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Dates: 06/16/21 – 06/18/21

## A Preliminary Investigation of TeloCol 3 Rheology with Temperature Variance

### Materials

- TeloCol-3, PN:5056, LN:8289
- Neutralization Solution for TeloCol-3 Collagen, PN:5163, LN:8297

### Equipment

- 1000  $\mu$ L pipette and tips
- Scales: (ID: 1075, 1320)
- ElastoSens (ID: 1271)
- Falcon 14 mL Polystyrene Round-Bottom Tubes
- VWR 12x75 mm Glass Tubes

### Procedure

#### *Setting up the ElastoSens*

1. With the ElastoView program running open 'Settings' and perform a system calibration using the calibration piece
2. In 'Configuration' set the following Parameters:
  - a. Sample & Holder configuration: Stiff Sample, Sample 1
  - b. Test description: Fill in required fields Project Name and Test Name
  - c. Measurement parameters: Turn 'Thermal chamber after the test' ON, add new parameters by clicking the '+' to the right of the table. on TIME choose the following:
    - i. Multiple Measurements
    - ii. Start time: 0 min
    - iii. Test duration: 45 min
    - iv. Temporal step: 1 minLeave TEMPERATURE settings on the default settings.
  - d. Thermal Chamber temperature setpoint was set at 20, 25, 30, and 37 at various times to reflect temperature variance in the experiment.
3. In Measures:
  - a. Click 'Initialize new test'.
  - b. Place chosen large ElastoSens cup into the machine and click 'Calibration'.
4. Begin preparing gel sample.

#### *Gel Preparation*

1. Fill a beaker with ice.
2. Pipette excess 500  $\mu$ L Neutralization Solution into a 12x75 mm glass tube and place in beaker with ice.
3. Weigh out 4.5 g TeloCol-3 into a 14 mL round-bottom tube and place in beaker with ice.
4. Pipette 500  $\mu$ L chilled Neutralization Solution into the 14 mL tube with TeloCol-3.
5. Gently mix for approximately 1 minute.
6. Pour approximately 3.5 g TeloCol mixture into a large ElastoSens cup.

7. Rotate and tilt cup slightly to break surface tension (aim to cause gel to concave rather than convex).
8. Place cup in ElastoSens and, under Measures on the ElastoSens, click 'Start'.

### Results and Discussion

In the 'Gel Preparation' procedure above weights for step 3 varied between 4.5 g and 4.51 g and weights for step 6 varied between 3.5 g and 3.56 g. A summary of the maximum G' values and approximate gelation times can be seen in Table 1. A continuous look at the viscoelastic reading taken can be seen in Figure 1.

Table 1. G' max and approximate gelation start times for TeloCol-3 gel at varying temperatures.

Date	Temperature (°C)	G' Max (Pa)	Approximate Gelation Start Time (min)												
06/16/21	37	2784.93	4												
06/16/21	30	2840.4	6												
06/17/21	25	2619.27	8	06/18/21	22	2590.47	14	06/16/21	20	2875	20	06/17/21	20	2597.07	23
06/18/21	22	2590.47	14												
06/16/21	20	2875	20												
06/17/21	20	2597.07	23												

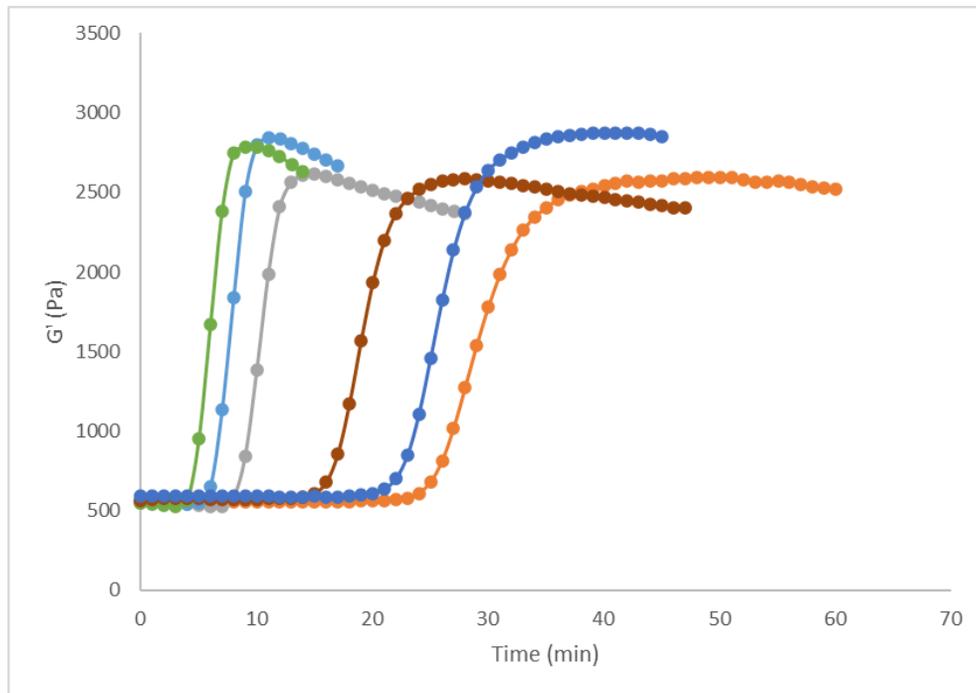


Figure 1. Viscoelasticity graphs for TeloCol 3 at Temperatures: (green) 37°C taken day 1, (light blue) 30°C taken day 1, (gray) 25°C taken day 2, (red) 22°C taken day 3, (dark blue) 20°C taken day 1, (orange) 20°C taken day 2.

Slight discrepancies in the maximum G' values can likely be attributed to variations between days as values were consistent when readings were taken in the same day. Taking into account the discrepancy between days, it can be seen that while temperature had a significant effect on gelation start time between the two temperatures, there was little effect on the maximum G' value. As temperature decreased the time

to begin gelation increased notably. However, while the maximum  $G'$  values were likely not affected, it should be noted that as temperature decreased the  $G'$  showed a more gradual decline after reaching its peak when compared to higher temperatures. This effect on decline could indicate an increased stability of the formed gels at lower temperatures. This effect could also be contributed to the sample “drying out” in the sample cup, or other unknown variables associated with this type of rheology/equipment.

### Conclusion and Future Work

From this investigation it can be concluded that temperature variance when creating TeloCol-3 gels has a significant affect on the gelation start time: where lower temperatures result in a later start in gelation than higher temperatures. In contrast temperature had little to no perceived effect on the maximum  $G'$  value.