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Does One Punch Man Have Alopecia?

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Abstract
One Punch Man the superhero claims he worked out so hard that he lost all his hair. In this paper we explore if this claim is really true by evaluating his workout routine and the physiological effects this has had on him. Alopecia is how most hair loss is referred to so we look at types of Alopecia and discern whether they could have been a reason for One Punch Mans hair loss.

Keywords: *Anime; Biology; Alopecia; Hair loss; One Punch Man; Saitama;*

Introduction
Saitama is the human protagonist of the manga series called One Punch Man, that was developed into an anime in 2015. He describes himself as a superhero for fun and in the series, Saitama claims to have followed such a rigorous workout routine that he lost all his hair. Saitama is introduced in the series as an unemployed businessman looking for a job. After encountering a certain villain, he decides to save a child and recalls that being a hero was what he always dreamed of doing as a child [1].

Saitama follows the rigorous workout routine of 100 push-ups, 100 sit-ups, 100 air squats, and a 10-km run everyday, he also ensures he eats 3 meals a day and does not use heating or air conditioning during winter and summer respectively to garner mental endurance [2]. After a year and a half of doing this routine Saitama realises he's bald. The series does not share information on his family so considering the information we have available this paper will explore if One Punch Man has alopecia to gauge if his hair loss was a result of his rigorous workout routine.

Alopecia
Alopecia is the medical term given for conditions characterised by hair loss. It is not contagious, and the incidence of this condition is due to a range of lifestyle or genetic factors [3]. There are several types of Alopecia and in this paper, we will consider the most likely types by considering Saitama's physical appearance and his lifestyle. Due to the various types of Alopecia, there are plenty of tests that can be done for a doctor to deliver a diagnosis, but initial diagnosis requires discussion with a dermatologist [4]. In this paper we will look at types of alopecia that may be linked to Saitama's workout routine as he attributes his hair loss to it.

Figure 1 – A collage of images of Saitama. (Top) After the 3 year rigorous training routine: his head is completely bald all the way round. (Bottom) Before the workout routine; he has a full head of hair as well as thicker eyebrows [1].

Frontal Fibrosing Alopecia
Frontal fibrosing alopecia (FFA) is a type of alopecia characterised by hair loss beginning towards the front of the scalp and this type of alopecia is linked to increased scalp sweating. As Saitama would be engaging in an intensive routine everyday even in summer it is likely that he would sweat more than he would at his previous job so this is a type of alopecia he may have.

The human body has millions of eccrine sweat glands. One of the body parts with the highest density of these glands is the scalp. These glands release sweat,

so when a person engages in an activity that raises their body temperature sweat is likely to be released from their scalp, for thermoregulatory purposes [5]. The excessive sweating characterised by FFA is proposed to be due to neurogenic skin inflammation leading to destruction of epithelial hair follicle stem cells [5] however Saitama's sweat is a physiological response. Studies have shown stressed mice to have increased neuropeptide expression and loss of hair follicle immune privilege [5] and Saitama's workout regime, new lifestyle or uncertainty in unemployment may have led to increased stress and therefore FFA. Many patients with FFA have referred to stress being a potential trigger [5]. FFA may also be characterised by eyebrow loss. Figure 1 shows that Saitama's eyebrows before and after his transformation are somewhat thinner. To detect and confirm this diagnosis Saitama would need to get a skin biopsy done. With FFA the slightly unnoticeable receding hairline that develops can lead to complete baldness, or hair is lost in patches [6].

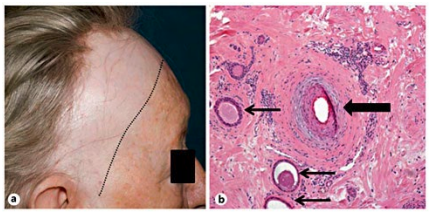

Figure 2 – (Left) A patient's scalp with FFA symptoms. (Right) Histopathology shows peri-follicular fibrosis and inflammation shown at the thick arrow and dilated eccrine glands near to the hair follicle shown by the smaller thin arrows.

Androgenic Alopecia

Androgenic Alopecia (AA) is one of the most common types of Alopecia that occurs in men; it is also referred to as male pattern baldness. It begins with bitemporal hair loss and with vertex balding and this can lead to the eventual loss of all of the hair on the head [3]. This type of alopecia is detected via physical examination and blood test or biopsy may be done to rule out other causes for the hair loss [7]. For scalp biopsies horizontal ones have greater diagnostic information [8]. This type of alopecia may be treated using topical minoxidil or oral Finasteride.

A study has shown the link between AA and hormones, and measured increased levels of androstenedione and cortisol [8]. When eunuchoidal patients with androgen-insensitivity syndrome and 5 alpha-reductase deficiency were observed to not go bald this heavily suggested that Male Androgenic Alopecia (MAA) is induced by activation of follicular androgen receptors by dihydrotestosterone (DHT). Greater levels of DHT have been found in balding scalp compared to non-balding scalp [8].

The article '*Does Exercise Increase Testosterone Levels?*' [9] mentions workouts to increase testosterone levels. Workouts such as squats, push-ups and sit-ups are mentioned in their list [9]. This list refers to workouts that are also featured in Saitama's routine. The article also refers to high intensity interval training and refers to sprints and it is possible that Saitama does his daily 10 km run not as a continuous run for endurance (which has been linked to low testosterone [9]) but in short sprinting bursts. This regime may have led to increased testosterone levels, which would have led to more DHT as about 10% of testosterone is converted to DHT in the body [10]. Most testosterone is bound to sex hormone-binding globulin whereas it is free testosterone that can be converted to DHT [11]. DHT binds to the scalp hair follicle androgen receptors and this in turn causes MAA [8].

Recommended treatment for Saitama's case would be Finasteride. This synthetic azo-steroid is potent. It works by binding irreversibly to the enzyme type II 5 alpha reductase and inhibits the conversion of testosterone to DHT [8]. A single daily dose 1 mg decreases serum DHT by 68% and scalp DHT by 64% [8]. Or wearing wigs as consequences are psychological and not of physical detriment.

Conclusion

It is very possible that Saitama has alopecia. Assuming his story was true, it is possible that training led to stress which led to increased cortisol or that training could have led to a hormonal imbalance of testosterone. The effect of the hormone imbalance from exercise needs to be explored further as we do not know how long this increase in testosterone may have lasted, and if it was long enough to gradually invoke hair loss in Saitama. From this review it is likely that Saitama could have (Male) Androgenic Alopecia as this is one of the most common types, or Frontal Fibrosing Alopecia. Other types of alopecia like Alopecia Areata were not explored in this paper. If Saitama were to have a physical examination biopsy other type of alopecia can be ruled out. In conclusion it is possible to say that Saitama worked out so rigorously that he lost his hair, but this hair loss resulted due to secondary consequences of the exercise as opposed to the regime itself.

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