In the Field of Sustainable Science

Arvensis PCR Plates:
DNA Binding Comparison Report

Background:

It has been found that DNA can bind to the surface of some types of plastics, including polypropylene. DNA binding to the surface of PCR plates can have a negative impact on the results, especially with low reaction volumes, qPCR and NGS applications. There are several brands of PCR plates available globally. Most PCR plates are manufactured with polypropylene reaction wells, however, there is a wide range of polypropylene resins used to manufacture PCR plates. Some of the leading companies offer PCR plates that are marketed specifically as low binding. Arvensis hired an independent analysis company to test DNA binding and compare Arvensis plates to the global market leaders. The purpose of the testing was to determine if there are differences in DNA binding between these global brands.

Overview & Methods:

The following sets of plates were tested to evaluate the retention of DNA on PCR plastics:

- Arvensis A-Frame® 96 Well PCR Plate (Item AFC-1041)
- Arvensis B-Frame® BIOCOMPOSITE 96 Well PCR Plate (Item BF-1001)
- Bio-Rad Hard-Shell® 96-Well PCR Plates (Item HSP-9601)
- Eppendorf twin.tec® PCR Plates LoBind® (Item 0030129504)

A tenfold human genomic DNA series (10ng/µl-0.01ng/µl) was prepared for testing. 50µl aliquots of each concentration were applied to samples of each plate type and were incubated at three separate temperatures for 30 mins: 4°C, 37°C, & 65°C, with separate plates used for each temperature tested. Following the incubations, the aliquots were transferred to the next row of the PCR plate and the incubation was repeated. This was repeated until all rows of the plates had been tested.

Following this, 1µl of each sample underwent qPCR analysis targeting the human ACTB gene in duplicates alongside a control dilution series that had not undergone incubation. To determine the level of DNA retention the difference in Cq between the test plates and each respective control dilution series (ΔCq) was calculated to determine if significant binding of DNA had occurred with each plate type.

Results and Summary of Findings:

The following pages contain the results of the study.

In summary, no significant differences in qPCR test results were observed between the plate batches tested and test controls. From this it was concluded that there was no significant binding of DNA to the plastic of the tested plates.

Results:

Table 1: Dilution series Cq values for each plate tested at different temperatures, with standard controls.

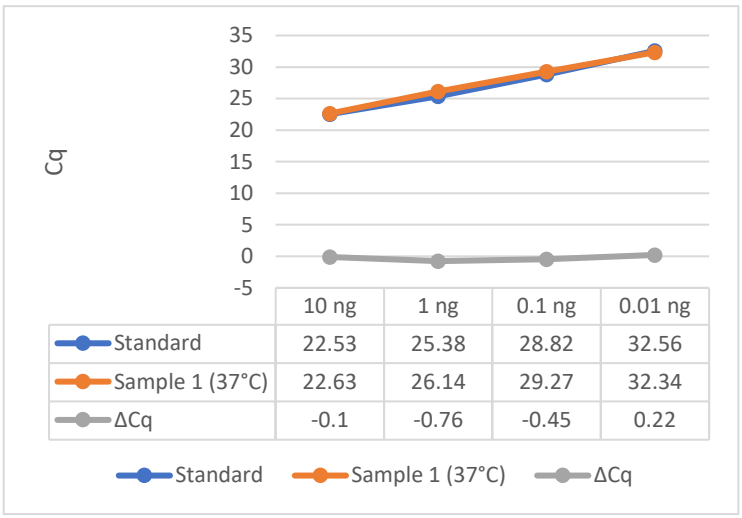
Cq	Standard	Sample 1 @ 4°C	Sample 1 @ 37°C	Sample 1 @ 65°C
10ng	22.53	22.59	22.63	22.40
1ng	25.38	26.22	26.14	25.56
0.1ng	28.82	29.55	29.27	29.06
0.01ng	32.56	32.62	32.34	32.48

Cq	Standard	Sample 2 @ 4°C	Sample 2 @ 37°C	Sample 2 @ 65°C
10ng	22.21	22.47	22.17	22.06
1ng	25.45	25.54	25.19	25.26
0.1ng	28.83	28.92	28.54	28.42
0.01ng	32.34	32.04	31.96	31.66

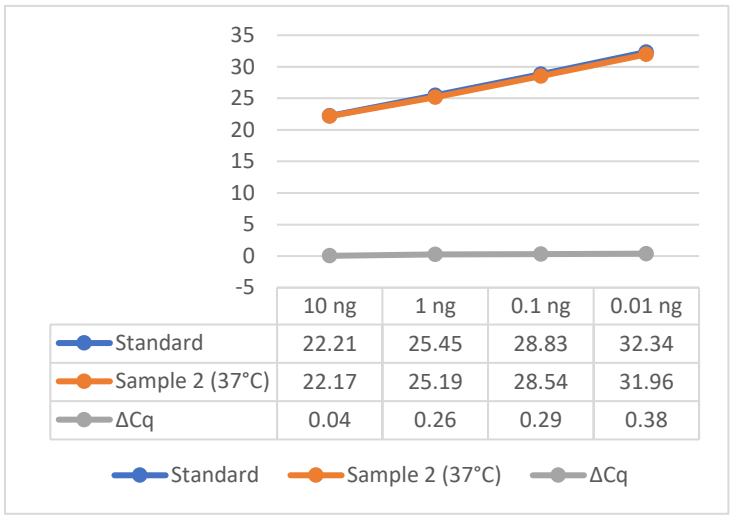
Cq	Standard	Sample 3 @ 4°C	Sample 3 @ 37°C	Sample 3 @ 65°C
10ng	22.21	22.42	22.20	22.11
1ng	25.45	25.91	25.38	25.34
0.1ng	28.83	29.38	28.64	28.52
0.01ng	32.34	32.83	32.03	32.37

Cq	Standard	Sample 4 @ 4°C	Sample 4 @ 37°C	Sample 4 @ 65°C
10ng	22.50	22.54	21.98	22.05
1ng	25.20	25.34	25.09	25.22
0.1ng	28.64	28.78	28.57	28.73
0.01ng	31.78	32.64	31.97	31.59

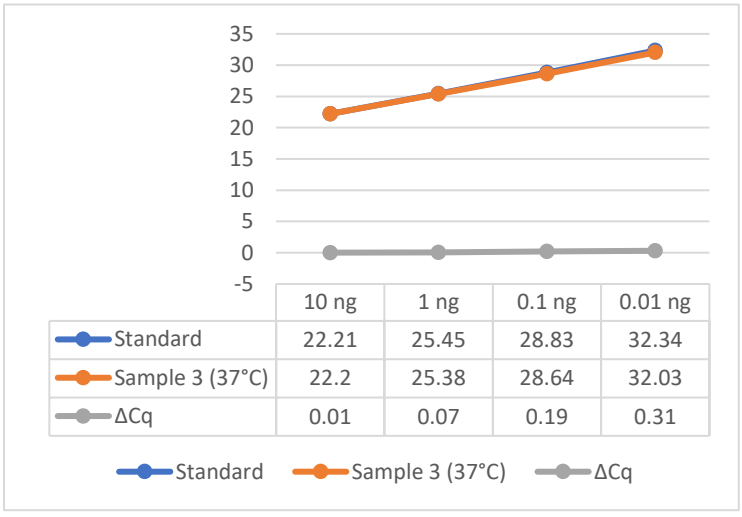
Figure 1: Graphical representation of the 37°C standard curves for each plate, with ΔCq comparison to standard controls.



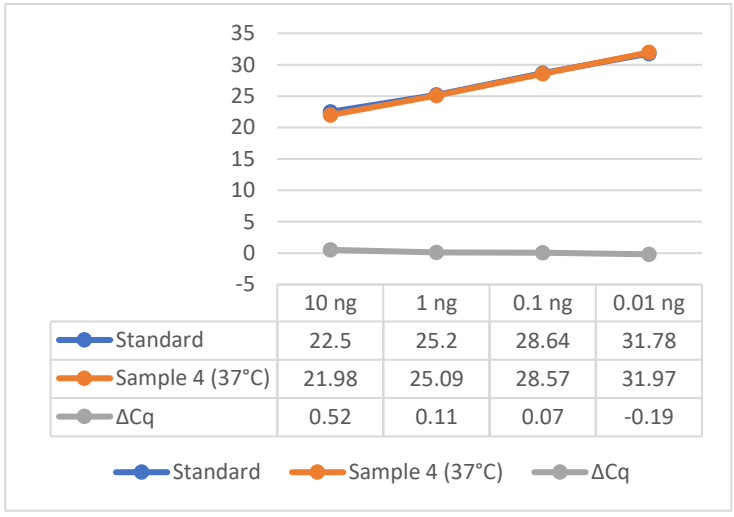
	10 ng	1 ng	0.1 ng	0.01 ng
Standard	22.53	25.38	28.82	32.56
Sample 1 (37°C)	22.63	26.14	29.27	32.34
ΔCq	-0.1	-0.76	-0.45	0.22



	10 ng	1 ng	0.1 ng	0.01 ng
Standard	22.21	25.45	28.83	32.34
Sample 2 (37°C)	22.17	25.19	28.54	31.96
ΔCq	0.04	0.26	0.29	0.38



	10 ng	1 ng	0.1 ng	0.01 ng
Standard	22.21	25.45	28.83	32.34
Sample 3 (37°C)	22.2	25.38	28.64	32.03
ΔCq	0.01	0.07	0.19	0.31



	10 ng	1 ng	0.1 ng	0.01 ng
Standard	22.5	25.2	28.64	31.78
Sample 4 (37°C)	21.98	25.09	28.57	31.97
ΔCq	0.52	0.11	0.07	-0.19

Table 2: ΔCq values and averages for each plate tested at different temperatures.

ΔCq	Sample 1 @ 4°C	Sample 1 @ 37°C	Sample 1 @ 65°C	Mean ΔCq across all Temps
10ng	-0.06	-0.04	0.23	
1ng	-0.84	0.08	0.58	
0.1ng	-0.73	0.28	0.21	**-0.02**
0.01ng	-0.06	0.28	-0.14	
Mean Δ	**-0.42**	**0.15**	**0.22**	
ΔCq	**Sample 2 @ 4°C**	**Sample 2 @ 37°C**	**Sample 2 @ 65°C**	
10ng	-0.26	0.30	0.11	
1ng	-0.09	0.35	-0.07	
0.1ng	-0.09	0.38	0.12	**0.12**
0.01ng	0.30	0.08	0.30	
Mean Δ	**-0.03**	**0.28**	**0.12**	
ΔCq	**Sample 3 @ 4°C**	**Sample 3 @ 37°C**	**Sample 3 @ 65°C**	
10ng	-0.21	0.22	0.09	
1ng	-0.46	0.53	0.04	
0.1ng	-0.55	0.74	0.12	**0.04**
0.01ng	-0.49	0.80	-0.34	
Mean Δ	**-0.43**	**0.57**	**-0.02**	
ΔCq	**Sample 4 @ 4°C**	**Sample 4 @ 37°C**	**Sample 4 @ 65°C**	
10ng	-0.04	0.56	-0.07	
1ng	-0.14	0.25	-0.13	
0.1ng	-0.14	0.21	-0.16	**0.04**
0.01ng	-0.86	0.67	0.38	
Mean Δ	**-0.30**	**0.42**	**0.005**	

On average, ΔCq values across all plate types and temperatures were within +/- 0.2 cycles of the control standards.