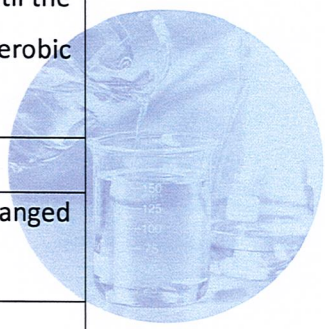
BioTip's freshness sensor performance evaluation during storage of vacuum-packed salmon at -20°C for one year

Experimental details

Duration of experiment	31.5.2023 to 6.6.2024
Goal	Validate that BioTip's freshness sensor changes color in accordance with the international microbial load recommendations of 10^6-10^7CFU/gram at different thawing time points during one year of storage at -20°C.
Product	Salmon fillets
Procedure	Fresh salmon was purchased at the local supermarket at Sderot, and vacuum-packed with BioTip's freshness sensor. All samples were transferred to Mérieux NutriSciences, Israel (https://www.merieuxnutrisciences.com/) and stored at -20°C for 1 year. During the period of one year, the performance of the sensor was tested by Mérieux NutriSciences after 2, 4, 9.5 and 12 months. At each timepoint, 9 samples were thawed at 4°C and three of them were tested at day0 for total aerobic bacterial count. The other 6 samples were kept at 4°C until the color of the sensor changed and then tested for total aerobic bacterial count by Mérieux NutriSciences.
Repeats	6 repeats per time point
Storage temperature	Stored at -20°C and then transferred to 4°C until sensor changed color.
Measurements	Total aerobic count (by CFU plate count)



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Results

During storage of food products at 4°C the bacterial load is expected to increase over time. According to international standards [1-3] total aerobic microbial count lower than 10^6-10^7 CFU/gram, indicates that the quality of fish (and meat) products is good and it can be safely consumed. Therefore, BioTip's freshness sensor was designed to change color when the total microbial count reaches 10^6-10^7CFU/gram.

Figure 1. Representative salmon sample that demonstrates that the blue sensor was placed on fresh product that turns clear upon product spoilage.

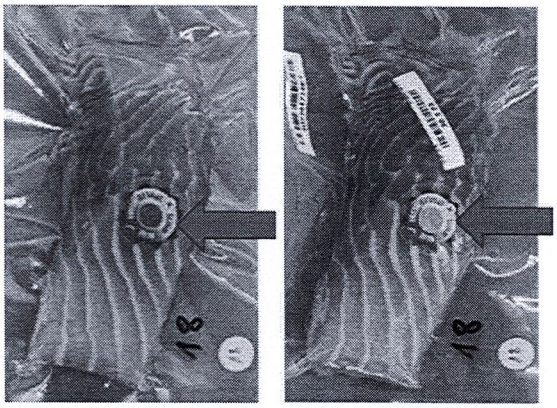
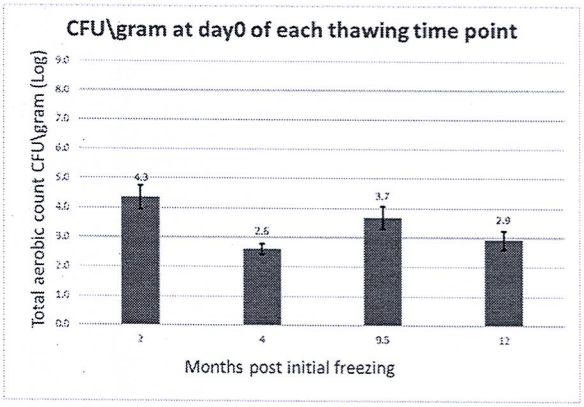
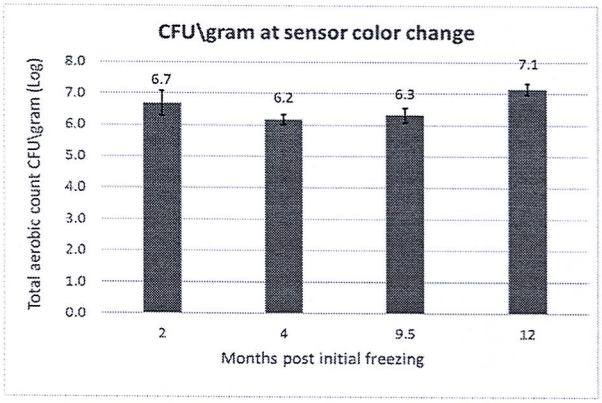


Table 1: Total Aerobic count at day0 and at sensor color change of different tested time points.

Months post freezing	Repeats	Average CFU/gram (Log)		SE
		At Day0	At sensor color change	
2	**6**	4.3	6.7	0.40
4	**6**	2.6	6.2	0.16
9.5	**6**	3.7	6.3	0.24
12	**6**	2.9	7.1	0.18

Figure 2: Total Aerobic count at day0 and at sensor color change of different tested time points.





Conclusions

It was found by Mérieux NutriSciences laboratory, that BioTip's freshness sensor changed color in the microbial level of $1.5X10^6$-$1.1x10^7$ CFU/g (log), with a standard error range of 0.16-0.39 (Figure 1).

The results are stable during one year of storage at -20°C and are in line with the official total aerobic count level indication for spoilage.

References

1. **The Standards Institution of Israel, regulation 1188 for minced meat and minced meat products, April, 2002.**
2. **https://www.fda.gov.ph/wp-content/uploads/2022/12/FDA-Circular-No.2022-12-2.pdf**
3. **International Commission on Microbiological Specifications for Foods (ICMSF), Microorganisms in Foods 8, 2011, Fish and Seafood Products, Table10-1, p110. Springer, New York.**

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Mérieux NutriSciences

Signature

Yulia Gormach
MILOUDA & MIGAL LABORATORIES

26/06/2024

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