

## Application and Effect Analysis of IVC Independent Air Supply System in SCID-Beige Mice Breeding

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**Abstract:** To study the application and effect of IVC independent air supply system in the breeding of SCID-Beige mice. Since April 2018, a 15m<sup>2</sup> room was randomly selected from SPF Animal Laboratory of the Laboratory Animal Center, and an IVC independent air supply system was installed on the basis of the barrier system as the experimental group; another room with the same area and only the barrier system was randomly selected as the control group. After the beginning of the experiment, 12 female rats and 12 male rats were placed in the experimental group and the control group respectively, and the ratio of male to female was 1:1. By December 2018, the between births, the average number of litters per fetus and the survival rate of the two groups were counted. There was no significant difference between the two groups in between births and average number of litters per fetus ( $P>0.05$ ); the survival rate of the experimental group was significantly higher than that of the control group ( $P<0.01$ ). The application of IVC independent air supply system in the breeding of SCID-Beige mice can significantly improve the survival rate of SCID-Beige mice, thus providing more high-quality experimental animals for animal experiments.

### 1. Introduction

SCID-Beige mice are mutant mice with NK cell (killer cell) functional deficit. Its immunological characteristics are the loss of endogenous NK cell function, the chemotaxis and killing effect of neutrophils on bacteria were decreased, the anti-killing effect of macrophages appeared late and lacked the bacteriologic function of T cells. The humoral immunologic function to homologous and xenogeneic tumor cell cells were decreased. Because of the deficiency of lysosome function, SCID-Beige mice are sensitive to pyogenic bacterial infection and various pathogens, therefore, it is necessary to survive in SPF environment. In the process of experiment and management, a little carelessness will lead to population pollution and death. Therefore, the breeding and rearing of SCID-Beige mice has become a problem that needs great attention and solution in the experimental process.

To improve the survival rate of SCID-Beige mice, the Laboratory Animal Center assembled an independent ventilated cages (IVC) to explore its application in the breeding of SCID-Beige mice.

### 2. Materials and methods

#### 2.1 Animals

Eight-week-old SCID-Beige mice were 24 females and 24 males, weighing 24±2g. After adaptive feeding, 12 female and 12 male rats were placed in the experimental group and the control group, caged in a ratio of 1:1, that is, one male and one female in each cage.

#### 2.2 Methods

A 15m<sup>2</sup> room was randomly selected from SPF Animal Laboratory of the Laboratory Animal

Center, and an IVC independent air supply system was installed on the basis of the barrier system, which as the experimental group; another room with the same area and only the barrier system was randomly selected as the control group.

### 2.3 Feeding of SCID-Beige Mice

A. Females and males SCID-Beige mice were used. The animals were housed in the animal facility under a reverse 12h light/dark cycle (with darkness starting from 09:00h) with controlled room temperature( $22\pm 2^{\circ}\text{C}$ ) and a relative humidity of 80–90 per cent. Tap water was made available ad libitum and food was restricted to 20 g/day. B. Air purification and filtration devices are set up according to different levels from low to high, and three groups of air conditioners alternately complete the filtering task. 3. The feed used for growth and reproduction contains a variety of essential nutrients. Drinking water is purified water with the PH value is 4.5 and added to a proper amount of concentrated fish liver oil powder. The water and feed were disinfected by  $^{60}\text{Co}$  irradiation. They are free to eat and drink water, supplemented regularly. Appropriate add to the cooked egg yolk and raw melon seeds. 4. Replacement of gaskets twice a week. Researchers should wear aseptic overalls, masks and hats after showers to minimize direct contact with animals.

### 2.4 Feeding records

When the SCID-Beige mice were arrived at the laboratory, researcher should to establish a detailed information Table.

### 2.5 Observation indicators

Breeding of SCID-Beige mice were be observed from 8 to 9 a.m. every day. Start to record information from each female rat gave birth to its first litter of offspring, by the end of december 2018, the between births and average number of litters per fetus and the survival rate of offspring 7 weeks after birth which were be counted in two groups

### 2.6 Statistical analysis

Using SPSS 17.0 software for statistical analysis of the obtained data, the results of the indicators were expressed by  $\bar{x}\pm s$ , significance test using the t test and ANOVA. With  $P<0.05$  was considered statistically significant and  $P<0.01$  as statistically significant difference.

## 3. Results

The between births of the control group was ( $41.76\pm 2.51$ ) d, and that of the experimental group was ( $42.59\pm 2.86$ ) d, there was no significant difference between the two groups ( $P>0.05$ ). The average number of births in the control group was ( $6.22\pm 1.47$ ) and that in the experimental group was ( $7.10\pm 1.09$ ), there was no significant difference between the two groups ( $P>0.05$ ). The survival rate of newborn SCID-Beige mice in the control group was ( $72.45\pm 2.73$ )%, which was significantly lower than that in the experimental group ( $88.26\pm 2.94$ )%. the difference was statistically significant ( $P<0.01$ ). Shown in Table 1.

Table 1 Between births, average litter size per litter and baby survival rate in two group

	control group	experimental group
Between births(d)	$41.76\pm 2.51$	$42.59\pm 2.86$
Average litter size per litter	$6.22\pm 1.47$	$7.10\pm 1.09$
Baby survival rate(%)	$72.45\pm 2.73$	$88.26\pm 2.94$

## 4. Discussion

With focus on the current research and technology development of biomedical technology, people are increasingly demanding high quality experimental animals. Experimental studies of the in vivo behavior of human tumor metastases and immunotherapy have become

possible with the development of germfree Swiss Webster and immunodeficient mice .SCID-Beige mice, which lack natural killer (NK) cells, were used to assess the importance of human immune responses and tumor metastasis.

IVC independent air supply system is a new generation of SPF, purifying ventilation equipment used in little rodent laboratory animal feeding, which can replace the barrier and purifying system of traditional laboratory animal feeding. This kind of air purification equipment installed in barrier environment is different from the complete barrier environment in the past and the IVC installation in open environment. Before entering the IVC system, the air was purified by three-stage air conditioning, then by IVC mainframe and cage boxes. The air breathed with SCID-Beige mice was in a relatively clean state. Because the air has been purified before entering the IVC system, the service life and efficiency of the IVC system are prolonged to a certain extent. In this way, not only can guarantee the growth and reproduction micro environment of SCID-Beige mice in the SPF state, but also can prevent SCID-Beige mice from infecting each other, at the same time, it can protect the health of researchers.

SCID-Beige mice were divided into experimental group and control group according to the presence or absence of IVC. For the between births, there was no significant difference between the control group ( $41.76 \pm 2.51$ ) d and the experimental group ( $42.59 \pm 2.86$ ) d ( $P > 0.05$ ). The average number of births per fetus in the control group ( $6.22 \pm 1.47$ ) and the experimental group ( $7.10 \pm 1.09$ ) had no significant difference between two groups ( $P > 0.05$ ), which indicated that IVC system had no significant effect on the fertility of SCID-Beige mice. Seven weeks after birth, the survival rate of the newborn mice in the control group was ( $72.45 \pm 2.73$ )%, significantly lower than that in the experimental group ( $88.26 \pm 2.94$ )% ( $P < 0.01$ ).

Compared with the barrier system, the air cleanliness, air humidity and ammonia concentration in IVC system are small, but there is no significant difference in the number of colonies between them. On the premise of saving energy and financial resources, IVC system can significantly improve the feeding density and comfort of living environment of experimental animals, and prevent cross infection between cages. It can greatly improve the welfare of experimental animals. Integrating the advantages of IVC, its market development prospects are very broad.

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