The right prescription?

Developing sustainable solutions for pharmaceutical and nutritional packaging.

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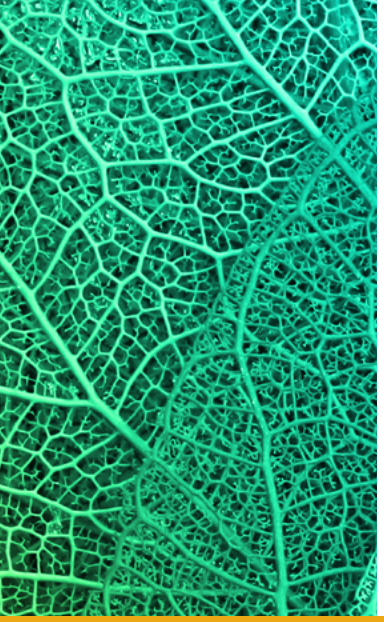
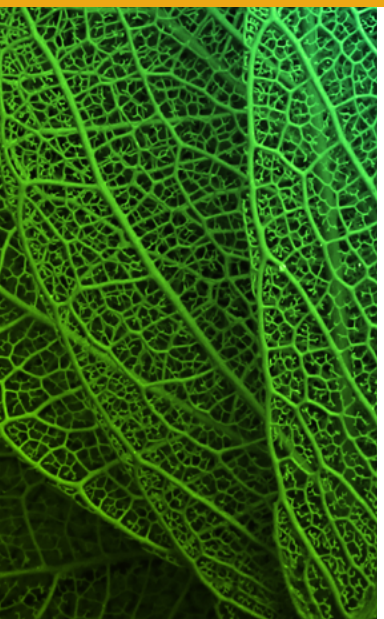


INTRODUCTION



Let's make a change for the better.

Stepping up.

There's an old joke that says, "Change is good. You go first."

A lot of people feel the same way about sustainability. We know it's essential…but nobody thinks it will be easy. Especially in a complex arena like pharmaceutical and nutritional packaging.

At Dow, we believe the best way to balance the needs of society and our planet is to keep moving toward a more sustainable, circular economy.

And the best way for us to help is to combine our knowledge and experience with that of our customers and other experts.

Moving forward.

That's why we're constantly working to improve. Innovating how we source, manufacture and deliver medical grade polymers. Striving to produce thinner, lighter mono-material solutions; designing for recyclability; helping reduce waste. And, most importantly, driving ahead with conversion to bio-based feedstocks and exploring other evolving technologies, such as advanced recycling.

We're excited by the challenges and opportunities ahead – and hope you'll join us on the journey to develop better, safer, more sustainable pharmaceutical and nutritional packaging solutions.

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PHARMA BOTTLES

How can we help **build a better bottle?**

There's a lot riding on pharmaceutical and nutritional bottles. In addition to helping ensure the quality and integrity of their contents, they need to help extend shelf life and be strong enough to prevent damage during shipping and storage.

Historically, many of these benefits have been achieved by increasing wall thickness – or even adding special barrier layers, desiccants or oxygen scavengers. These options, however, contradict today's demands for 100 percent recyclability and other contributions to sustainability efforts.

So, how can we help produce bottles that address all these evolving needs?

Breaking barriers.[1]

CONTINUUM™ DMDF-6620 HEALTH+™ Bimodal Polyethylene Resin is changing the game for pharma and nutritional bottles.

By offering significantly lower moisture vapor transmission rates (MVTR) than conventional blow molding materials (Figure 1), this advanced high density polyethylene (HDPE) can create excellent opportunities for extended shelf life. Likewise, the resin's inherent stiffness and toughness allow it to offer improved bottle rigidity/strength performance balance (Figure 2) and exceptional environmental stress crack resistance (ESCR – Figure 3). This also creates the potential for up to 30 percent lighter bottle weights – and corresponding reductions in the use of virgin plastic.

Figure 1: MVTR comparison at various bottle sizes[1]

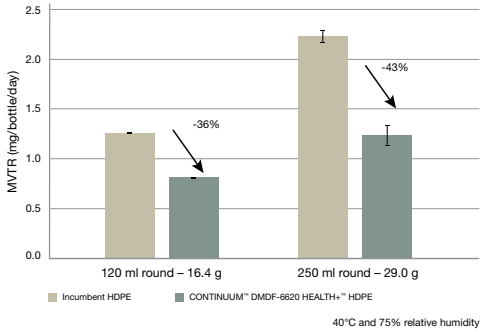


Figure 2: Top load comparison[1]

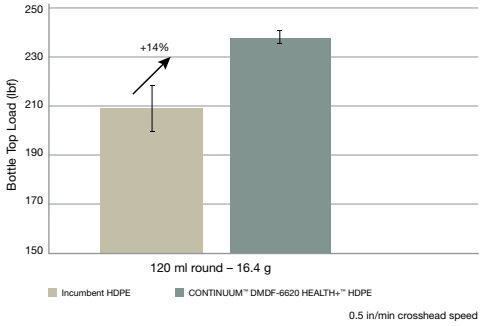
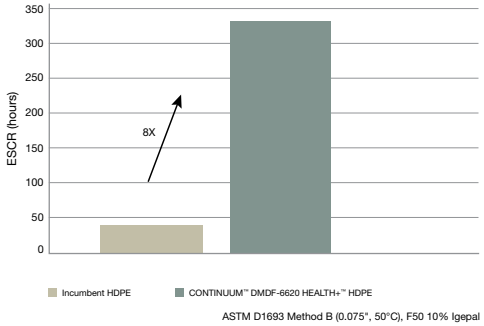


Figure 3: ESCR comparison[1]



[1] Typical values, not to be construed as specifications. Users should confirm results by their own tests.

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CONTINUUM™ DMDF-6620 HEALTH+™ Bimodal HDPE also offers excellent processability in a variety of blow molding processes. The single-pellet solution can enable faster cycle times, and its higher upper use temperature can be especially valuable for hot fill applications.

Finally, as part of our DOW™ HEALTH+™ Polymers family (page 7), CONTINUUM™ DMDF-6620 HEALTH+™ Bimodal HDPE complies with U.S. FDA 21 CFR 177.1520 (c) 3.2a, U.S. FDA drug master file (DMF) listings, U.S. USP Class VI[1] and USP <661.1>.[1] When you put it all together, the result is 100 percent recyclable bottles that answer all current pharma and nutritional packaging needs.

Into the future.

This exciting breakthrough also offers two distinct ways to enjoy its benefits. First, a conventional formulation is available now. Second, an identical formulation produced with bio-based feedstock will be available in 2024.[2]

We'd love to learn more about your specific pharma and nutritional bottle challenges. By combining our efforts, we can keep driving innovation, performance, efficiency, safety, security – and sustainability. Please contact your Dow representative or visit www.dow.com/contact to get the conversation started.

[1] TERC assessed for compliance via cross-read from a similar tested product.
[2] Pending ISCC certification.

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ADDING EVEN GREATER VALUE

How can we be **a better partner?**

Topping it off.

In addition to the groundbreaking CONTINUUM™ DMDF-6620 HEALTH+™ Bimodal HDPE, we offer several excellent solutions for pharma and nutritional caps and closures. Please see page 9 for more information on **DOW™ HEALTH+™ HDPE Resins** and **EVERCAP™ Innovative Closure Resins** designed to meet the unique challenges of these applications.

Excellent performance. Added assurance.

DOW™ HEALTH+™ Polymers are proven polyethylene (PE) resins designed specifically to meet the stringent requirements placed on healthcare-related applications.

These outstanding solutions are manufactured to rigorous specifications for lot-to-lot consistency and quality, meaning you get the same materials from initial application development through testing and final commercialization. Equally important, each DOW™ HEALTH+™ Polymer product is certified in accordance with requirements for selected healthcare applications – and they're backed by our HEALTH+™ service offering, which includes but is not limited to:

- Secure, global product supply
- 1-year notification of change (NOC) + 1-year right to buy
- Drug master file (DMF) listings
- USP Class VI and/or EU Pharmacopeia
- USP <661.1>

Health+™ polymers by DOW

In addition to offering exceptional performance and processability while helping navigate the regulatory compliance process, use of DOW™ HEALTH+™ Polymers can also promote sustainability. Helping to reduce raw material usage, simplify recycling processes and lower greenhouse gas (GHG) emissions/global warming potential (GWP) are just a few of the many opportunities.

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Collaborate. Innovate. Accelerate.

Our deep understanding of material science, versatile product portfolio, strong focus on innovation and fundamental belief in collaboration allow us to offer unique resources to help develop the best possible answers for specific application needs.

One example? **Pack Studios** – our exclusive, global network of technical experts, equipment and testing capabilities – which was specifically created to help bring innovative solutions to market faster.

pack STUDIOS

By teaming up, we can produce better, more sustainable pharmaceutical and nutritional products. Please contact your Dow representative or visit www.dow.com/contact to get the conversation started.

A specialized product offering

Our portfolio of premium materials for pharmaceutical and nutritional bottles, caps and closures features CONTINUUM™ DMDF-6620 HEALTH+™ Bimodal Polyethylene Resin, DOW™ HEALTH+™ 8000 Series HDPE Resins and select grades of EVERCAP™ Innovative Closure Resins. If you don't see what you're looking for here, please feel free to ask. We're always interested in collaborative innovation.

Table 1: Polymers for Pharmaceutical and Nutritional Bottles

Product	Fabrication Method(s)[1]	Typical Application(s)	Density (g/cc)[2]	Melt Index – 190°C/2.16 kg (g/10 min)[2]	Melt Temp. – DSC (°C)[2]	2% Secant Modulus (psi)[2]	Tensile Strength @ Yield (psi)[2]	Biocompatibility Test(s)
The following products use the NOC Policy for DOW™ HEALTH+™ Polymers and require **1-year** notification of change.								
CONTINUUM™ DMDF-6620 HEALTH+™ Bimodal High Density Polyethylene Resin **BIO-BASED OPTION AVAILABLE 2024[3]**	CBF, EBM, IBM	Rigid Bottles, Film	0.960	0.28	133	170,000	4,000	USP Class VI[4] USP <661.1>[4]

Table 2: Polymers for Pharmaceutical and Nutritional Caps & Closures

Product	Fabrication Method(s)[1]	Typical Application(s)	Density (g/cc)[2]	Melt Index – 190°C/2.16 kg (g/10 min)[2]	Melt Temp. – DSC (°C)[2]	2% Secant Modulus (psi)[2]	Tensile Strength @ Yield (psi)[2]	Biocompatibility Test(s)
The following products use the NOC Policy for DOW™ HEALTH+™ Polymers and require **1-year** notification of change.								
DOW™ DMDA-8007 HEALTH+™ High Density Polyethylene Resin[IV]	IM, CM	Caps & Closures, Molded Parts	0.965	8.3	133	205,000	4,500	USP Class VI USP <661.1>
DOW™ DMDA-8904 HEALTH+™ High Density Polyethylene Resin[IV]	IM, CM	Caps & Closures, Molded Parts	0.953	4.4	131	160,000	3,900	USP Class VI USP <661.1>
DOW™ DMDA-8907 HEALTH+™ High Density Polyethylene Resin[IV]	IM, CM	Caps & Closures, Molded Parts	0.952	6.8	131	155,000	3,900	USP Class VI USP <661.1>
DOW™ DMDA-8920 HEALTH+™ High Density Polyethylene Resin[IV]	IM	Caps & Closures, Molded Parts	0.954	20	130	167,000	4,100	USP Class VI USP <661.1>
DOW™ DMDA-8940 HEALTH+™ High Density Polyethylene Resin[IV]	IM	Caps & Closures, Molded Parts	0.951	44	128	148,000	3,900	USP Class VI USP <661.1>
The following products are in scope for bio-based feedstock options. Please contact a Dow representative for additional information.								
EVERCAP™ DMDC-1250 High Density Polyethylene Resin	IM, CM	Caps & Closures	0.955	1.5	130	160,000	4,100	—
EVERCAP™ DMDA-1260 High Density Polyethylene Resin	IM, CM	Caps & Closures	0.965	2.7	135	204,000	4,300	—

(1) Legend: IM = injection molding, CBF = compression blow forming, EBM = extrusion blow molding, IBM = injection blow molding, CM = compression molding
(2) These are typical properties, not to be construed as specifications.
(IV) Approved for use in intravenous applications (e.g., prefilled syringes, IV bags and tubing [excluding blood bags and tubing])
(3) Pending ISCC certification.
(4) TERC assessed for compliance via cross-read from a similar tested product

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For more information about Dow, visit **www.dow.com/about.** To contact a Dow representative, visit **www.dow.com/contact**.

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