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The Golden Winged Warbler And Creating Pharma Supply Chain Immunity

by Anju Ghangurde

Expert outlines how pharma can create resilient and secure supply chains and some benefits of localization.

Pharmaceutical companies should use digital technologies to immunize their supply chain networks against threats like the coronavirus pandemic while they are still brewing on the horizon, much as a certain species of bird native to a hurricane-prone region of the US somehow knows to take off long before the high winds arrive, a leading supply chain expert recently suggested.

Robert Handfield, executive director of the Supply Chain Resource Cooperative and professor of supply chain management at *North Carolina State University*, highlighted in a recent webinar the "exponential complexity" of global supply chains, with most organizations having "no idea" who their top 10 critical tier 2 suppliers are. Tier 2 firms are those that deal with a principal company's main direct suppliers.

Merck & Co., Inc. or *Pfizer Inc.* may have as many as 5,000 direct suppliers and each of these in turn may have up to 250 tier 2 suppliers of their own, resulting in more than a million different enterprises that are supporting an organization.

"What if there's a tornado, hurricane or a power outage? It only takes one incident because if you are producing a pharmaceutical good, you only need one supplier to fail you and if you don't have a backup, it can actually shut down production and lead to massive disruption in the supply chain," Handfield said in a keynote presentation at the virtual event. The webinar was organized by the Parenteral Drug Association India Chapter in collaboration with Rx-360, a non-profit industry consortium formed in 2009 in response to the economically motivated adulteration of

heparin active pharmaceutical ingredient in China. (Also see "*Coronavirus Supply Chain Threats Demand Coordinated Industry Response*" - Pink Sheet, 5 Feb, 2020.) (Also see "*Rx-360 Issues Guide On Remote Supplier Audits; CEO Warns They May Take Longer At First*" - Pink Sheet, 15 Oct, 2020.)

Handfield cited the instance of a congressional hearing in the US where *3M* was questioned on the domestic percentage of face mask production. While that figure stood at around 35%, which he said "doesn't sound too bad," that was only end production - the assembly of the spun fabric, elastic bands and nose plates. The worrying aspect was that all of those materials were produced in China and essentially in one region, Wuhan, the original epicenter of the coronavirus outbreak.

Similarly, in the pharma sector, a large number of active pharmaceutical ingredients (APIs) and API starting materials are produced in China and these are tier 2, 3 materials. Shortages in one of those areas could result in other spillover effects that would impact pharma companies.

The same holds true for India, where several APIs and critical materials are made. During the ongoing challenges amid COVID-19, organizations need to be aware and start looking at alternative suppliers, perhaps in other parts of India and not all located in one area, he advised.

Local And Regional Supply Chains

Handfield, who has consulted with more than 25 Fortune 500 companies across a variety of industries, noted how global supply chain networks started to break down as the pandemic spread. Fragmentation began as long lead times and export restrictions several nations imposed on personal protective equipment (PPE), drugs and critical materials exposed high risks in the chain. (Also see "*Lessons From COVID-19: How Pharma Supply Chains Must Evolve Before Next Disaster*" - Pink Sheet, 15 Apr, 2020.)

"All of a sudden, countries were really looking after their own and not really willing to ship critical components – this occurred even for test kits," he said in the pre-recorded presentation.

One of the key critical components of COVID test kits is the nasal swab. But the single largest manufacturer of nasal swabs is in Italy, which had shut down its borders and wasn't permitting exports of the swabs to third parties. "With these physical networks shut down, it starts to raise questions – maybe we need to look more closely at building a domestic supply or a supply [chain] that's perhaps more expensive but closer to us," Handfield proposed.

Domestic supplies may have some benefits as well, since lean supply chains mean you don't carry too much inventory if you have a local supplier who is shipping on a regular schedule. "You don't have a lot of inventory on boats/planes, sitting in customs, which is a good thing because less inventory means you have greater working capital/free cash flow. So, there is a movement - a lot of people asking the question - should we be producing locally using domestic suppliers and a lot

of discussion on that."

As organizations are starting to look at localization of certain critical industries, such as PPE, they are also thinking about building regional supply chains. India, Handfield said, has the potential to become a very strong player in terms of a regional hub that can serve much of Southeast Asia and other parts of the world as well.

Similarly, Mexico, Canada and the US may also emerge as another platform due to their proximity and trade agreements and the overall proximity of organizations in these countries. "I think we will start to see the deglobalization of our supply chains and starting to move towards more of the localization of supply chains."

However, the scale and scope are going to be difficult to predict since strategic supply chain redesign is impacted by various forces including capability, costs and regulatory considerations.

Supply Chain Sensing, Immunity

The way forward is to develop more agile and resilient supply chains, and Handfield outlined a new model that envisages creating "immunity" in the chain.

In a fascinating parallel to drive home the point, he referred to the golden winged warbler, a bird known to live in the southeastern US that typically flies in a pattern "guided by some sixth sense, which involves intense collaboration between thousands of birds all in motion flying together."

GOLDEN WINGED WARBLER

"If we use this metaphor and think of how supply chains could become more efficient through the Internet of things, technology - if we had all the trucks on our roads moving together at 80 miles per hour, six inches apart or in an Interstate having self-guided vehicles working together" Handfield imagined, adding that this idea of a pattern/self-guided supply chain is one he is exploring in a new book.

Interestingly, experts on bird migration have noted how a large group of warblers in one part of the US suddenly flew away, leaving the region for Florida, just two days before a massive hurricane hit the region. The birds apparently sensed the impending storm through infrasonic sounds emitted by such weather systems while they are still far away.

"And the challenge here is can humans find a way to mimic these ways or other signals to better predict what might happen to our supply chains later this afternoon/next week/month? The more sensing we pick in our supply chains, the better we will be able to sense and avoid disruptions, and risk and technologies may one day be able to help us to do so," he explained.

The idea behind sensing bad weather is analogous to the human immune system recognizing invaders; there is also an acquired immune system. Handfield recommended creating similarly immune supply chains that are more agile in responding to threats.

Creating Knowledge-Driven Supply Chains

Designing such supply chains will require thinking more broadly about emerging technologies, combined with the mapping of supply systems across all sub-tiers. Companies need to start mapping all the different components – chemicals, APIs, parts, delivery systems – to understand where they are produced and create a digital map of all the levels in the system.

"When we combine that with prescriptive technology and deep learning/machine learning technology that can recognize different events that are occurring in this big broad supply chain, then we can arrive to a point where we are creating knowledge-driven supply chains," Handfield observed.

These will allow machines to issue alerts about possible problems, although ultimately humans will still have to "interpret these signals, work with machines to understand what the indicators are," and then come up with a solution or way to respond to the different kinds of impending risks. "So these are future improvements that might occur."

He pointed to a specific example along those lines pertaining to the 2017 landfall of Hurricane Maria in Puerto Rico, which was expected to significantly impact several suppliers and critical US FDA-regulated materials. By identifying single/sole-sourced, constrained raw materials mapped to the relevant sites before landfall, Resilinc Corp., a supply chain monitoring, mapping and resiliency solutions firm based in Milpitas, CA, was able to help the customer meet all patient needs by understanding where, for which parts and at which suppliers the disruptions were occurring.

Resilinc identified 30 parts from two suppliers prior to the storm's landfall that would have been disrupted, and the customer initiated dual sourcing to secure supplies ahead of time. The customer was able to secure $1.5m of IV bag inventory within four days of the hurricane and medications were available to 100% of its patients, Handfield showed.

"That's the ultimate goal. … We don't want to shut down supply chains; we want to create more resilient and immune supply chains that can react and finally turn in solutions to a threat or disruptions on the horizon."

Data Leveraging Tools

Creating such solutions will, however, also require significant investments in digital systems.

Handfield explained that, while many organizations have historical data looking at "what has happened in the past, keeping track of transactions and things, payments and work flows," as firms start looking more at real-time supply chains they can see not only where they are spending money and who they are contracting with, but also understand the risks in the system.

"Eventually we want to get to a point where we can use predictive technologies/analytics that allow us to do analysis on what may happen in the future and create these innovative data leveraging tools that can help drive deep insights into business strategy problems," he added.

Handfield's keynote session also touched upon other considerations, including that customers need to be transparent with suppliers and that frequent communication is key to risk management. He also underscored the value of "relational" networks – sourcing decisions are still driven mostly by relationships and during a crisis, "people get things done."