

Final Project Report

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M1658

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Project Title: Determination of Paraffin Contamination between Users

Background of Study: For over 80 years medical and beauty professionals (and individuals) have used warm paraffin wax heated in a paraffin bath to provide penetrating heat that relieves pain and stiffness while softening skin. Generally, the paraffin wax has a melting point of 121°F, but is held at 130°F (54.4°C) ± 2 degrees in the bath. During a correctly performed paraffin treatment, a person submerses a 98.6°F hand, foot, or elbow into the molten paraffin and the paraffin solidifies instantly to form a layer of solidified paraffin. This procedure is repeated several times to build up multiple layers of solidified warm paraffin that is very therapeutic. After 10-15 minutes, the paraffin is removed and discarded. Typically the balance of paraffin in the paraffin bath is used to treat additional people performing the same procedure. It seems logical that the instantly formed solidified layer of paraffin wax prevents any bacteria or contaminants present on the previous persons' skin to disperse into the balance of the paraffin; and therefore not transferred to the next person's skin. This, however, had not been proven.

Objective: To prove that contaminants on skin do not contaminate the remaining paraffin in a paraffin bath during a correctly performed paraffin treatment.

Study Outline: The client provided all paraffin and heating containers for the study. The paraffin was held at 130°F (54.4°C) for the entirety of the study, which is the suggested hold temperature for treatments.

Hand Inoculation:

While wearing small latex gloves, an analyst's hands were inoculated with approximately 10^5 organisms from a cocktail of bacteria on their hands. The cocktail of organisms included *Staphylococcus aureus* ATCC 25923 and *Escherichia coli* ATCC 25922. To inoculate, one analyst pipetted 1ml of the diluted culture into the palms of the analyst who was wearing the gloves, and then rubbed the liquid into the gloves covering as much surface area as possible. The analyst then waited 1-2 minutes before moving onto the next step (this allowed some of the liquid to dry).

Contamination Analysis (Part 1):

After the hands were inoculated, the analyst dipped each hand into a heated paraffin bath (A & B) holding their fingers slightly apart so that the paraffin surrounded each finger. The hands were dipped slowly into the wax, held for 1-2 seconds, and then slowly pulled out. The hands were held out of the paraffin for approximately 5 seconds (until the paraffin no longer appeared shiny). This same dipping procedure was repeated 4 additional times.

Before and after the hand dipping, the paraffin from each bath was sampled for total microbial load. Before and after the hands were dipped into the paraffin, 4-11 Gram samples were tested by the aerobic plate count procedure from each bath to quantify any bacteria present. The post-dip samples were taken from the direct area where the hands were dipped. All plates were incubated for 48 ± 2 hours at $35 \pm 1^\circ\text{C}$.

Contamination Analysis (Part 2) – “Worst Case Scenario” Test:

During a correctly performed paraffin treatment, the paraffin on a person's hand, foot, or elbow is discarded after use, thus discarding any contaminants that were on the skin prior to being encapsulated by the paraffin. In the “worst case scenario”, used paraffin is placed back into the paraffin bath to be melted and used again. Though reusing paraffin is explicitly not recommended, it may happen.

This second test helped determine if the balance of paraffin in a paraffin bath is contaminated during the “worst case scenario” where used paraffin is placed back into the paraffin bath.

An analyst's hands were inoculated exactly as described above in the “Hand Inoculation” section, except that the analyst wore small nitrile gloves instead of latex gloves (solidified paraffin removes more easily from nitrile gloves).

After the hands were inoculated, the analyst dipped each hand into an unused heated paraffin bath holding their fingers slightly apart so that the paraffin surrounds each finger. The hands were dipped slowly into the wax, held for 1-2 seconds, and then slowly pulled

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out. The hands were held out of the paraffin for approximately 5 seconds (until the paraffin no longer appeared shiny). This same dipping procedure was then repeated 4 additional times.

After the last time the hands were pulled out of the wax, the hands were held at room temperature for 10 minutes. After the 10 minute hold, the solidified wax around the hands was peeled off and placed back into two unused paraffin baths at 130°F (54.4°C).

Before the solidified paraffin was added to the additional baths, 4-11 Gram samples from each bath was tested by the aerobic plate count procedure to quantify any bacteria present.

Immediately after the solidified wax was placed into the new paraffin baths, 4-11 Gram samples were removed from each paraffin bath from the area directly around the solidified hand wax (this wax did not immediately melt back into solution). These samples were tested by the aerobic plate count procedure as described above.

Each paraffin bath was tested again after the solidified wax had completely melted back into solution (this took approximately 45 minutes). After 45 minutes the paraffin was mixed with a sterile stir rod to evenly distribute any bacteria present. Then, 4-11 Gram samples were removed from each bath and tested by the aerobic plate count procedure as described above. Finally, each paraffin bath was tested for the final time at the 2 hour time point from when the solidified wax had been put back into the fresh paraffin. Again, 4-11 Gram samples were tested from each bath by the aerobic plate count procedure.

Results: All results are reported as colony forming units/gram of Paraffin.

Part 1:

Sample #	Bath A		Bath B	
	Before Dipping	After Dipping	Before Dipping	After Dipping
1	<10 est.	<10 est.	<10 est.	<10 est.
2	<10 est.	<10 est.	<10 est.	<10 est.
3	10 est.	<10 est.	<10 est.	<10 est.
4	<10 est.	<10 est.	10 est.	10 est.

Part 2: "Worst Case Scenario"

Uninoculated (Before solidified wax is placed into baths)

Sample	Bath A	Bath B
1	<10 est.	<10 est.
2	<10 est.	<10 est.
3	<10 est.	<10 est.
4	<10 est.	<10 est.

Immediately after solidified wax is placed into fresh baths

Sample	Bath A	Bath B
1	<10 est.	<10 est.
2	<10 est.	<10 est.
3	<10 est.	<10 est.
4	<10 est.	<10 est.

After solidified wax was completely melted (~45 minutes)

Sample	Bath A	Bath B
1	<10 est.	<10 est.
2	<10 est.	<10 est.
3	<10 est.	<10 est.
4	<10 est.	<10 est.

2 hours after solidified wax was placed into fresh baths

Sample	Bath A	Bath B
1	<10 est.	<10 est.
2	<10 est.	<10 est.
3	<10 est.	<10 est.
4	<10 est.	<10 est.

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Conclusions:

Part 1: The paraffin did not yield an increase in bacterial counts after the contaminated hands were dipped. This suggests that contaminants on the skin do not contaminate the remaining paraffin in a paraffin bath during a correctly performed paraffin treatment.

Part 2: The paraffin did not yield an increase in bacterial counts after the contaminated used paraffin was placed back into the new baths for any of the time points tested. This suggests that even during a worst case scenario where solidified paraffin is reused, contaminants present on the skin do not contaminate the remaining paraffin.

Project Coordinator: Gina Masanz

QC REVIEW

	Initials	Date
Analyst:	<u>GM</u>	<u>9-20-07</u>
Supervisor or Data Reviewer:	<u>GM</u>	<u>9-20-07</u>