final report

Project code: MLA project code = P.PSH.1190
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Date published: 31 July 2019

PUBLISHED BY
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Consumer willingness to pay for blockchain verified lamb

This is an MLA Donor Company funded project.
Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

1 Executive summary

Latitude 28° Produce (L28) is an Australian beef and lamb exporter with a focus on leveraging and developing technologies to better connect Asian consumers to the true origins of their products. Through innovative technology, L28 aims to empower Asian consumers with the choice of 100% accurate and immutable product authentication.

If distributed ledger, or blockchain, technology is applied to the meat and livestock supply chain, it can build a higher level of transparency and awareness of the products origins. The unknown is the willingness of consumers to pay for blockchain verified products, and this is what L28 plan to test.

Project P.PSH.1190 (herein referred to as the 'project') tracked the movement of lamb on the blockchain through the complete supply chain from a farm in Moora, Western Australia, to a BBQ restaurant in Shanghai, China. L28's decentralised blockchain application tracked the movement of the livestock and product on its journey from paddock to plate.

The project required the involvement of seven participants at different stages of the supply chain to scan the livestock, or animal product, via smartphone scanning device. Each scan captured the time, date and geographical coordinates of the product and the activity completed by the participant. The information from the scan was distributed instantly to the immutable blockchain ledger preventing any direct control of the information from any one source.

Blockchain technology has been touted as a technology that can build authenticity and transparency into supply chains, helping to eradicate food scandals which have become common in markets such as China. A major risk to the Australian red meat industry is inferior products being fraudulently sold as Australian. This fraudulent trade artificially increases the supply on Australian meat within international market, putting downward pressure on pricing as result of the artificially increased supply and cheaper products offered as Australian. The other major risk of this trade in inferior products is a poor product experience, which damages the reputation of Australian produce worldwide.

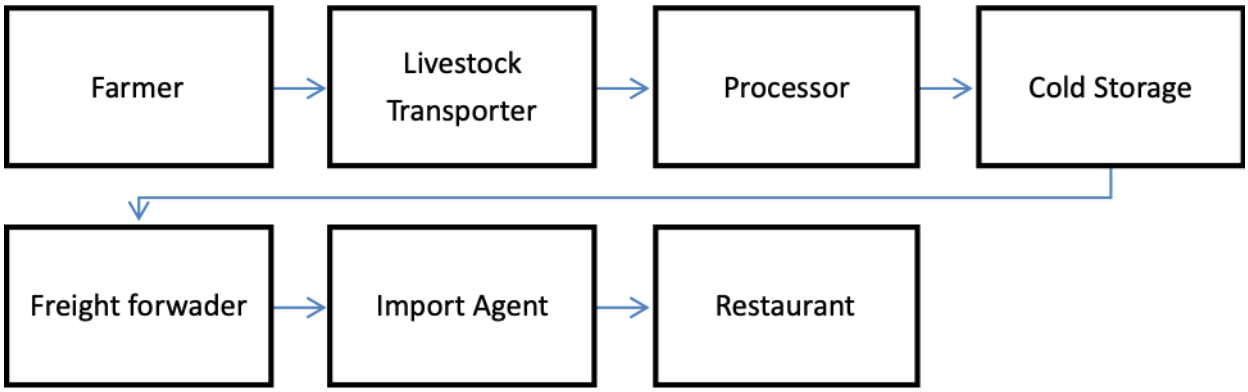

Fig 1: Flowchart of seven stages along the supply chain.

The blockchain verified lamb in this project was sold at a BBQ restaurant in Shanghai. Consumers used their smart phone to scan the unique QR code on the Australian packaged products. The unique code scanning enabled the customer to view the interactive blockchain authenticated supply chain. An e-survey was embedded within the blockchain application, to gather data around the consumer's future willingness to pay for this level of authenticity. To incentivise the completion of the survey, consumers were prompted to input a unique code printed on the lamb packaging. The

consumers entered the code at the end of the survey with one in five customers winning a free meal announced instantly on their phone.

There were several key findings from the survey:

- Just 12% of consumers were unaware of how blockchain can be used to authenticate product provenance, after a brief introduction to the verified lamb from the waiter.
- That 12% who were unaware of blockchain authentication, indicated a preference for blockchain verified over non-verified when made aware of its benefits with a short explainer in the survey.
- 51.4% of participants indicated they would pay additional value for blockchain verification in the future.
- Consumer sentiment at the restaurant indicated the blockchain verification can be used effectively as a marketing tool by the restaurant if customers are educated of the process.
- 100% of customers surveyed indicated they would choose blockchain verified product over non-verified, if the product price was comparable.

These key findings indicate that there is a definite support of blockchain verified products at a consumer level. The project in its practical completion did highlight there is still a need to educate customers on the exact benefits and how blockchain is applied in a supply chain setting. This education piece typically happened via a prior interaction with either the promotional material and or waiter.

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2 Background

2.1 Why was this project undertaken?

2.1.1 Identify if consumers are aware of what blockchain is and how it can give confidence.

There are few documented examples of blockchain verified products being processed into their final retail packaging in Australia, and sold directly to consumers, prior to this trial. Consumer sentiment and awareness of blockchain verification has been difficult to measure accurately, prior to this project.

While there is a lot of hype around the benefits of blockchain technology, there is little clear evidence at a consumer level of the demand for this type of technology. What is clear is the documented evidence that a large portion of Chinese consumers are concerned around the safety of the food they consume.

The need for greater safety and transparency of product origins is obvious. However, there was uncertainty if customers are aware of, or believe in, the ability of blockchain verified supply chains to solve these problems.

2.1.2 Determine if blockchain is a viable and cost effective solution to add value to Australian red meat products.

Adding additional stages to the handling of livestock and the transportation and distribution of red meat requires a willingness of supply chain participants to participate. Will adding these additional scanning stages add value or improve the saleability of the product?

If it adds value, then how much does it add? If it does not add value, is there a preference to select blockchain verified over non verified in the future or does blockchain add no great benefit to the product?

Surveying consumers who dined on Australian blockchain verified lamb, creates an immediate opportunity to capture their sentiment and willingness to pay for this experience in the future. Improvements in product value and/or demand for verification will drive value back to Australian downstream supply chains. Similarly, increased demand for verified products will create shifts in consumption to verified, 100% genuine Australian produce.

This demand shift over time has the ability to put pressure on other companies to adopt a blockchain verified approach, and promote distrust of unverified Australian produce. A shift in consumer demand to verified produce will ultimately drive out the trade of counterfeit Australian produce, bringing supply in international markets back to actual levels.

If supply returns to actual levels (only genuine Australian produce in market, supported by strong demand for Australian produce) market forces of demand and supply will naturally support pricing.

3 Project objectives

Track livestock on the blockchain from farm to plate, Gather insights from final consumers.

- Test how participants accept additional steps to existing processes.
- Identify if consumers are currently aware of blockchain capabilities and benefits.
- Determine consumers' willingness to pay for blockchain verified product.
    - Determine the percentage value that consumers' are willing to pay for blockchain verified product.
- Identify if consumers are interested to know the origin of the product at a farm level.

Fig 2: Latitude 28 co-founder Jarryd Morton pictured scanning lambs

4 Methodology

4.1 Overview of the method

To understand customer's willingness to pay for blockchain verification, customers who are already purchasing the lamb product from the menu of the Shanghai Lamb BBQ Restaurant were offered Australian blockchain verified lamb.

The product was authenticated from paddock to plate, thanks to seven participants who scanned the livestock or lamb products at different stages of the supply chain via a smartphone scanning device. Each scan captured a time, date and geographical coordinate of the product and the activity from Moora in Western Australia, to Shanghai, China.

The product, prior to being cooked, was presented to the customer in its original Australian packaging which includes the blockchain QR code. Trained staff prompted customers to take a photo

of the QR code and the unique promotion code to scan and review at their leisure. Promotional material at the restaurant informed customers that by entering the unique codes from the lamb packaging they had the opportunity to win a free meal.

Within the blockchain application customers were invited to take an e-survey that asked questions around their understanding of blockchain, their experience with the verified product and their willingness to pay for verified products in the future.

Fig 3: Latitude 28 Director Rhys Williamson in Shanghai, China.

After customers were presented the packaged lamb for scanning, the packaging was removed and the lamb skewered with a numerical metal skewer for reference of the customer and cooked in open view. The lamb is cooked over open coals and then finished at the diners table.

Fig 4: Latitude 28 Director Rhys Williamson with customers, Shanghai, China.

4.1.1 Project preparation

- *Beta blockchain test*
  To test the blockchain software a consignment of blockchain verified beef was exported to the China market in 2019. This Beta test highlighted several potential improvements to the software, specifically to speed up the scanning process at the abattoir. Although many potential improvements were identified, this test resulted in a successful export of Australian blockchain verified beef. The positive test enabled the opportunity to be expanded and tested in this lamb project.

  A learning of the Beta beef test was the difficulty the airline had being directly involved as a participant. Airlines were unable to download external software to their existing intracompany scanning devices. This issue can be mitigated with most airlines over time, with ongoing consultation.

  The Beta beef test was successful in demonstrating the willingness and positive participation of the Chinese cold chain logistics, in both scanning and handling. This major link in the chain is critical to demonstrate the receipt and handling of the product whilst in China. During this consignment, IOT sensors with live GPS trackers and temperature monitors accompanied the products.

  The positive result gave great confidence to the team in preparation for the lamb consignment.

- *Working with a software partner to program chips and ability to track individual animal back to farm*
  The scanning of livestock onto the blockchain is an area that, over time, can and will be improved to utilise the existing industry standard RFID tags. During this project, the lambs were tagged with custom chips. This proved to be a workable and feasible solution, but the retagging of the animals did add an additional step.

  In the future, should the primary producer adopt a blockchain solution, the livestock would be tagged with custom chips during the regular tagging process.

- *Conducted tests with tracking chips*
  Whilst testing the chips in regional areas of Western Australia, it was identified phone reception was an issue in many agricultural areas. Phone reception is required for the lodging of the scans onto the blockchain. This required a batching process, so individual scans could be batched and automatically distributed to the ledger when phone reception was available.

- *Finding a farmer and other participants to support trial*
  The overall willingness of supply chain members to participate in the project was a positive outcome. There was a clear message that people are willing to consider new technology when it offers a benefit. With a blockchain solution, the benefit may not be realised immediately at a producer level. This highlights the need to build awareness and educate producers on how this is an opportunity to eradicate fraudulent Australian produce reaching the international market.

  The technology first needs to be used to create a change in consumer sentiment to opt for blockchain verified over non-verified. At that point, there will be pressure on all sellers to adopt a solution. This type of consumer sentiment shift will take time and will require extensive marketing and education done by L28 as early adopters of this technology.

4.1.2 Implementation

1. Onboard supply chain participants
2. Put tracking chips on livestock and scan
3. Load livestock onto truck and despatch to processor
4. Process and package, with a unique blockchain QR included on each package
5. Export product from Australia
6. Clear products into China and into third party logistics
7. Dispatch to restaurant
8. Customers order and are offered blockchain verified lamb
9. Customers are surveyed on their blockchain experience

Fig 5: Lamb at processing facility and Latitude 28 co-founder Jarryd Morton with livestock in Moora, WA.

4.1.3 Collect consumer intel

The restaurant chain selling the blockchain verified lamb would be considered a mid-tier BBQ restaurant, popular with middle-income earners. The age demographic typically sits between 25 and 40 years.

This restaurant style with a signature dish of BBQ lamb shoulder, lamb kebabs and lamb chops, is becoming very popular in China. This style of restaurant is often a franchise, with many different franchises replicating a similar model of open cooking over coals and with the shoulder presented at the table to finish cooking and carving.

Fig 6: Lamb is carved at the table, Shanghai, China.

At the table, customers received a flyer informing that verified, 100% genuine Australian lamb was available and one in five people who purchased the Australian lamb would have the chance to win their meal free if they completed a survey.

Each product had a unique code to be input at the end of the survey, with winners notified immediately on their phone.

Waiters asked consumers to take a photo of the QR code on the packaged product so they could scan the product and complete the survey at their leisure. Scanning of QR codes from a picture is commonplace in China and needs no explanation. Within the L28 blockchain application consumers can view the supply chain movements, along with an interactive map, showing their product travelling all the way from a farm in Moora, Western Australia, along with video clips and photos telling a story of the supply chain. Survey questions in Chinese are also located within the application.

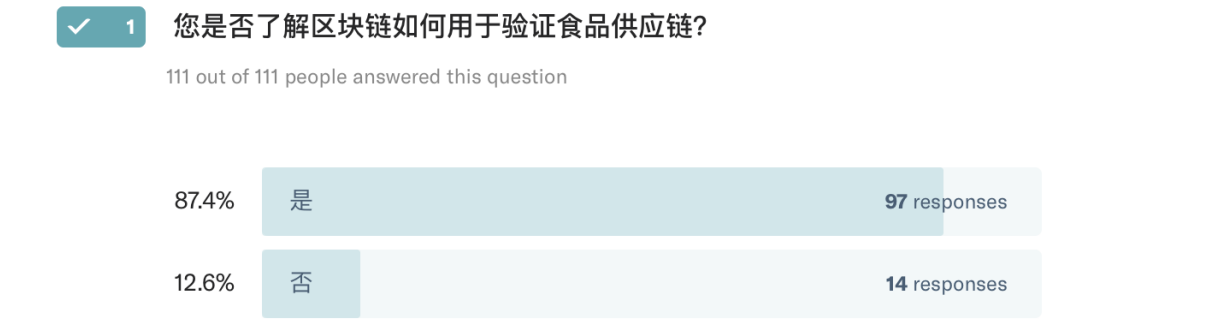
Fig 7: Decentralised Blockchain application revealed from the product scan.

5 Results

5.1 Survey Results

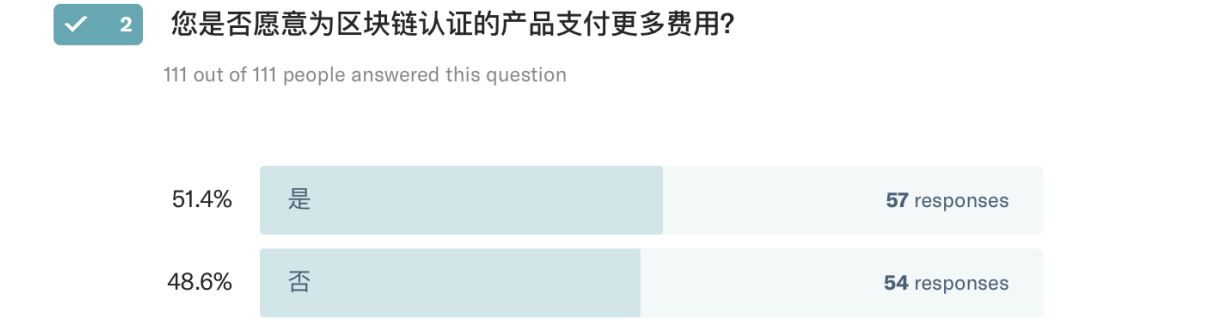
Are you aware of how blockchain can be used to authenticate food supply chains?

1. Yes – 87.4%
2. No – 12.6%



Would you pay more for blockchain verified product?

1. Yes – 51.4%
2. No – 48.6%

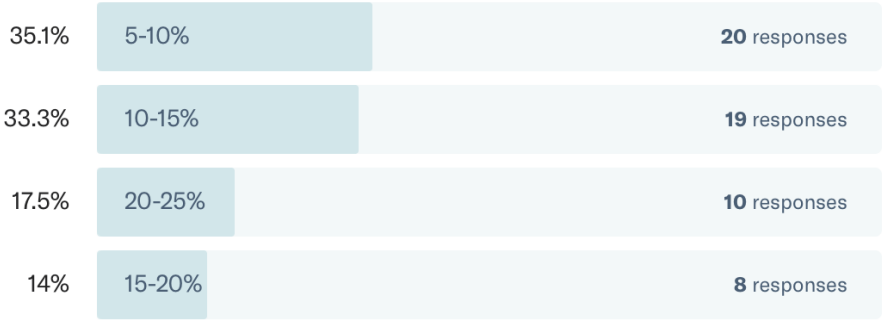


Follow up question to Answer for anyone that answered 'Yes'
Question - What % increase would you be willing to pay for blockchain guaranteed products.

1. 5-10%
2. 10-15%
3. 15-20%
4. 20-25%

✓ 3 您愿意为有区块链保证的产品额外支付多少百分比?

57 out of 111 people answered this question

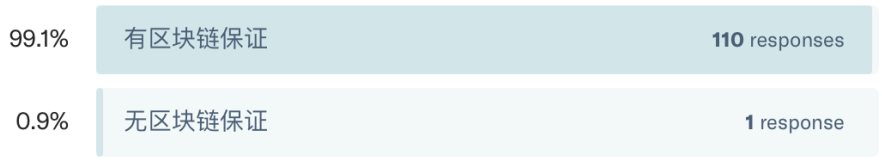


If two identical products are priced the same one is Blockchain Guaranteed one is not which would you choose.

1. Blockchain Guaranteed – 99.1%
2. Non-Blockchain – 0.9%

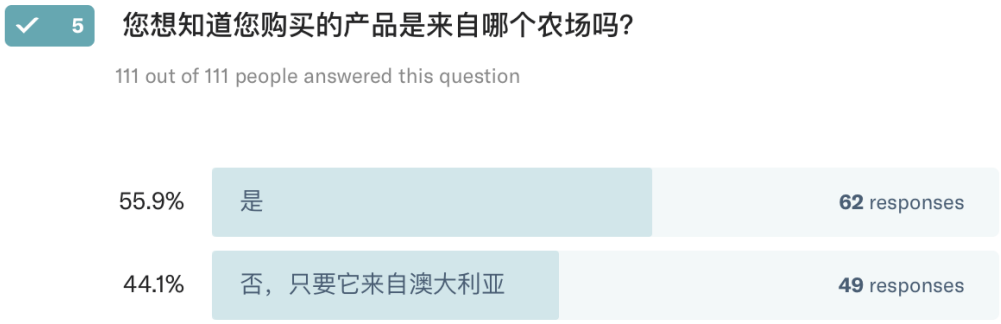
✓ 4 如果两种相同的产品定价相同，但一个是有区块链保证的产品，一个是没有区块链保证的产品，您会选择哪种?

111 out of 111 people answered this question



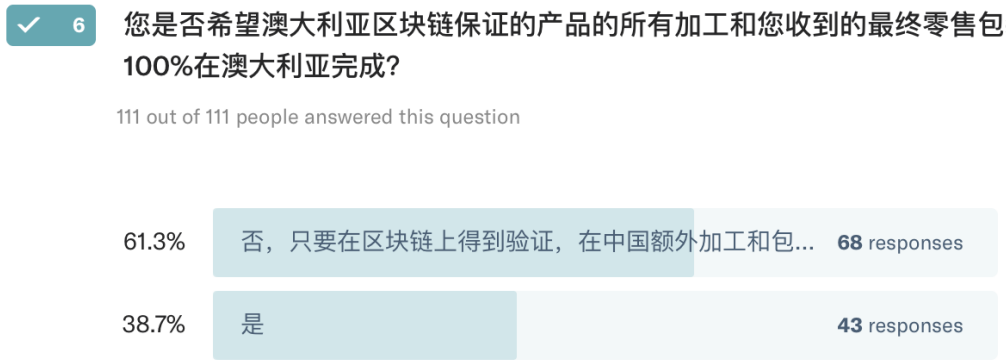
Would you like to know what farm your product came from?

1. No, just that it is from Australia – 44.1%
2. Yes – 55.9%



Would you prefer Australian blockchain guaranteed products to be 100% processed and packaged into the final retail packs you receive in Australia?

1. Yes – 38.7%
2. No, additional processing and packaging in China is acceptable if it is verified on the blockchain – 61.3%



6 Discussion

6.1.1 Value propositions and trial insights

- DISCUSSION: Test how adding additional steps to existing processes is accepted by participants.
- INSIGHT: The participants were all very willing to participate in the trial and partake in the additional steps required to deliver blockchain verified lamb. The farmer in particular was an ideal participant as he also owned several domestic Australian supermarkets and saw great value in creating a verifiable paddock to plate solution.

- DISCUSSION: Identify if consumers are currently aware of blockchain capabilities and benefits to give confidence.
- INSIGHT: The surveyed response indicated 87% of customers were aware of blockchain and its capabilities. This response is likely to have been derived from the prior explanation of the waiter whilst demonstrating the meat. The explanation did assist customers to understand the process but a similar explanation as part of the menu would also be suffice in demonstrating what a blockchain authenticated supply chain was.

- DISCUSSION: Determine consumers' willingness to pay for blockchain verified product.
    - Determine the percentage value that consumers' willingness to pay for blockchain verified product.
- INSIGHT: Of the 51% of customers that indicated they would be willing to pay more the results indicates that it would typically be between an additional of 5-15% increase in value.

- DISCUSSION: Identify if consumers would like to know the origin of the product at a farm level.
- INSIGHT: 56% of customers surveyed indicated they would like to see origin at a farm level whilst 44% indicated country of origin would be suffice in giving them comfort of authenticity.

7 Conclusions/recommendations

7.1 How to leverage blockchain for the benefit of the entire industry

L28 has demonstrated customers are supportive of blockchain verified products and likely to make future buying choices factoring blockchain verification into their purchasing selection criteria. It needs to be recognised that customers surveyed were educated on what blockchain verification is prior to completing the survey, by either a waiter or the promotional flyer. The positive response indicates that by building awareness of what blockchain verification is, we can shape consumers future purchasing decisions to opt for blockchain verified produce.

In a true authentication experience, customers are required to see the packaged product. In this project there was difficulty with this component, as restaurants traditionally do not present meat products to customers inside packaging. Attempts to promote blockchain verification, when how the blockchain protocol is anchored to the product cannot be physically demonstrated, will likely leave customers sceptical they are in fact receiving the product as per the menu promotion.

Something evident within this project worth noting is that customers can be educated easily through human interaction. Customers do not currently seek out blockchain verified products due to a lack of awareness. Customers are often influenced by unverified claims of product origin and China's consumers are often desensitised to QR code claims, because of a high volume of uses of QR codes used regularly in China. In the early stages of blockchain introduction, brands will need to leverage post-sale opportunities to explain the benefits of blockchain authentication. After customers have purchased a product, there is an opportunity to expand their awareness. Unfortunately, in driving the initial sale it is unlikely that blockchain will be the key factor to influence the sale unless the customer can be prior educated on its comparative benefits to unverified produce.

Looking to the future, as more consumers are educated on the benefits of a blockchain verified supply chain, it is L28's opinion that other retailers, wholesalers and importers will be forced to respond to consumer demands and adopt a blockchain verified supply chain. L28 believes that as demand for blockchain products grows, to maintain customers trust physical auditing of any supply chain participant outside of Australia will be required, if they are handling meat in its unpackaged form. Applying any blockchain protocol to a physical product is only as good as the authenticity and auditability of how well the protocol is anchored to the product. 61% of customers indicated they were happy for further processing and packaging to occur in China. If this was to occur without stringent protocol and inspection it could allow for misuse of the technology being anchored to a different product.

Allowing members of the supply chain to interact with products in an unpackaged form allows for the opportunity of product substitution. This needs to be monitored carefully as misuses of the term 'blockchain verified' in international markets will result in consumers losing trust in blockchain as an authentication tool.

Looking further into the future as blockchain verification becomes more commonplace, it is L28's opinion that unverified produce will have its authenticity questioned. At this point international participants interacting with unpackaged produce will no longer be motivated to fraudulently switch produce, as the unverified produce being substituted out of the blockchain would have essentially lost its value. The technology itself will not drive forward-looking statements; instead, it is going to be through educating customers to drive a shift in consumer sentiment to opt for blockchain verified produce.

A change in consumer sentiment will drive the wider use of blockchain amongst supply chain participants. If industry takes a long-term view to see the course of educating customers on a genuine blockchain verified supply chain, it will eventually force markets to respond to customer demands.

8 Key messages

8.1 Adoption of a blockchain protocol

- The success of Blockchain as a tool to eradicate the trade of counterfeit Australian meats will not be driven by the technology. Change will be driven by awareness and educating consumers of the benefits of Blockchain verification, markets will then need to shift to meet consumer demand.
- A shift in demand is not a given, it will take efforts from early adopters of the technology and wider industry support and a commitment to educating consumers.

- Creating Blockchain awareness and educating customers of the benefits will take several years.
- Chinese consumers are desensitised to QR code claims. Great effort must be made to engage and interact with consumers to educate them on the differences in un-verified claims and Blockchain verified claims.
- Applying a Blockchain protocol in the immediate future will not drive additional sales, it is simply a marketing tool. Successful marketing will still be the key factor to the generate sales.
- The Blockchain protocol must be anchored to the final product in the form that will be received or viewed by the end consumer to have any true benefit to the customer.
- The Blockchain verification is only as good as how well, and in what regulatory environment, the Blockchain protocol is anchored to the product.
- There is a lot of additional physical packaging security technologies that should be combined with blockchain packaged products to give even greater consumer confidence.