.3. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 476.23

**Day / time:** Monday, Nov. 10, 3:00 PM – 4:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # E53

**CX36 DISTRIBUTION IN THE CNS AND INTERACTION WITH ZONULA OCCLUDENS PROTEIN-1 (ZO-1).**

C.O.Olson; X.Li; S.Lu; J.I.Nagy\*

*Physiology, Univ. of Manitoba, Winnipeg, MB, Canada*

Connexin36 (Cx36) is so far the only gap junction protein found to be expressed in neurons of the mammalian CNS, but details of its distribution in brain has not yet been determined. Further, although a number of connexins interact with the tight junction associated protein ZO-1, Cx36/ZO-1 association has not been reported. Cell transfection, immunohistochemistry (IHC), immunoblotting, co-immunoprecipitation (IP) and GST-ZO-1 fusion protein binding assays were used to examine Cx36 distribution in the CNS and Cx36 association with ZO-1. Using several different anti-Cx36 antibodies against different epitopes in Cx36, Cx36 was detected in mouse CNS, pancreas and adrenal gland, as well as in Cx36 transfected HeLa cells. In wild-type mice, IHC labelling was punctate in all CNS regions and peripheral tissues examined. No Cx36 detection occurred in Cx36 knockout (KO) mice or in control non-transfected HeLa cells. By IHC, Cx36/ZO-1 co-localization was found in cultured HeLa cells and  $\beta$ TC-3 cells, and in adrenal gland and pancreatic islets in vivo. Nearly total co-localization of Cx36 with ZO-1 was observed in all brain regions examined. Co-IP of Cx36 and ZO-1 was obtained with homogenates of  $\beta$ TC-3 cells, transfected HeLa cells and CNS tissues. Deletion of the C-terminus four amino acids of Cx36 eliminated Cx36/ZO-1 interaction but did not prevent gap junction formation. Binding assays indicated that the first PDZ domain of ZO-1 interacts with Cx36. We provide evidence that Cx36 protein is widely distributed in mammalian CNS, indicating the importance of electrical synapses in higher vertebrates. If each puncta corresponds to a gap junction, then it is now possible to visualize the density of electrical synapses formed by gap junctions in brain. Further, these results indicate a novel interaction of Cx36 with the first PDZ domain of ZO-1, suggesting a functional role of ZO-1 at gap junctions forming electrical synapses between neurons. (Supported by CIHR grants to JIN).

Citation:

C.O. Olson, X. Li, S. Lu, J.I. Nagy. CX36 DISTRIBUTION IN THE CNS AND INTERACTION WITH ZONULA OCCLUDENS PROTEIN-1 (ZO-1). Program No. 476.23. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 498.15

**Day / time:** Monday, Nov. 10, 3:00 PM – 4:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # H103

**INTRASPINAL MICROSTIMULATION FOR BLADDER CONTROL BEFORE AND AFTER CHRONIC SPINALIZATION.**

**R.A.Gaunt**<sup>1\*</sup>; A.Prochazka<sup>2</sup>; V.K.Mushahwar<sup>1</sup>; J.W.Downie<sup>3</sup>; S.J.Shefchyk<sup>4</sup>

*1. Biomed. Engin., 2. Physiology, Univ. of Alberta, Edmonton, AB, Canada*<sup>3. Pharmacol., Dalhousie Univ., Halifax, NS, Canada</sup><sup>4. Physiology, Univ. of Manitoba, Winnipeg, MB, Canada</sup>

After spinal cord injury, normal bladder function is often lost. We are evaluating intraspinal microstimulation (ISMS) as a means of eliciting bladder contraction and concomitant inhibition of the external urethral sphincter (EUS) in chronic spinal cats. Changes in bladder pressure in response to ISMS were examined for 6 months prior to chronic complete spinalization at T10 and for 2 months subsequently. Microwires were implanted in the S1 and S2 segments of the spinal cord targeting the intermediolateral region (bladder preganglionic nucleus) and dorsal commissure (EUS inhibitory interneurons). Increases in bladder pressure of >30 mmHg were consistently recorded in the awake cat prior to, as well as after spinalization. The stimulation parameters (charge balanced biphasic pulses, 90–130  $\mu$ A, 200  $\mu$ s pulse width, 50 Hz) required to obtain these results did not change after spinalization. There were few signs of aversive response to ISMS except for some of the dorsally located microwires. This suggests that bladder contractions could be elicited, without discomfort, in spinal cord injury patients with incomplete lesions and residual sensation below their injury. Stimulation through two electrodes targeting bladder motoneuron pools as well as a single electrode targeting EUS inhibitory interneurons produced complete voiding prior to spinalization but only partial voids after spinalization. Our main finding is that similar increases in bladder pressure are readily elicited by ISMS before and after complete spinalization with the same stimulation parameters. EUS inhibition has been much more difficult to achieve with ISMS.

*Support Contributed By: NIH–NINDS–No1–NS–2–2342, Alberta Heritage Foundation for Medical Research and Natural Sciences and Engineering Research Council of Canada*

**Citation:**

R.A. Gaunt, A. Prochazka, V.K. Mushahwar, J.W. Downie, S.J. Shefchyk. INTRASPINAL MICROSTIMULATION FOR BLADDER CONTROL BEFORE AND AFTER CHRONIC SPINALIZATION. Program No. 498.15. 2003 *Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 529.20

**Day / time:** Monday, Nov. 10, 4:00 PM – 5:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # UU10

**ACUTE INFLAMMATORY RESPONSE FOLLOWING INJECTIONS OF BLOOD, THROMBIN, AND PLASMINOGEN INTO MOUSE BRAIN.**

**M.Xue<sup>1,2\*</sup>; J.Balasubramaniam<sup>1,2</sup>; M.Del Bigio<sup>1,2</sup>**

*1. Human Anat. & Cell. Sci, 2. Pathology, Univ. Manitoba, Winnipeg, MB, Canada*

**Introduction:** Intracerebral hemorrhage (ICH) is a common occurrence. Extravasation of blood is associated with ICH and head trauma. The mechanism of brain cell injury associated with hemorrhage differs from that due to pure brain ischemia. We hypothesize that there is an age-dependent response of brain inflammation and cell death following ICH. The purpose of this study was to investigate acute inflammatory changes after intracerebral injections of autologous blood and plasma proteins that are involved in blood clotting and clot lysis in 3 ages in mice.

**Methods:** 15 µl in 1-day old, 25 µl in 10-day old, 50 µl in adult mice of autologous blood, thrombin (3, 5, 10 units in 3 ages respectively), plasminogen (0.03, 0.05, 0.1 units in 3 ages respectively) (roughly the doses expected in same volume blood), and saline (15 µl, 25 µl, 50 µl) were injected into sixty-six mouse brain at three ages (newborn, 10-day old, and adult). Forty-eight hours later mice were perfusion fixed with 4% paraformaldehyde. Hematoxylin and eosin (H&E), histochemical, Fluoro-Jade, and TUNEL staining were used to quantify the damage area, neutrophils, microglia, and cell death at the edge of the hemorrhagic lesion.

**Results:** Damage area in brain, dying neurons, neutrophils, and microglial reaction were significantly greater following injections of blood, plasminogen, and thrombin than that following injection of saline in all 3 ages. Blood, plasminogen, and thrombin associated brain damage were greatest in 1-day old mice. In 10-day old and adult mice, injections of blood, thrombin, and plasminogen had similar reactions.

**Conclusions:** These results suggest that autologous blood, plasminogen, and thrombin are harmful to brain cells in vivo. In addition, there is an age-dependent difference in inflammatory response following blood, thrombin, and plasminogen injection.

*Support Contributed By: CIHR/HSFC*

**Citation:**

M. Xue, J. Balasubramaniam, M. Del Bigio. ACUTE INFLAMMATORY RESPONSE FOLLOWING INJECTIONS OF BLOOD, THROMBIN, AND PLASMINOGEN INTO MOUSE BRAIN. Program No. 529.20. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 615.1

**Day / time:** Tuesday, Nov. 11, 8:00 AM – 9:00 AM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # K11

**SUSCEPTIBILITY TO DEVELOP DIET–INDUCED OBESITY IS INCREASED IN NPY Y1 RECEPTOR KNOCKOUT MICE AND DECREASED IN NPY Y2/Y4 DOUBLE KNOCKOUT MICE.**

**H.T.Bergen<sup>1\*</sup>; H.Herzog<sup>2</sup>; G.J.Cooney<sup>3</sup>**

*1. Dept. Human Anat. & Cell. Sci., Univ. of Manitoba, Winnipeg, MB, Canada* *2. Neurobiology, 3. Diabetes & Obesity, Garvan Inst. of Med. Res., Sydney, Australia*

It has been proposed that NPY receptors play an important role in regulating energy balance. To determine the role of specific NPY receptors in mediating diet–induced obesity, mature male NPY Y receptor knockout mice were fed a high–fat diet (or chow) for 8 weeks. In NPY Y1 receptor knockout mice fed a high–fat diet, body weight increased by  $16.6 \pm 1.1$  g compared to  $7.3 \pm 1.5$  g in wild–type mice fed the high–fat diet. Increased weight gain in Y1 receptor knockout mice fed the high–fat diet was also associated with greater glucose intolerance but not a significant increase in food intake as compared to wild–type mice fed the high–fat diet. The enhanced response to the high–fat diet was attenuated if Y1 receptor deletion was combined with either Y2 receptor deletion (i.e., Y1/Y2 receptor double knockout;  $11.7 \pm 0.8$  g weight gain) or Y4 receptor deletion (i.e., Y1/Y4 receptor double knockout;  $9.9 \pm 1.2$  g weight gain). In Y1/Y4 receptor double knockout mice, weight gain in response to a high–fat diet was not significantly different than in wild–type mice fed the high–fat diet. High–fat fed double knockouts (i.e., Y1/Y2 and Y1/Y4) also exhibited improved glucose tolerance compared to Y1 receptor knockouts. In contrast, in high–fat fed Y2/Y4 receptor double knockout mice body weight gain was significantly lower at  $2.2 \pm 0.4$  g compared to wild–type mice. In Y1/Y2/Y4 triple knockout mice, body weight gain ( $4.3 \pm 0.5$  g) was also significantly lower compared to wild–type mice and was similar to that observed in chow–fed littermates ( $3.8 \pm 0.5$  g). Taken together, these results suggest that deletion of NPY Y1 receptors increases susceptibility to develop diet–induced obesity while deletion of Y2 and Y4 receptors decreases susceptibility to develop obesity in response to a high–fat diet.

*Support Contributed By: NHMRC*

**Citation:**

H.T. Bergen, H. Herzog, G.J. Cooney. SUSCEPTIBILITY TO DEVELOP DIET–INDUCED OBESITY IS INCREASED IN NPY Y1 RECEPTOR KNOCKOUT MICE AND DECREASED IN NPY Y2/Y4 DOUBLE KNOCKOUT MICE. Program No. 615.1. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** N/A

**Day / time:** Tuesday, Nov. 11, 5:30 PM – 6:30 PM

**Presentation Type:** Other Special Event

**Presentation Location:** Morial Convention Center – Room 285

**SOCIETY FOR NEUROSCIENCE BUSINESS/MEMBERS MEETING.**

K.Sale\*

Information will be posted on the SfN Web site as it becomes available.

Citation:

K. Sale. SOCIETY FOR NEUROSCIENCE BUSINESS/MEMBERS MEETING. Program No. N/A. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

**Program Number:** 870.1

**Day / time:** Wednesday, Nov. 12, 1:00 PM – 1:15 PM

**Presentation Type:** Slide

**Presentation Location:** Morial Convention Center – Room 255

**INTERNEURON MIGRATION FROM THE BASAL FOREBRAIN IS REGULATED BY DIRECT REPRESSION OF THE SEMAPHORIN RECEPTOR NEUROPILIN-2 BY DLX HOMEODOMAIN GENES.**

T.N.Le<sup>1</sup>; D.D.Eisenstat<sup>2,3,4\*</sup>

*1. Dept. BioChem. & Med. Genet., Univ. Manitoba, Winnipeg, MB, Canada*<sup>2. Dept Pediatrics, 3. Anat., 4. Physiology, Univ Manitoba, Winnipeg, MB, Canada</sup>

Understanding the specificity of homeobox genes has been hampered by the lack of known direct transcriptional targets. Dlx gene family members (Dlx1, 2, 5 & 6) are expressed in the ganglionic eminences (GE) of the developing forebrain. Dlx1/Dlx2 double knockout mice die at birth. Phenotypic analysis demonstrates abnormal cortical development, including loss of migration of GABAergic inhibitory interneurons to the neocortex. We have applied ChIP (chromatin immunoaffinity precipitation) to identify transcriptional targets of DLX homeoproteins derived in vivo from embryonic GE. Following cross-linking to enrich for protein-DNA complexes, nucleoproteins were incubated with DLX antibodies and genomic DNA (gDNA) fragment pools, including putative DLX1 or 2 transcriptional targets, were further characterized. PCR for the Neuropilin 2 promoter (NRP-2) showed that both DLX1 & 2 bind to this regulatory region in situ. Electromobility shift assays confirmed direct binding of DLX1 & 2 to the NRP-2 promoter in vitro. Reporter assays demonstrated that both DLX1 and DLX2 repress NRP-2 expression, confirming the functional significance of DLX binding to this promoter region and consistent with aberrant expression of NRP-2 in the Dlx1/2 double knockout mouse. NRP-2 is a receptor for semaphorin axonal guidance ligands in the developing forebrain. We have used ChIP to provide direct evidence for NRP-2 as a Dlx homeodomain target from embryonic forebrain tissue in situ. Repression of the neuropilin-2 promoter by Dlx genes is the first evidence that Dlx homeobox genes may act as repressors as well as activators. This finding will facilitate our understanding of Dlx gene function in cortical development in vivo, especially regulation of GABAergic interneuron migration to the neocortex.  
*Support Contributed By: CancerCare Manitoba, March of Dimes Foundation*

Citation:

T.N. Le, D.D. Eisenstat. INTERNEURON MIGRATION FROM THE BASAL FOREBRAIN IS REGULATED BY DIRECT REPRESSION OF THE SEMAPHORIN RECEPTOR NEUROPILIN-2 BY DLX HOMEODOMAIN GENES.

Program No. 870.1. 2003 Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, 2003.

Online.

**Program Number:** 920.4

**Day / time:** Wednesday, Nov. 12, 4:00 PM – 5:00 PM

**Presentation Type:** Poster

**Presentation Location:** Morial Convention Center – Hall F–I, Board # G32

**MAP–2 EXPRESSION IN MOTOR CORTEX FOLLOWING SKILL LEARNING.**

T.L.Ivanco\*; M.J.Derksen

*Dept. Psychology, Univ. Manitoba, Winnipeg, MB, Canada*

Reorganization of cortical neurons in response to experience has been well documented. The final morphology of these neurons, however, is likely preceded by numerous changes in the regulation of various structural proteins. Microtubule Associate Protein (MAP–2) is a protein involved in structural reorganization of dendrites. Long–Evans rats were divided into five groups. One group was trained on a motor skill learning task (DLS), one group was trained to traverse a complex runway (HL), one group was trained to traverse a less complex runway (EL), one group was trained to transverse a flat, easy runway (FLT), and a final group was housed in standard lab cages (IC). The goal was to create a set of motor learning tasks that are similar in nature, but vary in the amount of difficulty to animals. The amount of time to traverse the DLS task was significantly longer than for traversing other tasks, suggesting that it is the most difficult. Further, animals get significantly better at the DLS over just a few days, which suggests motor learning. In evaluating the MAP–2 expression changes associated with learning the tasks using immunohistochemistry and western blot analysis using antibodies to MAP–2, it was found that there was a specific time–course for induction of changes in MAP–2 with training on the DLS. The data are discussed with respect to the dynamic changes in structural proteins that may underlie the learning induced changes in cortical neuron structure, often reported following experience.

*Support Contributed By: NSERC and CFI grants to TLI, UMGF to MJD, additional funds provided by Carsen Group, MicroBrightField Inc, and Optical Imaging Inc*

Citation:

T.L. Ivanco, M.J. Derksen. MAP–2 EXPRESSION IN MOTOR CORTEX FOLLOWING SKILL LEARNING. Program No. 920.4. *2003 Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience, 2003. Online.

## Author Index

Balasubramaniam, Janani.	529.20
Bergen, Hugo.T.	615.1
Bertrand, S.	377.3
Bose, Ratna.	305.19
Bukauskas, Feliksas.	375.5
Castillo, Carl.	375.5
Chakrabarty, Samit.	276.10
Cooney, Greg.J.	615.1
Cowley, Kristine.C.	277.10
Davidson, Kim.	375.5
Davidson, Kimberly.G.V.	10.6
Del Bigio, Marc.	529.20
Derjean, D.	377.3
Derksen, Matthew.J.	920.4
Downie, John.W.	498.15
Dudek, F.E.	10.6
Eisenstat, David.D.	333.8, 870.1
Furman, C. .S.	10.6
Gaunt, Robert.A.	498.15
Herzog, Herbert.	615.1
Ivanco, Tammy.L.	920.4
Jordan, L.M.	276.10
Jordan, Larry.M.	277.11, 277.12
Lafreniere–Roula, M.	276.10
Lafreniere–Roula, Myriam.	276.13
Le, Trung.N.	333.8, 870.1
Li, Xinbo.	476.23
Lu, Shijun.	476.23
McCrea, D.A.	186.12, 276.10
McCrea, David.A.	276.13
Melanson, Maria.J.	213.1
Miao, Pinhui.	213.1
Mushahwar, Vivian.K.	498.15
Nagy, F.	377.3
Nagy, James I..	375.5
Nagy, James.I.	10.6, 476.23
Namaka, Michael.P.	213.1
O'Brien, John.	375.5
Olson, Carl.O.	476.23
Parkinson, Fiona.E.	305.19
Pereda, Alberto.	375.5
Plews, Margot.	333.8
Prochazka, Arthur.	498.15

Quevedo, J.	186.12
Rash, John R..	375.5
Rash, John.E.	10.6
Royer, Suzanne.	10.6
Sale, Katie McCollins.	N/A
Schmidt, Brian.J.	277.10, 277.11, 277.12
Shefchyk, Susan.J.	377.3, 498.15
Stecina, Katinka.	186.12
Wang, Guqi.	213.1
Xue, Mengzhou.	529.20
Yasumura, Thomas.	10.6
Yasumura, Tomhas.	375.5
Zamzow, Christina.	305.19
Zaporozhets, Eugene.	277.10, 277.11, 277.12
Zhou, Qing–Ping.	333.8

## Key Word Index

	375.5
5-HT	277.11
AUTOIMMUNITY	213.1
BCECF	305.19
BLADDER	377.3
BLOOD-BRAIN BARRIER	213.1
BODY WEIGHT	615.1
BRAIN DAMAGE	529.20
CELL DEATH	529.20
CENTRAL PATTERN GENERATOR	276.10
CHROMATIN IMMUNOPRECIPITATION	333.8, 870.1
CNS	476.23
FOOD INTAKE	615.1
FOREBRAIN	333.8
GABAERGIC	870.1
GANGLIONIC EMINENCES	870.1
Gap Junction	375.5
HYPERGLYCEMIA	615.1
INFLAMMATION	529.20
INJURY	213.1
INTRACEREBRAL HEMORRHAGE	529.20
LTP	375.5
Long-Evans rats	920.4
METABOTROPIC GLUTAMATE RECEPTOR	377.3
MOTONEURON	276.10
Mauthner	375.5
NEUROPEPTIDE Y	615.1
PATCH CLAMP	377.3
PERIPHERAL NERVE	213.1
RETINA	333.8
RHYTHM	276.10
SPINAL CORD	276.10, 377.3
SPINAL CORD INJURY	498.15
STIMULATION	498.15
TRANSCRIPTION FACTOR	333.8, 870.1
acetate	305.19
astrocyte	10.6
brainstem	277.12
bulbospinal	277.11
connexin36	476.23
correlation	276.13
freeze fracture	10.6
immunogold	10.6

interneuron	277.12
locomotion	186.12, 277.10, 277.12
monoamines	277.11
motoneuron	186.12
motor control	186.12
motor learning	920.4
network	277.10, 277.12
neuron	920.4
oligodendrocyte	10.6
pH	305.19
pattern generation	277.10, 277.11
propionate	305.19
propriospinal	277.10
scratch	276.13
spinal cord	186.12, 276.13
synchrony	276.13
tight junction	476.23