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CHRONIC EXPOSURE TO POLYSTYRENE MICROPLASTICS AND ITS EXPECTED EFFECTS ON TISSUE REMODELING AND FOLLICULAR FUNCTION IN FEMALE RATS: A PROPOSED HISTOPATHOLOGICAL STUDY

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Introduction

Microplastics have become one of the most widespread environmental contaminants of the past decade, and there is growing evidence that they don't just pass through the body harmlessly — they can trigger oxidative stress and cause direct damage at the tissue level. We already know these particles can cross into systemic circulation, but surprisingly little work has looked at how different parts of the female reproductive tract might respond to them individually. This study is designed to address that gap by examining what happens structurally — and at the cellular level — in the uterus and ovaries following extended microplastic exposure.

Planned Methods

We plan to use 70 mature female Wistar rats, exposing them orally to pristine polystyrene microplastics (1–5 µm particle size) over 60 days at two dose levels — a low dose (0.5 mg/kg) and a high dose (10 mg/kg) — with matched vehicle-only controls run in parallel. After tissue collection and standard histological processing, we will assess follicle counts (both primary and atretic), measure endometrial thickness, and quantify interstitial collagen deposition using Masson's trichrome staining. Mucin integrity in the tissue will also be evaluated through PAS staining.

Expected Findings

Based on existing literature on microplastic toxicity in other organ systems, we anticipate that the high-dose group will show measurable pathological changes, including:

1. A reduction in ovarian reserve, potentially driven by granulosa cell detachment and increased follicular atresia.
2. Accelerated fibrosis in the ovarian stroma and myometrium, expected to appear as increased collagen deposition under Masson staining.
3. Structural disruption of the uterine lining — possible disorganization of the luminal epithelium, basal membrane thinning, and reduced secretory gland density.

Significance

If confirmed, these findings would suggest that microplastics do not affect the female reproductive system uniformly, and that their most damaging effect may be accelerating follicular atresia while driving fibrotic remodeling of reproductive tissue. Given how widespread microplastic exposure already is, this study aims to contribute meaningful evidence toward understanding the long-term reproductive health risks associated with it.

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