

Soil amendment with CAC-717 solution also acts as a prion disinfectant



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We obtained a new electrically charged material (CAC-717) by continuously applying an electric field to mineral water containing calcium hydrogen carbonate. A Teflon insulation-coated electrostatic field electrode (N-800N, Mineral Activation Technical Research Center, Tamana, Japan; Japan Patent No. 5864010) was used to create the electric field at a voltage of 2×10^4 V for 48 h. CAC-717 solution in distilled water (Japan Patent No. 5778328, FDA/USA Regulation No. 880.6890 Class 1 disinfectant) had a pH of 12.39 ± 0.03 and contained calcium hydrogen carbonate particles (1,120 mg/L) and carbon complex microparticles (50–500 nm) with a mesoscopic structure.

CAC-717 solution was subsequently sprayed onto normal soil then growth of different crops observed for 6 months. Yield, as calculated by leaf weight, was then determined. The weights of cabbage, green tea, and kale increased 1.5~2.0-fold compared with plants grown on soil without CAC-717 solution (Figure 1-4). Cabbage seeds and black rot bacteria experiment suggest that CAC-717 also acts as an effective disinfectant against *Xanthomonas campestris* pv. *Campestris* (Xcc: black rot bacteria in cabbage and kale) (Figure 5-6) and possibly other plant pathogens.

For the animal pathogens, mouse prion (Chandler) infected N2a cell (ScN2a) lysate was subsequently mixed with equal volume of CAC-717. As a negative control, uninfected N2a cell lysate was diluted 2-fold with PBS or RIPA buffer. 200 µg lysate protein was diluted in 100 µg of buffer (PBS or RIPA) and mixed with 100 µl of PBS. Mixtures were incubated at room temperature for 1 h then immediately diluted in PBS before determining the amount of prion in each sample for Western blotting with SAF83 monoclonal antibody. Prion was not detected in the ScN2a cell line lysate mixed with CAC-717 solution after testing with Western blotting (Figure 7-8).

Soil structure, nutrient content, composition, and microbiological activity tend to increase following organic amendment. Numerous studies have therefore examined the effect of organic soil amendment on crop yield and quality, soil erosion and nutrient availability, and bioremediation of heavy metals. Our future aims are to determine the microbiological activity of soil after spraying with CAC-717.

References

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 Nakashima, R., Kawamoto, M., Miyazaki, S., Onishi, R., Furusaki, K., Sakudo, A., and Onodera, T.: Evaluation of calcium hydrogen carbonate mesoscopic crystals as a disinfectant for influenza A viruses. *J. Vet. Med. Sci.* 79: 939-942, 2017

Figure 1
CAC-717 non-treated Tea plantation



Figure 2
CAC-717 treated Tea plantation



Figure 3
CAC-717 non-treated flower garden



Figure 4
CAC-717 treated flower garden



Figure 5
Mid Infrared ray Emission from CAC-717 in ARITA CERAMIC

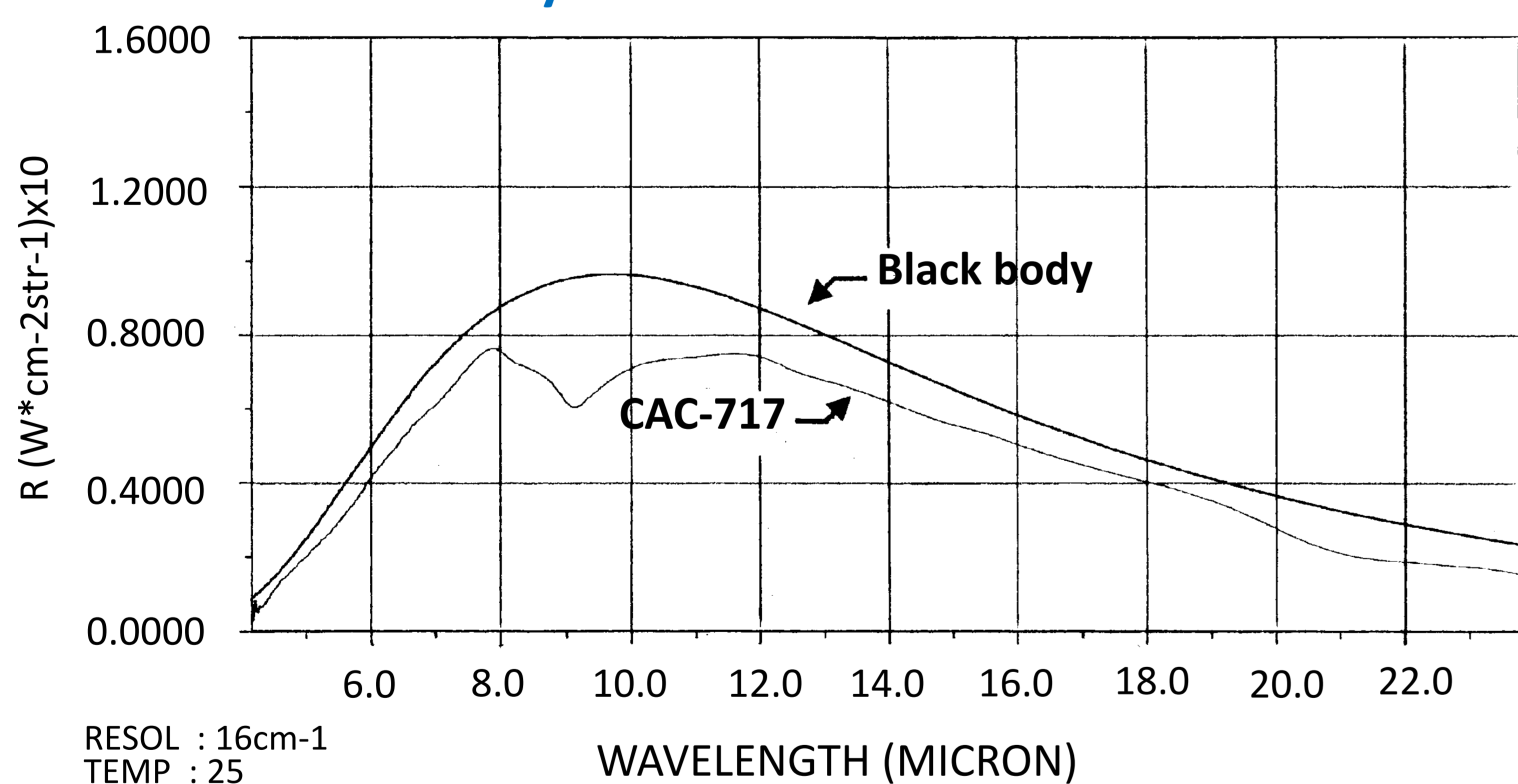
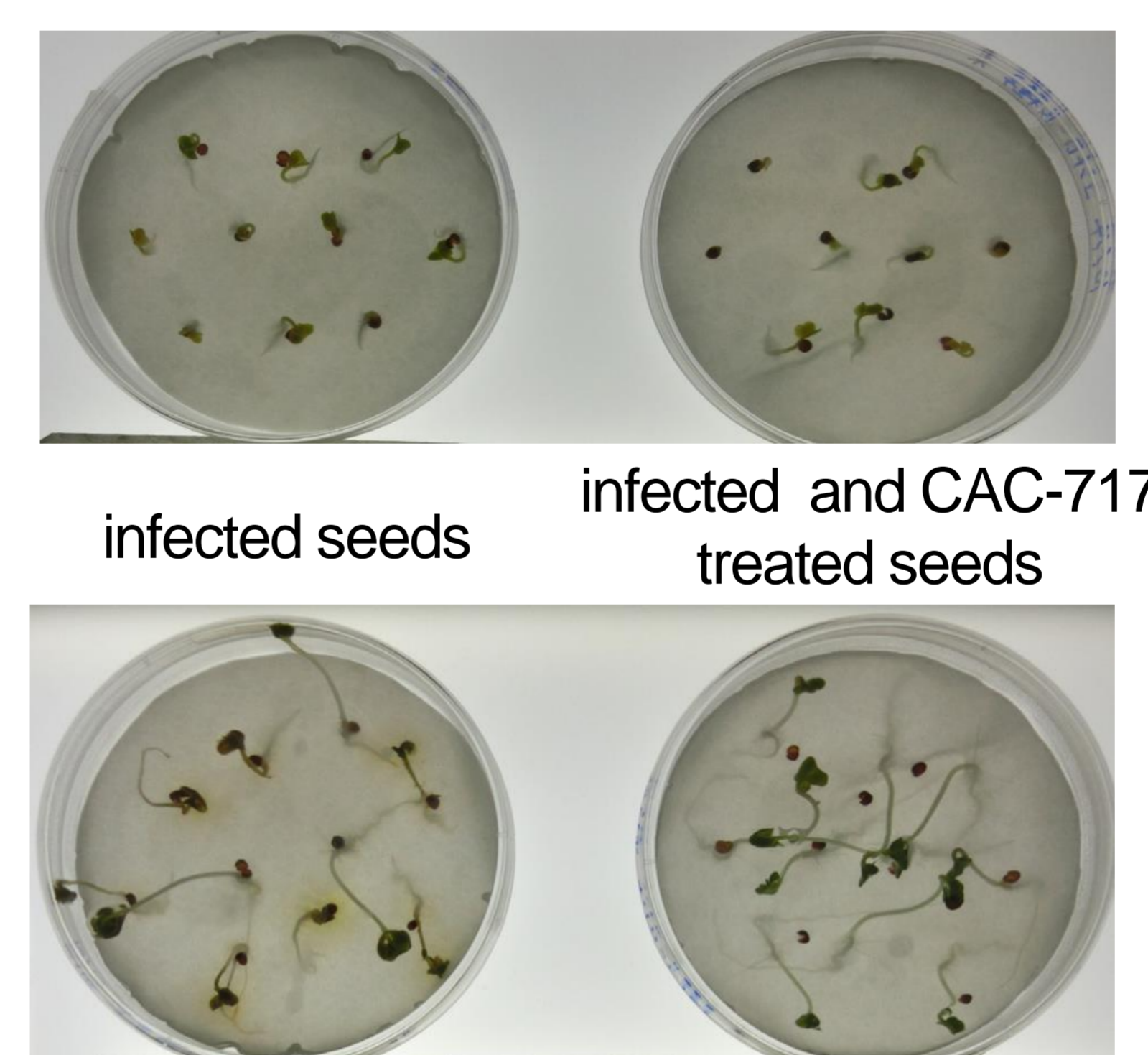


Figure 7

200µg protein in 100µL PBS or RIPA
 (ScN2a or N2a cell lysate)
 +
 100µL CAC-717 solution or PBS (control)

 Total 200µL
 1 hr, room temperature
 ↓
 PK treatment 20µg/ml 37°C 1hr
 ↓
 15µL/lane

Figure 6
Cabbage seeds infected with black rot bacteria

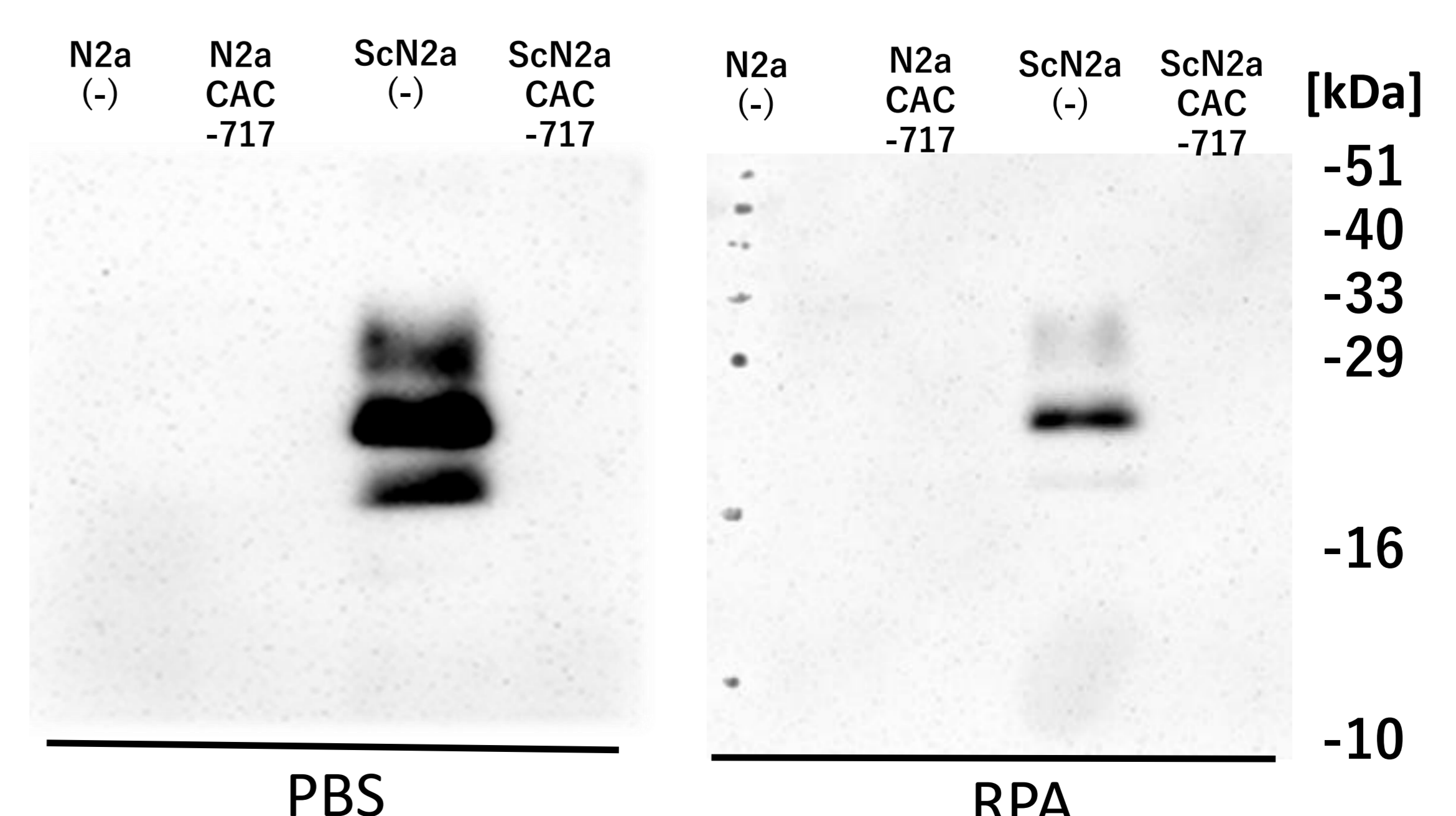


2 days cultivation
 No change in colour

5 days cultivation
 Change in colour in infected seeds

No change in colour
 in infected and CAC-717 treated seeds

Figure 8
CAC-717 treatment to Chandler prions



ScN2a or N2a cell lysate

PBS or RIPA diluted samples, PrPres decreased to under the detection levels, after treatment with CAC-717

15 µL/lane (-) indicated PBS instead of CAC-717 solution