



Nickel Contamination in Vaporizer Cartridges Used for Cannabis Concentrates

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Background

- ❖ Vaporizer pens heat and aerosolize cannabis concentrates prior to inhalation
- ❖ They are popular because they are accessible, discreet, and easy to use
- ❖ Cannabis vaporizer pens are a public health concern due to their potential to deposit heavy metals into the product^{1,2}
- ❖ Metal leaching contributes to concentrations exceeding the action limit, occurring even after the product has passed compliance testing^{3,4,5}
- ❖ The State of Michigan has mandated testing for nickel in cannabis vaporizer pens with an action limit of 500 ppb. Concentrations exceeding this limit are defined as compliance failures³
- ❖ Nickel contamination in cannabis vaporizer pens remains a new and unknown issue facing the industry



Figure 1: Typical vaporizer cartridges, very similar to the ones utilized in this study

Table 1: Michigan heavy metal action limits (ppm)⁶

Metal	Flower	Concentrates	Edibles
Lead	1.0	0.5	0.5
Arsenic	0.4	0.2	1.5
Mercury	0.2	0.1	3.0
Cadmium	0.4	0.2	0.5
Chromium	1.2	0.6	2.0
Nickel	1.0	0.5	NA
Copper	NA	3.0	NA

Methods

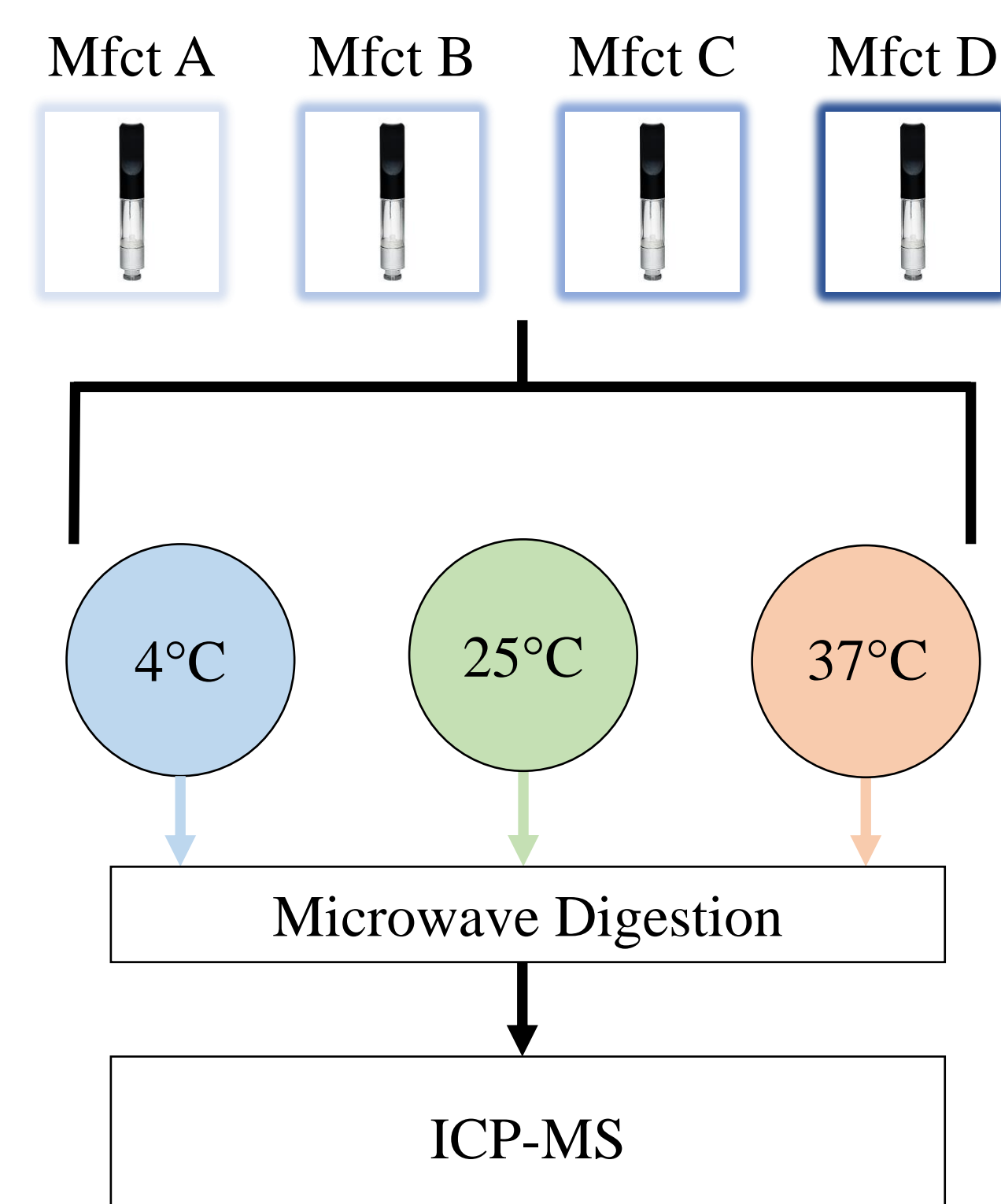


Figure 2: The process by which vaporizer cartridges were processed. 30 cartridges from each manufacturer were stored at 4°C, 25 °C, and 37 °C. 3 were removed each day for metal analysis.

- ❖ A ten-day study was conducted on cartridges from four manufacturers
- ❖ 30 of each cartridge brand were filled with vegetable glycerin and exposed to 3 different temperatures
- ❖ 3 were removed on each day and tested for nickel with Agilent 7800 ICP-MS
- ❖ Ambient nickel concentration was also tested for each set

Results

Time-Dependent Evaluation

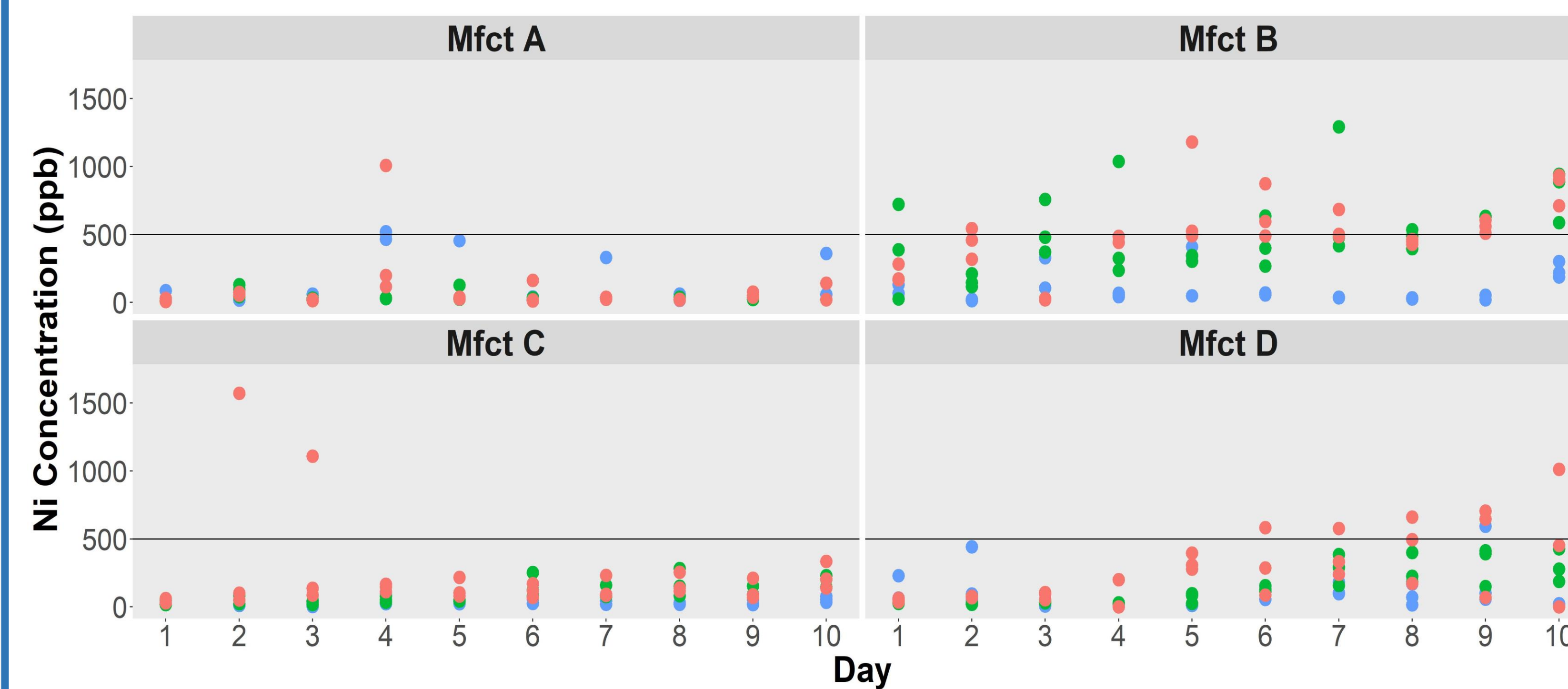


Figure 3: Nickel concentration of cartridges during each of the 10 days. The black line shows the 500 ppb action limit while the color of each point corresponds to the temperature (blue is 4°C, green is 25°C, and red is 37°C)

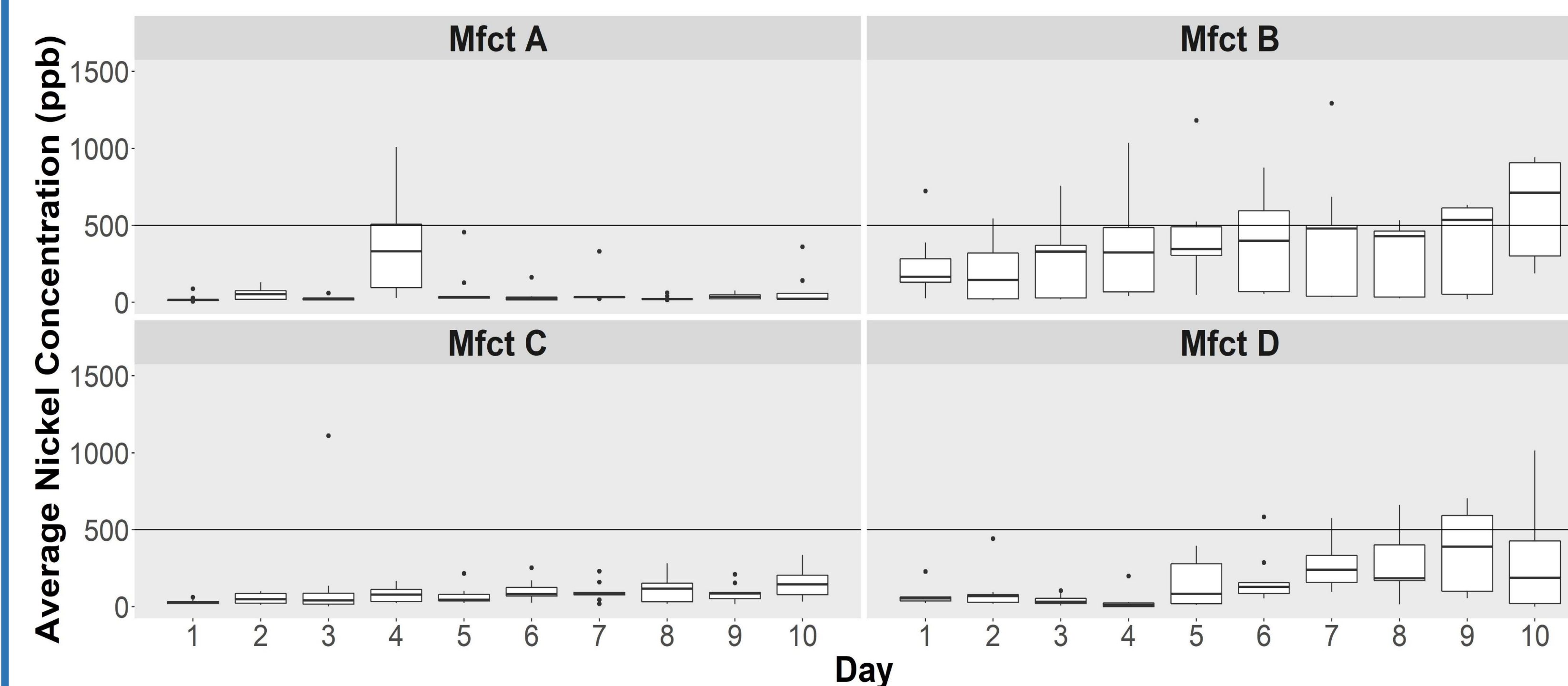


Figure 4: Average of the 9 cartridges each day over time. The black line represents the 500 ppb action limit. The blue line describes a linear regression on the means

Percentages Exceeding Action Limit

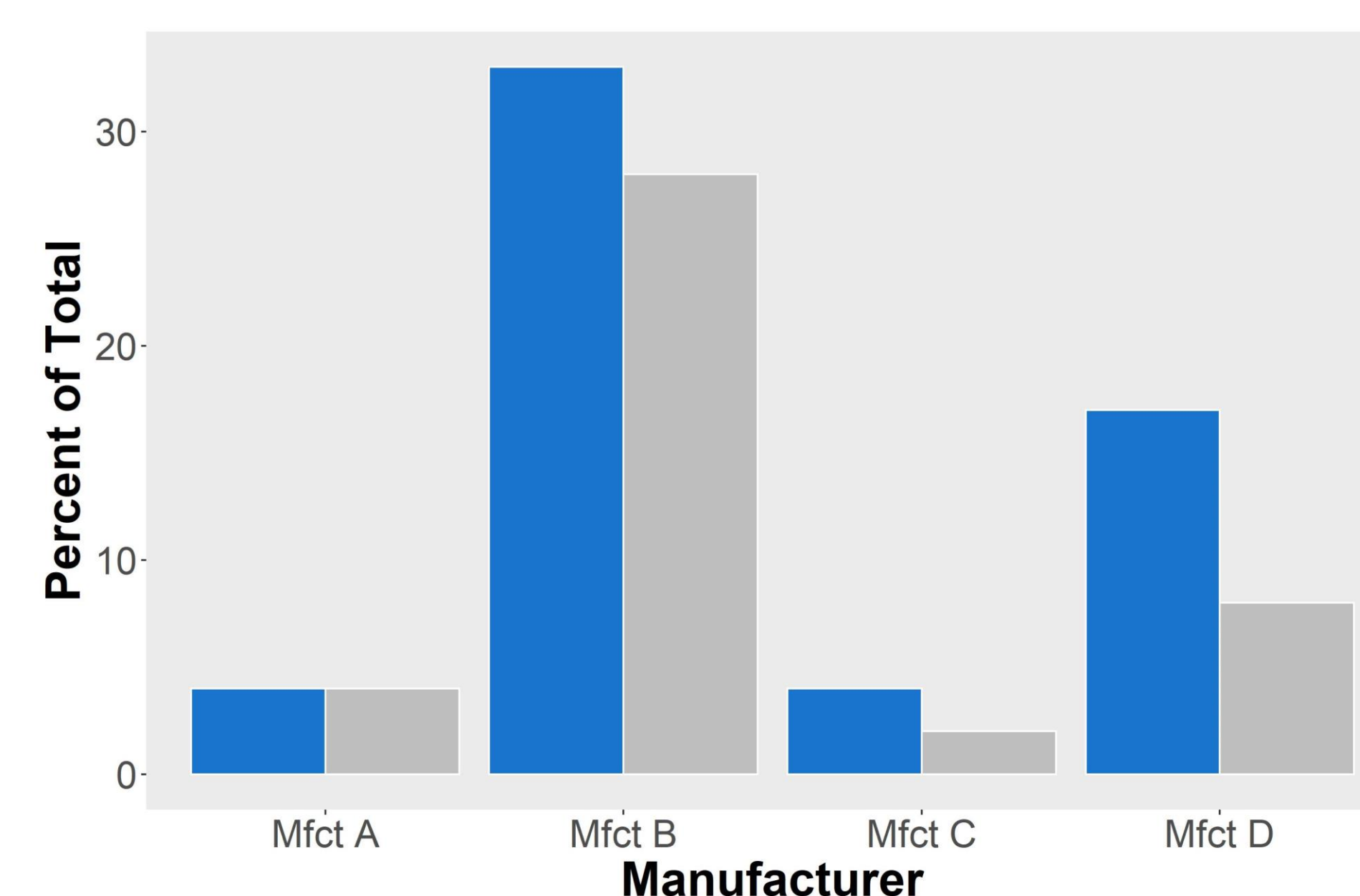


Figure 5: Percentage of cartridges for each manufacturer in two concentration ranges: between 250 and 500 ppb (blue) and above 500 ppb (grey – exceeds action limit)

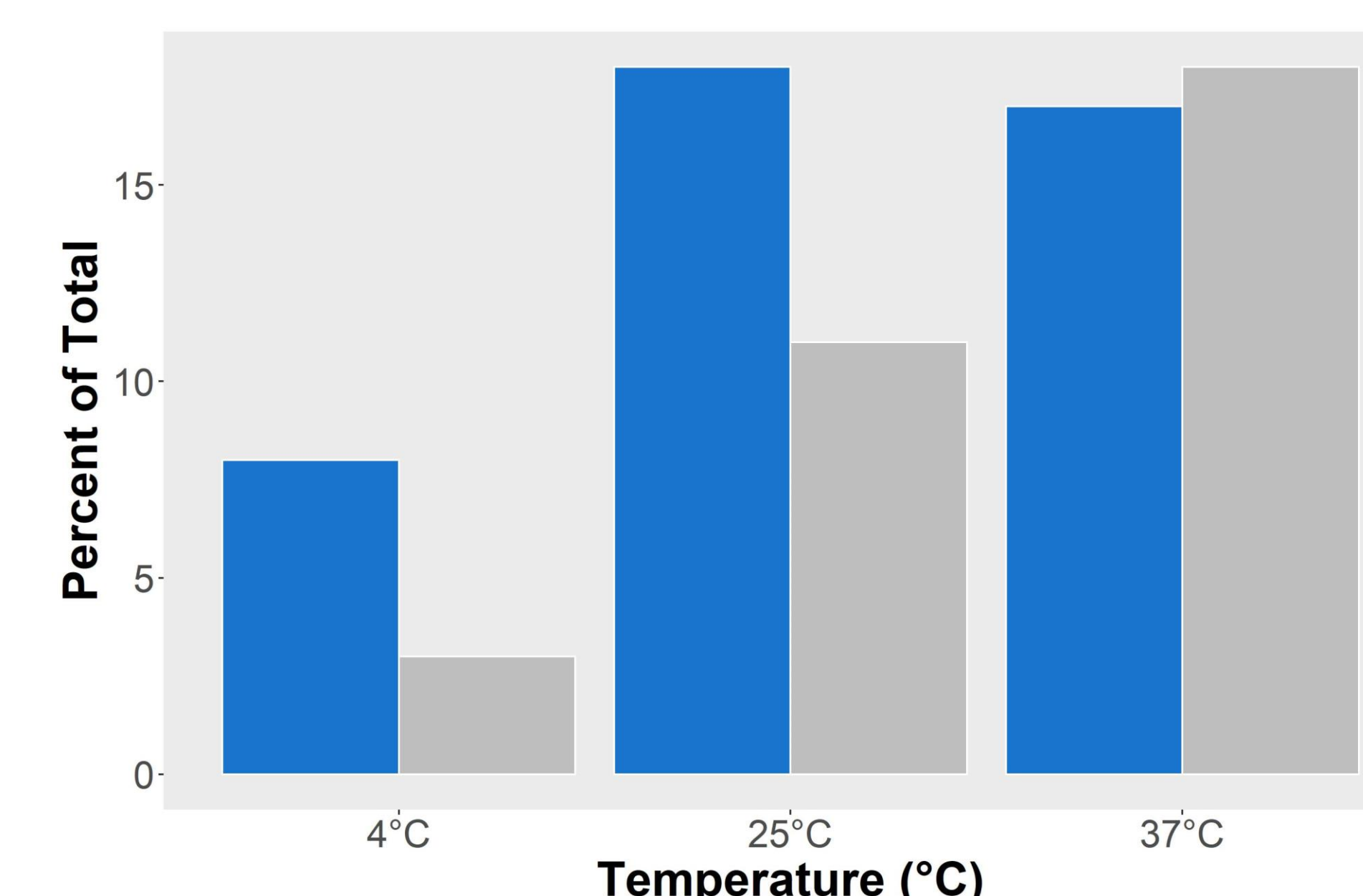


Figure 6: Percentage of cartridges at each temperature (°C) in two concentration ranges: between 250 and 500 ppb (blue) and above 500 ppb (grey – exceeds action limit)

Discussion

- ❖ Mfct B (27.8%) and D (7.8%) showed the highest rate of cartridges exceeding the 500 ppb action limit
- ❖ Nickel concentration does not appear to be dependent on time
- ❖ There was large variation among cartridges exposed to the same conditions, displaying an average relative standard deviation of 51.2% and a median of 42.8% among triplicates
- ❖ Increased temperature increased the rate of cartridges exceeding the action limit; 37°C yielded a failure rate of 18.3% while 4°C yielded a failure rate of 2.5%
- ❖ There is need for change in the regulations associated with compliance in metal concentrations in vaporizer cartridges
- ❖ Stock cartridges possess the capacity to leach toxic levels of nickel into the product itself, indicating compliance failures may be due to manufacturing error
- ❖ Eliminating metal contamination in cartridges is of prime research importance in the interest of public health

References

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