

## Rapid Colorimetric Surface Protein Test:

### Determination of the Limit of Detection for PRO-Clean at Incubated Temperatures

#### Application

PRO-Clean is a quick and easy way to monitor the cleanliness of food equipment surfaces to help ensure food safety and product quality. PRO-Clean detects protein residues left on a surface after cleaning. Simply swab a surface, release the reagent and if food residue containing protein is present the reagent will turn purple. The color change provides a semi-quantitative measure of the surface cleanliness. The more protein present, the quicker the color change to purple and the darker the color. PRO-Clean quickly validates the hygiene of a surface, allowing immediate corrective action to be taken if necessary.

#### Test Performance

The reaction is time and temperature dependant, i.e. the color develops with time and the speed of color development is slower or faster depending on the temperature. We recommend that results be read within 10 minutes of activation, and then discarded. The reaction takes place in minutes depending on the level of contamination. The test chemistry will turn to purple over a long period of time (4-5 hours) even with the absence of protein. Users may interpret the level of contamination on a surface based on the speed and intensity of the color change. The speed of the reaction and the sensitivity reached is enhanced by incubation.

Since the reaction is temperature-dependent, it is important to allow the devices to equilibrate to ambient room temperature (15 - 25°C) if they have been stored at refrigerated temperatures.

#### Sensitivity

A dilution series of a known purified protein solution (Bovine Serum Albumen, BSA) was prepared covering a range of 0 – 100 µg (micrograms). A 10 µl aliquot was added to each of three replicate PRO-Clean devices that were activated and incubated at 37°C and 55°C each. The color development was assessed visually at 1, 5 and 10 minutes. The color changes were interpreted and recorded using the color chart below. The results from 37°C incubation are shown in Table 1. The results from 55°C incubation are shown in Table 2.

#### Visual Color Interpretation of PRO-Clean Results



Color	PASS/FAIL	Value
Light Green	PASS	1
Grey/Light Purple	FAIL	2
Light Purple	FAIL	3
Dark Purple	FAIL	4

**Table 1 Results of Initial Visual Detection Over 10 Minute Period at 37°C**

Protein (BSA, µg)	1 minute	1 min Value	5 minutes	5 min Value	10 minutes	10 min Value
100µg	FAIL	3	FAIL	4	FAIL	4
90µg	FAIL	3	FAIL	4	FAIL	4
80µg	FAIL	3	FAIL	4	FAIL	4
70µg	FAIL	3	FAIL	3	FAIL	4
60µg	FAIL	3	FAIL	3	FAIL	4
50µg	FAIL	2	FAIL	3	FAIL	3
40µg	FAIL	2	FAIL	3	FAIL	3
30µg	FAIL	2	FAIL	2	FAIL	3
20µg	FAIL	2	FAIL	2	FAIL	2
10µg	PASS	1	FAIL	2	FAIL	2
5µg	PASS	1	PASS	1	FAIL	2
1µg	PASS	1	PASS	1	PASS	1

**Table 2 Results of Initial Visual Detection Over 10 Minute Period at 55°C**

Protein (BSA, µg)	1 minute	1 min Value	5 minutes	5 min Value	10 minutes	10 min Value
100µg	FAIL	4	FAIL	4	FAIL	4
90µg	FAIL	4	FAIL	4	FAIL	4
80µg	FAIL	3	FAIL	4	FAIL	4
70µg	FAIL	3	FAIL	3	FAIL	4
60µg	FAIL	3	FAIL	3	FAIL	4
50µg	FAIL	2	FAIL	3	FAIL	4
40µg	FAIL	2	FAIL	3	FAIL	3
30µg	FAIL	2	FAIL	2	FAIL	3
20µg	FAIL	2	FAIL	2	FAIL	3
10µg	PASS	1	FAIL	2	FAIL	2
5µg	PASS	1	PASS	1	FAIL	2
1µg	PASS	1	PASS	1	FAIL	2

**Summary Conclusions**

- At 37°C, PRO-Clean will detect 20µg, 10µg, and 5µg in 1, 5, and 10 minutes respectively
- At 55°C, PRO-Clean will detect 20µg, 10µg, and 1µg in 1, 5, and 10 minutes respectively