INTERVIEW: JOHN A. MERHIGE, CREDENCE MEDSYSTEMS

Credence MedSystems is an award-winning medical device company based in Menlo Park, California, in the heart of Silicon Valley, developing a platform of innovative, fully passive injection safety devices that fully serve both needlestick prevention and auto-disabling functions without impacting on the drug product manufacturing supply chain.

The Companion System was first introduced by Credence's Chief Commercial Officer, John A. Merhige, in previous feature articles in ONdrugDelivery Magazine (September 2014, Issue 52, pp 10-12, and February 2015, Issue 55, pp 45-46). We were pleased to have the opportunity to speak with him live recently, and dig a little deeper into the company's history, the people behind it, and the devices it is developing, and to discover not only more about what the company's core philosophy, "Innovation Without Change" is really about, but how much it genuinely means to Credence.

Q Many readers of ONdrugDelivery Magazine will already be familiar with Credence MedSystems, but perhaps you could start by giving us an overview of the company's main product offering, the Companion Safety Syringe System, the main elements it comprises, and what the system does?

A At its core the Companion is a product family of advanced syringe delivery systems, and they all have critical safety features and critical usability features for the end user. In that family we've got a staked-needle solution, a luer lock solution, and we now have a dual chamber reconstitution safety device as well. The family has expanded in a very short time but all of the devices share that same safety feature of offering passive needle-stick safety.

The user performs the injection, they complete the injection and receive cues that the dose is complete. Many folks talk about "safety activation cues" but in this system they are end-of-dose cues. It's an important distinction. So they receive the cues and then automatically and passively the needle retracts into the barrel of the syringe where it is safely contained and the syringe is permanently disabled from future use.

Really that's one of the things that led to the choice of the name "Companion"; that fundamentally these devices help protect the user, be they a nurse or a self-injecting patient, just like a trusted friend or companion can do. So fundamentally these are passive safety devices. But that's only half the story of the system though. There's more – which we can talk about later.

Q The injection safety device space is extremely crowded and highly competitive. Credence says it offers *Innovation Without Change* as a differentiating factor. Could you describe how the concept of *Innovation Without Change* is more than just a marketing line? How does it relate back to the technical design and form of the Companion Safety Syringe System and, crucially, how does it translate into a real-world advantage for your pharma partners?

A Well, this is indeed a crowded space, and sometimes I think the technology that is out there isn't really where it should be. But then I realise that we have really only been talking about these devices for 15 years or so, when things really started moving along with the Needlestick Prevention Act in 2000. Compared with how long needles and syringes have been around these are relatively new and so it's fair that the technology is still evolving.

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Getting back to your question, *Innovation Without Change* is so much more than a tag line. It's truly Credence's core philosophy. It's our corporate philosophy. It's our design philosophy. It's our business partnering philosophy. It really has permeated everything we do because, from our perspective, it is so obviously the right approach.

So let me explain where it comes from and what it's all about. Well it has come from a simple idea. In this space, everything we do – from manufacturing to design to corporate partnering – should be done with both the end user performing the injection in mind *and* the drug company in mind. Our partners and the end users need to *always* be omnipresent in the decision making process.

More tangibly, if we take this down from the philosophical to the more practical, *Innovation Without Change* means this: we offer the *Innovation* of the final device that is placed in the end-user's hands, with all of its safety and usability features, *Without the Change* that typically comes along when drug manufacturers perform drug device combination development.

So, how do you achieve this idea of *Innovation Without Change*? I think the easiest way to think about it is that the Companion System uses a modular approach. Drug manufacturers are able to select any primary package component they want out of all and any that exist today, from the syringe barrel (which can be from any manufacturer, any size, made from glass or plastic) to the stoppers (for example standard butyl or Fluorotec coated for sensitive biologics), to the tip-caps, and the needleshields. These can all be sourced from any combination of vendors the drug companies choose. The point is that the Companion works around those choices.

The Companion needle is either pre-attached if the product uses a staked-in syringe, or is attached by the user if it's a luer. And the Companion plunger rod is assembled in secondary packaging just the way plunger rods are assembled today. So we build everything around the core choices of primary package components that work for the drug manufacturer, for the specific drug and the specific user population.

As an aside, that's the other side of where

the Companion name comes from. The Companion components *accompany* the existing primary packaging. And for that reason the choice of name Companion was an obvious choice for us and it has resonated with our partners and our customers.

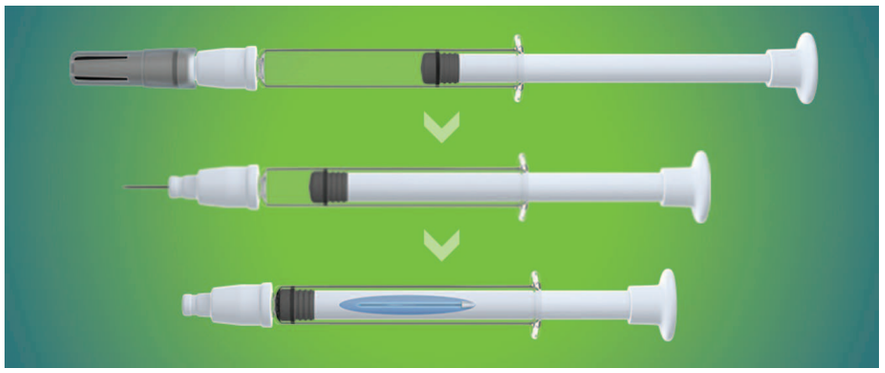
Innovation Without Change, keeping those existing components, not having to change them, is massively important. There is data in the literature that quantifies the consequences of changing primary packaging components and it's somewhere around three years and several million dollars of development. Our approach simplifies that process. We let the manufacturer choose their component, we simplify the development process and the commercialisation process and, just as importantly, we fit into the existing supply chain seamlessly.

This allows us and our pharma partners to leverage the expertise of their trusted vendors who have been perfecting their craft of making syringe and closure components for a long, long time. Alternative solutions in the market seem to hold the drug manufacturer captive to a single source supplier. That's absolutely not our approach. Instead we give the manufacturers the ability to dual source their syringes and other critical components and we take out the risk that could come from disrupting the supply chain.

The other thing I really think is worth looking at is not just the design and development side but the impact – or lack thereof – to the manufacturing environment. We all know that change is really hard in this drug development world. It should be of course, but the fact that change is so hard has left good technologies on the cutting room floor, because they were too costly or too risky to implement.

So what's the Companion's impact on the manufacturing environment? First of all, aseptic fill-finish is completely unchanged. The filler – whether it be the drug manufacturer or a contract filler – will receive the syringes in the same conventional tubs that they are used to receiving them in. The syringes are compatible with ready to fill or bulk lines. So filling is unchanged.

Just as importantly, the impact of secondary assembly is really significantly minimised. All we've got to do is assemble the plunger rod. The finger flange is optional – the manufacturer can opt to have it or not, and that decision is driven by human factors studies in a particular application. But essentially all they have to do is screw in a plunger rod, just as they are conventionally doing today, and we're done. The system is put together. In contrast, the most prevalent of needlestick safety devices have significant secondary assembly steps to wrap the exoskeleton cage around the syringe. That drives a big capital investment, it drives the need for time, space on the floor, through to the cost of assembly.



The Companion Safety System provides passive needle retraction directly from the injection site with end-of-dose cues, is automatically and permanently disabled after injection, all without disrupting the existing manufacturing supply chain.

What we've done is make it easier for drug companies to do the right thing. They no longer have to sacrifice safety and usability in order to give their customers the right product, in order to give their marketers the differentiated product, in order to satisfy risk management and compliance.

So whilst *Innovation Without Change* is so much more and runs so much deeper than just being a tag line, nonetheless it is also a great tag line!

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Q The Companion received the "Award for Best and Most Innovative Advancement in Drug Delivery" at Drug Delivery Partnerships 2015 in Boca Raton, FL, US, and Credence MedSystems was awarded the "Innovation First Prize" at Pharmapack Europe 2015 in Paris, France, for its novel drug delivery system. But behind the award-winning products Credence is developing, there is of course a company, people and investors. Could you tell us a little about this aspect of Credence MedSystems? What is the company's history, the story of its founding, its sources of funding, and who are the key people who set-up and who run Credence MedSystems?

A It's kind of you to mention those awards, and for a younger company as we are, external validation is really important. We all work tirelessly because we think we do have that solution to address a global healthcare problem, in a way that benefits drug manufacturers and the end users. That external validation is so important because it tells us that yes, we are on to something. And those awards and frankly the progress we've made with lining up collaborations with drug companies, really are important in enforcing that.

To be honoured with major awards is just fantastic!

In a young company, the culture is so critical. In huge companies there are buffers. In a young company the drive that comes from knowing that we are doing something that is important, and having others tell us that, really does help people get out of bed in the morning.

The company was founded about two or three years ago in an incubator in Northern California called Reprise Medical. The incu-

bator was started by Credence's Chairman, Dr Frank Litvack and our Chief Executive Officer Jeff Shanley. So Frank and Jeff are extremely accomplished and have had a lot of success in medical technology. Frank is an interventional cardiologist turned successful entrepreneur. Jeff is a successful executive but he's also a first rate inventor and patent strategist. That's obviously very important for our company, which has a partnering model, to be secure in our own IP but also to give security to our collaborator that they are free to market. So it's extremely important.

Once they realised that this technology was deserving of its own company, they brought me and my partner, Jeff Tillack in, as well as the rest of our fantastic team. Jeff runs the operations, QA and development, whilst my focus is more external – partners, investors, marketing and sales and so on. So while this company is still fairly young, the team is not!! We've all been around a long time and we've been very fortunate – each of us – to have brought multiple companies from technology invention to product development and through to commercial launch and scaled manufacturing volumes. We've all had companies that have gone through successful public offering events or acquisitions or the like, so we've done this before.

Getting back to the company, we're based in the Bay Area of Northern California, right in the heart of Silicon Valley. As everybody knows, that area is absolutely ripe with technology and there is the air of inevitable success. Certainly every company doesn't succeed, but so many have in such a public fashion that it's an exciting culture.

Q We touched on differentiation earlier in terms of *Innovation Without Change*. What other ways does the Credence Companion Safety Syringe System stand out as offering something over-and-above the many other injection safety systems out there? And I'm thinking not only from the point of view of pharma/biotech industry partners but also about what this syringe safety system brings to the table for hospitals, healthcare professionals, patients and carers.

A Well this is really an important question and it takes us squarely back to *Innovation Without Change*, and keeping the drug manufacturer and the end user permanently in mind.

The user discussion has to start with passive needlestick safety. We just did another human factors study. This one was with a nursing population. Nine out of ten of them – 90% – had experienced a needlestick! This is just astounding. It simply has got to start with safety.

The legislation out there is directed towards healthcare providers in the formal healthcare setting. It's not yet directed towards home users or self-injectors. I think the first line of thought there was that they are injecting themselves so they are not going to get sick from a needlestick from their own needle. But you have to ask, what happens to the needle immediately after an injection? Does the grandchild or child or a sanitation worker or the housekeeper stick themselves? It's a population that has been left behind a bit and it shouldn't be.

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Just to review, with the Companion, the user simply performs the injection, gets the cues that the dose has finished and the needle automatically retracts to safety within the barrel of the syringe. The syringe is then disabled and cannot be used again. So we don't only think about needle safety during the initial injection but also about preventing re-use.

This is all at the heart of passive safety because we know that active approaches – that require specific action by the user – are ineffective. There is plenty of data to support that. One study in Massachusetts found that 75% of injuries occur from devices that already have safety features on board, the old style of approaches. Again, related to that whole experience are the cues – not just of safety activation but end-of-dose cues. So a nurse in a busy environment can simply inject with Companion until they feel the click and they know then that the entire dose has been delivered and that the needle is safe. It's a very important feature.

Beyond that, another aspect of Companion's design is allowing the syringe to be used the way people have been using syringes for hundreds of years. It allows the use to have full visibility of the syringe barrel and of the drug inside, which is critical for pre-injection inspection. The main products out there today do not allow that. The Companion allows the user to perform conventional operations like purging an air bubble, or aspiration to make sure they are not in a blood vessel. Whereas most other approaches out there specifically instruct the user not to do that because of the risk of premature activation of the safety feature. We like to say that Companion acts like a normal syringe when you want it to, but brings with it all of the other important features.

Finally, there's the design. One of the really revealing insights that has come out of our human factors studies over the years is that the user wants to trust the device. I don't want to be too grandiose about it but it's really an emotional trust they are looking for. The user experiences the device and measures that trustworthiness certainly by a history of reliable experience to some extent but also, more personally and maybe more palpably by the look and feel of the device in their hand. And so you do have to pay attention to the thumb pad, the finger flange, the overall fit. The product is designed to fit in the user's hand and look familiar so that the user can begin building trust. That ultimate trust comes down to, "Does that device protect me".

We were thrilled to see in our recent study that 100% of the users said that the device would protect them from needle sticks. It comes back to the name – we trust our companions. It's an important thing.

One more thing comes to mind - it's a bit more technical. The Companion is glue free. In existing staked syringes, it's adhesive which holds the needle in place. The fact that the Companion is glue free eliminates any risk of unwanted interaction or leaching between the glue and the drug product. It also enables certain lubrication techniques that reduce the level of silicone laid down which also reduces the risk of unwanted aggregation in sensitive drugs. Eliminating glue makes the product safer, lower risk, for everyone.

Q Let's say I'm a company interested in doing business with Credence. What kind of company is Credence to work with, in the context of a long-term partnership? What's its culture, and what are its driving forces and corporate philosophies? And also, day-to-day on the ground, what can I expect from a relationship with Credence MedSystems?

A We are a partnering company. Not just with our drug manufacturer partners, which is obvious, but with syringe manufacturers, with contract fillers, with the component suppliers. One of our customers said to us recently that this product should become ubiquitous. What he is getting at there is that because you are combining the added value of the device with the simplified de-risked approach to the drug companies, and the supply chain, it should become an obvious choice.

So we focus then on the supply chain. Once again, this brings me back to *Innovation Without Change* because Credence is evolving into a major presence in the supply chain. But we are doing this by playing nicely with others. There is every reason to assimilate in the supply chain and partner with these extremely successful supply chain partners that have been doing what they've been doing for a long time.

As for day-to-day, I love working with this company! I have worked everywhere from enormous manufacturing in the motor industry, to Credence where we started with one or two people. It is a place where people do what they do because they like doing what they do. You never have to worry about whether something is going to get done, or whether someone is going to go the extra mile. These are experienced people who have done it before and know what it takes and have taken the conscious decision to be at Credence because it is the right thing in their lives.

Beyond that I would say this – and I get to say this because while I was schooled as an engineer I have since moved on to a different functional focus – this is easily the best engineering team I've ever worked with. They *get* customer wants and needs, they bring invention into development quickly, the answer is never "no" and inevitably they come back with a solution to a problem. It's really just a pleasure.

Q The past year or so have been very successful for Credence, the industry has been introduced to the Companion System, and had a great reception, winning several awards and attracting the attention of serious players in the industry. What are the next steps? For the safety syringe system in particular, but also more broadly for the company and its medium/long-term strategy?

A I have to fight the temptation to be overly nostalgic or romantic but I really do think of it as a story that has chapters. Chapter one was focused on invention and intellectual property and development. That was when we were very internally focused, trying to work out how we could solve the problems of current approaches that we saw in the market.

Chapter two was a bit of a coming out party where we stepped into the industry's view, and that's always interesting. I remember we had a team meeting right before we went out and started showing the device and we thought, who knows what the reception is going to be? And I guess this is what makes this exciting and why we do what we do. Looking back on that chapter I don't think it could have possibly gone any better. We won the awards, and more importantly we've aligned with numerous customers who are at various stages of development and evaluation and implementation.

So looking ahead, chapter three has got to be about evolution. It's got to be about continuing to execute, and about scaling the manufacturing to meet the demand that comes as these devices progress through the development path with the pharma partners. You start with a couple of hundred of devices for evaluation and then a couple of thousand for human factors studies, and stability and so on. It's about evolving and growing while continuing to hammer the execution. And then of course it's about continuing to line up the pharma and biotech manufacturers as partners.

Success always begets success right! We're not a company that makes a lot of public announcements and we don't need to because of the way we're capitalised, but we're quietly lining up a lot of partners. With each one, the next one becomes a lot easier because we are a known entity, because we are continuing to grow our credibility in the industry.

It brings us back to the name discussion. There's a reason why the Companion is called the Companion, there's a reason we talk about *Innovation Without Change*, and there is also a reason why we are called Credence MedSystems. It's about the credibility that you build with partners that trust you, and that trust continues to grow over time.

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John A. Merhige
Chief Commercial Officer
T: +1 844 263 3797 (844-CMEDSYS)
E: jmerhige@credencemed.com

Credence MedSystems, Inc
1600 Adams Drive, Suite 235
Menlo Park
CA 94025
United States

www.CredenceMed.com

John A. Merhige is Chief Commercial Officer at Credence MedSystems. Previously, he was Vice-President, Market Development at Sanofi BioSurgery. He came to Sanofi upon its acquisition of Pluromed in 2012, which John joined in its early stages and where he was a member of the executive management team. He led the commercial activities at Pluromed, which developed and commercialised rapid transition polymers for cardiovascular and other surgical procedures. Prior to Pluromed, John founded Prelude Devices to target early-stage medical device technologies for development and commercialisation. John is a member of PDA, MassMEDIC, MassBio and has served on the board of directors of the MedDev Group.