

Initial study on the safety test using the planarian regeneration

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Abstract

Freshwater planarians have remarkable regeneration ability. We did the elementary experiment which utilized the regeneration capacity of this planarian for safety evaluation of chemicals. The regeneration level of planarian measured the regeneration rate from the tail side where the reproduction of eyes was able to watch. This time, we examined the regeneration inhibition of the planarian by the ethanol. As the result, the regeneration of planarian was inhibited of the ethanol dose-dependent. In 0.25% concentration, the ethanol slightly inhibited the regeneration of the planarian, and in 0.1%, it was not effective for the regeneration. The dissolution of the planarian body was generated over 0.5% ethanol concentration. Though we were the initial stage, it was considered that there was the possibility of the safety evaluation method using the planarian regeneration.

Keyword: planarian, safety evaluation, *Dugesia japonica*, toxicity, regeneration

Introduction

Planarian (*Dugesia japonica*) except in Hokkaido in northern Japan throughout the relatively good water quality of rivers and water intake to live on. It is used as model organism of the regeneration research, because planarian has the remarkable regeneration capacity. Even a small fragment cut from the body can give rise to an intact original size planarian. The nou-darake gene is identified as a concentration gradient contributor of the internal for carrying out the regeneration in the right order (Cebrià et al, 2002). As an application of the planarian to the safety test, it is reported as a method for observing research model of genetic toxicity test (Prá et al, 2005) and acute toxicity test using enzymatic activity (Li, 2007) of chemical substance. We made present experiment to be the elementary research on the safety test using the planarian regeneration.

Material & methods

Planarians

We collected the planarian for the experiment in near river (Echi River, Shiga, Japan). The worms were maintained asexually in autoclaved tap water at 22-24°C and fed chicken liver twice a week. After starvation for at least two days, worms about 1 cm in length was cut by the cutter knife at the half, and it were used for the regeneration test.

Test samples

The ethanol solution diluted by distilled water at 0.5% and 0.25% and 0.1% was used the test.

Method of safety test

Ethanol solutions and distilled water were placed in test tubes. The planarian cut in the head and tail side was transferred the test tube and it was cultivated at the room temperature for 2 weeks. The observation of regeneration performed 1, 2, 6, 9, 12 and 14 day after test start. The regeneration rate of the planarian tail side expressed original size before the cut as 100%.

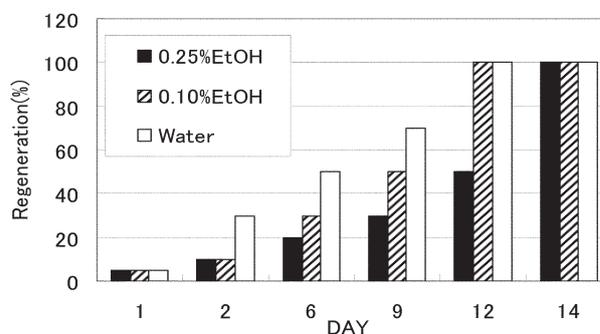


Fig. 1 The regeneration rate of planarian tail side with ethanol. The regeneration rate of the planarian tail side expressed original size before the cut as 100%.

Result

The planarian cut was exposed to 0.5 % ethanol solution, and the body dissolved it immediately. In 0.25% concentration, the ethanol slightly inhibited the regeneration of the planarian, and in 0.1%, it was not effective for the regeneration (Fig. 1). As the result, the regeneration of planarian was inhibited of the ethanol dose-dependent.

Discussion

Planarians are useful organism for evaluating environmental genotoxicity because of their high sensitivity, low cost, high proliferative rate (Prá et al, 2005). In order to accumulate the safety of the sample, it is to observe the effect on the regeneration process of planarian, and it is considered that developmental toxicology and irritation can be evaluated. The material which hastens the speed of the regeneration seems to be the useful material in the organism. Therefore, the application to safety evaluation and usefulness evaluation which do not use the animal is expected the testing method using regeneration capacity of the planarian.

In this study, it was proven that the ethanol inhibited the regeneration of the planarian on us concentration-dependent. In the future, the type of evaluating chemical substance is increased, and the validity of the testing method is examined in comparison with the animal test result.

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