TO INVESTIGATE THE PROTECTION OF SUNCREAMS AGAINST UV RAYS

Aim:

Our aim for this project is to collect data on the effectiveness of different sunscreens against UVA and UVB light,

a) In natural sunlight

b) In a sun bed.

Research

Sun Exposure & UV Rays - The Basic Facts

The human body benefits from sun exposure. And a little bit of tan protects you from the sun. Right? Wrong!

The body does indeed benefit from sun exposure. But a little bit of tan does not necessarily protect you from the sun. Let’s see why.

The sun’s rays are a major source of vitamin D and help the body’s systems acquire much needed calcium for building healthy bones. However, most people don’t need to spend large amounts of time exposed to the sun in order to get their required amount of vitamin D.

In fact, the body’s health can actually suffer negative effects when it’s exposed too long to the sun’s rays, especially if it’s unprotected. Results can vary from skin and eye damage to immune system suppression and ultimately cancer, even for the young.

So let’s look at the basic facts about sun exposure.
There are three kinds of invisible ultraviolet (UV) rays in the sun that reaches earth: UVA, UVB, and UVC. When these rays come in contact with our skin, affects of UVA and UVB can be - tans, burns and other reactions (e.g. like acne and cancer).

It’s also notable that the effects of all UV rays are not the same. Depending upon the season, time of day and place on the planet in relation to the sun - (i.e. your altitude and latitude), the rays’ intensities vary. For example, during summertime, UV rays are at their strongest. Between 10 a.m. and 4 p.m., the rays are strongest. And close to the equator and at high altitudes (where air and cloud cover are less, resulting in increased harmful penetration of UV rays into the environment), the rays are also strongest.

In order to protect ourselves from the harmful UV rays, let’s look at the skin’s first defence - melanin.

Melanin is a chemical present in a variety of colours and concentrations in most people’s skin that helps with defence from the sun. Melanin reacts with UV rays and absorbs them. Or rather, to be more specific, the rays act upon melanin, causing the melanin to spread out or grow, increasing its presence in response to the sun’s exposure. The result? A ‘sun tan’. The darker the skin colour, the more melanin the skin has for protection. And ‘tanning’ for darker colour is included here; ‘colour’ does not have to refer to just the original skin colour.

A word of caution…

Tanning may look great on the surface, - but the amount and length of time a person is exposed to the sun, determines the amount of possible damage. It also determines the future risk of damage that’s likely.

For example, people who are exposed to the sun in huge doses like ship crews, field workers and beach surfers, are at higher risks for skin damage than indoor workers. What happens is that when the amount of UV exposure is greater than what the skin’s
melanin can handle, sunburn can result. And those with lighter, fairer skin, who have less melanin, absorb less UV, suffering less protection.

Since research has shown that UV damage from the sun is the main cause of skin cancer, (with as high as 20% of some populations developing skin cancer during their lifetime), we need to take a proactive approach in relation to sun exposure to avoid harmful skin damage.

**Sun beds, tanning and UV exposure**

The desire to acquire a tan for fashion or cosmetic purposes has led to a large increase in the use of artificial tanning sun beds in, mostly, developed countries. Sun beds for tanning continues to increase in skin cancers are attributable to over –exposure to natural UV radiation.

Primary among these artificial sources is sun beds. popularity, especially among young woman.

Sun beds used in solariums, and sun tanning are lamps, are artificial tanning devices that claim to offer an effective, quick and harmless alternative to natural sunlight. There is growing evidence that the ultraviolet radiation emitted by the lamps used in solariums may damage the skin and increase the risk of developing skin cancer. Some 132,000 cases of malignant melanoma (the most fatal kind of skin cancer) over 2 million cases of skin cancer are caused by sun beds.

**What is ultraviolet light ?**

Ultraviolet (u,v) light is electromagnetic radiation with a wavelength shorter than that of visible light, But longer than x-rays, in the range 10nm to 400nm, and energies from 3 Ev to 124 Ev. It is so named
because the spectrum consists of electromagnetic waves with frequencies higher than those that humans identify as the colour violet.

UV light is light with a wavelength shorter than that of visible light. UV light is more energetic than visible light and has a shorter wavelength, letting it penetrate more readily through obstacles. The ultraviolet in ultraviolet light refers that UV light is beyond violet on the electromagnetic spectrum. UV light is invisible, but it can be observed indirectly by the way it makes many other substances fluoresce in the visible spectrum.

UV light is primarily thought of as a party light because of the way it makes textiles and clothing, particularly white shirts, fluoresce brightly. “Black lights” are synonymous with UV light. These lights primarily produce light in the UV portion of the spectrum; they also produce a slight violet glow. Special posters or other works of art are often created with the express purpose of fluorescing a certain way under a black light. UV light has many other applications outside of the party scene.

Frequently used in security. For instance sensitive documents, such as currency, driver’s licences or passports.

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Planning our investigation.

When we were planning our investigation we had learned in science that you can have one variable in any experiment and we need to ensure that it is a fair test. We needed to include a control to use to compare our results.

To ensure the tests are fair and accurate

We collected this data by using UVA and UVB sensors logger pro and also labquest. By spreading an even amount of different factors of sunscreen onto petri dishes and then collecting the data by holding the sensors up to petri dishes same distance away from the ultra violet light source. As a control we measured the radiation levels with the petri dish only. In sunlight we recorded the radiation with cling film only.

After collecting the data we then transfer the data onto the laptop into logger pro to make up our graphs which show the results of our collected data.

Experiment 1 To test our own sun cream in the sun bed.

Method:

1. Spread an even amount of sun cream on the petri dish.
2. Prepare the UV sensors, logger pro and lab quest.
3. Hold the UV sensors to the petri dish.
4. Hold in position for 2 minutes, take notes of data being collected.
5. Them make graphs.
How we prepared our Cream

1. We added 70gs of white petroleum jelly to a 100cm³ beaker.
2. We added 10g of liquid paraffin to the beaker.
3. We heated on a hot plate until the solution was completely melted.
4. We added 16grams of zinc oxide and stirred constantly until a smooth paste was formed and allow to cool until it formed a solid.
Conclusion

We found that our sun cream when tested has a good protection against UVA rays. The UVA radiation decreased from 2000 mW/m² to 500 mW.m². When we turned the light back on and placed the petri dish in front of the rays the radiation levels dropped.
Experiment 2

We tested each cream in the sunbed.

Method

We connected the UV sensors to the labquest

We spread an even amount of sun cream on each Petri dish

We held the UVA and UVB sensors to a Petri dish

We tested our creams in a local beautician who has a sunbed.
Analysis of the results

With no Petri dish the UVA radiation level was 11,000 mw/m². With a Petri dish there was a small reduction. Factor 12 went down to 500 mw/m². Factor 50 reduced the radiation levels to almost nothing. The lotion the beautician uses gave a result which indicated that the radiation increased to over 5000 mW.m². The radiation levels at the top of the sunbed were extremely high. Outside the level of radiation were 600 m/Wm².

The radiation level is higher in the sun bed than outside.

The lotion we were giving does not protect your skin against UV rays in any way is you are in contact with UV rays for a long period of time.

Our lotion had a protection factor of 25.
Experiment 3

We wanted to compare our suncream to suncreams that we bought in Sunlight.

We made a wooden frame and attached cling film to the frame

See photograph.

We measured the levels of UVA and UVB rays with factor 8,12,25,30.
We recorded the results and constructed a trend graph.

**Analysis of graph**

We can see that there was a sun protection difference between the factors of suncream. There is very little difference between 8 and 12 when we used factor 30 we noticed a change in the readings. When we tried our own suncream the data showed our cream had a protection factor between 25 and 30.
Analysis of the results

With no Petri dish the UVA radiation level was 11,000 mw/m2. With a Petri dish there was a small reduction. Factor 12 went down to 500 mw/m2. Factor 50 reduced the radiation levels to almost nothing. The lotion the beautician gave us rose to just over 5000. The radiation levels at the top of the sunbed were extremely high. Outside the level of radiation were 600.

The radiation level is higher in the sun than outside.

The lotion we were giving does not protect your skin against UV rays in any way is you are in contact with UV rays for a long period of time.

Summary/Abstract.

For our experiment we wanted to test different sun creams against the suns UV rays in order to find what protects you more. We went to our local beautician to measure the UV radiation levels in a sun bed. We wanted to measure and collect data using the lab quest and UVA and UVB sensors on the effectiveness of protection creams with different factors.

We used a frame with cling film to collect data on the effectiveness of the creams in bright sun light. In natural sunlight factors 8 and 12 have a lower protection factor than factor 25 and factor 30. The cream we made has a protection factor of about 27. Our experiment in the sun bed showed that with no petri dish the UVA radiation level was 11,000 mw/m2. With a petri dish there was small reduction. The lotion the beautician gave us rose to just over 5,000.
The radiation levels at the top of the sun bed were extremely high.

Outside the level of radiation was 6,000 m/W m².

The radiation level is higher in the sun bed than outside.

The lotion we were giving does not protect your skin against UV rays in anyway if you are in contact with UV rays for a long period of a time.