Age related changes in different regions of brain (hypothalamus, medulla, midbrain, cerebral cortex, striatum and cerebellum) of male albino rats (Wistar strain) of 12.5, 25, 50, 75 and 100 weeks old were studied. The results showed that:

1. Organic solvent soluble lipofuscin content of different regions of brain exhibited a gradual and linear increase as a function of age. The rank order of lipofuscin accumulation with age from highest to lowest was: a) hypothalamus, b) medulla, c) midbrain, d) cerebral cortex, e) striatum and f) cerebellum. This gradation remained same at all the ages studied.

The rate of lipofuscin accumulation in various brain regions was differential. With advance in age from 12.5 to 100 weeks, the lipofuscin content increased by 650% in cerebral cortex, 550% in medulla, 525% in midbrain, 450% in hypothalamus, 425% in striatum and 400% in the cerebellum.

2. Histochemically, the lipofuscin in the neurons of rat brain exhibited a characteristically differential staining behaviour. While the lipofuscin in the brain regions of 12.5, 25 and 50 week old animals had more affinity for PAS and Sudan black B techniques than the Schmorl and Nile Blue sulphate methods, the lipofuscin in the neurons of 75 and 100 week old animals had more affinity for the latter than the former.
The rate of lipid peroxidation in various regions of the brain during aging showed a progressive linear increase. Malonaldehyde formation increased in all the 6 regions of brain as a function of age. The rank order of peroxidising activity of various brain regions from highest to lowest was: a) hypothalamus, b) medulla, c) midbrain, d) cerebral cortex, e) striatum and f) cerebellum. The overall increase in the peroxidizing activity with advance in age from 12.5 to 100 weeks was by 335% in hypothalamus, 259% in medulla, 248% in midbrain, 251% in cerebral cortex, 265% in striatum and 300% in cerebellum.

The level of concentration of DNA in all the 6 regions of brain fluctuated moderately with age, but the levels at 100 weeks were significantly higher than at any previous age. With advance in age from 12.5 to 25 weeks, the DNA content of various brain regions decreased by 5-10%. By 50 weeks, an increase of 7-17% was evident. By 75 weeks, the DNA content of various brain regions declined to the levels observed at 12.5 weeks. This, however, was followed by increase in all the 6 regions by 100 weeks.

Acid phosphatase activity in all the brain regions exhibited enhanced activities as a function of age. The extent of increase, however, varied. With advance in age from 12.5 to 100 weeks, the increase was by 37% in hypothalamus, 54% in medulla and midbrain, 60% in cerebral cortex, 64% in striatum and 83% in cerebellum.
6. Age associated activity profile of N-acetyl β-glucosaminidase in different regions of the brain also showed an increasing trend. With advance in age from 12.5 to 100 weeks, the enzyme activity increased by 29% in hypothalamus and cerebral cortex, 39% in medulla and striatum, 34% in midbrain and 20% in cerebellum.

7. β-Glucuronidase activity in various brain regions increased during aging. With advance in age from 12.5 to 100 weeks, the enzyme activity increased by 61% in hypothalamus, 99% in medulla, 108% in midbrain, 62% in cerebral cortex and 70% in striatum and cerebellum.

8. As a function of vitamin E deficiency, the wet weight of various brain regions showed a decline of 1-7%, but the decrease was statistically significant only in the medulla.

   Organic solvent soluble lipofuscin content of various brain regions showed an increase as a function of vitamin E deficiency. The increase was by 4.12% in hypothalamus, 8.2% in medulla, 6.84% in midbrain, 11.43% in cerebral cortex, 5.88% in striatum and 20.4% in cerebellum. The increase was significant only in the cerebellum, cerebral cortex and medulla.

   Lipid peroxidation rate in various brain regions also showed an increase as a function of vitamin E deficiency. The malonaldehyde formation increased by 31.25% in hypothalamus, 20% in medulla, 21.25% in midbrain, 16.85% in cerebral cortex, 23% in striatum and 19.45% in cerebellum.
9. The wet weight of various brain regions upon a 10 week daily administration of centrophenoxine showed a gain of 0–4.5% but the increase was not statistically significant in any region.

Organic solvent soluble lipofuscin content showed a reduction upon drug administration. The lipofuscinolytic activity of the drug was variable in different regions of the brain. The decrease in the lipofuscin content was by 16.07% in hypothalamus, 9.7% in medulla, 15.5% in midbrain, 22.6% in cerebral cortex, 35.7% in striatum and 35.5% in cerebellum. The decrease was statistically significant in all the regions of the brain.

A decline in the peroxidizing activity of the different brain regions was observed as a result of 10 week treatment with centrophenoxine. Malonaldehyde production was reduced by 16.67% in hypothalamus, 18.35% in medulla, 11% in midbrain, 15.5% in cerebral cortex, 19.5% in striatum and 22.85% in cerebellum. This decrease was highly significant in all the regions of the brain.

The pattern of age related changes in different regions of rat brain were similar but the magnitude of change varied in each region. Decrease in brain weight may be attributed to the loss of neurons. Neuronal loss in turn may be due to accumulation of lipofuscin. The impairments in sensory, associative and motor capacity, frequently cited as prominent manifestations of senescence, appear to be as a consequence
of selective alterations in discrete regions of the brain rather than uniform cellular aging.