

**THE EFFECTIVENESS OF SEA CUCUMBER IN
INHIBITING CANCER OF THE MOUTH:
*LITERATURE REVIEW***

THESIS

*Submitted to fulfill one of the requirements to achieve the
degree
Bachelor of Dentistry*



ARRANGED BY:

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**DEPARTMENT OF ORAL DISEASES
FACULTY OF DENTISTRY
HASANUDDIN UNIVERSITY
MAKASSAR 2022**

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SKRIPSI

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ABSTRAK

Efektifitas Teripang Dalam Menghambat Kanker Pada Rongga Mulut

Literature Review

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Latar Belakang: Kanker adalah suatu kelainan yang ditandai dengan pertumbuhan cepat, menyerbu ke dalam jaringan yang berada di sekitarnya dan dapat menuju ke daerah organ lain yang lebih jauh atau dengan kata lain metastasis. Kanker di rongga mulut merupakan salah satu dari enam jenis tumor yang paling sering ditemukan di dunia. Di Indonesia berdasarkan sumber Kementerian Kesehatan Republik Indonesia 2018 jumlah kasus penderita kanker bibir, rongga mulut, dan tenggorokan sebesar 4,5%, sedangkan jaringan lunak 11,4%. Faktor penyebab kanker rongga mulut sangat kompleks antara lain bahan karsinogenik, seperti tembakau, sigaret termasuk asap rokok, selain itu virus EBV, HPV, pola makan dan minum serta gaya hidup yang tidak sehat. Banyak penelitian yang sedang mengembangkan obat-obat herbal dengan efektivitas tinggi dan toksisitas rendah juga penelitian yang mendalam terhadap supresor onkogen dan gen resistensi obat. Dalam penulisan ini akan dipaparkan obat alami berbahan teripang sebagai salah satu penanganan dalam kanker. salah satu senyawa yang dimanfaatkan dari teripang adalah *Holothurin A*. Bahan aktif tersebut diketahui memiliki fungsi mencegah metastasis kanker hingga membunuh sel kanker payudara dan kanker ovarium. **Tujuan:** Mengetahui keunggulan dan efektivitas teripang yang mengandung senyawa yang dapat digunakan sebagai penghambat kanker di rongga mulut. **Metode:** Jenis penulisan adalah literature review, yang berasal dari jurnal penelitian online, seperti PubMed, Researchgate, Google Scholar, Science Direct, MedScape, dan sumber relevan lainnya. **Hasil:** Penelitian ini menunjukkan adanya pengaruh percobaan terhadap efektivitas senyawa antikanker atau pada sel kanker dengan menggunakan sampel dari beberapa jenis teripang (*Holothuria*), sehingga menjanjikan sebagai kandidat antikanker. **Kesimpulan:** teripang memiliki komponen bioaktif yang dapat menghambat kanker di rongga mulut MPS, Lectin, Omega-3, triterpenoid, dan saponin yang memiliki penggunaan efektif dalam mengurangi gejala efek samping serta meningkatkan kualitas hidup manusia.

Kata Kunci: Kanker, Teripang

ABSTRACT

The Effectiveness of Sea Cucumbers In Inhibiting Cancer In The Oral Cavity

Literature Review

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Background: Cancer is a disorder characterized by rapid growth, invaded into the surrounding tissue and can go to other organs that are more distant or in other words metastases. Cancer in the oral cavity is one of the six most common types of tumors in the world. In Indonesia, based on sources from the Ministry of Health of the Republic of Indonesia in 2018, the number of cases of cancer of the lips, oral cavity and throat was 4.5%, while soft tissue was 11.4%. The causative factors for oral cancer are very complex, including carcinogenic substances, such as tobacco, cigarettes including cigarette smoke, in addition to the EBV virus, HPV, eating and drinking patterns and an unhealthy lifestyle. Many studies are currently underway to develop herbal medicines with high effectiveness and low toxicity as well as in-depth research on suppressor oncogenes and drug resistance genes. In this paper, a natural remedy made from sea cucumbers will be described as a treatment for cancer. One of the compounds used from sea cucumbers is *Holothuria A*. These active ingredients are known to have the function of preventing cancer metastasis to killing breast cancer cells and ovarian cancer. **Objective:** Knowing the advantages and effectiveness of sea cucumbers containing compounds that can be used as cancer inhibitors in the oral cavity. **Methods:** The type of writing is literature review, which comes from online research journals, such as PubMed, Researchgate, Google Scholar, Science Direct, MedScape, and other relevant sources. **Hasil:** This study shows the effect of experiments on the effectiveness of anticancer compounds or on cancer cells using samples from several types of sea cucumbers (*Holothuria*), so that they are promising as anticancer candidates. **Kesimpulan:** Sea cucumbers have bioactive components that can inhibit cancer in the oral cavity MPS, Lectin, Omega-3, triterpenoids, and saponins which have effective use in reducing symptoms of side effects and improving the quality of human life.

Keyword: Cancer, Sea Cucumber

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CHAPTER 1

INTRODUCTION

1.1 Background

Various cases in the dental and oral field do not only discuss the teeth, but covers cavity mouth consisting of periodontitis and hard tissue mucosal soft. Diseases of the mucous tissue in oral cavity has become a necessary thing attention especially on the increase in the number of deaths caused by malignancy in cavity mouth. One of the malignancies in the oral cavity, namely cancer. Cancer is a disorder characterized by rapid growth, invade into the surrounding tissue and can go to the area of other organs Which more distant or in other words metastases. Metastases disease malignant the going to to organs other Can through various method, that is *hematogenous* and *lymphogen* . Cancer Biologically it can be caused by a failure in the process of apoptosis so that it can cause the cancer cells to survive autonomously in body. ¹

Cancer in cavity mouth is Wrong One from six type that tumor most often found in the world. In Indonesia based on Ministry sourcesHealth of the Republic of Indonesia 2018 the number of cases of cancer of the lips, oral cavity and throat by 4.5%, while soft tissue 11.4%. Causes of cavity cancer mouth very complex, including carcinogenic substances, such as tobacco, cigarettes, including smoke smoking, in addition to the EBV virus, HPV, eating and drinking patterns and unhealthy lifestyles. Given the increasing number of oral cancers, it is estimated that the number of cases in Indonesia on which year will come increased. Even so, there have been many studies that are developing herbal medicines with high effectiveness and low toxicity as well as in-depth research on suppressors oncogene And gene resistance medicine . With Keep going emergence drug anti cancer new Also discovery of herbal medicines, such as ingredients sea cucumbers then this can make medicines herbs increasingly involved big. ¹ In this paper, a natural remedy made from sea cucumbers will be described as Wrong One handling in cancer. As for definition from Sea cucumber is the name

given to the *Holothuroidea invertebrate* . There are about 1,400 species of sea cucumbers worldwide. Apart from being used as food, people in the country also have it use sea cucumbers as medicine because they are believed to have health benefits. Masteria said, one of the compounds utilized from sea cucumbers is *Holothurin A*. Active ingredients It is known to have the function of preventing cancer metastasis to killing cancer cells breast And cancer ovary. Head Hall Bio Industry Sea LIPI Ratih Pangestuti disclose active ingredients for cancer prevention by utilizing marine organisms intended to kill free radicals in the body. Thus, it can improve resilience body. ²

So, it is known that sea cucumbers can be used as a drug in inhibiting cancer so that in this writing it refers to several references to research results regarding the superiority of sea cucumbers in inhibit cancer in cavity mouth.

1.2 Problem statement

Based on this background, it appears that there is an alternative in treating cancer by utilizing marine life in this case, namely sea cucumbers. In its effectiveness in inhibiting cancer has been referred to several references, so the formulation of the problem from this *literature review* , namely the effectiveness sea cucumbers in inhibiting cancer in the oral cavity and how is the effectiveness of sea cucumbers in inhibiting cancer in the oral cavity ?

1.3 Objective

Based on the formulation of the problem, the purpose of writing this *literature review* is:

1. Know effectiveness sea cucumbers Which contain compound Which can used inhinder cancer in the oral cavity.
2. Knowing the effectiveness of deep sea cucumbers inhibit cancer in the oral cavity .

1.4 Benefit

Based on the background of the problem, the benefits are:
expected from this *literature review* , among others:

1. Add And expand study scientific results studies *literature reviews* about superiority sea cucumbers in inhibiting cancer in cavity mouth.
2. Give information to public about effectiveness sea cucumbers in inhibiting cancer in the cavity mouth .
3. Become a reference material for the development of knowledge on topics and problems related to the effectiveness of sea cucumbers in inhibiting cancer in cavity mouth .

CHAPTER II

LITERATURE REVIEW

2.1 Sea cucumbers

2.1.1 Morphology

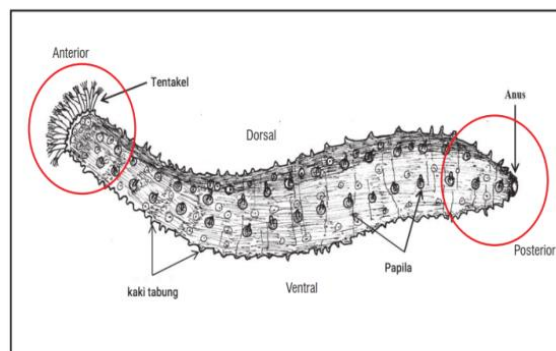
Indonesia is an archipelagic country the world's largest with 17,504 islands with coastline length of 81,000 km with wide waters sea around 5.8 million km² (75% of the total area of Indonesia), stretching on the equator , causing Indonesia to have source Power very rich and varied Good for land area nor sea , so known as a mega biodiversity country. Riches biological the need utilized the best For welfare of the Indonesian people.

one _ results sea that has mark economical important is sea cucumbers or also called _ *sea cucumber* , *teat fish* and sea ginseng . A number of factor important cause _ in a manner economy sea cucumbers own mark important that is as source biopharmaceuticals potential from results sea and as food health that is material raw various industry in various countries. Sea cucumbers is one _ commodity sub-sector exports enough fishing _ potential . Utilization sea cucumbers in Indonesia as material food compared product fishery other belong low and less popular , caused sea cucumbers own mark low aesthetics _ seen from form physique impressed sea cucumbers disgusting , however thereby sea cucumbers indeed contains sufficient protein high .

Sea cucumbers is animal No boned behind with body shaped cylinder elongated with oral and aboral lines as connecting axis _ anterior and posterior parts . Form the resemble cucumber so that sea cucumbers known with Name cucumber sea (*sea cucumber*).

The mouth and anus are located at the ends axis opposite , ie mouth anteriorly and anus posteriorly, at around mouth sea cucumbers there is tentacles that can

extended and pulled with fast . Tentacle is leg modification working tube _ For catch food .^{3,4}



Morfologi teripang secara umum

Figure 2.1 Sea cucumbers

Surface body sea cucumbers No ciliated and enveloped layer thick chalk _ influenced age . Condition elongated mouth _ to the anus there are five rows of tube feet (*ambulaceral*), three tube feet _ suckers (*trivium*) are in the stomach role in movement and attachment . Two rows of tube feet found on the back (*bivium*) as tool respiration . Layer lower skin own one layer of muscle circular and five layers of muscle . on layers lower muscle there is cavity body that contains organs _ such as gonads and intestines.^{5,6}

2.1.2 Type sea cucumbers

Amount species Sea cucumbers in the world about 2000 species with area deployment very broad sea cucumbers . Color sea cucumbers different , ie white , black , brown greenish , yellow , gray , orange , purple even some are striped . From several type sea cucumbers the only three genera of sea cucumbers found in Indonesia , namely the genera *Holothuria* , *Muelleria* and *Sticopus* . Species found _ are 23 species and only five species (from the genus *Holothuria*) have been exploited and exploited as well as have mark economical important . Fifth type sea cucumbers the is sea cucumbers black (*Holoturia edulis*), sea cucumber sap or rivet (*Holothuria vacabunda*), sea cucumbers red (*Holoturia vatiensis*), sea cucumbers brown (*Holoturia marmorata*), and sea cucumbers sand (*Holothuria scabra*) which is most species _ cultivated and traded in Indonesia. ⁷

2.1.3 Components of Bioactive Substances

Sea cucumbers are a bioactive source which has antibacterial, antifungal, anticancer, antihypertensive, antithrombotic, antinociceptive and anti-inflammatory properties. Sea cucumbers are detritus-eating animals, that is, they eat by sweeping sand into their mouths. The slow movement of sea cucumbers causes these animals to have an efficient body defense mechanism, namely by releasing *holothurin* which is toxic and can paralyze small animals. *Holothurin* is secreted by special glands known as *cuviers* . Research on *holothurin* began in the early 1920s and began intensively in the 1950s. One of the main types of *holothurin* from sea cucumbers which is efficacious in wound healing, postpartum care and as an antifungal are saponins.

Sea cucumber bioactive ingredients are also known as antioxidants which help reduce damage to cells and body tissues. The antibacterial and antifungal properties of sea cucumbers can enhance their ability for treatment purposes skin. Sea cucumbers are also known to have antinociceptive (painkilling) and anti-inflammatory (against inflammation and reduce swelling) effects. Research

that has been conducted in several areas, especially in Malaysia on residents in Kudat, Semporna, Setiu, Kuantan, Pekan , and Pangkor Island proves the efficacy of sea cucumbers as an antihypertensive agent. Kaswandi and Lian reported the active ingredients produced by *Holothuria* sp. As antibacterial and antifungal. ⁸,
⁹Based on the results of this study it was concluded that the active ingredient from the sea cucumber *Holothuriatubolosa* can inhibit the growth of *Saccharomyces cerevisiae* .

Kustiariyah reported that the bioactive of sea cucumber (*Holoturia scabra*) can inhibit the growth of *Candida maltosa*. ⁹ Besides containing antibacterial and antifungal properties, sea cucumbers are also reported to contain various unsaturated fatty acids such as linoleic, oleic, eicose pentaenoic (EPA), and docosahexaenoic (DHA). Several studies also show the potential of sea cucumbers as anti- cancer . Sea cucumbers also contain antioxidants in the form of saponin glycosides. This component has a structure similar to the active compounds of ginseng and ganoderma. Anticancer compounds in the form of terperoids, proteins, saponins, and polysaccharides are also found in sea cucumbers. The results showed that sea cucumbers contain the active compound triterpene glycosides which can inhibit cancer growth in lymphoid cells, human lung cancer cells, cervical cancer cells , and mouse melanoma at a concentration range of 0.38–0.46 mg/ml. ¹⁰

Sea cucumbers are also reported to contain lectins, which are non-immunogenic proteins or glycoproteins Which can inhibit cancer growth. The compound at a concentration of 50 µg can agglomerate and kill cancer cells . Research results medical lately this is on sea cucumbers *Stichopus japonicus* show that almost in all part her body contain a number of type of " *mucopolysaccharida* " acid that has effect special to growth , recovery (*recovery*) of sick , anti-inflammation , formation bones , and prevention / delay to aging tissue , as well as " *arteriosclerosis* ". *Mucopolysaccharide* is also powerless anticancer drug . ¹

2.1.1.1 Mucopolysaccharides (MPS)

Body and skin sea cucumbers *stichopus japonicus* a lot contain sour mucopolysaccharide one _ useful content _ For healing disease kidney , anemia, diabetes, lung wet , anticancer , anti- inflammatory , prevention aging network body as well as prevent arteriosclerosis. ^{1 2}

2.1.1.2 Lectins

Lectin is a sugar with activity normal anticancer _ We find inside _ plant . In chemical assays , *the lectins* are isolated from wall body sea cucumbers is a Type *Non - Blood - specific Lectin* that agglutinates blood type A, B, AB, and O. besides that , *No – Blood – Lectin* classified as a complete *lectin* , no need more testing formerly with *trypsin* for know activity *lectins* . *Lectins* are also found effective oppose cancer muscle mice and cancer lungs humans at levels of 5 and 50 micrograms, respectively. ^{1 2}

2.1.1.3 Omega-3

Sea cucumbers as one _ product *seafood* has content Omega-3 fatty acids are needed by the body . Deep omega-3 fatty acids matter This These are EPA (*eicosapentanoic acid*) and DHA (*docosahexaenoic acid*). Relative content of EPA and DHA high , respectively 25.69% and 3.69%. EPA value high _ shows speed _ _ sea cucumbers in repair network damaged and obstructed causative prostaglandin formation inflammation high . While DHA, fatty acids in sperm and brain , and the retina of the eye . When DHA intake is high can lower triglycerides blood reason disease heart . However , can cause

decreased brain serotonin trigger disease Alzheimer's and depression. ^{1 2}

2.1.1.4 Triterpenoids/ steroids

Triterpenoids and terpenoids were also detected in the extracts rough *H. atra* . Triterpenoid positive test results are marked with exists formation color red until orange . Triterpenoids and terpenoids in sea cucumbers own benefit as anti- inflammatory , anticancer , sedative , and insecticide. ²⁰ Compound active sea cucumbers triterpenoid / steroid group can hinder growth cancer in cells cancer lungs humans and cells cancer cervix with IC50 2.38 and 2.46 µg/ mL. ¹³

2.1.1.5 Saponins

Saponins (triterpenes glycosides) is glycosides complex triterpenes with molecule lots of carbohydrates Found in plants , bacteria nor organism lots of sea own activity biologics , like antifungal , antibacterial and anticancer . Saponin content in sea cucumbers *H. atra* Lots found in the wall body with a number of saponins (triterpenes glycosides) that have identified , including : (1) holothurin B1 (2) holothurin B2 (3) holothurin B3 and (4) holothurin B/B4 which have activity as anticancer . ^{14 , 15}

2.1.3 Benefits

Since ancient times sea cucumbers has known nutritious as medicine . this _ No not only trust a number of public such as Korean and Chinese , but also various nation in the world. One of them is public Malaysian fishermen who are common drink essence sea cucumbers before go to sea this _ done Because essence sea cucumbers the effect the tonic can strengthen the body. Beside In addition , sea cucumbers are also used as drug wound light , sick joints , inflammation , asthma , lungs , pressure blood height , and pee sweet . As source of protein, sea cucumbers speed up healing wound in after surgery , normal delivery , and caesarean section. Sea cucumbers can too function For strengthen bones and joints . Content chondroitin sulfate prevent thinning joints maker inflammation . Compound That fix and build return bone prone , forming eroded joints _ consequence accidents , collisions , and excesses body weight without effect side .

Besides being able to cure various diseases, sea cucumbers also have the ability to regenerate cells and this is the main reason sea cucumbers are used to cure various diseases. Besides capable regenerate sel , sea cucumbers are also rich in content nutrition . Compound active the most form excellent antioxidant _ For repair cell body human . efficacy sea cucumbers chase away cancer has proved Tong Y, et al , from the Pharmacology Division Anticancer , State Key Laboratory of Drug Research, Shanghai Institute of Materia Medica, Chinese Academy of Sciences, Shanghai, China . Tong isolate sulfated saponins from sea cucumbers *Pentacta* the so -called *quadrangulari philinopside A*. With inject 2-10 microliters *philinopside A* in rat aorta , able prevent formation

vessels blood micro new cells (angiogenesis). cancer . As a result , cell cancer No get supply nutrition so that cell fail growing and finally die . That result prove that phalinopside A on sea cucumbers potentially as anticancer . ^{12,15,16}

2.2 Cancer

2.2.1 Definition

Cancer or carcinoma (Greek *karsinomos*) is any formation of new tissue that is abnormal and malignant (*malignant*). The cancer cells will infiltrate into the surrounding tissues and destroy them. ¹⁷ Cancer is a disease caused by the growth of body tissue cells that are not normal, develop quickly, are uncontrollable and continue to divide. Cancer is also disease No marked infectious _ with growth cell in a manner constantly and no under control so that can damage network surrounding as well as can metastasize . Cell cancer characteristic fierce and can grow from every type cells in the body human . ¹⁸ Cancer or malignant tumors happen consequence exists growth cells network abnormal body , caused by neoplasia , dysplasia , and hyperplasia . Neoplasia is condition cells present in the tissue proliferate in a manner abnormal and invasive , dysplasia that is condition cells that don't develop normally with indication exists changes in the nucleus (cell nucleus), and hyperplasia is condition normal cells in the tissue experience growth excessive . ¹⁹

2.2.2 Cancer in the Oral Cavity

The oral cavity is a cavity in the mouth that is bounded by the red border of the lips, tongue, lining of the inner cheek called the cheek

mucosa, palate, and gums. Cancer that occurs in the oral cavity is a growth of cancer cells in the oral cavity including the lips, tongue, salivary glands, and other parts of the mouth. Oral cavity cancer is also a serious problem and when combined with throat cancer, it is the sixth most reported case in the world.³ Oral cavity cancer is a chronic multifactorial disease caused by interactions between internal factors, namely nutrition and genetics, and external factors, including chronic exposure to sunlight and *human papilloma virus* and factors such as smoking, excessive alcohol consumption, chewing betel nut, and delays in diagnosis. dentist. Cases of oral cancer in Indonesia are still high followed by increasing mortality from cancer.

There are also cancers of the oral cavity that start from untreated teeth or chronic wounds due to improperly positioned dentures. So that constant irritation due to the sharp edges of the teeth that will break can cause an additional risk of developing malignant tumors in the oral cavity.^{20,21,22,23}

2.2.2.1 Classification and Staging of Oral Cavity Cancer

Based on abnormal cell growth, oral cancer is divided into;²⁴

a) Benign Tumors of the Oral Cavity

Benign tumors of the oral cavity can originate from various cells, namely;

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|----------------------------------|---------------------------------|
| 1. <i>Eosinophilic granuloma</i> | 9. <i>Neurofibromas</i> |
| 2. <i>Fibromas</i> | 10. <i>Papillomas</i> |
| 3. <i>Granular cell tumors</i> | 11. <i>Condyloma acuminatum</i> |
| 4. <i>Keratoacanthoma</i> | 12. <i>Verruciform xanthoma</i> |

- | | |
|--------------------------|-------------------------------|
| 5. <i>Leiomyomas</i> | 13. <i>Pyogenic granuloma</i> |
| 6. <i>Osteochondroma</i> | 14. <i>Rhabdomyoma</i> |
| 7. <i>Lipomas</i> | 15. <i>Odontogenic tumors</i> |
| 8. <i>Schwannomas</i> | |

b) Pre-cancerous Lesion of the Oral Cavity

1) Leukoplakia

Leukoplakia is a lesion in the form of white plaque attached to the oral mucosa. These lesions are difficult to distinguish from other white plaque lesions caused by other factors, such as infection, inflammation, or other causes. This lesion can develop into oral cancer depending on the causative factors, such as the degree of dysplasia, the size of the leukoplakia, and the progression of the lesion.²⁵

Dysplasia in the basal third of the epithelium is mild dysplasia, more than half of the epithelium is moderate dysplasia, and severe dysplasia covers the entire depth of the epithelium. Severe dysplasia with carcinoma *in situ* has a 43% ratio to squamous cell carcinoma.²⁶

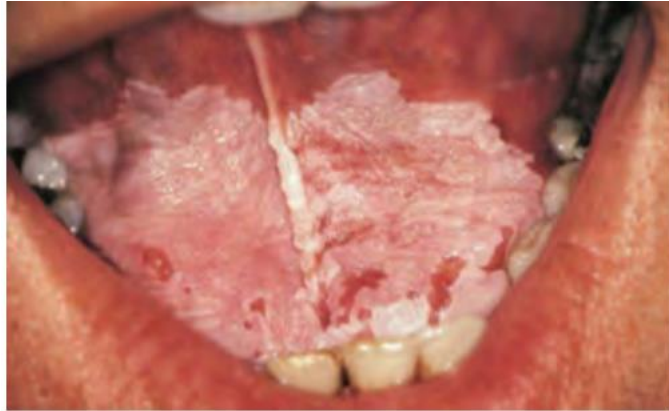


Figure 2.2 Mouth Floor Leukoplakia

2) Erythroplakia

Erythroplakia are bright red plaques on the oral mucosa, which may or may not be raised. These lesions may not appear in all parts of the oral cavity, often on the floor of the mouth, soft palate, ventral tongue, and *tonsillar fauces*. Erythroplakia has an atrophic epithelium and a less keratinized layer, which can lead to hyperplasia. The reddish color in erythroplakia is caused by the thin layer of the epithelium so that *microvasculature structures appear*. Erythroplakia needs to be treated immediately because of the risk of malignancy.²⁴

3) Erythroleukoplakia

Erythroleukoplakia is a combination of oral mucosal plaques marked with red and white areas. Erythroleukoplakia is rare, but has the potential to become malignant.²⁴

c) Oral Cavity Cancer

a) Squamous Cell Carcinoma of the Oral Cavity (SCCRM)

As much as 90% of oral cancers are KSSRM which develop from squamous cells with characteristic flat, scaly appearance that lines the oral cavity and pharynx. The development of squamous cells can go through several stages, from metaplastic, displaced, to *carcinoma in situ*. Named *carcinoma in situ*, which means cancer cells are only present in the outer layer of the epithelium. Position lesion carcinoma cell squamous get on the lips bottom (30%-40%), tongue (25%), and base mouth (20%). Carcinoma on the tongue, 75% in section frequent tongue _ move especially on the edges tongue and 25% occurs at the base tongue. Expansion KSSRM invasion can contralateral and bilateral. carcinoma cell squamous on the lips bottom and bottom mouth will invade the submental nodes, whereas carcinoma in the posterior region of the mouth will invade the superior jugular node. ^{24,26}

b) Minor Salivary Glandular Carcinoma

This cancer develops from the glands that line the skin of the mouth and pharynx. The types of cancer are adenoid cystic carcinoma, mucoepidermoid carcinoma, and *polymorphous low-grade adenocarcinoma*. ²⁴

2.2.2.2 Oral Cavity Cancer Etiology

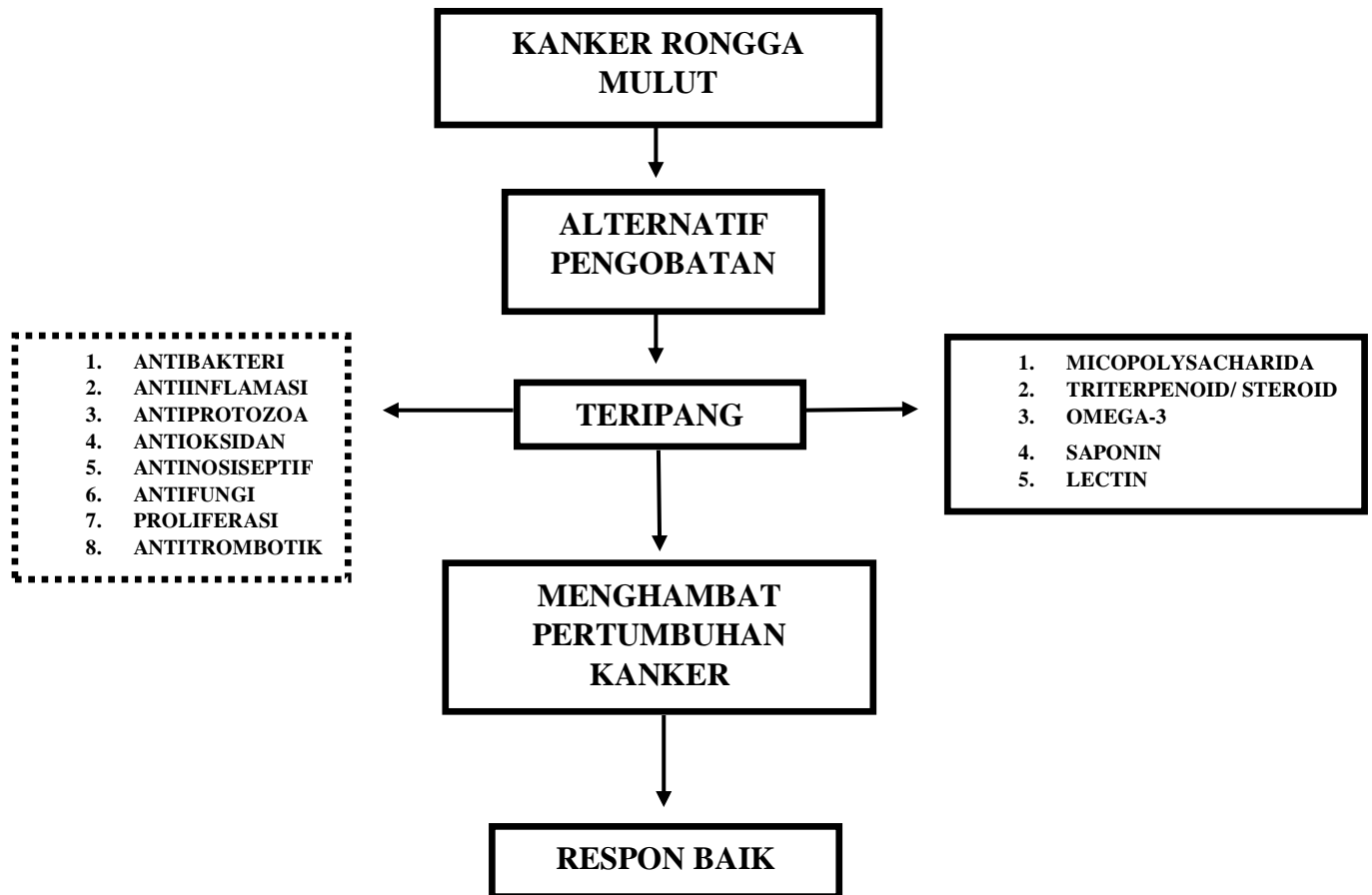
The causes that can trigger oral cancer, namely tobacco, alcohol, iron deficiency Plummer-Vinson syndrome, UV light, AIDS, radiation, chemotherapy, and chronic irritation. Of these various causes, tobacco causes a significant risk of developing oral cancer. Intensity

Tobacco use due to smoking affects the palatal and lingual parts of the oral cavity. In cigarettes there are doses of carcinogens that greatly affect the cause of oral cancer. Tobacco use, whether it produces smoke or not, still poses a risk of developing oral cancer. Another cause of oral cancer that has been tested by research, namely alcohol, although it does not contain carcinogens, can increase the risk of developing oral cancer. Research showing the existence of Human Papilloma Virus (HPV) subtypes 16 and 16 in squamous cells of oral cancer indicates a potential role for viruses in oral cancer.²⁷

2.2.2.3 Pathomechanism of Oral Cavity Cancer

Cancer grows and develops gradually. The growth of cancer begins when one cell out of many normal cells suddenly develops a genetic mutation. Then the cell will undergo another mutation to cause the cell size to become abnormal, this condition is called the *dysplasia phase*. Dysplasia will continue to develop from mild, moderate, severe dysplasia, and eventually become cancer *in situ*, namely cancer that has not penetrated the boundaries of the tissue where the cancer grows. Several years later, cancer cells will penetrate the basal tissue and infiltrate the surrounding tissue, this condition is known as *invasive cancer*. Cancer cells can also penetrate blood vessels or lymph vessels, then along with the bloodstream the cancer is carried to other parts of the body. Cancer cells that spread to new places have the same characteristics as their parent cancer cells. The cause of cancer to other tissues is called spread or metastases. It is usually difficult to avoid the risk of death when metastases have occurred.²⁸

Theoretical framework



Note:

: ~~reviewed~~

: not reviewed