The laboratory simulation for induction of diapause and diapause induced physiological and biochemical changes are investigated in a tropical earthworm Octochaetona surensis.

1. Diapause in earthworms can be induced by lowering the moisture in the soil of its habitat, to a range of 7 - 11 g °/o. Although temperature is not the primary inductant; 22 to 30°C is the tolerable limit for worms diapausing in laboratory. These worms have morphological features similar to those in natural diapause. There is a significant loss in body fresh weight during diapause, which includes the losses in body water and dry weight.

2. Decrease in the content of macromolecules such as RNA, protein, glycogen and lipid contribute to the dry weight loss in diapausing worm. The level of DNA content is relatively stable as compared with other macromolecules. The loss in dry weight as well as the molecules during first 15 days of diapause is more than that in the later period, suggesting the metabolic transition in the diapausing worm during the earlier period. A significant loss in the oxygen consumption rate during diapause indicates adaptational strategy of the worm for energy conservation.

3. In absence of a suitable method for isolation and assay of earthworm mitochondria, procedures for the same are standardised. A medium containing KCl, Tris, EDTA and BSA is found to be ideal for isolation of mitochondria in earthworms. The reaction mixture for in vitro assay of oxidative phosphorylation should contain cyt C and BSA besides other basic components. The earthworm mitochondria exhibit respiratory control like those in mammals.
4. Several changes in the structure and function of mitochondria are observed in diapausing earthworm. An increase in heat susceptibility and $K^+$ uptake indicate diapause induced alterations in the mitochondrial structure. A decrease in SDH activity, loss in ADP/O ratio and respiratory control reveal functional alterations in earthworm mitochondria during diapause. These observations suggest a regulatory mechanism of diapause at the level of membranes.