



## Exploring the Risks of Copulatory Trauma in Immunocompromised NOD SCID Mice

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### Abstract

This report documents a sudden and fatal case of copulatory breeding trauma in a 7-month-old NOD SCID male breeder mouse. While similar injuries in other mouse strains typically result in recovery, the immunocompromised status of NOD SCID mice significantly impairs their healing abilities and heightens their susceptibility to infections. The mouse exhibited acute lethargy, gastrointestinal distress, and penile discharge, leading to death within a few hours. Postmortem examination revealed a significantly distended bladder with haemorrhagic spots, and urine analysis showed numerous motile sperm-like structures. The findings indicate that copulatory trauma was the primary cause of death, emphasizing the need for careful monitoring and preventive measures in breeding management, particularly for immunocompromised strains

**Keywords:** NOD SCID Mouse; Breeding Trauma; Copulatory Injury; Laboratory Animals; Veterinary Pathology; Immunodeficient Mice; Reproductive Health

### Introduction

NOD SCID (Non-obese diabetic severe combined immunodeficiency) mice are extensively used in biomedical research due to their lack of functional immune cells, making them ideal for studying various diseases, immune responses, and transplantation [12]. These mice present unique challenges in breeding due to their immunocompromised status, necessitating meticulous care to avoid stress and injury. This report details a case of copulatory breeding trauma resulting in the sudden death of a NOD SCID male breeder, highlighting the importance of careful breeding management.

### Case Description

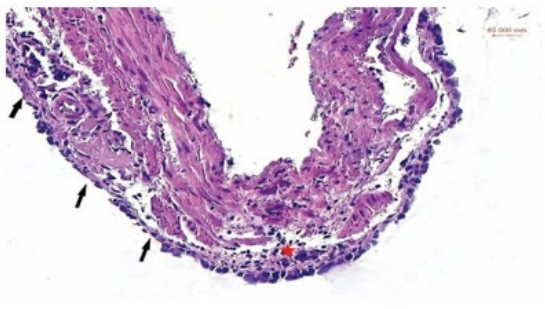
A 7-month-old male NOD SCID breeder mouse residing in a controlled research environment at Institute Animal Facility, IISER, Bhopal exhibited signs of lethargy and dullness. The mice displayed symptoms of gastrointestinal distress, including a soiled anus and tail with loose faeces. Additionally, there was evidence of blood-tinged discharge from the penile region, indicating a possible internal injury or trauma. Despite the prompt administration of supportive care, the mouse was discovered deceased by 4 PM on the same day, having already entered rigor mortis at the time of

discovery. A detailed necropsy was conducted and it revealed the grossly distended bladder approximately the size of a grape, indicating urinary retention and possible obstruction. There were also haemorrhagic spots present on the bladder surface, indicative of trauma and possible cystitis. No significant abnormalities were observed in other organs upon gross examination

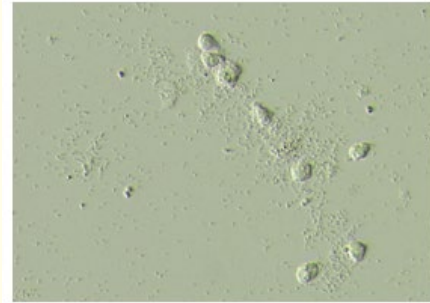


**Figure 1:** Gross pathology of distended bladder with haemorrhagic spots.

Upon histopathological analysis, the urinary bladder showed loss of lining transitional epithelial cells focally (arrows) and in the lamina propria there was infiltration of inflammatory cells (red star) (Figure 2). The analysis of urine sample revealed numerous motile structures resembling spermatozoa, suggesting a possible rupture or trauma to the reproductive or urinary tract (Figure 3)



**Figure 2:** H and E staining of Urinary Bladder.



**Figure 3:** Motile structure in urine sample.

### Discussion

The clinical signs and postmortem findings strongly suggest that the death was due to copulatory breeding trauma. Specific complications include retrograde sperm movement, cystitis and penile injuries. The presence of motile sperm-like structures in the urine suggests retrograde movement, likely caused by physical damage during copulation. Retrograde ejaculation, which can lead to internal injuries and inflammation, is often caused by nerve damage or surgeries affecting the bladder sphincter [5]. This abnormal movement can lead to further internal injuries and inflammation. The distended bladder and haemorrhagic spots indicate inflammation and possible infection of the bladder (cystitis), a common consequence of urinary tract trauma [1]. In immunocompromised mice, such as NOD SCID strains, impaired healing abilities heighten the risk of infection and exacerbate the severity of the trauma [13].

The blood-tinged discharge observed from the penile region is indicative of trauma to the penile tissue, likely caused by aggressive mating behaviour [14]. In NOD SCID mice, delayed healing due to immunocompromise prolongs the recovery process, increasing the risk of secondary infections [6,16]. Our interpretation of these complications in the context of the case is consistent with existing literature on copulatory trauma in rodents. Copulatory trauma in male mice can occur during aggressive mating, where physical injuries to the urinary or reproductive tract may result in severe complications.

NOD SCID mice have a severely compromised immune system, which impairs their ability to fight off infections and recover from injuries. In other strains of mice, copulatory trauma might lead to

temporary distress and healing over time. However, in NOD SCID mice, the lack of functional immune cells means that even minor injuries can lead to severe infections and systemic complications [7,13]. The presence of haemorrhagic spots and inflammatory cells in the bladder further suggests that an infection likely developed quickly and exacerbated the trauma, leading to rapid deterioration and death. The immunocompromised nature of NOD SCID mice means that they are more susceptible to infections that would be easily managed by other strains. The urinary retention and trauma observed in this case created a conducive environment for bacterial proliferation, leading to cystitis and systemic infection. The presence of numerous motile sperm-like structures in the urine indicates potential retrograde infection, where bacteria might have travelled back through the urethra, causing widespread inflammation and infection [8,9]. The healing process in immunocompromised mice is significantly delayed compared to immunocompetent strains. The physical trauma from copulation, combined with the inability to mount an effective immune response, likely led to a cascade of complications. The blood-tinged discharge and inflammatory infiltration observed in the bladder tissue suggest ongoing and unresolved damage that the mouse's body could not repair [2,11].

This case underscores several critical points for managing breeding in NOD SCID mice mainly Monitoring breeding behaviours, Health Status of Breeders, Environmental Enrichment and Preventive Measures. Close observation of mating pairs can help identify aggressive behaviours early, allowing for intervention before severe injuries occur [4]. Detailed logs of breeding behaviour and any noted aggression should be maintained to identify patterns and potential risks. Regular health checks can ensure that breeders are in optimal condition, reducing the risk of injuries during copulation [3]. This includes routine physical examinations and monitoring for signs of stress or illness. Providing a less stressful environment can mitigate aggressive behaviours, promoting safer breeding interactions [15]. This includes proper cage enrichment and ensuring adequate space and hiding places for the animals. Implementing strategies such as pairing compatible mates and providing adequate recovery time between breeding sessions can help prevent similar incidents [10]. Additionally, using less aggressive or younger females for breeding with males that have shown signs of previous trauma might be beneficial.

## Conclusion

This report describes a fatal case of copulatory breeding trauma in a 7-month-old NOD SCID male breeder mouse. The rapid onset of lethargy, gastrointestinal distress, and penile discharge followed by sudden death underscores the need for vigilant breeding management. Postmortem findings of a distended bladder, haemorrhagic spots, and indicators of retrograde sperm movement confirm the diagnosis. While other strains might recover from such injuries, the immunocompromised nature of NOD SCID mice exacerbates the severity, leading to fatal outcomes. Implementing preventive measures and careful monitoring can reduce the risk of such traumatic incidents in breeding colonies, particularly for immunocompromised strains.

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