

## **DEVELOPMENT OF LATENT LIP PRINTS ON MULTICOLOURED SURFACES, A PROBLEM RESOLVED USING FLUORESCENT DYES**

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### **Abstract**

Fingerprints are one of the most effective methods of identification. However lip prints can also provide important information. At the present time more and more people use protecting lipsticks and permanent lipsticks. With these lipsticks a latent lip print is generated by contact with a surface and, like with the latent fingerprints occur, this latent lip print can be developed.

In a previous work the use of lysochromes, specifically Sudan III, Oil Network Or and Sudan Black, was used for the development of latent lip prints on porous and non porous surfaces, is proposed. These reagents are very effective even for old latent lip prints . But when prints are left on very dark or multicoloured surfaces, some problems of contrast may hide the development.

The work that follow study the usefulness of fluorescent reagents to develop latent lip prints on very dark or multicoloured surfaces. Preliminary analysis have demonstrated the efficiency of Nile Red to develop old prints on different dark colour surfaces (specifically blue, red and black). Current research tests the usefulness of fluorescent reagents on both multicoloured and dark coloured surfaces.

Results show that in these cases, Nile red is especially useful and an high quality development for two years old prints (and older also) can be obtained.

## **Keywords:**

Lipstick; Latent print; Forensic identification; Nile Red, Luminescence

## **Introduction:**

In a criminal investigation, fingerprints are one of the surest and simplest means of identification (1,2) Although less studied than fingerprints, lip prints also offer the possibility of providing important information (3,4)

Different kinds of reagents make it possible to develop invisible or latent prints that may provide pieces of information of an unquestionable value, both for the study of the characteristic lines and for the possibility of extracting DNA to obtain a genetic profile.

The use of latent lip prints is more restrictive because databases of lip prints do not exist. However this type of evidence can be useful for identification if it is possible to compare the latent lip print with the lip prints of a suspect. In addition, like in fingerprints, the DNA extraction is possible from the lip print because epithelial cells could be stay at the print.

At present with an aesthetic purpose or also for protection of the lips, the use of protecting lipsticks and permanent lipsticks is more and more widespread. These lipsticks do not leave any visible print but can make a latent one. This characteristic has opened a field of investigation about the possibility of developing latent lip prints, and some results have been already obtained.

It has been published that lysochromes, specifically Sudan III, Oil Red O and Sudan Black, are very effective reagents for developing lip prints, and positive results have been produced with recent and old prints, on both porous and non-porous surfaces (5,6)

It is possible that when working on very dark or multicoloured surfaces problems of contrast may make it difficult to visualize a lip print. In these cases it could be advantageous to use a fluorescent reagent to avoid those problems. Previous studies indicate that Nile Red is useful for developing old prints on different dark colour surfaces, specifically blue, red and black (7,8)

The work that follows goes on this line of investigation. The study compares the usefulness of two kinds of fluorescent reagents -Yellowescent Fluorescent Latent Prints Powder and Nile Red- for developing latent lip prints, older than one and a half year, on multicoloured surfaces. The reagents were used in powder form and luminescence were observed by an alternate light source and ultraviolet light. In principle Nile Red, like lysochromes, have advantage over other Fluorescent powders because react with fats and physical agents.

## **Materials and Method:**

### **Materials**

Long-lasting lipstick (Lipfinity, Max Factor ® n°19)  
Standard protective lipstick (Liposan ®, Sunstick 15 Deliplus ®)  
Unperfumed white and multicoloured untextured paper napkins cut into 8x8 cm squares  
Brushes, fuming chamber, dark chamber, UV goggles, red and yellow glasses, masks  
Ultraviolet light that works between 320 and 400 nanometers)

Bluemaxx TM (Alternate light source that works between 390 and 520 nanometers)

## Reagents

Sudan black (CI 26150) (Panreac)

Yellowescent Fluorescent Latent Prints Powder (Sirchie Finger Print Laboratories, INC. Catalogue number LL705). Chemical composition: Lycopodium (33%), Satum yellow AX pigment (66%) (9)

Nile Red (Aldrich)

## Method

### a - Sample preparation:

After applying protective and long-lasting lipstick on six volunteers and waiting the recommended time, 1 minute, for fixation, lip impressions were made on multicoloured paper, using sustained pressure for three seconds. The process is repeated in successive days until obtaining a sufficient number of prints. The samples were stored at laboratory at room temperature

Control samples were also prepared on unperfumed white paper. The use of control samples were necessary because it was possible that a print developed with Sudan Black on the multicoloured surface can not be seen because contrast problems. To control for this, multicoloured and white paper were both processed with Sudan Black. This control guaranteed proper development of the Sudan Black.

### b - Reagent preparation:

Reagents were used in the powdered form, without any additional preparation.

### c - Processing procedure:

Previously known results (8) show that Nile Red is able to develop latent lip prints 430 days old on different porous surfaces.

Based on these dates, the research samples sat for 450 days and then are processed in 50 day increments. Every 50 days different latent prints are processed.

### Development with Sudan Black:

Using a brush, a small quantity of powder was carefully applied on the surface where the attempt was being made to locate the latent lip print. When using lysochromes in powder it is advisable to use very little reagent and leave it to work. A few minutes after application it can be seen how the development becomes increasingly clearer to present a better quality image. Application was continued until the print was clearly seen.

When using lysochromes, very little reagent was used, but sufficient time was provided to allow it to work. With time, the development became clearer, presenting a better quality image. Beyond the initial 2 minutes of development, develop is observed and the result is adding to the chart.

### Development with Yellowescent Fluorescent Latent Print Powder:

Using a brush, a small quantity of powder was carefully applied on the surface where the attempt was being made to locate the latent lip print. With the lights off, the sample was exposed to the Bluemaxx TM light until the print was seen clearly.

With this processing technique, it was necessary to work in a dark room. The prints were developed on

multicoloured paper.

The same process was used with the UV light. Check if using red or yellow glasses, visualisation is better.

#### **Development with Nile Red:**

The same process described in the previous section was followed, In a dark room, latent prints on multicoloured surfaces were developed. Using a brush a very small amount of reagent was applied and allowed to work for two minutes. Beyond the initial 2 minutes of development, development became clearer, presenting a better quality image. After two minutes from the reagent application, develop is observed and the result is adding to the chart.

### **Results**

The results for the latent lip prints produced by protective lipsticks are shown in Table 1 and the results corresponding to latent prints produced by long-lasting lipstick are shown in Table 2.

In reference to the tables, the development quality is represented as follows:

- A high quality development (++++) indicates that the shape and the outline, as well as the lips lines and wrinkles, can be easily noticed. The print could be also useful for DNA analysis.
- A low quality development (+) implies the shape and the lip outlines that are readily noticed, but less the lines and the wrinkles. The print could be useful for DNA analysis.
- Medium quality developments (++) are classified in between the above development designations. On medium quality prints the shape of the lips as well as the outline can be readily observed, but just partially the lines and the wrinkles. The print could be also useful for DNA analysis. No development is represented by the sign – and no contrast by  $\emptyset$ .

#### **Development with Sudan Black:**

Results from the control samples showed that developing was achieved on all of the cases. Specifically, good development for lip prints was produced by protective lipsticks, and low quality development was produced by permanent lipsticks. As postulated, lip prints located on multicoloured surfaces could not be visualized because contrast of problems.

It was observed that a few minutes later, development becomes clearer.

#### **Development with Yellowescent Fluorescent Latent Prints Powder:**

The development was classified as a low quality development. For the older prints no development was obtained. It was observed that development can be better viewed when lighting with the Bluemaxx alternate light source than using ultraviolet light. However, visualisation with the UV light improved when red glasses were used to observe the development.

#### **Development with Nile Red:**

Good quality development was obtained on all samples. As with Yellowescent Fluorescent Powder, the development was better seen when lighting with the Bluemaxx alternate light source than when using ultraviolet light, and the visualisation with ultraviolet light improved when red glasses are used to observe the development.

It was also observed that development increased as a few minutes passed after the application.

## Discussion

The effectivity of the development for the powders and reagents studied in this case depends on two factors: the surface coloration and the age of the latent lip print

Sudan Black was a very effective reagent for old prints deposited on light colour porous surfaces. Unfortunately, its black colour did not allow visualization of the development when the surface was multicoloured and contained dark colours.

Results show that fluorescent reagents were a good option when working with multicoloured surfaces.

It has been observed that visualisation of the development with fluorescent reagents was better when lighting with the Bluemaxx alternate light source than when using ultraviolet light.

However visualization on multicoloured surfaces with ultraviolet light was better when using red glasses to observe the development.

For lip prints made on multicoloured or dark surfaces, Nile Red in powder form produced high-quality developments for both recent and older lip prints. Yellowescent Fluorescent latent print powder was less effective for older lip prints. Consequently for this kind of sample, Nile Red was a more effective reagent than the fluorescent latent print powders.

Development differences were observed between lip prints deposited with permanent lipstick and those from protecting lipstick.

## Conclusion

In conclusion, results showed that Nile Red was a very effective reagent to develop old latent lip prints deposited on porous surfaces. When the print was deposited on multicoloured or dark surfaces, Nile red was especially useful. In these cases, high quality development for prints two years old and older were obtained.

Lip-print comparison need be addressed in the forensic science community before it can be regarded by an accepted technique. Our method of development can be useful to help establish the validity of the technique. Also the possibility to obtain DNA from a latent lip print could be other useful application for crime investigation.

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**TABLE 1:** Results of protective lipstick latent prints

DEVELOPER	MATERIAL	DEVELOPMENT TIME (in days)						
		450	500	550	600	650	700	750
Sudan Black	White paper (control)	++	++	++	++	++	++	++
	Multicoloured paper	∅	∅	∅	∅	∅	∅	∅
Yellowescent Fluorescent LPP	Multicoloured paper	+	+	+	+	-	-	-
Nile Red	Multicoloured paper	+++	+++	+++	+++	+++	+++	+++

\* Developing quality: +++high, ++medium, +low, - none, ∅ no contrast

**TABLE 2:** Results of long-lasting lipstick latent prints

DEVELOPER	MATERIAL	DEVELOPMENT TIME (in days)						
		450	500	550	600	650	700	750
Sudan Black	White paper (control)	+	+	+	+	+	+	+
	Multicoloured paper	∅	∅	∅	∅	∅	∅	∅
Yellowescent Fluorescent LPP	Multicoloured paper	+	-	-	-	-	-	-
Nile Red	Multicoloured paper	+++	+++	+++	+++	+++	+++	+++

\*Developing quality: +++high, ++medium, +low, - none, ∅ no contrast

**Figure 1: Development using Nile Red of a latent print (750 days old) produced by permanent lipstick.**



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