

CHAPTER I

INTRODUCTION

1.1. Background

1.1.1. The Human Skin

The skin is considered to be the largest organ in the body, covers its external surface, and is made up of three layers, called the epidermis, dermis, and hypodermis. It is responsible for the homeostasis of the body by regulating the body's temperature and also the amount of water the body releases. It is an ecosystem of diverse habitats, with a primary function of being a physical barrier, which protects our bodies from potential assault, such as UV light, harmful chemicals, and mechanical injury, and by foreign organisms, and even water. The skin's endocrine function includes the production of vitamin D with the help of the sun, while its exocrine function includes sweating by the sebaceous gland. The skin is also responsible for pigment production and the sensation of touch, heat, cold, pain, and so on. Finally, the skin is responsible for the general appearance, which can give an insight into the general body health (Yousef, 2020; Rodan et al., 2016).

Humans are known to have a primordial need to advertise health, and because of this, Desmond Morris, a zoologist, once said that "Flawless skin is the most universally desired human feature." Perfect skin is considered to be radiant, firm, smooth, evenly toned, and unblemished. To achieve perfect skin, people partake in an endless search for the best skin products by shopping at department stores, online, and so on. They tend to ask for recommendations from friends, family, and so on, as expensive products do not always live up to their reputed benefits (Rodan et al., 2016).

1.1.2. Acne

Unfortunately, acne affects 10% of the world's population and is considered to be the eight most prevalent disease in the world. In the year 2001, 2.1 billion euros were spent worldwide on acne medications alone, and it increased up to over 2.2 billion US dollars in the year 2004. Acne is a chronic inflammatory disease of the pilosebaceous unit that has the potential to leave a scar. People with a darker skin type even have a larger chance of experiencing post inflammatory hyperpigmentation that can last for months, or even years. Acne can either be mild or severe, and it has multiple etiologies. Although acne is mostly known to appear during adrenarche, it can also appear for the first time in adults. Luckily this disease is not known to be life-threatening, however, it is considered to have a huge impact on social and psychological aspects, especially when scarring occurs, as people with acne are often considered as unhealthy, unattractive, unclean, and even unlovable because skin health and beauty is considered to represent overall well-being and health in humans (McLaughlin et al., 2019; Rodan et al., 2016; Gollnick & Zouboulis, 2014; Ganceviciene et al., 2012).

The scars that acne is able to leave behind forms when the wounds heal. Those wounds, found in the skin's deeper layers, heals in different ways. Some of the scars are small, flat, and are barely noticeable, others are very visible indented scars, also known as pockmarks. Acne scars can be divided into three different groups: atrophic, hypertrophic, and keloid scars. Atrophic scars happen when there are not enough connective tissues made, causing the wound to not properly heal, forming a scar beneath the surrounding tissue, which then creates a skin dent. Hypertrophic scars are raised scars that form when there is too much connective tissue that is developed. Although less common, these types of scars typically appear in people with severe acne and can appear in different parts of the body. Finally, keloid scars are caused similarly to hypertrophic scars, however, in this type, the scars end up bigger than the original area that was inflamed. This type is considered to be the rarest type (IQWiG, 2019).

As previously mentioned, the severity of acne can range from mild to severe. Mild acne is typically non-inflammatory, which includes blackheads and whiteheads, also known as comedones.

1.1.3. Current Treatments Available

There are currently a big number of over-the-counter products sold for acne. However, some acne treatments can instead cause severe irritations and allergic reactions that have the potential to be life-threatening. Irritations include burning, itching, dryness, peeling, swelling, and so on. Severe allergy symptoms include throat tightness, wheezing, shortness of breath, fainting, and so on (FDA, 2014).

Research has also shown that resistance of *P. acnes* to commonly used drugs have been increasing over the years. Oral erythromycin and topical clindamycin have been used as a treatment, however, studies suggest that they encourage *P.acnes* to be resistant. Drugs like isotretinoin are used when avoiding antibiotics and are considered to be the most effective drug. However, it does have strict precautions, especially among girls of childbearing age. Due to these reasons, herbal medicines are being used. Known for its advantages, herbal medicine has been used to treat multiple diseases, especially ones that are difficult to treat, and is considered to be less expensive and have fewer side effects than over the counter drugs (Nasri et al., 2015; Eady et al., 1989).

Currently, many different nonscientific articles are claiming certain natural products work for acne, which may not have significant scientific proof. Out of the different products mentioned, lemon, garlic, and especially tea, stood out. These articles claim that if applied topically, these products would be able to get rid of acne, some even claim that it would get rid of it overnight. In this review, we conducted it in lemon, garlic and tea. This paper aims to summarize and review the antimicrobial properties of natural antibiotics against *P.acnes* from current existing scientific literature, and to indicate which products would be a promising candidate for the treatment against *P.acnes*.

1.2. Research Questions

The research has four research questions that will be answered:

1. Is there a possibility that these products could be a good replacement for over the counter antibiotics against acne?
2. Are there enough studies done regarding these products when it comes to acne?
3. Could these products have the potential to aid in the treatment of acne in a way that is less harmful?
4. Are the claims of non-scientific articles based on proper research?

1.3. Objectives

The objectives of this research are:

1. To summarize and review the antimicrobial properties of natural antibiotics against *P.acnes* from current existing scientific literature
2. To compare which products would be a promising candidate for the treatment against *P.acnes*.
3. To prove whether the claims of non-scientific articles are true.