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Body weight of control and experimental rats

6-OHDA infusion into rats showed a significant (p<0.001) decrease in body weight after 18 days compared to control. 12 days after the treatment 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT, GABA and BMC in combination significantly (p<0.001) regained the body weight near to control compared to the 6-OHDA infused group. Meanwhile 5-HT, GABA and BMC supplemented alone showed no significant reversal in the body weight towards the control (Table-1).

Behavioural studies

Apomorphine induced rotational behaviour in control and experimental rats

Apomorphine induced rotational behaviour showed a significant (p<0.001) increase in rotation/10min compared to control. 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT, GABA and BMC in combination significantly (p<0.001) reversed the rotational behaviour near to control. But 5-HT, GABA and BMC treated alone showed no significant reversal in the rotation towards the control (Figure-1).

Limb use asymmetry test in control experimental rats

There was a significant (p<0.001) increase in the use of unimpaired forlimb in 6-OHDA infused rats compared to control. A significant reversal in the asymmetry score was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in the asymmetry score towards the control (Figure-2).

Rotarod performance of control and experimental rats

Rotarod experiment showed a significant (p<0.001) decrease in the retention time on the rotating rod in the 6-OHDA infused rats at 10, 15 and 25 rpm when compared to control. Treatment groups significantly reversed the retention time: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT,
GABA and BMC (p<0.001) near to control. BMC treated alone showed no significant reversal in the retention time towards the control (Figure-3).

**Behavioural response of control and experimental rats in swim test**

6-OHDA infusion into rats showed significant (p<0.001) decrease in swim score compared to control. A significant reversal in the swim score was observed in the treatment groups: 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). 5-HT, GABA, BMC treated alone showed no significant reversal in the swim score compared to 6-OHDA infused rats (Figure-4).

**Behavioural response of control and experimental rats on number of visit to novel arm (count/5 minutes) in y maze**

6-OHDA infusion into rats showed significant (p<0.001) decrease in the number of visit to novel arm compared to control. A significant reversal in the number of visit to novel arm was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal compared to 6-OHDA infused rats (Figure 5).

**Behavioural response of control and experimental rats on criterion performance in radial arm maze**

6-OHDA infusion into rats showed significant (p<0.001) increase in the mean number of trials to achieve the criteria compared to control. A significant reversal in the number of trials to achieve the criteria was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal compared to 6-OHDA infused rats (Figure 6).
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Behavioural response of control and experimental rats on reference errors in radial arm maze

The mean reference memory error in all the groups of rats decreased over trial from first to the fourth trial. A significant (p<0.001) increase in mean reference memory error over trial was observed in 6-OHDA infused rats compared to control. A significant reversal in the mean reference memory error was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal towards the control rats (Figure 7).

Behavioural response of control and experimental rats on working errors in radial arm maze

The mean working memory error in all the groups of rats decreased over trial from first to the fourth trial. A significant increase in mean working memory error over trial was observed in 6-OHDA infused rats compared to control. A significant reversal in the mean working memory error was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal towards the control rats (Figure 8).
Corpus Striatum


Scatchard analysis of $[^3]$H]glutamate against glutamate in the Corpus Striatum of 6-OHDA infused rats showed a significant (p<0.001) increase in $B_{\text{max}}$ compared to control rats. All the treatment groups significantly reversed the receptor number to near control: 5-HT (p<0.01), GABA (p<0.01), BMC (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). There was no significant change in $K_d$ in all experimental groups of rats (Figure 9, 10; Table 2, 3).

Scatchard analysis of NMDA receptors using $[^3]$H]MK801 against MK801

Scatchard analysis NMDA receptors using $[^3]$H]MK801 against MK801 in the Corpus Striatum of 6-OHDA infused rats showed a significant (p<0.001) increase in $B_{\text{max}}$ compared to control rats. Significant reversal in the $B_{\text{max}}$ was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in $B_{\text{max}}$ compared to 6-OHDA infused rats. There was no significant change in $K_d$ in all experimental groups of rats (Figure 11, 12; Table 4, 5).

Glutamate content in the Corpus Striatum of control and experimental rats

Glutamate content in the Corpus Striatum showed a significant (p<0.001) increase in 6-OHDA infused rats compared to control rats. A significant reversal in the glutamate content was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal in glutamate content compared to 6-OHDA infused rats (Figure 13; Table 6).
Real-Time PCR analysis of mGluR5 receptors

The gene expression studies using real-time PCR was done in corpus striatum to confirm the receptor analysis which showed a significant (p<0.001) up regulation in mGluR5 receptor expression in 6-OHDA infused rats compared to control rats. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 14; Table 7).

Real-Time PCR analysis of NMDAR1 receptors

The Real-Time PCR analysis of NMDAR1 receptors in the Corpus Striatum showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control rats. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 15; Table 8).

Real-Time PCR analysis of NMDA2B receptors

The Real-Time PCR analysis of NMDA2B receptors in the Corpus Striatum showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control rats. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 16; Table 9).

Real-Time PCR analysis of GLAST glutamate transporter

The Real-Time PCR analysis of GLAST glutamate transporter in the Corpus Striatum showed a significant (p<0.001) down regulation in 6-OHDA infused rats
compared to control rats. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 17; Table 10).

**Real-Time PCR analysis of Bax mRNA in the control and experimental rats**

Gene expression of Bax mRNA showed significant up regulation (p<0.001) in the Corpus Striatum of 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 18; Table 11).

**Real-Time PCR analysis of tumor necrosis factor-α in the control and experimental rats**

Gene expression of tumor necrosis factor-α mRNA showed significant up regulation (p<0.001) in the Corpus Striatum of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 19; Table 12).

**Real-Time PCR analysis of α-synuclein in the control and experimental rats**

Gene expression of α-synuclein mRNA showed significant up regulation (p<0.001) in the Corpus Striatum of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-
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HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 20; Table 13).

Real-Time PCR analysis of CREB in the control and experimental rats

Gene expression of CREB mRNA showed significant down regulation (p<0.001) in the Corpus Striatum of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 21; Table 14).

IP3, cAMP and cGMP content in the Corpus Striatum of control and experimental rats

The IP3 and cAMP contents in the Corpus Striatum was significantly (p<0.001) increased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in IP3 and cAMP contents compared to 6-OHDA infused rats (Figure 22, 23; Table 15, 16).

The cGMP content in the Corpus Striatum was significantly (p<0.001) decreased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in cGMP content compared to 6-OHDA infused rats (Figure 24; Table 17)

mGluR5 receptor antibody staining in control and experimental groups of rats

mGluR5 receptor antibody staining was carried out to confirm the receptor and gene expression studies. The mGluR5 receptor antibody staining in the Corpus Striatum showed significant (p<0.001) increase in the mean pixel value in 6-OHDA
infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 25; Table 18).

**NMDAR1 receptor antibody staining in control and experimental groups of rats**

The NMDAR1 receptor antibody staining in the Corpus Striatum showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Individual treatment with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 26; Table 19).

**NMDA2B receptor antibody staining in control and experimental groups of rats**

NMDA2B receptor antibody staining was carried out to confirm the receptor and gene expression studies. The NMDA2B receptor antibody staining in the Corpus Striatum showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 27; Table 20).
**Substantia nigra pars compacta**

**Real-Time PCR analysis of mGluR5 receptors**

The gene expression studies of mGluR5 receptors using real-time PCR in the Substantia nigra showed a significant (p<0.001) up regulation in the expression in 6-OHDA infused rats compared to control rats. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 28; Table 21).

**Real-Time PCR analysis of NMDAR1 receptors**

The Real-Time PCR analysis of NMDAR1 receptors in the Substantia nigra showed a significant (p<0.001) up regulation in the gene expression in 6-OHDA infused rats compared to control. Treatment groups significantly reversed gene expression near to control: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 29; Table 22).

**Real-Time PCR analysis of NMDA2B receptors**

The Real-Time PCR analysis of NMDA2B receptors in the Substantia nigra showed a significant (p<0.001) up regulation in the gene expression in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 30; Table 23).

**Real-Time PCR analysis of GLAST glutamate transporter**

Gene expression study of GLAST glutamate transporter in the Substantia nigra showed a significant (p<0.001) down regulation in 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the
treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 31; Table 24).

**Real-Time PCR analysis of Bax mRNA in the control and experimental rats**

Gene expression of Bax mRNA showed significant (p<0.001) up regulation in the Substantia nigra of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 32; Table 25).

**Real-Time PCR analysis of tumor necrosis factor-α in the control and experimental rats**

Gene expression of tumor necrosis factor-α mRNA showed significant up regulation (p<0.001) in the Substantia nigra of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats. (Figure 33; Table 26).

**Real-Time PCR analysis of α-synuclein in the control and experimental rats**

Gene expression of α-synuclein mRNA showed significant up regulation (p<0.001) in the Substantia nigra of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01), and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 34; Table 27).
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Real-Time PCR analysis of CREB in the control and experimental rats

Gene expression of CREB mRNA showed significant down regulation (p<0.001) in the Substantia nigra of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001), and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 35; Table 28).

Real-Time PCR analysis of nestin

Gene expression study of nestin in the Substantia nigra showed a significant (p<0.05) up regulation in 6-OHDA infused rats and the rats individually treated with 5-HT and GABA compared to control rats. BMC treated alone (p<0.01) and along with 5-HT (p<0.01) and GABA (p<0.01) further enhanced the nestin gene expression compared to control. Prominent significant (p<0.001) expression was observed in the rats treated with 5-HT, GABA and BMC in combination (Figure 36; Table 29).

Real-Time PCR analysis of GFAP

Gene expression study of GFAP in the Substantia nigra showed a significant (p<0.01) up regulation in 6-OHDA infused rats and the rats individually treated with 5-HT and GABA compared to control rats. Prominent significant (p<0.001) expression of GFAP was observed in the rats treated with individual BMC treated group (p<0.001), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT + GABA + BMC (p<0.001) treated groups (Figure 37; Table 30).

Real-Time PCR analysis of tyrosine hydroxylase

Gene expression study of tyrosine hydroxylase in the Substantia nigra showed a significant (p<0.001) down regulation in 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-
HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01), and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 38; Table 31).

**Dopamine content analysis**

6-OHDA infusion into the SNpc resulted in a significant (p<0.001) decrease in DA content in the PD rats compared to control. A significant reversal in the DA content was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01), and 5-HT+ GABA+BMC (p<0.001). BMC treatment alone did not reverse DA content (Table-32).

**Morphological changes of bone marrow cells after the injection into Substantia nigra**

*In vitro and in vivo* imaging of BMC tagged with PKH2GL was done. Cellular morphology was changed once the BMC was injected into Substantia nigra (Figure 39).

**In vivo expression studies of bone marrow cells and Nestin in the Substantia nigra of experimental rats**

Our results proved that BMC differentiate to neuronal cells once the proper conditions are given. When autologous BMC treatment was given to SNpc, they differentiated to neuronal cell types. PKH2GL tagged BMC when injected into the brain it started expressing nestin. The BMC division was increased in 5-HT, GABA and BMC in combination later differentiating to neurons *in vivo*. Maximum mean pixel value was observed in the rats treated with 5-HT, GABA and BMC in combination (Figure 40, 41; Table 33).

**In vivo expression studies of bone marrow cells and GFAP in the Substantia nigra of experimental rats**

PKH2GL tagged BMC injection into the brain leads to its differentiation and within 12 days it started expressing GFAP. Also we observed a marked activation of
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Astrocytes in the SNPC. In the Confocal analysis, the mean pixel value of GFAP in the Substantia nigra showed a significant (p<0.01) increase in 6-OHDA infused rats and the rats individually treated with 5-HT and GABA compared to control rats. Prominent significance (p<0.001) in expression of GFAP was observed in the rats treated with individual BMC treated group and combinational 5-HT, GABA and BMC treated groups. Activated astrocytes made connections with the transplanted BMC and helped its differentiation. Confocal analysis confirmed astrocytes migration into the SNPC region after BMC injection (Figure 42, 43, 44, 45; Table 34).

Tyrosine hydroxylase antibody staining in control and experimental groups of rats

Tyrosine hydroxylase antibody staining in the Substantia nigra showed significant (p<0.001) decrease in the mean pixel value in 6-OHDA infused rats compared to control. A significant reversal in the mean pixel value was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone did not reverse the alteration compared to other groups (Figure 46; Table 35).
Cerebral cortex

Scatchard analysis of glutamate receptors using \([^{3}H] \) Glutamate against glutamate

Scatchard analysis of total glutamate receptors using \([^{3}H] \) glutamate against glutamate in the cerebral cortex of 6-OHDA infused rats showed a significant (p<0.001) increase in B\(_{\text{max}}\) compared to control rats. All the treatment groups significantly reversed the receptor number to near control: 5-HT (p<0.01), GABA (p<0.01), BMC (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). There was no significant change in K\(_{d}\) in all experimental groups of rats (Figure 47, 48; Table 36, 37).

Scatchard analysis of NMDA receptors using \([^{3}H] \) MK801 against MK801

The total muscarinic receptor status was assayed using the specific ligand, \([^{3}H] \) MK801 and NMDA receptor antagonist MK801. Scatchard analysis NMDA receptors using \([^{3}H] \) MK801 against MK801 in the cerebral cortex of 6-OHDA infused rats showed a significant (p<0.001) increase in B\(_{\text{max}}\) compared to control rats. All the treatment groups significantly reversed the receptor number to near control: 5-HT (p<0.01), GABA (p<0.01), BMC (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). There was no significant change in K\(_{d}\) in all experimental groups of rats (Figure 49, 50; Table 38, 39).

Glutamate content in the cerebral cortex of control and experimental rats

Glutamate content in the cerebral cortex showed a significant (p<0.001) increase in 6-OHDA infused rats compared to control. Significant reversal in the glutamate content was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal in glutamate content compared to 6-OHDA infused rats (Figure 51; Table 40).
Results

Real-Time PCR analysis of mGluR5 receptors

The gene expression studies of mGluR5 receptor was done using real-time PCR in cerebral cortex to confirm the receptor analysis which showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 52; Table 41).

Real-Time PCR analysis of NMDAR1 receptors

The Real-Time PCR analysis of NMDAR1 receptors in the cerebral cortex showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control rats. Treatment groups significantly reversed gene expression near to control: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 53; Table 42).

Real-Time PCR analysis of NMDA2B receptors

The Real-Time PCR analysis of NMDA2B receptors in the cerebral cortex showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 54; Table 43).

Real-Time PCR analysis of GLAST glutamate transporter

The Real-Time PCR analysis of GLAST glutamate transporter in the cerebral cortex showed a significant (p<0.001) down regulation in gene expression in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001)
reversed the alteration. BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 55; Table 44).

**Real-Time PCR analysis of Bax mRNA in the control and experimental rats**

Gene expression of Bax mRNA showed significant up regulation (p<0.001) in the cerebral cortex of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 56; Table 45).

**Real-Time PCR analysis of tumor necrosis factor-α in the control and experimental rats**

Gene expression of tumor necrosis factor-α mRNA showed significant up regulation (p<0.001) in the cerebral cortex of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 57; Table 46).

**Real-Time PCR analysis of α-synuclein in the control and experimental rats**

Gene expression of α-synuclein mRNA showed significant up regulation (p<0.001) in the cerebral cortex of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.01), GABA (p<0.01), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 58; Table 47).
Results

Real-Time PCR analysis of CREB in the control and experimental rats

Gene expression of CREB mRNA showed significant down regulation (p<0.001) in the cerebral cortex of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 59; Table 48).

IP3, cAMP and cGMP content in control and experimental rats

The IP3 and cAMP content in the cerebral cortex was significantly (p<0.001) increased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in IP3 and cAMP content compared to 6-OHDA infused rats (Figure 60, 61; Table 49, 50).

The cGMP content in the cerebral cortex was significantly (p<0.001) decreased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in cGMP content compared to 6-OHDA infused rats (Figure 62; Table 51)

mGluR5 receptor antibody staining in control and experimental groups of rats

mGluR5 receptor antibody staining was carried out to confirm the receptor and gene expression studies. The mGluR5 receptor antibody staining in the cerebral cortex showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC
(p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 63; Table 52).

**NMDAR1 receptor antibody staining in control and experimental groups of rats**

The NMDAR1 receptor antibody staining in the cerebral cortex showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 64; Table 53).

**NMDA2B receptor antibody staining in control and experimental groups of rats**

NMDA2B receptor antibody staining was carried out to confirm the receptor and gene expression studies. The NMDA2B receptor antibody staining in the cerebral cortex showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 65; Table 54).
Results

Hippocampus

Scatchard analysis of glutamate receptors using $[^3]$HGlutamate against glutamate

The total glutamate receptors status was assayed using $[^3]$H glutamate against glutamate. Scatchard analysis of $[^3]$Hglutamate against glutamate in the hippocampus of 6-OHDA infused rats showed a significant (p<0.001) increase in $\text{B}_{\text{max}}$ compared to control rats. All the treatment groups significantly reversed the receptor number to near control: 5-HT (p<0.01), GABA (p<0.01), BMC (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). There was no significant change in $\text{K}_d$ in all experimental groups of rats (Figure 66, 67; Table 55, 56).

Scatchard analysis of NMDA receptors using $[^3]$HMK801 against MK801

The total muscarinic receptor status was assayed using the specific ligand, $[^3]$HMK801 and NMDA receptor antagonist MK801. Scatchard analysis NMDA receptors using $[^3]$HMK801 against MK801 in the hippocampus of 6-OHDA infused rats showed a significant (p<0.001) increase in $\text{B}_{\text{max}}$ compared to control rats. All the treatment groups significantly reversed the receptor number to near control: 5-HT (p<0.01), GABA (p<0.01), BMC (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). There was no significant change in $\text{K}_d$ in all experimental groups of rats (Figure 68, 69; Table 57, 58).

Glutamate content in the Hippocampus of control and experimental rats

Glutamate content in the hippocampus showed a significant (p<0.001) increase in 6-OHDA infused rats compared to control rats. A significant reversal in the glutamate content was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal in glutamate content compared to 6-OHDA infused rats (Figure 70; Table 59).
Real-Time PCR analysis of mGluR5 receptors

The gene expression studies of mGluR5 receptors using real-time PCR analysis in the hippocampus showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 71; Table 60).

Real-Time PCR analysis of NMDAR1 receptors

The Real-Time PCR analysis of NMDAR1 receptors in the Hippocampus showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control rats. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 72; Table 61).

Real-Time PCR analysis of NMDA2B receptors

The Real-Time PCR analysis of NMDA2B receptors in the Hippocampus showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 73; Table 62).

Real-Time PCR analysis of GLAST glutamate transporter

The Real-Time PCR analysis of GLAST glutamate transporter in the Hippocampus showed a significant (p<0.001) down regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed
the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 74; Table 63).

**Real-Time PCR analysis of Bax mRNA in the control and experimental rats**

Gene expression of Bax mRNA showed significant up regulation (p<0.001) in the Hippocampus of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 75; Table 64).

**Real-Time PCR analysis of tumor necrosis factor-α in the control and experimental rats**

Gene expression of tumor necrosis factor-α mRNA showed significant up regulation (p<0.001) in the Hippocampus of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 76; Table 65).

**Real-Time PCR analysis of α-synuclein in the control and experimental rats**

Gene expression of α-synuclein mRNA showed significant up regulation (p<0.001) in the Hippocampus of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 77; Table 66).
Real-Time PCR analysis of CREB in the control and experimental rats

Gene expression of CREB mRNA showed significant down regulation (p<0.001) in the Hippocampus of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 78; Table 67).

IP3, cAMP and cGMP content in control and experimental rats

The IP3 and cAMP content in the Hippocampus was significantly (p<0.001) increased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in IP3 and cAMP content compared to 6-OHDA infused rats (Figure 79, 80; Table 68, 69).

The cGMP content in the Hippocampus was significantly (p<0.001) decreased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in cGMP content compared to 6-OHDA infused rats (Figure 81; Table 70)

mGluR5 receptor antibody staining in control and experimental groups of rats

mGluR5 receptor antibody staining was carried out to confirm the receptor and gene expression studies. The mGluR5 receptor antibody staining in the Hippocampus showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC
treated alone did not reverse the alteration compared to 6-OHDA group (Figure 82; Table 71).

**NMDAR1 receptor antibody staining in control and experimental groups of rats**

The NMDAR1 receptor antibody staining in the Hippocampus showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 83; Table 72).

**NMDA2B receptor antibody staining in control and experimental groups of rats**

NMDA2B receptor antibody staining was carried out to confirm the receptor and gene expression studies. The NMDA2B receptor antibody staining in the Hippocampus showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 84; Table 73).
**Cerebellum**

Scatchard analysis of glutamate receptors using [3H]Glutamate against glutamate

The total glutamate receptors status was assayed using [3H] Glutamate and glutamate. Scatchard analysis of [3H]glutamate against glutamate in the cerebellum of 6-OHDA infused rats showed a significant (p<0.001) increase in B$_{\text{max}}$ compared to control rats. All the treatment groups significantly reversed the receptor number to near control: 5-HT (p<0.01), GABA (p<0.01), BMC (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). There was no significant change in K$_{d}$ in all experimental groups of rats (Figure 85, 86; Table 74, 75).

Scatchard analysis of NMDA receptors using [3H]MK801 against MK801

The total muscarinic receptor status was assayed using the specific ligand, [3H]MK801 and NMDA receptor antagonist MK801. Scatchard analysis NMDA receptors using [3H]MK801 against MK801 in the cerebellum of 6-OHDA infused rats showed a significant (p<0.001) increase in B$_{\text{max}}$ compared to control rats. All the treatment groups significantly reversed the receptor number to near control: 5-HT (p<0.01), GABA (p<0.01), BMC (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). There was no significant change in K$_{d}$ in all experimental groups of rats (Figure 87, 88; Table 76, 77).

Glutamate content in the cerebellum of control and experimental rats

Glutamate content in the cerebellum showed a significant (p<0.001) increase in 6-OHDA infused rats compared to control rats. A significant reversal in the glutamate content was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone did not show any significant reversal in glutamate content compared to 6-OHDA infused rats (Figure 89; Table 78).
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Real-Time PCR analysis of mGluR5 receptors

The gene expression studies using real-time PCR was done in cerebellum to confirm the receptor analysis which showed a significant (p<0.001) up regulation in mGluR5 receptor expression in 6-OHDA infused rats compared to control rats. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 90; Table 79).

Real-Time PCR analysis of NMDAR1 receptors

The Real-Time PCR analysis of NMDAR1 receptors in the cerebellum showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 91; Table 80).

Real-Time PCR analysis of NMDA2B receptors

The Real-Time PCR analysis of NMDA2B receptors in the cerebellum showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 92; Table 81).

Real-Time PCR analysis of GLAST glutamate transporter

The Real-Time PCR analysis of GLAST glutamate transporter in the cerebellum showed a significant (p<0.001) down regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC
(p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 93; Table 82).

**Real-Time PCR analysis of Bax mRNA in the control and experimental rats**

Gene expression of Bax mRNA showed significant up regulation (p<0.001) in the cerebellum of 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 94; Table 83).

**Real-Time PCR analysis of tumor necrosis factor-α in the control and experimental rats**

Gene expression of tumor necrosis factor-α mRNA showed significant up regulation (p<0.001) in the cerebellum of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 95; Table 84).

**Real-Time PCR analysis of α-synuclein in the control and experimental rats**

Gene expression of α-synuclein mRNA showed significant up regulation (p<0.001) in the cerebellum of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 96; Table 85).
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Real-Time PCR analysis of CREB in the control and experimental rats

Gene expression of CREB mRNA showed significant down regulation (p<0.001) in the cerebellum of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 97; Table 86).

IP3, cAMP and cGMP content in control and experimental rats

The IP3 and cAMP content in the cerebellum was significantly (p<0.001) increased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in IP3 and cAMP content compared to 6-OHDA infused rats (Figure 98, 99; Table 87, 88).

The cGMP content in the cerebellum was significantly (p<0.001) decreased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 100; Table 89).

mGluR5 receptor antibody staining in control and experimental groups of rats

mGluR5 receptor antibody staining was carried out to confirm the receptor and gene expression studies. The mGluR5 receptor antibody staining in the cerebellum showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 101; Table 90).
**NMDAR1 receptor antibody staining in control and experimental groups of rats**

The NMDAR1 receptor antibody staining in the cerebellum showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 102; Table 91).

**NMDA2B receptor antibody staining in control and experimental groups of rats**

NMDA2B receptor antibody staining was carried out to confirm the receptor and gene expression studies. The NMDA2B receptor antibody staining in the cerebellum showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 103; Table 92).
**Brain stem**


The total glutamate receptors status was assayed using $[^3]$H] Glutamate and glutamate. Scatchard analysis of $[^3]$H]glutamate against glutamate in the brain stem of 6-OHDA infused rats showed a significant (p<0.001) increase in $B_{\text{max}}$ compared to control rats. All the treatment groups significantly reversed the receptor number to near control: 5-HT (p<0.01), GABA (p<0.01), BMC (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). There was no significant change in $K_d$ in all experimental groups of rats (Figure 104, 105; Table 93, 94).

Scatchard analysis of NMDA receptors using $[^3]$H]MK801 against MK801

The total muscarinic receptor status was assayed using the specific ligand, [3H]MK801 and NMDA receptor antagonist MK801. Scatchard analysis NMDA receptors using $[^3]$H]MK801 against MK801 in the brain stem of 6-OHDA infused rats showed a significant (p<0.001) increase in $B_{\text{max}}$ compared to control rats. Significant reversal in the $B_{\text{max}}$ was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in $B_{\text{max}}$ compared to 6-OHDA infused rats. There was no significant change in $K_d$ in all experimental groups of rats (Figure 106, 107; Table 95, 96).

Glutamate content in the brain stem of control and experimental rats

Glutamate content in the brain stem showed a significant (p<0.001) increase in 6-OHDA infused rats compared to control. Significant reversal in the glutamate content was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC
treated alone did not show any significant reversal in glutamate content compared to 6-OHDA infused rats (Figure 108; Table 97).

**Real-Time PCR analysis of mGluR5 receptors**

The gene expression studies using real-time PCR analysis were done in brain stem to confirm the receptor analysis which showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 109; Table 98).

**Real-Time PCR analysis of NMDAR1 receptors**

The Real-Time PCR analysis of NMDAR1 receptors in the brain stem showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 110; Table 99).

**Real-Time PCR analysis of NMDA2B receptors**

The Real-Time PCR analysis of NMDA2B receptors in the brain stem showed a significant (p<0.001) up regulation in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 111; Table 100).

**Real-Time PCR analysis of GLAST glutamate transporter**

The Real-Time PCR analysis of GLAST glutamate transporter in the brain stem showed a significant (p<0.001) down regulation in 6-OHDA infused rats
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compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 112; Table 101).

Real-Time PCR analysis of Bax mRNA in the control and experimental rats

Gene expression of Bax mRNA showed significant up regulation (p<0.001) in the brain stem of 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone did not show any significant reversal in gene expression compared to 6-OHDA infused rats (Figure 113; Table 102).

Real-Time PCR analysis of tumor necrosis factor-α in the control and experimental rats

Gene expression of tumor necrosis factor-α mRNA showed significant up regulation (p<0.001) in the brain stem of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 114; Table 103).

Real-Time PCR analysis of α-synuclein in the control and experimental rats

Gene expression of α-synuclein mRNA showed significant up regulation (p<0.001) in the brain stem of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 115; Table 104).
Real-Time PCR analysis of CREB in the control and experimental rats

Gene expression of CREB mRNA showed significant down regulation (p<0.001) in the brain stem of 6-OHDA infused rats compared to control. A significant reversal in the gene expression was observed in the treatment groups: 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.001), GABA+BMC (p<0.001) and 5-HT+ GABA+BMC (p<0.001). BMC treated alone showed no significant reversal in gene expression compared to 6-OHDA infused rats (Figure 116; Table 105).

IP3, cAMP and cGMP content in control and experimental rats

The IP3 and cAMP content in the brain stem was significantly (p<0.001) increased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01) and GABA+BMC (p<0.01) 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in IP3 and cAMP content compared to 6-OHDA infused rats (Figure 117, 118; Table 106, 107).

The cGMP content in the brain stem was significantly (p<0.001) decreased in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05), 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) reversed the alteration. BMC treated alone showed no significant reversal in cGMP content compared to 6-OHDA infused rats (Figure 119; Table 108).

mGluR5 receptor antibody staining in control and experimental groups of rats

mGluR5 receptor antibody staining was carried out to confirm the receptor and gene expression studies. The mGluR5 receptor antibody staining in the brain stem showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 120; Table 109).
Results

**NMDAR1 receptor antibody staining in control and experimental groups of rats**

The NMDAR1 receptor antibody staining in the brain stem showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 121; Table 110).

**NMDA2B receptor antibody staining in control and experimental groups of rats**

NMDA2B receptor antibody staining was carried out to confirm the receptor and gene expression studies. The NMDA2B receptor antibody staining in the brain stem showed significant (p<0.001) increase in the mean pixel value in 6-OHDA infused rats compared to control. Treatments with 5-HT (p<0.05), GABA (p<0.05) and 5-HT + BMC (p<0.01), GABA+BMC (p<0.01) and 5-HT+GABA+BMC (p<0.001) significantly reversed the mean pixel value. BMC treated alone did not reverse the alteration compared to 6-OHDA group (Figure 122; Table 111).