Developmental and aging effects on (i) the metabolism of glutamate group of amino acids, (ii) the metabolism of vitamin B₆ and (iii) age-related effects of nutritional pyridoxine deficiency on amino acids of the glutamic acid family and related B₆-dependent enzymes in the brain of rat were studied. The results showed that:

1. Wet weight of 1 day old brain was about 12% of adult brain weight and increased to 39%, 58% and 72% at 7, 14 and 21 days. With increase in age from 3 to 12 months, a significant 2% increase and at 24 months, no significant change was observed.

2. The level of glutamic acid doubled between 1 d and 21 days with a maximum increase during the III postnatal week. Adult values were attained at 3 months and increase in age to 12 and 24 months resulted in a 14% and a 32% decrease.

3. 7-amino-butyric acid showed very little increase during the first 3 weeks and maximum change occurred between 21 days and 3 months. Significant 24% and 40% increases in the level as compared to the adult were observed at 12 and 24 months.

4. The level of glutamine in 1 d old brain was 62% of the adult level and decreased to 46% at 7 days. Between 7 and 14 days there was a 2-fold increase which again decreased by 15% at 21 days. Adult levels were reached at 3 months and at 12 and 24 months, a 24% and a 25% decrease was observed.
5. Aspartic acid showed progressive increase from 7 days to 3 months and decreased by 8% and 19% at 12 and 24 months.

6. Alanine decreased progressively during the first 3 weeks and thereafter increased to adult levels at 3 months. At 12 and 24 months an 11% and a 21% increase was observed.

7. Ratio of glutamic acid + aspartic acid/7-ABA + alanine was lowest in 1 day old brain and increased more than 2-fold at 21 days decreasing progressively thereafter.

8. Glutamic acid dehydrogenase activity increased dramatically during I and III weeks and between 21 days and 3 months. The same decreased by 23% and 35% at 12 and 24 months.

9. Glutamine synthase activity was high at 14 and 21 days as compared to the 3 month old animal. At 12 and 24 months a 19% and a 32% decrease was observed.

10. Glutaminase showed maximum increase in activity during the III postnatal week and adult value was attained at 21 days which was maintained at 3 and 12 months. At 24 months, a significant 21% increase was observed.

11. Glutamotransferase showed dramatic increase in activity during the III postnatal week and between 21 days and 3 months. At 12 and 24 months, significant 30% and 67% increases in activity was observed.
12. Ratio of glutamine synthase to glutaminase was highest at 14 days when the level of glutamine was found to be the highest. The decrease in the ratio observed later on reflected on increased ammonia levels observed during aging.

13. Glutamic acid decarboxylase activity increased 5-fold between 1 day and 21 days and doubled between 21 days and 3 months. A 14% and a 21% increase in the activity occurred at 12 and 24 months.

14. The activity of r-ABA-transaminase increased 10-fold between 1 day and 3 months. At 12 and 24 months, a 12% and a 33% decrease was observed.

15. Succinic semialdehyde dehydrogenase activity doubled during II and III postnatal weeks and a 24% and a 37% decrease in activity was noted at 12 and 24 months.

16. Pyruvate level doubled between 1 d and 21 days and between 21 days and 3 months, with small insignificant changes at 12 and 24 months.

17. The level of α-ketoglutarate showed a maximum increase during the III postnatal week. Adult level was attained at 21 days. At 12 and 24 months a 14% and a 56% increase was observed.

18. Oxaloacetate increased more than 2-fold between 1 d and 21 days. The adult level was maintained at 12 months which decreased by 39% at 24 months.
19. Aspartate aminotransferase activity increased 2-fold between 1 day and 3 months. Maximum increase was observed during the III postnatal week. At 12 and 24 months, a 3.5% and a 16% increase (not significant) in activity was observed.

20. The activity of alanine aminotransferase increased progressively during the first 3 postnatal weeks attaining adult values at 21 days. The changes observed at 12 and 24 months were not significant.

21. NAD$^+$-isocitrate dehydrogenase showed a 5-fold increase in activity between 1 day and 3 months. Maximum increase occurred during II and III weeks. At 12 and 24 months, a 17% and a 37% decrease was observed.

22. The activity of NADP$^+$-isocitrate dehydrogenase was 8-fold higher in 1 day old brain compared to the adult. With advance in age after 3 months, this enzyme showed very slight or no change in activity.

23. α-Ketoglutarate dehydrogenase activity almost doubled every week during the first 21 days and increased 15-fold between 1 day and 3 months. At 24 months a significant 43% increase in the activity was observed.

24. The concentration of total vitamin B$_6$ in 1 day old brain was 151% of the adult level which decreased by 6% at
7 days, 23% at 14 days and 44% at 21 days - the time at which it almost reached the adult level. At 12 and 24 months, no difference in its concentration was observed. Pyridoxine was found only in 1 day old brain. Pyridoxal at day 1 was 125% of the adult level and pyridoxamine almost 3-fold. Both decreased progressively reaching adult values at 21 days. No significant change in their levels was observed at 12 and 24 months.

25. Pyridoxal phosphate and pyridoxamine phosphate attained 70% and 64% of the adult levels at 14 days and 88% and 90% at 21 days. At 12 and 24 months, pyridoxal phosphate showed an increase of 7% and 28% and pyridoxamine phosphate a decrease of 6% and 12%.

26. The activity of pyridoxal phosphokinase with both pyridoxal phosphate and pyridoxamine phosphate as substrates attained 2/3 and 4/5 of the adult level at 14 and 21 days. With advance in age from 3 to 24 months, a 10% decrease in activity with pyridoxal phosphate as substrate and a 19% decrease with pyridoxamine phosphate as substrate was observed.

27. The activity of pyridoxine phosphate oxidase showed dramatic increase during the III week and reached the adult level at 21 days. At 24 months, a 28% increase in activity was observed.
28. Pyridoxal phosphate phosphatase showed a maximum increase between 21 days and 3 months. At 12 and 24 months, a 19% and a 40% increase in its activity was observed.

29. Pyridoxine deficiency induced at different ages (between 1 day and 21 days - Group 1; at 21 days for 4 weeks - Group 2; at 3 months for 4 weeks - Group 3; at 12 months for 10 weeks - Group 4 and at 24 months for 10 weeks - Group 5) resulted in a significant reduction in body weight in groups 1, 2 and 3 and brain weight in groups 1 and 2 whereas all the five amino acids studied - glutamic acid, 7-amino-butyric acid, glutamine, aspartic acid and alanine decreased significantly in all the age-groups studied.

30. The deficiency resulted in decreased activity of GAD holoenzyme in all the age groups studied. However, group 1 was affected maximally. GAD apoenzyme showed significant 6% and 12% increases in groups 1 and 2 and the changes observed in groups 3, 4 and 5 were not significant.

31. 7-ABA-transaminase, like GAD, showed significant decrease in the level of holoenzyme in all the age groups. 7-ABA-T apoenzyme decreased significantly in groups 1 and 2 and differences observed in group 3, 4 and 5 were not significant.

32. The activity of aspartate aminotransferase decreased in all the age groups while the
apoenzyme activity decreased only in groups 4 and 5.

33. Deficiency did not result in significant changes in the alanine aminotransferase apoenzyme at any age. The degree of decrease in the activity of alanine aminotransferase holoenzyme at all ages was more compared to the aspartate enzyme.

34. Deficiency affected the holoenzyme of glutamotransferase only in group 1 and the apoenzyme was not affected at any age.