## CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. INTRODUCTION AND AIMS</strong></td>
<td></td>
</tr>
<tr>
<td>1. Introduction</td>
<td>1 - 3</td>
</tr>
<tr>
<td>2. Aims</td>
<td>3 - 7</td>
</tr>
<tr>
<td><strong>B. REVIEW OF LITERATURE</strong></td>
<td></td>
</tr>
<tr>
<td>1. Malnutrition in general</td>
<td>8 - 11</td>
</tr>
<tr>
<td>2. Malnutrition effects on body growth and brain development</td>
<td>11 - 16</td>
</tr>
<tr>
<td>3. On cortical development</td>
<td>16 - 20</td>
</tr>
<tr>
<td>4. On synaptic profile studies and undernutrition effects</td>
<td>20 - 31</td>
</tr>
<tr>
<td>5. On histofluorescence study of catecholaminergic innervation of cortex</td>
<td>31 - 35</td>
</tr>
<tr>
<td><strong>C. METHODS</strong></td>
<td></td>
</tr>
<tr>
<td>1. Housing and maintenance of the rat colony</td>
<td>36</td>
</tr>
<tr>
<td>2. Diet</td>
<td>37</td>
</tr>
<tr>
<td>3. Rearing of the rats</td>
<td>37 - 39</td>
</tr>
<tr>
<td>a) Control group</td>
<td></td>
</tr>
<tr>
<td>b) Undernourished group</td>
<td></td>
</tr>
<tr>
<td>c) Post-weaning rehabilitated group</td>
<td></td>
</tr>
<tr>
<td>4. Body weights and Brain weights</td>
<td>39</td>
</tr>
<tr>
<td>5. Ages studied</td>
<td>39</td>
</tr>
</tbody>
</table>
6. Areas chosen for the present study 39 - 40

7. Protein estimation 40 - 41

8. Methodology for electron microscopy - E-PTA 41 - 50
   a) Solutions and other formulae
   b) Processing of tissue for electron microscopy
      i) Fixation
      ii) Dehydration
      iii) Staining
      iv) Clearing infiltration and embedding
      v) Polymerization
      vi) Ultramicrotomy
   c) Demarcation of molecular layers
      i) Cingulate cortex
      ii) Hippocampus-dentate molecular layer
      iii) Scanning of grids under TEM

9. Methodologies for histochemical fluorescence 50 - 59
   a) Formaldehyde induced histofluorescence
      i) Materials required
      ii) Composition of tyrodes solution
      iii) Iris-stretch preparation
   b) Glyoxylic-acid induced histofluorescence
i) Stock solutions
ii) Perfusion solution
iii) Immersion solution
iv) Krebs ringer solution
v) MAO inhibitor
vi) Rat Perfusion
vii) Preparation for perfusion
viii) Perfusion
ix) Vibratome sectioning and processing

D. RESULTS

1. Alteration of growth of body and brain
   a) Body Weights
      i) Growth in the normal subjects
      ii) Growth in the undernourished
      iii) Growth in post-weaning rehabilitated
   b) Brain Weights
      i) In normal group
      ii) In undernourished group
      iii) In rehabilitated group
   c) Serum protein level
2. Changes in cingulate cortex molecular layer  
   a) Thickness of molecular layer  
      i) Control group  
      ii) Undernourished group  
      iii) Rehabilitated group  
      iv) Conclusion  
   b) Alterations in ontogeny of numerical density of synapses  
      i) Control group  
      ii) Undernourished group  
      iii) Rehabilitated group  

3. Changes in numerical density of synapses of Hippocampal (CA1) - Dentate Molecular Layer  
   i) Control group  
   ii) Undernourished group  
   iii) Rehabilitated group  

4. Catecholaminergic Axons: Study of intervaricosity distance  
   a) Iris  
   b) Frontal cortex
E. DISCUSSION

1. General

   a) Aims
   b) Comments on the undernutrition type
   c) Comments on E-PTA method of studying synapses

2. Alterations of numerical density of synapses

   a) Cingulate cortex
      i) General comments
      ii) Comments on normal ontogenic changes
      iii) Comments on changes due to undernutrition
      iv) Comments on changes due to rehabilitation
      v) Conclusion

   b) Hippocampus (CA-1) - Dentate molecular layer region
      i) General comments on sources contributing to synapses
      ii) Comments on normal ontogeny of synapses
      iii) Comments on effects of undernutrition
      iv) Comments on effects of rehabilitation
      v) Conclusion comment
3. Comments on studies of changes of numerical density of varicosities of catecholaminergic axons

a) Comments on ontogeny in normal group
b) Comments on effects of undernutrition on intervaricosity distance

F. SYNOPSIS

1. Aims
2. Methods
3. Results and discussion
   a) Alterations in body and brain weight
   b) Serum protein levels
   c) Alterations of thickness of molecular layer of cingulate cortex
   d) Alteration of numerical density of synapses of cingulate cortex
   e) Changes in synapses of hippocampus - dentate molecular layer
   f) Intervaricosity distance on catecholaminergic axons

4. General overview and conclusion

G. REFERENCES

H. APPENDIX