

PERFORMANCE COMPARISON BETWEEN MICRO ELECTRO MECHANICAL SYSTEMS TRACKING TAGS AND OTHER LABELLING STRATEGIES FOR CRYOVIALS

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Background

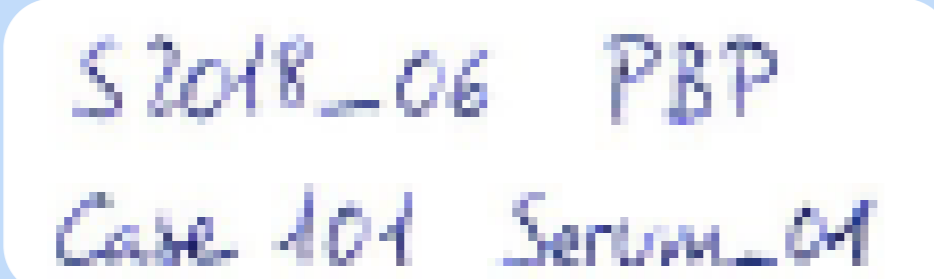
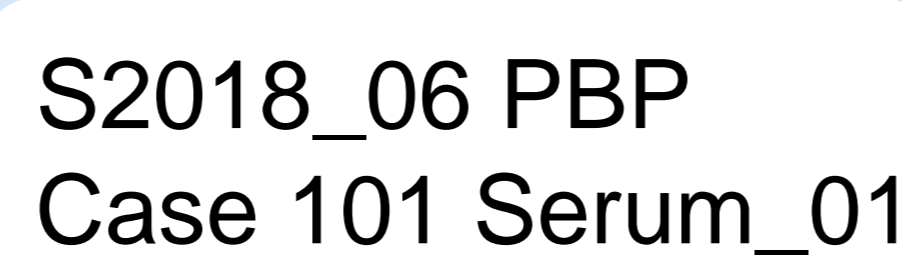


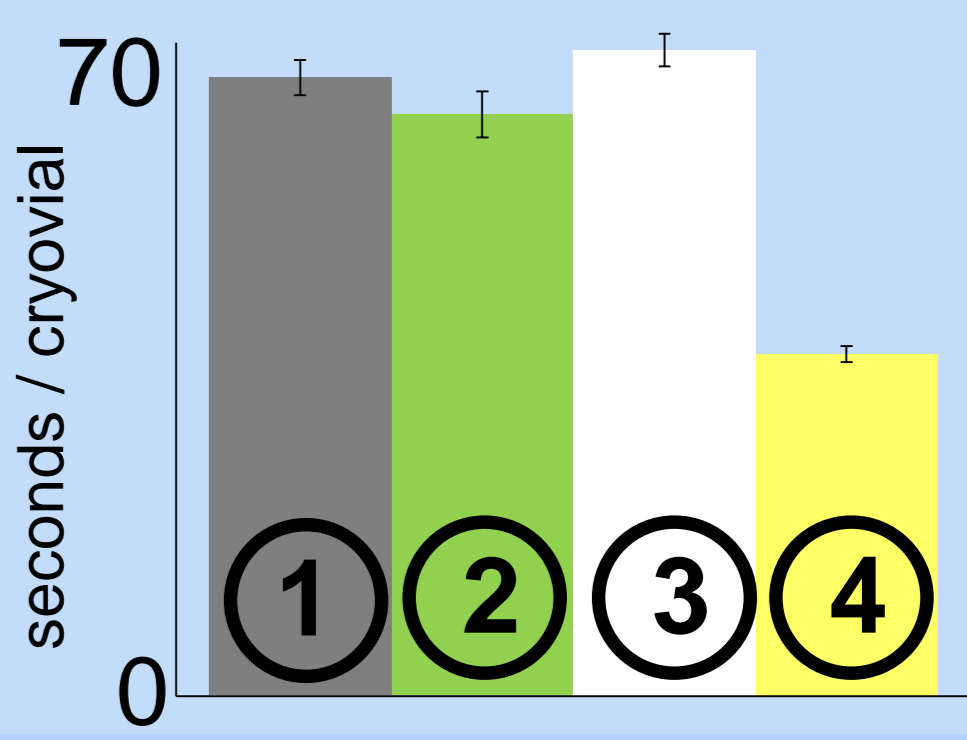
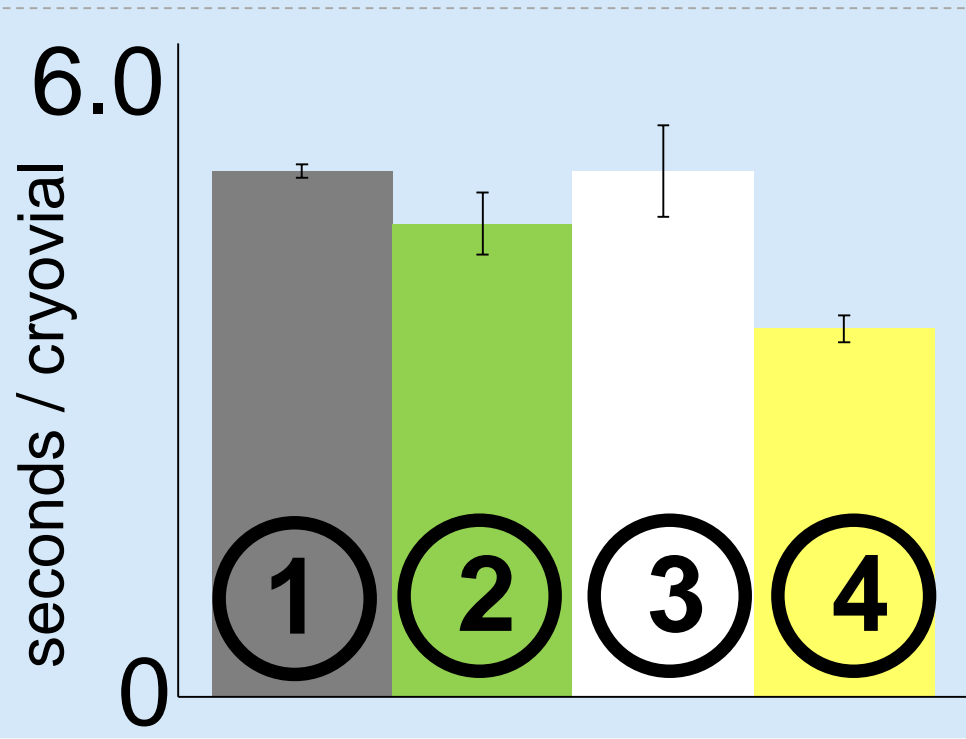
Reliable and efficient methods of identification can be extremely useful for ensuring the quality of samples, maintaining integrity of procedures and improving productivity in biobanking. There are many methods of identification available for use in cryopreservation procedures (handwritten markings, human readable printed labels, barcoded label, RFID tags, and Micro Electro Mechanical Systems (MEMS) tracking tags). The MEMS tracking tag is a mechanical device based on mechanically resonating micro-structures used to encode an identification number and measure temperature at the individual sample level.

Objective

The objective of the present study is to compare the performance of MEMS chips-based method for identifying cryovials with the currently printed label method used in the biobank. MEMS method has been also compared with some other methods during day-to-day process and tested in low temperature storage conditions.

Results

The less time-consuming method to tag cryovials was the MEMS based one (37 seconds per cryovial). Regarding to manual reading time of heavily frozen cryovials, MEMS based method also slightly outperformed the rest of the methods (3.5 s. per cryovial). All the values were calculated over 3 replicates.

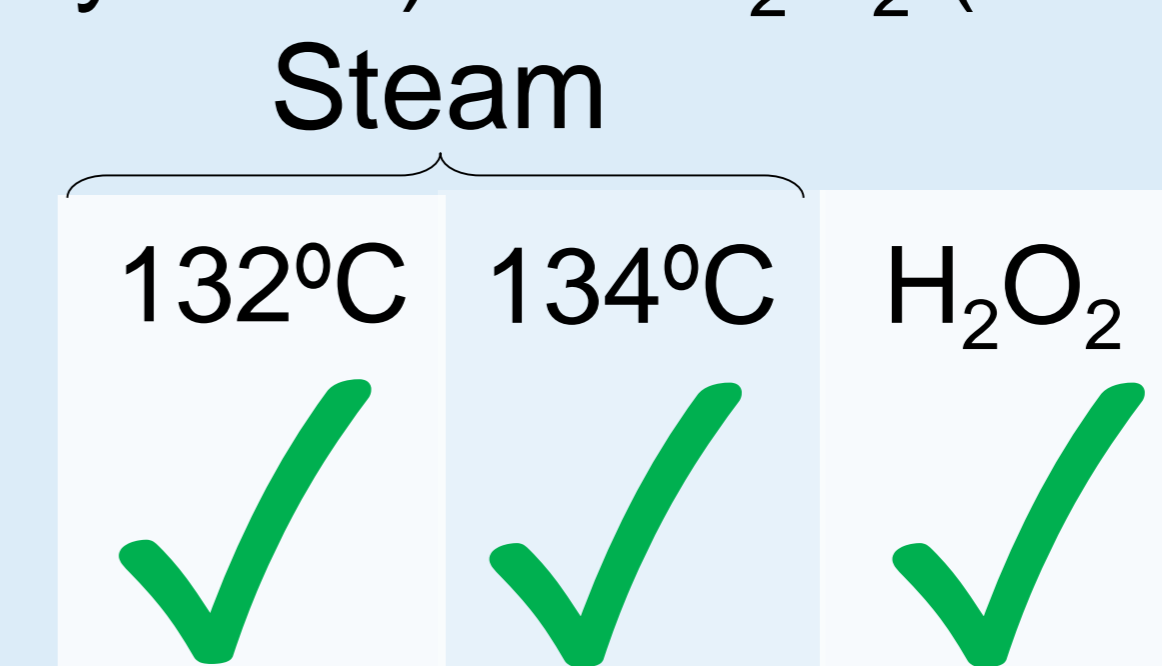
	Handwritten markings  ①	Human readable printed labels  ②	Barcoded printed labels  ③	MEMS tracking tags  ④	Comparison between labeling methods
SAMPLE REGISTRATION: time spent in 10 aliquots registration	11 min 14 s	10 min 26 s	11 min 42 s	6 min 14 s	
3 replicates: n=30 Time spent per cryovial in seconds (s)	67 ± 1.93 seconds / cryovial	63 ± 2.5 seconds / cryovial	70 ± 1.76 seconds / cryovial	37 ± 0.87 seconds / cryovial	
IDENTIFICATION OF HEAVILY FROZEN TUBES: time to read 10 aliquot labels covered by ice layer	50 s	45 s	50 s	35 s	
3 replicates: n=30 Time spent per cryovial in seconds (s)	5.0 ± 0.06 seconds / cryovial	4.5 ± 0.30 seconds / cryovial	5.0 ± 0.44 seconds / cryovial	3.5 ± 0.13 seconds / cryovial	

MEMS tracking tags characteristics tests

CRYOGENIC STORAGE SAMPLE IDENTIFICATION: reading 5 cryovials at -80°C and -196°C. The MEMS tracking tag acquired a positive read at the two ultra-low reading scenarios (-80°C and -196°C).



STERILIZATION: the MEMS chip cryovials were sterilised using three different methods: steam at 132°C (5 cryovials), steam at 134°C (5 cryovials) and H₂O₂ (300 cryovials).



Conclusions

The use of MEMS tracking tags can reduce our biobank labeling time from 35 to 18 minutes (49%) per donation event (calculated using the mean number of cryovials acquired by donation in our biobank in 2018, n= 30). MEMS tracking tagged cryovials can be sterilized using at least two of the more common used methods, H₂O₂ and autoclave.