Utilizing chewing gum as a collection device for HLA typing

Lydia Peavy[1], Leigh Smith[1], Genesis Muñoz[1], Brian Norvell[1], Kim Moore[1], Isha Shah[1], Marti Freund[3], Samantha Wilkerson[1], Jason Munroe[1], Stephanie Wars-Williams[1], Jill Raflako[2], Megan Shaffer[1], Vera Lattier[1], Eric Weimer[1], Debbie Boles[2], Marcia Eisenberg[2], Gloria Haskell[1]

[1]DNA Identification Testing Division, Labcorp, Burlington, NC, USA. [2]CMBP, Labcorp, Durham, NC, USA, [3] Gift of Life Marrow Registry

Introduction

Individuals who require hematopoietic cell transplants often rely on unrelated HLA-matched donors from stem cell and marrow registries. There is an ongoing effort by these registries to find new and interesting ways to increase recruitment of new donors and make registration a simpler process. Gift of Life requested that we validate chewing gum as a collection device for their new initiative "Hero Gum" in hopes of attracting more participants. When chewed, gum picks up epithelial cells from the cheeks, much like a buccal swab. DNA from the chewed gum can be extracted and G-group HLA typing can be achieved with short read amplicons and Illumina Sequencing.

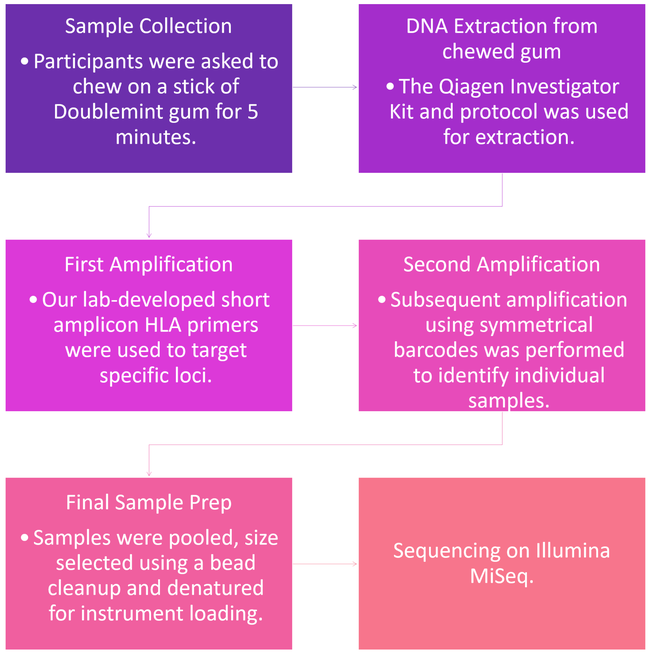


Figure 1: This flowchart details the steps taken to collect and process samples to obtain G-group HLA results.

Methods

Samples were tested for Accuracy (n=20), Precision (intra n=5, inter n=3) and Stability (n=20), with ambient temperature tested at 3 months. It was also necessary to test shipping stability, as sample shipping would not be temperature controlled. Two sets of samples (n=20) were stored at multiple temperatures for various time points to simulate shipping at hot or cold temperatures before extraction. All samples were extracted using the Gum protocol for the Qiagen Investigator Kit and amplified using lab-developed primers before sequencing using the Illumina Miseq. Experimental results were compared to those obtained using previously validated sample types (buccal swabs or whole blood).



Figure 2: Above is the promotional branding of Double Mint "Hero Gum" which premiered during the Giants vs Mets baseball game in Citi Field Stadium, NY[1].

Results

Accuracy was determined to be 100% with 267/267 G-groups identified correctly. Intra- and inter-assay precision was determined to be 100%, with 186/186 and 123/123 G-groups correctly identified, respectively. 3-Month stability was also found to be 100%, with all 20 samples producing the same result found before stability incubation. Cold shipping stability was found to be 100% with all 20 samples producing a correct result. One hot condition sample did not return a result for all of HLA Class I and HLA-DPB1, though its replicate resulted all loci accurately. One other hot condition sample did not identify the second HLA-C allele but was typed in the Sanger SBT parallel that is paired with Class I NGS testing. In calculations, the sample with failed loci was not included, and the G-group result from Sanger Sequencing was counted as an accurate typing, for a hot shipping stability of 100%.

Validation sample quantification data					
SAMPLE #	Accuracy (ng/µL)	90-Day Stability (ng/µL)	Precision Replicate 1 (ng/µL)	Precision Replicate 2 (ng/µL)	Precision Replicate 3 (ng/µL)
1	1.23	1.5	----	-----	-----
2	2.18	1.68	1.79	1.81	1.31
3	5.6	5.4	----	-----	-----
4	7.9	0.509	----	-----	-----
5	1.22	2.23	1.3	1.9	1.8
6	4.57	2.99	----	-----	-----
7	3.87	1.24	----	-----	-----
8	5.9	1.76	----	-----	-----
9	2.15	0.861	1.98	1.4	2.12
10	2.04	2.48	----	-----	-----
11	0.831	1.09	----	-----	-----
12	2.95	2.94	----	-----	-----
13	4.11	2.57	----	-----	-----
14	8.5	1.4	----	-----	-----
15	1.79	2.72	----	-----	-----
16	2.99	4.31	1.24	2.47	3.96
17	6.4	4.37	2.82	3.12	5.3
18	----	-----	1.48	1.33	1.45
19	1.51	2.99	----	-----	-----
20	3.86	1.67	----	-----	-----
21	3.41	9.3	----	-----	-----

Table 1: This table lists the quantification data for the accuracy, precision, and stability samples used in this validation. These quants were obtained using the QuantiFlour ONE dsDNA system and range from 0.509-9.3 ng/µL with an average of 2.9±1.9 ng/µL.

Conclusions

All results were accurate and precise when compared to other validated collection devices. Double Mint gum was implemented as a registry collection device by Labcorp. Hero Gum was distributed by Gift of Life for Donor Registry on August 1st at a Mets and Giants Baseball game[1].

References

1. Hero Gum Debuts at New York Mets Game, Providing Fans Opportunity to Sign Up for Gift of Life Marrow Registry. 2025. Available at: https://www.globenewswire.com/news-release/2025/08/04/3126697/0/en/Hero-Gum-Debuts-at-New-York-Mets-Game-Providing-Fans-Opportunity-to-Sign-Up-for-Gift-of-Life-Marrow-Registry.html. Accessed September 5, 2025.

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