

Comparison of Fluid Handling and Softness Properties of Three Foam Dressings

Hansen Swaniker
Research Associate, R&D Wound Care
Kendall, a division of Tyco Healthcare Group LP
Mansfield, MA

SUMMARY

COPA™, ALLEVYN™ Non-adhesive and POLYMEM®* polyurethane foam dressings were characterized for two key customer requirements, Softness and Fluid Capacity.

The COPA dressing at 8.0 cc/ in², exhibited a fluid capacity that is almost 2 times (1.70x) that of the ALLEVYN dressing at 4.8 cc/ in², and almost 3 times (2.97x) that of the POLYMEM dressing, which showed a fluid capacity of 2.7 cc/ in² (*Table 1, Figure 3*)

In the Softness evaluations, the COPA dressing, with a Softness value of 7.8 N/ cm, is approximately three times (2.7x) softer than the ALLEVYN which has a Softness value of 20.7 N/ cm. COPA is more than fifteen times (15.4x) softer than the POLYMEM dressing which is shown to have an average Softness value of 120.5 N/ cm (*Table 2, Figure 4*).

PURPOSE

To qualitatively characterize fluid handling, specifically fluid capacity, and softness properties of three currently marketed polyurethane foam dressings.

MATERIALS/ EQUIPMENT

Softness

- Texture Analyzer (TA-32, XT – Plus)
- 2in² Indentor Foot (see Figure 1)

Fluid Capacity

- Calibrated weighing balance capable of measuring to 3 decimal places (0.000).

- Isotonic saline (0.9% NaCl) - record date produced and expiration date if made in-house, or lot number and expiration date if purchased from vendor.
- Petri or other dish large enough to hold 2 inch x 2 inch specimen.

Test Articles

- COPA Hydrophilic Foam Dressing (Product Code 55544, Lot 532641, Exp 2010-02), Tyco Healthcare/ Kendall.
- ALLEVYN Non-Adhesive Hydrocellular Foam Dressing (Product Code 66927637, Lot 0431, Exp. 2007-08), Smith & Nephew.
- POLYMEM Foam Dressing (Product Code 5044, Lot 10305E1, Exp. 2008-04), Ferris Pharmaceuticals, Inc.

METHODS

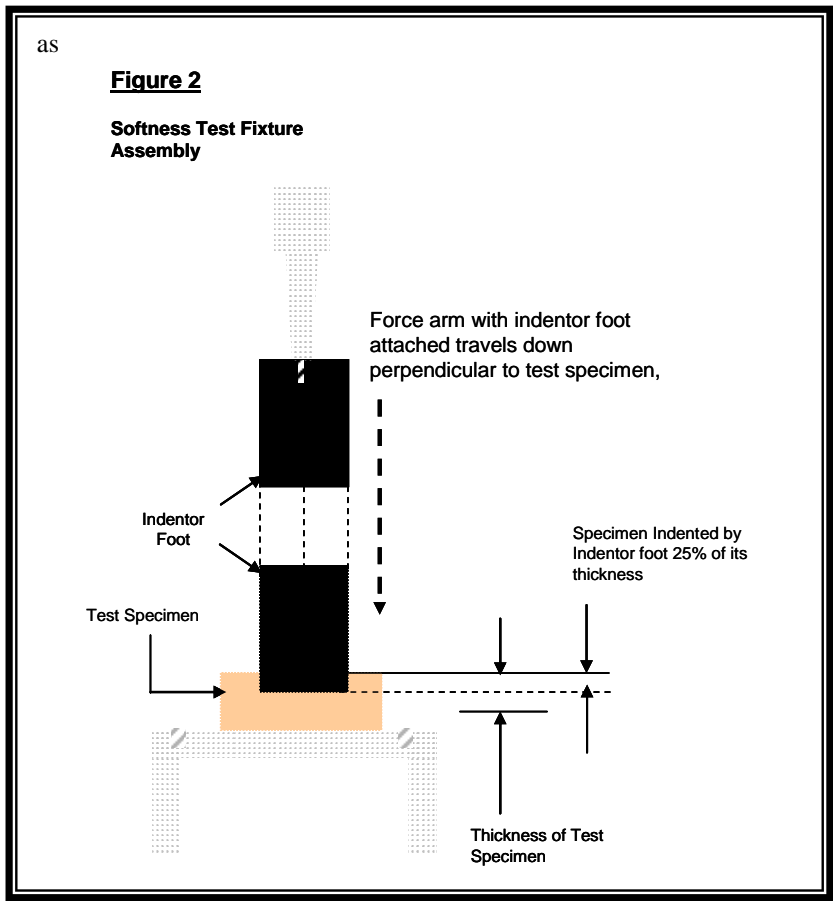
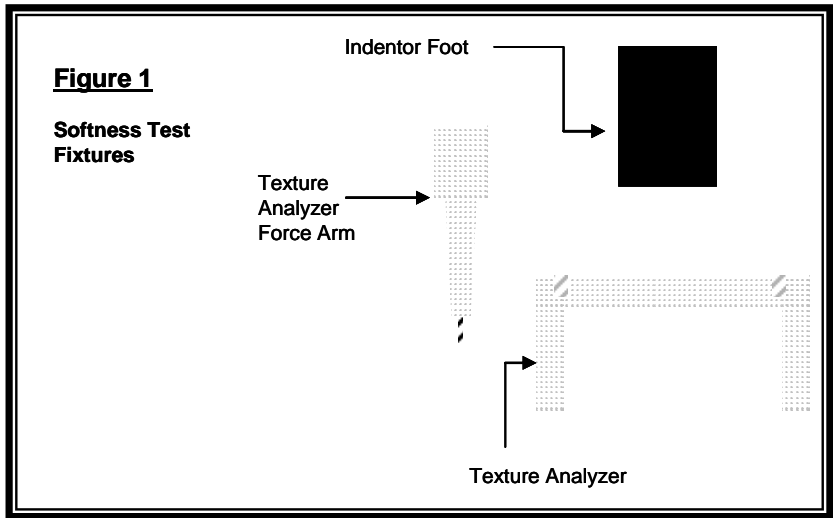
Softness

- The thickness¹ (t) of test specimen is measured and recorded in centimeters (cm)
- The unknown force required to indent the specimen 25% of its thickness (f_{25}) using a 2in² round indenter foot is measured and recorded in Newtons (N). The Texture Analyzer apparatus, related software program sequence and ancillary fixtures are used (*Figures 1 & 2*).
- Softness (S) is calculated by dividing force required to indent the specimen by the thickness of the specimen ($S = f / t$)

Fluid Capacity

- The dimensions, length (l) and width (w), of dry dressing specimen is measured in inches.
- The dry weight (dw) of specimen is measured in grams...
- A bath is filled with saline solution.
- The specimen is placed in the saline bath.
- Using a plate, the specimen is compressed and released inside the saline bath three times in succession to remove any air bubbles which may be trapped within the specimen, and to force fluid into the matrix of the specimen.
- After 24 hours in the saline bath, the saturated specimen is removed from bath and weighed. The wet weight (ww) is recorded.
- The fluid capacity (fc) of the specimen per unit a given unit of specimen is calculated by subtracting the dry weight from the wet weight and dividing the quantity by the dry area of the specimen tested. $fc = (ww - dw) / (l \times w) = \text{g} / \text{in}^2$.

¹ To accommodate for the unavoidable variation in the thicknesses of samples of interest, and to normalize the data to facilitate comparison of samples, the thickness of each specimen tested is factored into the calculation of the Softness value.



RESULTS

Table 1: Fluid Capacity

Replicate No.	cc/ in ²		
	COPA	ALLEVYN	POLYMEM
1	8.2	4.9	2.6
2	8.0	4.9	2.5
3	8.3	5.1	2.7
4	8.1	5.0	2.7
5	7.9	4.8	2.9
6	8.0	5.0	2.7
7	7.8	5.0	2.8
8	8.1	4.7	2.8
9	8.1	4.6	2.8
10	8.0	4.4	2.4
Avg.	8.0	4.8	2.7
St Dev	0.1	0.2	0.1
Min.	7.8	4.4	2.4
Max.	8.3	5.1	2.9

Table 2: Softness

Replicate No.	N/ cm		
	COPA	ALLEVYN	POLYMEM
1	8.1	21.0	109.4
2	8.4	20.5	118.0
3	7.8	20.7	122.8
4	7.5	19.7	129.5
5	7.0	21.4	125.1
6	6.9	21.5	123.3
7	8.2	20.4	117.8
8	8.8	20.7	127.5
9	7.4	20.4	122.1
10	8.0	20.9	110.1
Avg.	7.8	20.7	120.5
St Dev	0.6	0.5	6.8
Min.	6.9	19.7	110.1
Max.	8.8	21.5	129.5

Figure 3
Absorptive Capacity - Foam Dressings (cc/ in²)

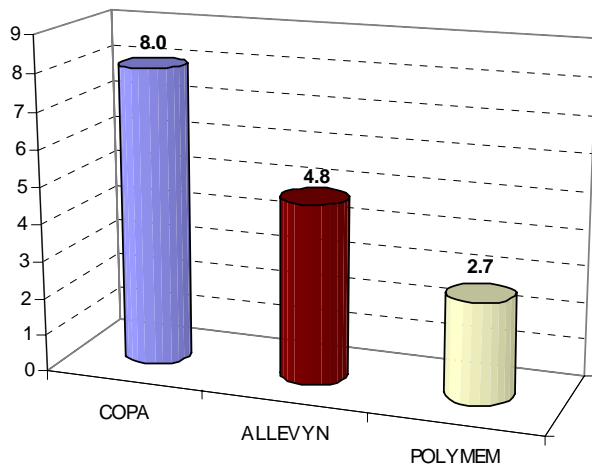
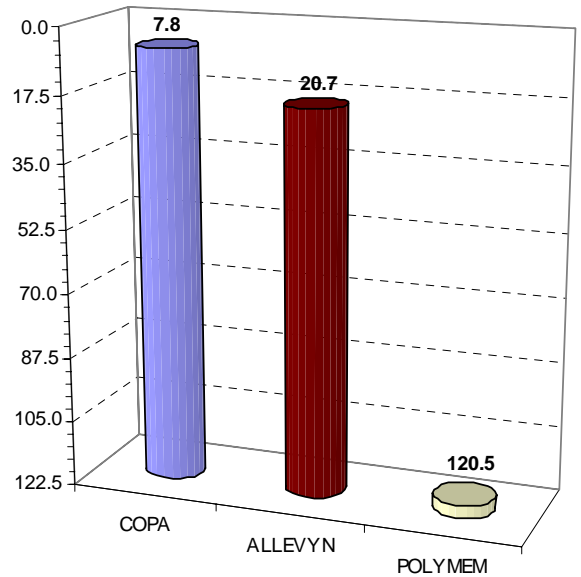


Figure 4
Softness - Foam Dressings (N/ cm)



DISCUSSION

For Fluid Capacity, ten replicates were tested for each dressing type evaluated. The COPA foam averaged a fluid capacity of 8.0 cc/ in² of dressing material. Test values ranged from 7.8 cc/ in² to 8.3 cc/ in² with a standard deviation of 0.1 cc/ in². The Allevyn foam averaged a fluid capacity of 4.7 cc/ in² of dressing material. Test values ranged from 4.4 cc/ in² to 5.1 cc/ in² with a standard deviation of 0.2 cc/ in². The Polymem foam averaged a fluid capacity of 2.7 cc/ in² of dressing material. Test values ranged from 2.4 cc/ in² to 2.9 cc/ in² with a standard deviation of 0.1 cc/ in². (*Table 1, Figure 3*)

For Softness, ten replicates were tested for each dressing type evaluated. The COPA foam showed an average Softness value of 7.8 N/ cm. Test values ranged from 6.9 N/ cm to 8.8 N/ cm with a standard deviation of 0.6 N/ cm. The Allevyn foam showed an average Softness value of 20.7 N/ cm. Test values ranged from 19.7 N/ cm to 21.5 N/ cm with a standard deviation of 0.5 N/ cm. The Polymem foam showed an average Softness value of 120.5 N/ cm. Test values ranged from 110.1 N/ cm to 129.5 N/ cm with a standard deviation of 6.2 N/ cm. (*Table 2, Figure 4*)

CONCLUSION

The COPA dressing appears to be significantly superior to both the Allevyn and Polymem dressings with respect to the functional attributes evaluated in this study.

COPA absorbed and retained an average 8.0 cc/ in² of fluid per square inch of dressing material compared 4.8 cc/ in² for the Allevyn dressing and 2.7 cc/ in² for Polymem (*Table 1, Figure 3*).

The lower the Softness value, the softer the dressing is. The average Softness value of the COPA dressing was 7.8 N/ cm compared to 20.7 N/ cm for the Allevyn dressing, and 120.5 N/ cm for Polymem (*Table 2, Figure 4*).