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In Vitro Study of Various Extracts and Bioactive Compounds Potential Role in Increasing Radiation Efficacy in Human Cancer Cell Lines

Introduction

Despite technological advances in cancer treatment especially in radiotherapy, cancer cells radioresistance still leave a problem for radiation oncologist. In line with that, many efforts are being made in to increase therapeutic ratio, in order to reduce toxicity to surrounding healthy organ and increasing local/locoregional control in tumor. One among the most popular strategy to boost the radiation efficacy is using combination of chemotherapy and radiotherapy, known as chemoradiation. As a tropical country, Indonesia has a rich biodiversity. Many plants contain a great future potential as therapeutic agents, e.g. soursop (Annona muricata L.) and red algae (Eucheuma cottonii).

Numerous extract from plants component or bioactive compounds (e.g. piperine, and gallic acid) has been studied and found to have an anticancer effect in human cancer cell lines (in vitro) and in animal (in vivo). Unfortunately, there is still a lack of research that study the potential of this extracts/compounds to increase the radiation efficacy.

HCLL is a basic cancer cells model, which allows a research in a limited simplified controlled environment. We are also able to make a genetic engineering in HCLL. In vitro HCLL has several similarities with in vivo cancer cells, i.e. uncontrolled growth (oncogenic), unresponsiveness to anti-growth signal, cell cycle checkpoint avoidance, immortality, loss of negative feedback, and invasive characteristics. After a cell receives ionizing radiation, several changes involving plentiful of pathways and proteins known as cellular response happen. There are various pathways/proteins that could be used to increase the radiation potential.

Objectives

In the present in vitro study, we evaluate the possibility of several extracts and bioactive compounds in increasing radiation efficacy in human cancer cell lines (HCCL). Several extract and bioactive compounds have been collected. They are Annona muricata leaves extract, gallic acid, piperine, and Eucheuma cottonii extract. Many studies have reported their anticancer effect on numerous HCLL. Unfotunately, there is a lack of studies which reported their potential to increaes the radiation efficacy.

Materials and Methods

We will perform a cancer cells clonogenic assay, and give treatment of extracts/bioactive compounds. We will give radiation of several different doses to both groups (0, 2, 4, 6, and 8 Gy), making cell survival curve, and then compare the cell count of the cell line receiving extracts/compounds to the control group.

Expected Results

While all anticancer activity of these extracts/bioactive compounds has been well proven, we expect that there is synergy between radiation and agent administration, meaning that combination of both of them will result in greater cancer cells killing effect than either of them when delivered alone.

Conclusion

Clonogenic cell assays is a valid method of pre-testing any potential treatment before clinical studies. We cannot make a final conclusion regarding the potential of aforementioned extracts/bioactive compounds, as the study is still ongoing, but postponed due to COVID-19 pandemic.

Country or Int. Organization

Indonesia

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