

Using a scanning electron microscope to visualise the effects of heat protectant when straightening hair

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Abstract

In this research project, the aim is to investigate whether heat protectant is useful or not. Previous studies have shown that heat protectant has caused 10-20 percent less damage than without heat protectant, however the aim of this investigation is to see if there are any visual difference in damage. In order to determine this, hair samples were collected from people who had straightened their hair without hair protectant and from people who had used hair protectant. From this, the condition of the hair cuticle and damage, such as raised cuticles and split ends may be observable.

Research aims

The aim is to see if there is a relationship between the use of heat protectant when straightening hair stops hair from being as damaged compared to straightening without heat protectant. The hypothesis is that when straightening without heat protectant there will be more damage to the hair due to heat when compared with when you use heat protectant when straightening. The aim is to get results to see if there is a relationship between damaged hair and lack of heat protectant when straightening to see if heat protectant is really worth the money and whether it is useful or not.

Background information

The original focus of this research was to look at eyelashes due to us being aware of the bacteria and microorganisms that live on them.

The initial approach was to analyse eyelashes for evidence of demodex mites, the varying structure of eyelash follicles and whether eyelashes can be damaged by the prolonged use of mascara or other products such as extensions. However, it was advised that it would be unlikely that it would be lucky enough to observe the actual mites, on an eyelash, as part of this study and that we would probably just see the eggs.

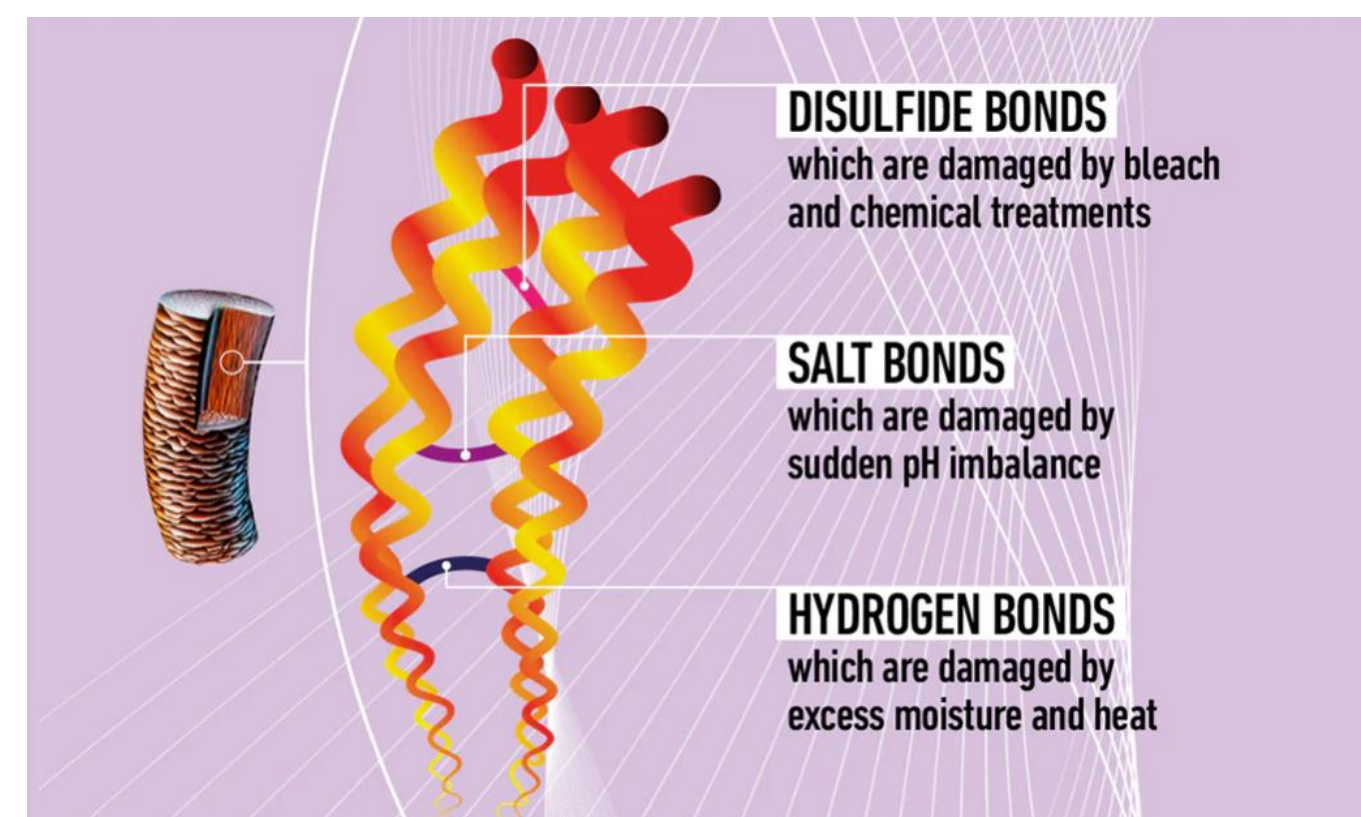
Therefore, the research focus was altered and changed to investigate head hairs instead. Lots of people have heard of the importance of using heat protectant on hair to maintain good hair health. GHD, a popular heat protectant brand was selected for the investigation.

GHD have created a microscopic image to prove that their product works efficiently. As a result of this, the aim is to compare our results to that of GHD.



Hair is bound by 3 different bonds: disulfide, salt and hydrogen bonds. It exists in keratin chains which are bonded by hydrogen bonds which maintains the hair's shape. When heat is applied, the weak hydrogen bonds are broken and then rearranged temporarily after cooling to be curly or straight according to the shape of the hot plate.

However, this also can cause more cracks in the cuticles of hair which could lead to moisture loss and damaged hair. Heat protectant claims to form a barrier between hair cuticles and the heat which would seal the cuticle and protect from moisture loss when applying heat. In this research, the aim was to observe the effects of heat protectant on preserving the hair during heat straightening.



Experimental Method

Obtaining samples: There were volunteers who used straightener and divided the observations into two groups: the ones who used heat protectants and the ones who didn't

Sample preparation: Hair's middle was carefully cut and arranged on the stage. They are then vacuumed inside the SEM chamber. This is because vacuum eliminates contaminations, vibrations and noise

Sample observation: The samples were observed at varying magnifications and chose the magnification appropriate for capturing the details.

Variables:

Independent variable: heat protectant
 Dependant variable: visible cuticle damage
 Control variables: distance from scalp, length of hair sample

Limitations of investigation: The following variables were not controlled: temperature, duration of straightener use, volume of heat protectant, age of participant.

Results

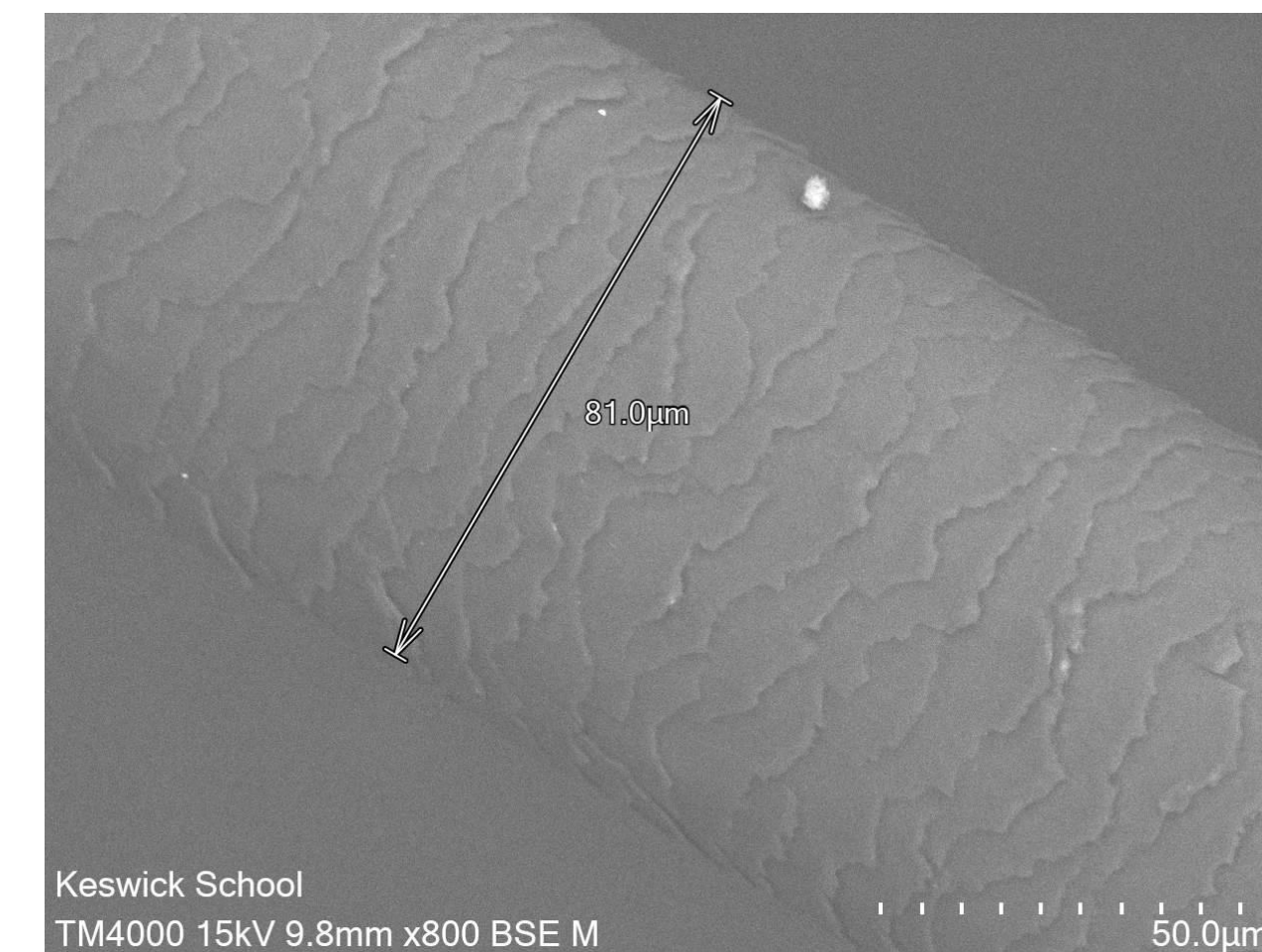


Figure 1 Straightener X1000 mag heat protectant

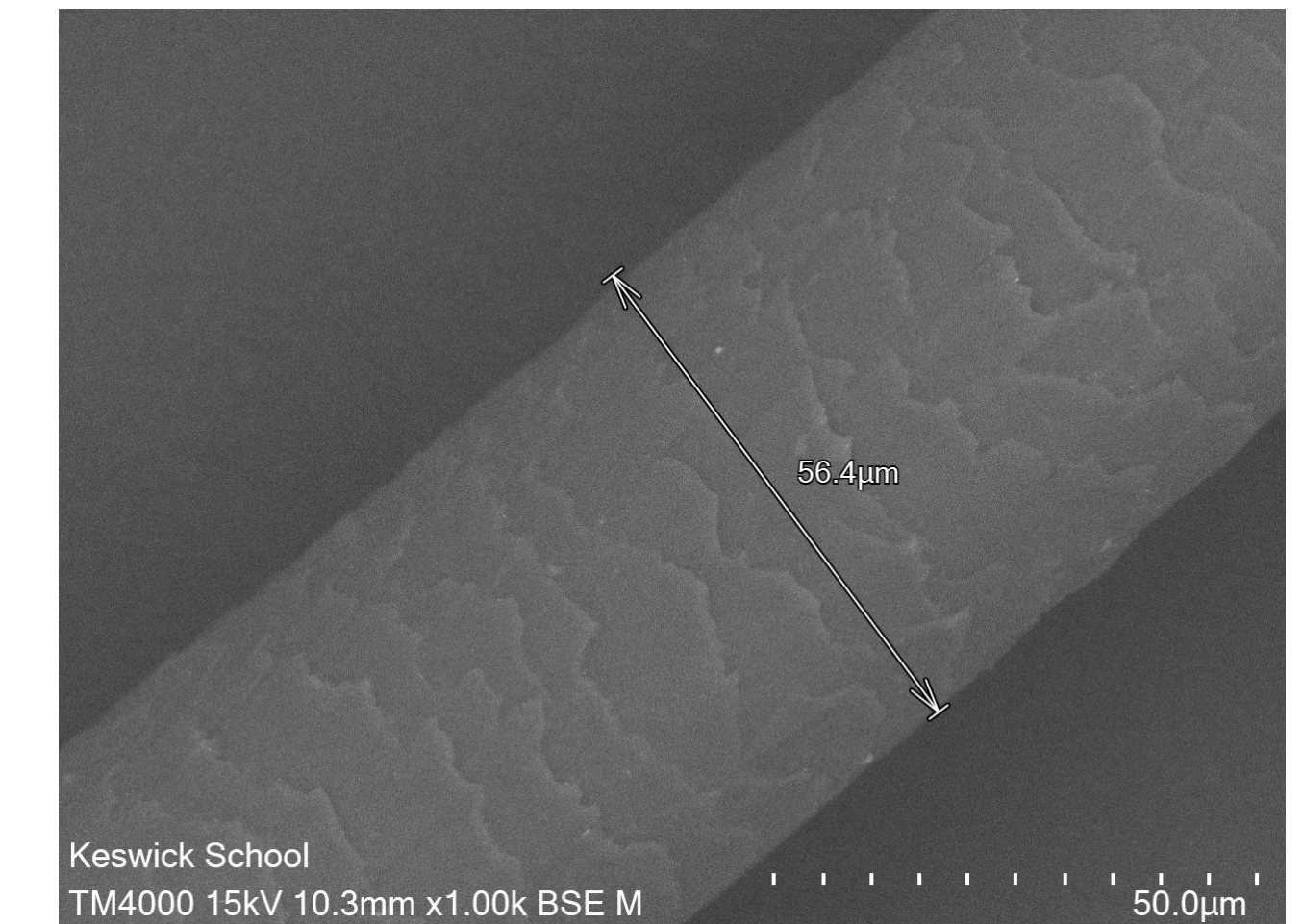


Figure 2 No straightener X800 mag no heat protectant (control)

Analysis

Figure 1 shows a hair which is straightened with the use of heat protectant. It can be observed that this hair doesn't show signs of breakage or raising of cuticles. The cuticle looks uniformly even and closed which is a good sign of retaining moisture. It can be supposed that the heat protectant helped the hair cuticle retain moisture by sealing the hair shaft.

Figure 2 shows an image of a hair not straightened, without heat protectant. It can be observed that this is a healthy hair, not showing any signs of breakage. Compared to figure 3, this hair looks to be far more healthy, with no splits. This helped us discover that heat does have a negative impact on the health of our hair and that using heat protectant helps us maintain good hair health.

Figure 3 shows a hair that has been straightened without heat protectant. It can be observed that the hair has been split, this could be because of the use of heat making the proteins in the hair denature. This helped us realise that heat protectant could be important in keeping your hair healthy as compared to figure 1 which was straightened with heat protectant, the hair in figure 3 is noticeably more damaged.

Conclusion

From comparing the results to figure 2 (the control), it is observable that the hair that was straightened with heat protectant (figure 1) retained the smooth, closed cuticle while the hair which straightened without heat protectant (figure 3) showed a total loss of cuticle and breakage of hair. In conclusion, it is evident that the heat protectant was useful in protecting and sealing the hair's cuticle. It is possible to conclude that the hair in figure 3 had its keratin weakened by the high heat, opening up the hair cuticle (the protective layer) and allowing moisture to escape which makes it more prone to damage. However more repeats and would be needed to increase the validity of these conclusions.

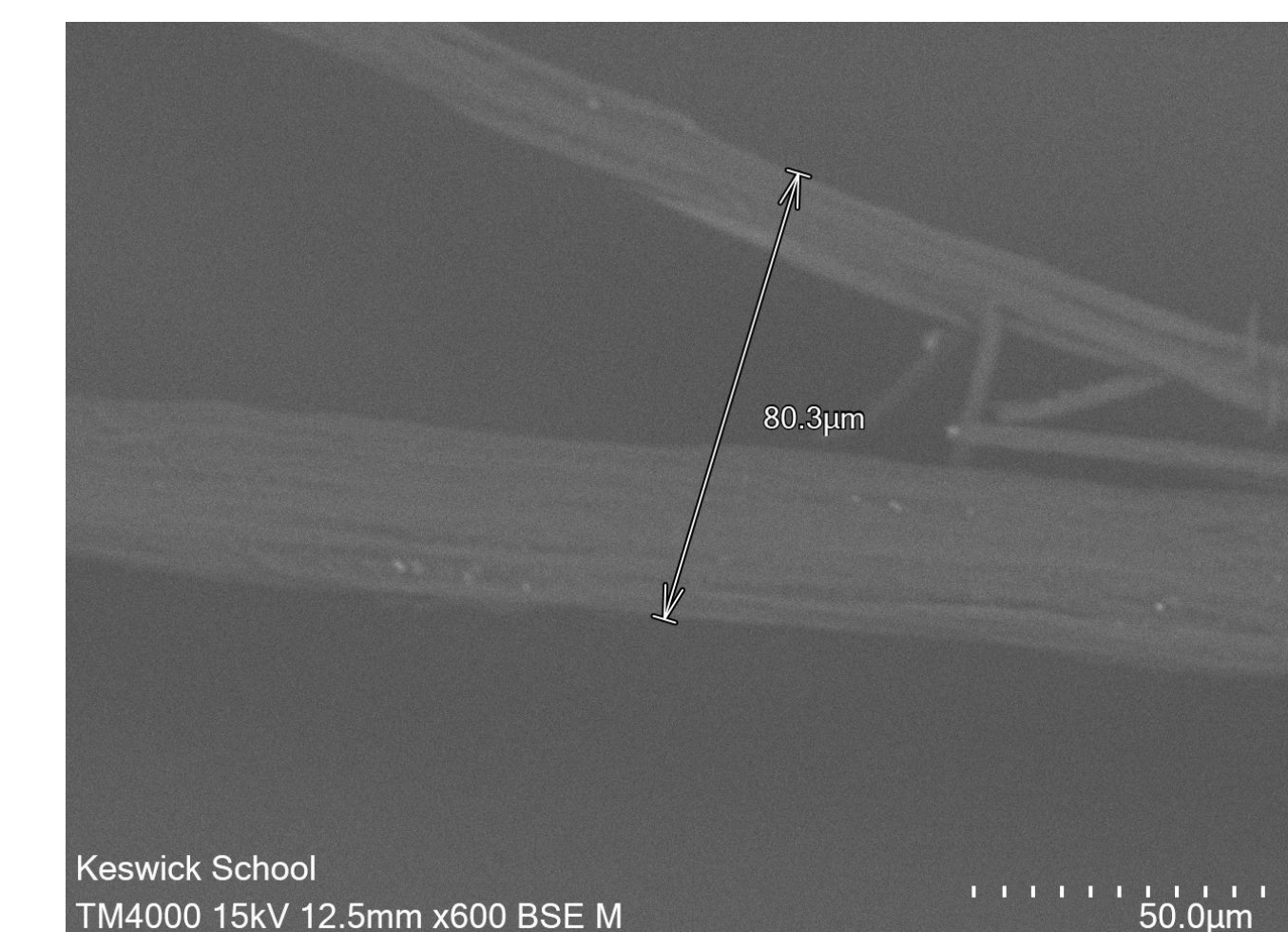


Figure 3 Straightener X600 mag no heat protectant

Further research

The research with the SEM shows how heat protectant protects hair when straightening, however further research could be done into the long term effects of heat protectant and whether the effects lasts more than one time when straightening hair. This could be valuable information for the consumer as a single bottle of heat protectant can cost between £2.50 and £22.83 (Amazon 10/05/24). Research could be done into comparison of different brands and companies to see which has the best value for money for the consumer when taking into account effectiveness and longevity of the product.