

## The Relationship between Metal Ions in Aqueous Solution and Survival Time of Planaria

Zeze high school, Biology;

### SUMMARY

Planaria

### MOTIVE • HYPOTHESIS

Flatworm, which planaria is included, gains nutrition by diffusion. According to a previous study, when planaria died, they lost sodium ions. If diffusion has an apparent effect, substances of breeding liquid or its molarity influence planaria. And we've researched about the effect of metal ions on planaria.

### PREPARATION

Planaria which we used is Platyhelminthes, Rhabditophora,



Tricladida, Dugesidae, *Girarda tigrina*.

### PRE-EXPERIMENT

#### **Content:**

Irradiating planaria with black light.

#### **Result:**

Planaria have a repellent reaction to black light irradiation. The repellent reaction is defined as changing the direction of travel so that the planaria avoid irradiated light, or when movement is observed in the planaria that did not move before irradiation.

### EXPERIMENT

content :

Breeding planaria in sodium chloride aqueous solution (NaCl aq), potassium chloride aqueous solution (KCl aq), calcium chloride aqueous solution (CaCl<sub>2</sub> aq)

### **Purpose:**

The viable concentrations in each aqueous solution of planaria are explored.

### **Aqueous solution of the target:**

NaCl aq, KCl aq, CaCl<sub>2</sub> aq

0.05,0.1,0.15,0.2 [mol/L]

### **Method:**

- ① Put one planaria in a small petri dish, measure about 6 ml of the aqueous solution to be used with a pipette, and take it in.
- ② Observe the movement of planaria
- ③ When it is determined that is dead, record the time since the planaria put into the aqueous solution.
- ④ Experiment 4 planaria for each aqueous solution.



↑ Scene of the experiment

### **Definitions of "death" and "alive":**

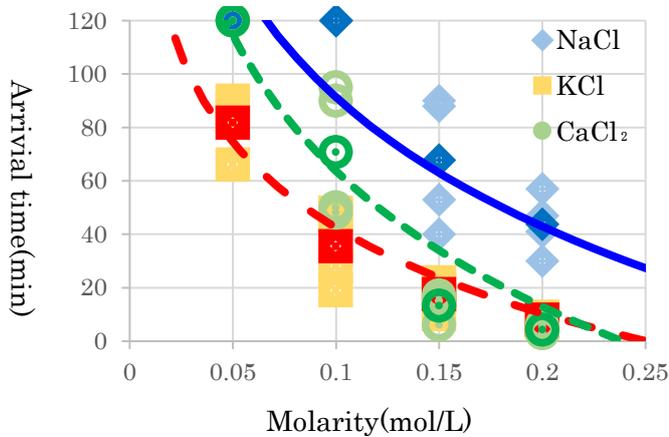
In this research, death means that when the planaria was poked with a glass rod about three times, did not show any movement, and no repellent reaction was observed even when irradiated with a black light.

Regarding alive, it is assumed that death could not be determined even after 2 hours after the injection of the aqueous solution.

**Results** : (These numbers show minutes.)

mol/L	NaCl aq	KCl aq	CaCl <sub>2</sub> aq
0.05	ALL ALIVE	81.75	ALL ALIVE
0.1	ALL ALIVE	35.5	62.7
0.15	67.75	19.8	12.7
0.2	43.75	8.0	4.25

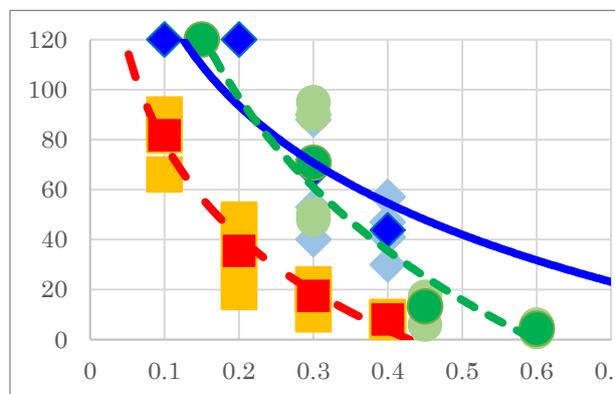
It is as shown in the table above. The average of the same experiment is used for the result.



This is shown in the graph as follows.

There is a negative correlation.

Since  $\text{Ca}^{2+}$  is divalent, the number of ions in the aqueous solution is different, so there is a difference in osmotic pressure. The number of ions in the aqueous solution is shown in a graph on the horizontal axis as follows.



In addition, there were differences in the movement of planaria in aqueous solutions for each type of solution. In particular, NaCl aq and KCl aq at high concentration stretched the pharynx, it works just as same as our mouth, and CaCl<sub>2</sub> aq showed a twisting reaction.



## CONSIDERATIONS

1. Planaria is affected by changes in the growing environment due to the type of metal ions in the aqueous solution and their concentration.
2. Since the expansion and contraction of the pharynx was observed in planaria in aqueous solutions at high concentrations, the normal exchange of solutions inside and outside the body takes place on the surface of the body, and the pharynx is used to regulate the body when faced with excessive environmental changes. Or the elongation of the pharynx can be a sign that you are in a critical situation.
3. The survival time of NaCl and CaCl<sub>2</sub> was almost the same when the amount of substance in the breeding medium was the same. For this reason, Na<sup>+</sup> and Ca<sup>2+</sup> are considered to have no significant effect on growth. On the other hand, KCl had a clearly shorter survival time even if the amount of substance was the same. From this, it is thought that K<sup>+</sup> may have the function of causing the loss of important substances in individual planarians.

## FUTURE TASKS

This experiment suggests that pharynx has a function of controlling ions concentration between the inside of body and the outside. However, It is still unclear why planaria in CaCl<sub>2</sub> aq didn't stretch their throat. Furthermore, we uncover why planaria showed a twisting reaction in CaCl<sub>2</sub>.

## REFERENSES

\*1 プラナリアに対する紫外線の致死効果-2-

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\*2 プラナリアに対する紫外線の致死効 掲載誌 大阪府立公衆衛生研究所研究報告. 環境衛生編/大阪府立公衆衛生研究所 編