

Hong Kong Student Science Project Competition 2022

Team Number: SDBC169

Project Title: The Rebirth of Weeds

Project Type: Investigation Design Proposal

To our best knowledge and after thorough literature research, as at 04/03/2022, there are similar works. If there are, the reference links are as below:

[https://www.researchgate.net/publication/262725209_](https://www.researchgate.net/publication/262725209)

[Assessment_of_nutritional_values_of_three_underutilized_indigenous_leafy_vegetables_of_Ebonyi_State_Nigeria](#)

The enhancement our project has made for the existing related products or research is summarized as below:

The under-utilised plants we are examining for calcium content are weeds that are common in Hong Kong

*Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.

I. Background

Osteoporosis is a common disease characterized by a systemic impairment of bone mass. With an aging population, the medical and socioeconomic effect of osteoporosis will increase further. Therefore, calcium supplements are needed to prevent osteoporosis in elderly. However, not all the aged especially those grassroots may be able to afford the calcium supplements due to the high costs. So that, we would like to investigate an alternative for calcium supplements with lower price and help to reduce the burden of the grassroots.

II. Objective(s)

To investigate the possibility of using the common weeds in Hong Kong to make cheaper and safe calcium supplements.

III. Hypothesis

We can extract and purify the calcium successfully from 2 types of common weeds in Hong Kong (para grass and ryegrass) and can be used to slow down the bone loss and improve bone growth, thus may aid in the prevention of osteoporosis.

IV. Methodology

Extraction and purification

1. Calcium are extracted from paragrass/ryegrass and calcium crystals are obtained.
2. Purified the calcium crystals by using 30% hydrogen peroxide.

To test the effect of calcium extracted from bones by using bone cell culture (in vitro):

1. Human osteoblast cell cultures were established from the iliac crest.
2. MC3T3-E1, an established osteogenic cell line, was employed as a control.
3. Add 2 grams of para grass and ryegrass calcium extract each to the human osteoblast cell culture each day
4. Count the number of bone cells present in each set-up every 3 days

To test the effect of calcium extracted from bones by using mouse models (in vivo):

1. 24 female mice of 24 months old [***Female mice that are 24 months-old are used as mice ranging from 18 - 24 months of age correlate with humans ranging from 56 - 69 years of age**] were randomly assigned to consume a diet either consisting of only rice porridge(control-setup) or consisting of rice porridge with 25 grams of oven-dried, powdered para grass/ryegrass found in Hong Kong for 6 months.
2. At time 3 month and 6 month, the lumbar vertebrae and mandible structure were analysed using micro-computed tomography.
3. By using micro-computer tomography, the change in bone calcium density of the mouse can be measured.
4. The denser the bones of the mouse in the experimental group compared to the control group, the more effect calcium from para grass/ryegrass has on the bones of the mouse.

V. Expected Results and Impact of research

To test the effect of calcium extracted from bones by using bone cell culture (in vitro):

Expected results

The number of bone cells increased which shows that the addition of calcium extract from para grass and ryegrass could induce the growth of bone cells.

To test the effect of calcium extracted from bones by using mouse models (in vivo):

Expected result:

The peak bone mass of mice assigned with diets consisted of rice porridge with 25 grams of oven-dried, powdered para grass/ryegrass after 6 months is higher than the one assigned with diets consisted of only rice porridge.

Impact of research

Calcium extracted from para grass, ryegrass can be used for stimulating bone growth and can be used to make calcium supplement to alleviate osteoporosis. It is hoped that more grassroots elderly people can afford buying calcium supplements so that less elderly people will suffer from osteoporosis.

Limitation:

Rodents, not humans, were the subject of the experiment. As the body structure and mechanisms maybe different in humans and rodents, the bone mass growth in rodents due to the effect of calcium in the common weeds may not be directly apply in human cases. In other words, bone growth in humans cannot be directly demonstrated through the in-vivo study in rodents.

VI. Conclusion

In conclusion, we expect that the calcium from para grass, ryegrass can be used for stimulating bone growth and maybe used to make calcium supplement to alleviate osteoporosis as these weeds contain high amounts of calcium. It is hoped that more grassroots elderly people can afford buying calcium supplements so that less elderly people will suffer from osteoporosis and in turn partially help reducing the burden on the medical system.