

The Lost Recipe

HANO Taiga, KITAZAWA So, KUNICHIKA Gento, NISHIMURA Manaka, TANAKA Seido

Abstraction

We conducted an experiment for extracting adrenaline from adrenal gland with Dr. Takamine's method.

Introduction

Johkichi Takamine is one of the great men of Kanazawa. He invented Takadiastase, medicine for stomachs and bowels. Also, he and his assistant succeeded in extracting crystalized adrenaline from cow adrenal glands. However, J.J. Abel, an American scientist, also succeeded in extracting adrenaline shortly after them, and the academic society determined that Abel was the first person to extract adrenaline. We would like to prove Takamine's achievement.

In general, when a scientist recreates an old experiment, he needs quantitative data. However, Takamine's thesis is too vague to recreate his experiment with the same method. For future study, Takamine's thesis should be easy to recreate.

Hypothesis

If we do the experiment the same way as Takamine's experiment, we should be able to extract crystalized adrenaline.

Experiment1

We did an experiment the same way as Takamine.

First, we got 90g adrenal gland from the cow, crushed it with a mixer, and added 94g of acetic acid. Second, we added 338g water, and heated it for five hours. We squeezed the sample using a suction filter. We applied low pressure steam so the sample reduced from 522g to 193g. We add 400g ethanol to the sample. Next, the sample separated, producing 112g of clear liquid on top and 203g of settlement. We added an ammonia solution to make the sample 10pH, and maintained it for about 12 hours, but we could not get the crystalized adrenaline.

Experiment2

In order to check whether adrenaline exists in the extract, we conducted three controlled experiments. First, color reaction was examined by putting Iron(III) chloride into both the extract and the pure adrenaline solution. The former turned black and the latter turned green. From the result, it turns out that the extract might have contained adrenaline.

Second, chromatography with benzene dichloromethane was examined. We attempted to separate two liquids by using both dichloromethane and benzene as expansion solvents. Separation could not be confirmed, so this experiment failed.

Finally, the biotic reaction of killifish was examined. We used the phenomenon that the velocity of killifish blood flow increases when it takes in adrenaline. Its blood was placed on a microscope slide and each of the two liquids was poured on it. When the extract was administered to it, the blood flow velocity didn't change, although the velocity accelerated when the pure adrenaline solution was given.

Experiment3

In order to prove the result of experiment1 depends on the amount of adrenal gland or not, experiment 3 was done. If adrenaline could be extracted, the cause of the failure would be considered to be the amount. If not, it is considered to be the method. 100mg of adrenaline was dissolved into 150g of water. 0.5 ml of acetic aqueous solution and 2.36g of salad oil were

added to the solution. The solution was heated at 50°C to 80°C for 5 hours, then at 90°C to 95°C for an hour. The solution was concentrated to 30g. Ammonia water was added to the solution in order to set the pH of the solution to 10. The solution was left overnight.

Consideration

In experiment 2, adrenaline was not extracted. The cause is considered to be the loss of adrenaline due to the mixers used and excess ammonia, or insufficient adrenal glands. Also, from experiment 3, it is proved that adrenaline can be recrystallized by the method of Takamine.

Further research

We should shift our method in order to recreate Takamine's experiment with more adrenal glands and no mixer.