CHAPTER V. CONCLUSIONS

5.1 Conclusion

The conclusion of this study are as follows :

1. Supplementation with 14g Lima Beans and Patin Fish Flour (LBPF) significantly restored cerebral cortex thickness approximately 1.2 times and hippocampal neuronal density approximately 1.8 times. Addition of LBPF 14 g shows effectively decreasing degenerated cells in cerebral cortex 20 times and in hippocampal 5.4 times. This findings even closely similar to normal group and demonstrating potent neurorecovery effects against malnutrition-induced structural damage.

2. Addition of lima beans and patin fish flour at dosage 14g have significant effect on improving cognitive function in malnourished rats. There is a strong correlation between brain histopathological changes with cognitive function in malnourished rats.

3. LBPF supplementation (7g and 14g) led to improvements in brain structure and cognition. Importantly, brain MDA levels were not significantly different between the LBPF-supplemented groups (8.36–8.61 µM) and the malnourished group (10.26 µM), indicating that protein malnutrition itself did not alter MDA levels in this study. Supplementation of LBPF also improve brain weight 1.16 times even though did not approximately similar to normal group. This suggests LBPF have potential neurorecovery effects may comes from mechanisms other than oxidative stress prevention, such as enhanced protein synthesis or neurotrophic support.

5.2 Recommendation

For the next research, it is recommended to conduct further studies :

1. Demonstrate MDA measurement with differentiate parts of brain (hippocampus, cerebellum, and cerebral cortex separately) to gain more insight of impact of protein malnutrition towards MDA levels in different parts of brain and finds which parts that susceptible. Adding more induction or treatments period (> 8 weeks) may also resulting in differents results.

2. Conduct a comprehensive oxidative stress analysis by measuring SOD, catalase, and glutathione peroxidase activities alongside inflammatory markers (TNF-α, IL-6) to clarify the dissociation between MDA levels and neuroprotection observed in this study.

3. Investigate cerebral cortex synaptic density using immunohistochemistry (DCTX+ and BDNF expressions) and assess long-term cognitive outcomes through complex behavioral tests (Barnes Maze) to validate the functional relevance of cortical thickness improvements.