



# INSIDER<sup>®</sup>



A SPECIAL ALL-DIGITAL ISSUE

VOLUME 4 ISSUE 5

\$20.75 US

March 2014

# Vegetarian Softgels: Clean Labels, Stable Manufacturing

Popular delivery form  
gets innovative update



# A Softie for Vegetarians

**P**lenty of the capsules I use are gelatin, and I'm OK with that.

But I prefer to use vegetarian softgels, and I'm willing to spend more on them. It seems right to me to reduce the carbon footprint, the risk of consuming animals that were treated inhumanely and to support companies that are taking a step to reducing meat consumption.

Plus, it makes sense for a lot of supplements to have vegetarian softgels. For instance, if a customer is supplementing with algae as a vegetarian source of DHA (docosahexaenoic acid) and EPA (eicosapentaenoic acid), she is likely looking for a vegetarian softgel to go along with it.

I've always thought vegetarian softgels were something companies could do to serve their customers' desires, but at an increased manufacturing hassle. Why else would gelatin be so common?

But this Digital Pulse explains that vegetarian softgels can provide manufacturing benefits along with a vegetarian claim. Technology has advanced so far that plant-based products offer a high heat stability.

But it's not likely to be a one-to-one conversion from gelatin to plant-based softgels. A supplement brand looking to offer vegetarian options must consider the manufacturing environment. Softgel machines will need reconfiguration, and employees will need training on new processes.

The new process could be slower, and thus, more costly to brand owners, which may cause them to increase prices of finished products. Although, experts say as technology improves, prices are likely to decrease.

A brand needs to research before it leaps to veggie softgels, but for those companies that do, consumers like me are willing to reward the investment.



**Vegetarian softgels can provide manufacturing benefits along with a vegetarian claim.**



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# Vegetarian Softgels Allow for Clean Labels, Stable Manufacturing

Popular delivery form gets innovative update with vegan- and manufacturing-approved softgels

by Marygrace Taylor

**S**oftgels have been a mainstay in supplement delivery, but innovation has brought new life into the traditional delivery system. Early starch-based vegetarian softgels lacked the stability to compete against more durable, gelatin-based versions. However, recent modifications to plant-based gels have made vegetarian capsules a viable option with attractive manufacturing benefits and label claims.

## INSIDER's Take

- Plant-based diets are growing in popularity, with 13 percent of American identifying themselves as vegan or vegetarian.
- Plant-based softgels satisfy vegetarian consumers' concerns and also provide great heat stability.
- Development of rigid carbohydrate gels has made vegetarian softgels stronger and more durable than their starch-based predecessors.

## Animal vs. Vegetarian Softgels

Both animal- and plant-based softgels are popular supplement delivery systems that take about 15 minutes to disintegrate once swallowed. But that's largely where their similarities end. Animal-based softgels are made from gelatin, derived from bovine or porcine skin and bones.<sup>1</sup> And until recently, gelatin was the only material that proved durable enough to reliably hold softgel fillings and withstand temperature fluctuations.

"Gelatin has been around for centuries, and it's a strong performer," said Lara Neimann, marketing director at Gelita USA. "It's temperature stable, is humidity stable, has a long shelf life, is highly soluble and is able to release an active fill," she said. What's more, as a collagen-derived protein, gelatin is a non-allergenic protein that's highly absorbed. "All of those foundation points make gelatin highly desirable as a delivery system," Neimann said.

Unlike protein-based animal softgels, vegetarian softgels are carbohydrate-based. The earliest incarnations consisted largely of starch and tended to perform poorly. "They were only available in small sizes, and because it was just starch, there were a lot of leakage issues," said Robin Koon, executive vice president at Best Formulations.

Other experts echoed a similar story: "You'd hear mixed reviews in terms of affordability, performance and physical ability," said Lisa Clark, vice president of business development at Capttek Softgel Formulations. "That's really important, because you don't want things to be leaking."

### Animal-based softgels

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derived from



or



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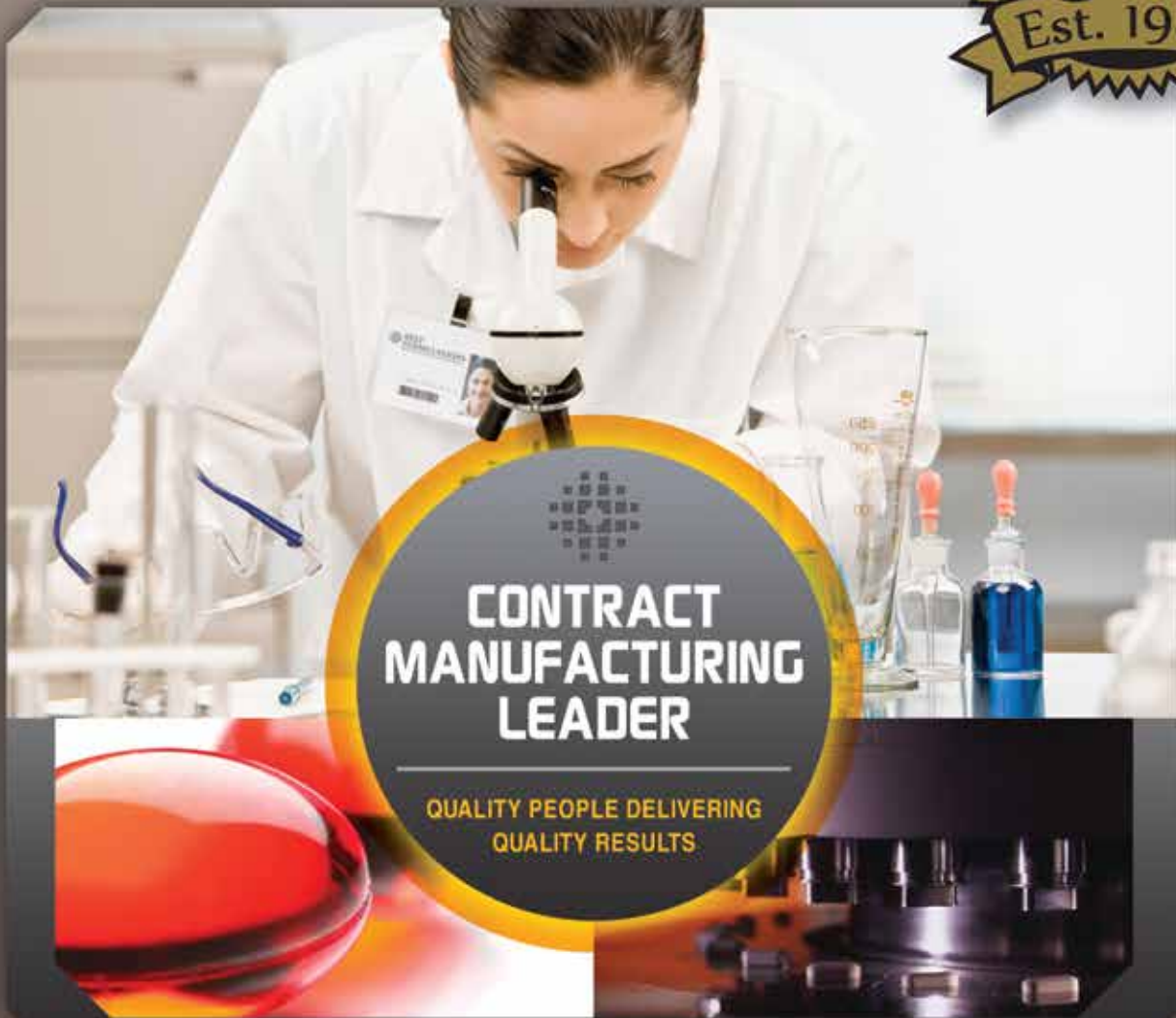
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While starch-based vegetarian softgels proved unreliable, the game changed once a certain type of seaweed was added to the mix. In the mid 2000s, Chemical manufacturing company FMC Corp. developed Kappa-2, a gel derived from carrageenan, a naturally-occurring carbohydrate extracted from red seaweed.<sup>2</sup> By binding to water to create a strong, rigid gel structure,<sup>3</sup> Kappa-2's firmness eliminated the leaking problem common in earlier, starch-based gels. By using a combination of carrageenan, modified starch, cellulose, water, and plasticizing agents such as glycerin and sorbitol,<sup>4</sup> softgel manufacturers were able to pump out vegetarian capsules in a range of sizes with durability that measured up to their animal-based counterparts.

### The Vegetarian Benefit

Plant-based diets are growing in popularity. In 2008, a Harris Interactive poll found 3.2 percent of Americans identified as vegetarian and 0.5 percent identified as vegan.<sup>5</sup> Those numbers increased by 2013, when a Public Policy Polling survey found that 6 percent of Americans identified as vegetarian and 7 percent identified as vegan.<sup>6</sup> Fear of certain animal-transmitted diseases, such as mad cow disease, also continue to grow.<sup>7</sup>

"There's a large and growing population concerned about gelatin," said Chris Coscino, a business development consultant and owner of Marketing Concepts International.

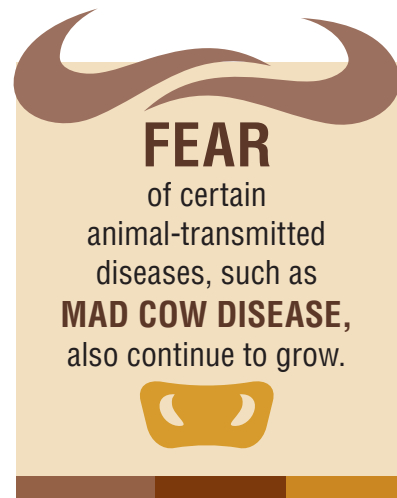
"They're realizing it's an animal by-product, and it's not appealing."

The growing interest in plant-based diets translates into a wider base for vegetarian softgels. "Twenty years ago, when you were looking at this vegetarian position, we had a much smaller population," Coscino said. "Years later, there's a critical mass."

Plant-based softgels are also experiencing a surge of interest in international markets such as Asia, said Terry Jackson, vice president of sales for Captek Softgel.

Still, being plant-based isn't always enough for many vegetarian and vegan food and supplement brands. According to Clark, many manufacturers in the vegetarian marketplace

are springing for non-GMO certification. Right now, the verification is out of reach for vegetarian softgel manufacturers. Currently, the only independent verifier is nonprofit organization the Non-GMO Project, who stipulates that every ingredient in a product must be certified GMO-free beginning at its source of origin. Under those guidelines, that makes FMC's carrageenan, which is grown in the ocean and considered an uncontrolled material, uncertifiable, Clark said. "If people are going to spend a premium [for vegetarian softgels] and not get the non-GMO seal, we'll see how that will play out this year," Clark said.



Additional non-GMO certifying bodies are currently in development, and both Clark and Koon expect non-GMO interpretations to be better defined in 2014.

## Manufacturing Pros and Cons

Label appeal aside, there's another big benefit to vegetarian softgels: They're incredibly heat-stable. In fact, when researchers at Captek Softgel International started designing a vegetable capsule, it wasn't actually with the intent of reaching vegetarian audiences. Instead, it was to develop a capsule that would withstand hot, humid temperatures that can cause animal-based softgels to clump, leak or even melt during shipping. FMC's Kappa-2 fit the bill.

"The protein structure of animal gelatin interacts with water slightly higher than room temperature," said Paul Hwang, Captek's vice president of quality and regulatory. "With the non-animal form, you have to take it to excessive heat in order for the polysaccharides to take up water." While vegetarian capsules tend to be softer than bovine ones at room temperature, they've proven remarkably stable when the mercury and humidity rise. "We ran our own temp studies on the vegetarian gel, and they're still a perfect shape at 130 degrees Fahrenheit with no change," Koon said. "It doesn't suck up water from the atmosphere, either."

On the other hand, the same properties that make carrageenan-based softgels so heat stable are what can complicate the manufacturing process. "The physiochemical structure is entirely different, hence manufacturing processes being different," Jackson said. The thicker, stickier, more heat-resistant vegetarian gel is hard for machines built for manufacturing animal-based gels to process.



**While vegetarian capsules tend to be softer than bovine ones at room temperature, they've proven remarkably stable when the mercury and humidity rise.**

"You can't just buy a machine, plug it in and run veggie gelatin," Coscino said. "It's a pretty long, expensive R&D (research and development) process. It can take several years and several million dollars to tweak the machine to get it right."

In this case, tweaking means developing a machine that can heat the vegetarian gel up to around 200 degrees Fahrenheit to make it pliable and able to be hydrated. Even then, the gel's high viscosity causes the machines to run slower, resulting in fewer capsules manufactured per hour, Koon said. The thickness also creates a bigger potential for air bubbles, which, once they've made their way into the gel, can be hard to get out.

Vegetarian softgels can be dyed using the same process as animal-based gels. However, the actual colors used may vary, since the very high processing temperatures call for colors that can withstand intense heat. "A lot of natural colors are not heat stable. But we've been working with some suppliers that were already developing new materials that were more heat

stable because of growing interest in natural coloring,” said Rebecca Montes, Captek Softgel International’s director of R&D. Currently, Captek has been working with heat-stable annatto, lycopene and chlorophyll as colorants.

And as for fillings? Simple, lower viscosity pastes such as CoQ10, ubiquinol, astaxanthin and algae oil work well in vegetarian capsules. Captek tests showed higher viscosity multivitamin pastes can hold up well too, Montes said. For the time being, formulations with a lower pH, or that include ingredients that are hydroscopid-lecithins or phospholipids are more challenging. Leakage-prone krill is also difficult, “but that’s the case with bovine-based softgels too,” Hwang said.

Overall, the additional manufacturing considerations add up to a price point that’s about 25-percent higher than animal-based gels, with smaller capsules costing less than larger ones. “Usually, the larger the softgel, the bigger the cost spread between animal and non-animal encapsulation pricing, both in raw material and encapsulation costs,” Clark said.

**The additional manufacturing considerations add up to a price point that’s about 25-percent higher than animal-based gels.**



## The Future of Vegetarian Softgels

Are vegetarian softgels primed to overtake the softgel market? The answer depends on whom you talk to. “We’ve observed that overall, the softcap market continues to grow at about 8 percent a year, and that’s conservative,” said Gelita’s Neimann. “We’ve seen marginally higher growth in the vegetarian side, but it’s a really small portion of the market and hasn’t had a direct impact on our business.”

Plant-based softgel manufacturers tell a different story. While manufacturing and retail costs for vegetarian softgels run higher than their animal-based counterparts, those numbers are starting to drop. “We’re continuing to improve the manufacturing process and lower costs, and our yields have come up considerably,” Koon said, who estimated that non-animal gels account for 45 percent of Best Formulations’ business.

Clark agreed: “We’ve generated a new platform for a number of brands that are so far happy with it, and anticipate half of our demand will be for vegetarian softgels in about five years,” she said.

There’s also the fact that gelatin prices have risen 10 to 15 percent annually for the last several years, Coscino said. “The bone gelatin price is going up closer to vegetarian. There’s still a gap, but the gap is closing,” he said. “At what point do prices become almost the same, and for a company to spend an extra \$1 or \$2 per kilo, so they can get extra market share?”

Which raises the question: Will all softgels one day be vegetarian? No one seems ready to make that claim yet, but the outlook is positive. “As more companies start to get on vegetarian softgels, the future will get brighter,” Koon said. ■



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