
Crowding Stress

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GLOSSARY

- amyloidosis** A severe pathological change of various organs and tissues where aggregated amyloid fibers develop and induce the destruction of affected cells.
- channeling** Interaction of enzymes catalyzing consecutive enzyme reactions where the product of the "first" reaction becomes the substrate of the "second" enzyme by a directed molecular transfer largely avoiding free diffusion.
- hypothalamic-pituitary-adrenal (HPA) stimulation/axis** A major peripheral mechanism of the stress response, involving three major constituents: the corticotrophin releasing hormone (CRH), corticotrophin (ACTH), and glucocorticoids.
- molecular crowding** A term to denote a dense population of molecules (usually macromolecules) where aggregation, diffusion, hydration, and other properties of the individual molecules are significantly altered.

Crowding stress is a type of psychosocial stress induced by an increased density of population. Population density may be raised either by increasing the number of species living in the same area and/or by reducing their living space. Crowding stress induces complex changes at the behavioral, physiological, and molecular levels, which differ, depending if crowding stress is acute or chronic. Crowding stress can also be interpreted at the molecular level: molecular crowding promotes aggregation of various macromolecules and causes profound changes in numerous physicochemical parameters of their solution.

I. INTRODUCTION

As outlined above, studies on crowding stress consider an exceptionally high number of variables. Several consequences of crowding stress may differ greatly, depending if population density is raised by increasing the number of species living in the same area or by reducing living space. If crowding is increased to such an extent that it leads to confinement, malnutrition, or an increased incidence of infections, other complications develop. Crowding stress may be "acute" (transient), i.e., the effects manifest after a few days, or "chronic," i.e., changes occur after prolonged overcrowding lasting for weeks, months, or even years. While mice or rats are the most commonly used species in crowding stress experiments, studies have been performed with almost all types of domesticated animals, various fishes, and even humans. Though the conclusions of these studies can be directly compared only within the same species, some general trends can be observed. This article focuses on these general aspects of crowding stress.

II. CROWDING STRESS: PSYCHOSOCIAL EFFECTS

Crowding as a chronic source of stress constitutes a major threat to psychological well-being. Dense populations are characterized by considerably increased aggressive behavior. Crowded monkeys (even well fed), including females and young, have brutal fights and wound and kill each other. Crowding stress adversely affects gonadal functions and if it occurs during pregnancy may inhibit reproductive activity of the second generation through masculinization of female pups. Chronic crowding leads to deficits in learning tasks and has been used in animal