

# Science AMA series: I co-founded two companies focused on rare and neglected diseases, I'm Sean Ekins, Ask Me Anything!

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## Abstract

Hi Reddit, I am currently CSO of Collaborative Drug Discovery, CEO of Phoenix Nest, CEO of Collaborations Pharmaceuticals, Inc and CSO of the Hereditary Neuropathy Foundation and I am on the Editorial Board of Pharmaceutical Research. I am a graduate (MSc, PhD, DSc) of the University of Aberdeen. I have spent 20 years working in the USA, first as a postdoc at Eli Lilly, then as a senior scientist at Pfizer and Lilly before joining smaller start-up companies. I then went on to co-found and found two rare and neglected disease companies. My background is in clinical pharmacology, with an interest in understanding drug-drug reactions and toxicology. I quickly moved from doing bench work to learning how to use computational approaches to make predictions that could help drug discovery. Over the years I have collaborated with different academics and companies to build models that help predict how compounds bind to enzymes, transporters, ion channels and receptors. As the datasets have grown I have applied different machine learning approaches. My work in the last 8 years has brought me into working on neglected diseases like tuberculosis and rare diseases such as Sanfilippo syndrome and Charcot-Marie-Tooth disease. Again collaborations are central to what I do. Virtually everything I work on is funded by a grant whether from the NIH, EU or others so even though I am not working in a university I am constantly working on small business or other grants. Most recently my work has led to projects and collaborations on the Ebola and Zika viruses. All of this has been published openly and I am an advocate of open access publishing as well as using social media to publicize science. I believe it's important for scientists to use tools like Twitter to tell the world about their work, conferences they are attending and publications. I will be back at 11 am ET (8 am PT) to answer your questions on rare diseases, science collaborations, and my experience doing science outside of academia.

[REDDIT](#)

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SEAN\_EKINS [R/SCIENCE](#)

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Hi Sean!

Thanks for coming to Reddit and doing this AMA!

Your PhD "Maintenance and cryopreservation of xenobiotic metabolism in precision-cut liver slices. Evaluation of an alternative in vitro model to isolated hepatocytes" sounds more like wetlab work than bioinformatics or computational biology. How did you make the transition/Where did you learn how to program?

A lot of my biologist friends doing their PhDs now seem to think that it's too late for them to learn how to use computers since they've already put so much time into studying something else. I'd like to convince them that it's worth learning some bioinformatics.

[frostickle](#)

Me Anything!, *The Winnower*  
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Thank you. Correct..my masters and PhD were all wet lab doing experiments with cells and tissues from humans and animals - thye goal was to show we could reduce the use of animals by using slices of tissues..During my postdoc I came back from a conference and asked if I could build a model of the enzyme I was working on using just the data I was generating the lab. That was my first exposure to using QSAR and pharmacophore software. That shifted my whole career - one of several pivots. I used a little UNIX over the years but never learnt to program - my strength was biology and chemistry - its my one regret but maybe one day! Its never too late to use a computer / software to help - learn cheminformatics or bioinformatics skills. Good to have in back pocket!

What was your experience like doing an industry post-doc? As a grad student who does not really want to go into academia, I've been trying to look into other options, and industry is a strong possibility.

[kerovon](#)

Thank you - back in 1996 (so a long time ago) the experience I had was excellent.. But it was a very different time. At Lilly there were approx 50 post docs then from all over the globe. I had an excellent mentor and great colleagues to be around. They helped make my transition to a move from the UK to USA a very smooth experience. The people of Indianapolis were also very friendly. Lilly provided excellent facilities, I did my experiments and could publish findings. I had one or two conferences per year. Within a few months of being in the post doc I was getting invited to interview at other drug companies.. I would always fly back to Indy and think why would I give up the freedom of a postdoc to earn more money (2x what I was making then) - so I stuck around, published a few papers and changed the whole direction of my career in 2 yrs. So bottom line is I would definitely check out industry postdocs..you never know what is going to happen plus you get valuable experience in a job.

What advice do have for someone who is suffering from a disease so rare that almost no one is doing anything to combat it?

[08RedFox](#)

Thank you - I would learn as much about it as I can - become the expert on the disease then go find a scientist to take on your cause.

Where did you learn to get your initial angel funding? As scientists, we write grants, but when it comes to business- scientists are hardly trained for the skillset required. And when starting out, even if you secured a \$100,000, it seems that would hardly pay a janitor and a year's rent on a biomedical startup's facility- There are so many components of overhead that an academic lab rarely has to consider. The field does not lend itself to garage startups the way say, computer programming can.

[obeytrafficlighs](#)

Thank you - I disagree. For between 10-20K you can do an awful lot or preliminary work if there are reagents / assays available from a CRO. Rare disease foundations can have a huge impact raising similar sums to fund scientists so that they have enough data to go after a bigger grant. I have seen that directly. We don't have angel funding at Phoenix Nest - would be good to have some but we went after STTR grants, so far had 3 funded.. its tight but not impossible to get something off the ground in this way.

Hello Sean, it's amazing I clicked on this AMA going "Heh it would be funny if he researched CMT, but

no one actually does that!" Why it's funny to me is I suffer from CMT 1A. A lot of my interest in Biology is just from reading about the disease in nitty gritty in high school. Alas I have no talent for the pursuing the subject but it is definitely a casual interest because of it.

Anyways I guess I have two major questions I was curious on.

1) Is there any research in the last few years to perhaps of finding ways to remylenating (spelling?) nerve cells, perhaps through artificial means of getting or generating the protein?

2) In the early 90s soon after I was born I was part of a small study done to see why there were just some individuals that despite having the same type and subtype of CMT would just have the disease expressed far greater in certain individuals, I was noted to being one of the ones that this was very apparent with. I was curious as if my memory serves from last time I read the study it was inconclusive, if there was any progress on that front?

[Tagnol](#)

Thank you - we recently put out a white paper on CMT research <http://f1000research.com/articles/4-53/v1> also take a look at the Hereditary Neuropathy Foundation - we are supporting scientists looking for drugs for CMT1A and other rare forms of the disease <http://www.hnf-cure.org/> - we are having a patient meeting in October in NY - open to anyone..There is a phase III clinical trial just started in US and Europe on a combination treatment. very exciting time for the disease.

In your opinion, what is the most fascinating/unusual disease you've researched?

[battlecows9](#)

Thank you - They are all fascinating - each one I encounter just makes you wonder how amazingly complex we are. In some case one mutation is catastrophic, but in other cases we can cope without something for a long period before succumbing. That resilience and also fragility is amazing.

What is your take on the Martin Shkreli controversy?

[aeschenkarnos](#)

Thank you - He started multiple rare and neglected disease companies - made some v. questionable decisions - but bottom line he did something few do and that is start companies focused on rare and neglected diseases. Lets see how it pans out ..

Many "rare" diseases (some not truly rare--affect millions of people--but rarely diagnosed) get little research funding, thus little progress. But much recent progress is pointing again and again to auto-immunity, sometimes in concert with genetic predispositions. What can scientists like you focus on to help develop treatments or cures for conditions like CFS/ME, POTS, Hashimoto's, etc? What pieces of research do you need put in place before you can work your magic?

[WobblyGobbledygook](#)

Thank you - Sometimes its just as simple as connecting disparate information thats spread all over. We need to combine the different silos of data, mine it and come up with hypotheses we can test quickly and cheaply and put those immediately in the public domain. There is a business model here.

The market seems like a really poor choice to address the issue of rare diseases: extremely high costs, high risk, and low chance of profit. It's not a problem unique to rare diseases, either - antibiotics are another risky bet for companies - if they do develop something new, doctors want to save it for last line of defense against resistant strains, which means the product won't sell. I applaud you for taking the initiative to do what you can, within the bounds of the current system, but do you have any thoughts on how society could better address this problem?

[theothercoolfish](#)

Thank you - we have to take the perspective of the families that are affected. They want to save their child. Cost is not a factor to them, there are no hurdles high enough that they cannot climb.

So lets flip the perspective, don't treat everything as if it has to be profitable or cost billions to develop - its flawed. I know one family that worked to raise about \$6M through fundraising to bring a gene therapy to clinical trial <http://www.hannahshopefund.org/>

Antibiotics is a different issue - the problem is we sat back and rested on laurels while the bacteria mutate - need to continually develop new drugs.

What is your long term business model when/if you discover something marketable and how do plan on transitioning from a company relying on outside funding to a self sustaining one?

[Rzzth](#)

Thank you - great question - Challenge with diseases we are focused on with Phoenix Nest is the very small number of patients. We are heavily dependent on going after a pediatric review voucher from the FDA which we can monetize to fund more research. With Collaborations Pharmaceuticals I am willing to work in bigger neglected diseases as well as go after enabling technologies that could provide income to fund rare disease R&D.

Chronic Fatigue Syndrome AKA Myalgic Encephalomyelitis is a totally neglected disease. Many of us are fully disabled and bedbound due to extreme exhaustion and chronic pain. Is this an area your looking into or have thoughts on?

[Horizon183](#)

Thank you - I have been contacted about getting involved in this..

What are your thoughts on tracking drug-drug interactions? My wife suffers from an autoimmune disease, and it's incredibly difficult figuring out what symptoms are caused by new medication, and if it's a side effect of the medication itself or a cause from the interaction of more than one drug on the body.

[Salomon3068](#)

Thank you - I started out working on predicting P450 drug drug interactions. Start with the package label - look for information on CYPs and transporters.. Then look at the structures of the drugs - you can search Pubmed to find papers.. if you find something interesting definitely reach out to academics - many of the papers will have the email of the scientist. Its definitely complex, sometimes we can build models around enzymes and transporters and predict new interactions for drugs that we did not know before <http://www.ncbi.nlm.nih.gov/pubmed/19437106>

Hi there Sean, I would like to ask a bit of a practical question. I'm in experimental onco-pharmacology, and in the age of kit science I can chose pretty much whatever method of research that has my preference for which I can find the relevant reagents. There are cell lines with specific genetic constructs just for my specific cancer, microarray setups with genes all relevant to cancer, myriad oncoprotein antibodies & PCR primers, etc. The first problem that comes to our minds when we think of rare diseases research is "lack of funding", but what are the more day-to-day problems that you or others working with rare diseases run into? Is there an urgent need for suppliers to provide reagents that are specific to rare diseases, or are there other facets that require more attention?

[UGenix](#)

Thank you - Very timely question - several of us think we are at an important period in biomedical research because of what is available. We can do everything virtually without a lab. An academic say a physician can have an idea and pretty much test it in vitro for less than \$10K.. challenge is in vivo.. there are many small family and disease foundations that could fund such work.. day to day issues in an institute are getting peer support, reluctance filing provisional patents which in turn would limit outside interest, some politics in institutes may also hinder how someone without their own lab can do research, they might require them to work with others to do work inside etc..we could definitely use more reagents for rare diseases but there are more fundamental issues. For example a rare disease parent can become an acknowledged expert on the disease but without a PhD they could not readily publish or go after a grant - which is unfortunate and should change.

Dear Dr. Elkins,

Thanks a lot for doing this AMA.

I work in drug safety research, mostly in signal detection, communication and I'm approaching methods development in detecting novel or early signals. Do you have any recommended data sources or resources for predicting how compounds bind to proteins and generating side effect hypotheses? I have been considering KEGG and STITCH 4.0.

Secondly, how likely would you say it is nowadays to develop a new drug based on reported side effects and predicted off-targets (or secondary drug targets)?

Finally, what made you choose to dedicate yourself to rare diseases, moving from big pharmaceutical companies to smaller startups?

All the best

[Okkeh](#)

Many thanks - Those data sources are probably a good place to start - any of the recent papers will point you to more.. There are definitely increasing numbers of groups looking at repurposing - very active field. Meeting a rare disease parent and being asked for my advice was a turning point for me to get involved.

Have you done any work on stealth pathogens like Lyme disease, Bartonella or Babesia? I understand they are hard to test for because these bacteria and parasites evade the immune system and have persister cells? I have also heard it takes combinations of antibiotics to eradicate them? Is this the kind of work you could do?

[liketosee](#)

Thank you - Lyme disease does interest me. I could work on this disease and I have found a recently published HTS, I reached out to the lab but no response. Would like to help if I can. And I think I can learn from what has been done so far.

What diseases does your companies focus on or does your focus shift depending on whats going on in the world? Also, is there pressure from a lot of governments or media ever to "just get it done?"

[thebiggestdump](#)

Thank you - I have worked on TB since ~2008, and rare diseases have been of interest since 2011. I mostly focus on where I can collaborate and get things done. I do not need governments or anyone else telling me what to do. There is a huge need and we have a responsibility to chip in, money or no money involved.

Hi Sean! As someone with a rare disorder (Hereditary Neuralgic Amyotrophy), I want to give you my heartfelt thanks. It's the sad fact of life but obviously the more common disorders get most of the attention/funding. Do you see this lack of funding as a long term barrier to work on these disorders or do you have a plan to mitigate this? I know some of these are high-profile right now (such as Zika and Ebola), but for longer term research on other less "popular" disorders do you think this is a sustainable business model?

[Takaian](#)

Thank you - Every disease needs a champion, someone to fight for the research, the funding. Your voice is equal to any of the bigger diseases. As I mention above we can have a large perhaps disproportionate impact on rare disease research with small amounts of funding. There is a business model around the knowledge created around the diseases (7000 to understand) overlaps and also in the way we discover treatments for them in a cost effective - almost super thrifty way..That is a big take home for the industry working on bigger diseases flooded with funding.

How do you justify the costs for inherently limited benefity that may not even come to fruition?

[Iceklimber](#)

Thank you - I think we can certainly do a lot of R&D for a small amount of money and any research we can do on rare diseases can help many others - that is priceless.

Hi there! I'm a moderator of [/r/clusterheads](#) and someone suffering with Cluster Headaches. [With a prevalence of 1 case per 1000 people](#) there has been almost no research into treatment. The treatments normally prescribed are either off label or hand me down migraine medicine that often isn't effective at aborting an episode let alone an entire cycle. With a significant portion of sufferers resorting to using illegal narcotics as the most effective way to treat and abort entire cycles, [there was a study done that showed a significant improvement treating CH with Bromo-LSD, a non-hallucinogenic version of LSD.](#)

My question is this, do you foresee us ever getting more research into treatment for CH, or the possible approval of Bromo-LSD as a treatment?

[applecorc](#)

Many thanks - I think the community suffering from this disease could certainly lobby to move this along - perhaps finding a company to take it on to license the science.

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[applecorc](#)

Thank you - find company to take this on perhaps or scientists that can pursue.

Best advice for a physician considering a transition from academia to industry.

[Chris\\_8a](#)

Thank you - I am not a physician and I have never made such a transition! I would suggest that the job in industry has to be a good fit for you naturally and tick all the boxes, location, responsibility, people, salary etc. Good Luck!

I'm a grad student interested in doing molecular dynamics modeling of proteins for my MDPH.D. I want to go into orphan diseased research eventually, because of Matt Might's story. Do you have any life/career advice?

More specific to drug development, what are your strategies for including ability to cross the blood brain barrier, cell targeting, metabolic breakdown, etc in the process before synthesizing the drug? It seems like some groups try a bunch of chemicals and see which ones happen to work. Some others rely on loading drugs onto delivery systems. What do you/your collaborators prefer? What would be your ideal workflow?

[Codes4Nailpolish](#)

Good to hear a rare disease story inspiring scientists to get involved - there are plenty more stories out there.. Think about how you could help - what skills can you offer that would help a family? what project could you apply Molecular dynamics too etc..? There are plenty of good models for predicting BBB permeation in the literature.. of course if you cannot get across you can also deliver intrathecal as used with some enzyme replacement therapies.

Hey there! Some economic-political questions for you here.

What is your opinion on the structure of companies, and do you think co-ops or syndicates are better at achieving the goals you set out for?

While I'm at that, do you think capitalism a good, bad or neutral factor in eliminating these diseases?

[daveboy2000](#)

Thank you - I think these might be worth a try but I have no real opinion - whatever gets the job done - find treatments for disease and deliver to patient.

Do you find that the patent system adequately awards innovation in the rare-disease realm? I know that the FDA provides a longer period of exclusivity for such innovation before generics can pop in; is such a longer period enough time? Do you have any views on the matter?

[total\\_carnations](#)

Thank you - I would say it could always be better.. exclusivity is good.. we just need to keep the incentives we have like the pediatric priority review voucher etc..

Why do you feel the need to work on neglected diseases? Why doesn't every see fit to work collaboratively on just a few, much more pressing and common diseases to hopefully find a treatment/cure faster?

[P00shy](#)

Thank you - I have worked on major diseases at pharma companies and biotech i worked for. Neglected and rare diseases need as much help as they can get from scientists so I am willing to get involved - there is also much to learn.

My daughter was recently diagnosed by Whole Exome Sequencing with a de novo mutation in the SCN8A gene, which codes for a voltage gated sodium channel. This gene was first implicated in human disease about 4 years ago, and there are now ~150 known cases of patients with mutations in this gene. This number continues to rise as Whole Exome Sequencing becomes available to more patients.

I anticipate that as Whole Exome Sequencing becomes more accessible, that more gene mutations will be identified as contributing to human disease, and more patients will be identified with these types of rare mutations.

As someone who studies rare diseases, how has the increasing availability of Whole Exome Sequencing influenced your work, or how do you envision it influencing work like yours in the future?

[ADVentive](#)

Thank you - I see the potential for faster diagnosis - which is huge - find out fast what the disease is and give the researchers longer to find a treatment. We should be screening all children at birth. I know its expensive but lets face it we could then get a head start on diseases.

Hi Sean,

I'm an engineer (mechanical, so wrong starting point, but I'm interested nonetheless) with a passing (hobbyist?) interest in computational approaches to pharmacology in general, and toxicology specifically. Firstly, as a South African, thanks for helping in the fight against TB. In general, people don't realise how modern and deadly a disease it is.

a) Is there any specific existing software that model things in the pharmacology sphere well?

- b) Is there a particular need for software in the pharmacology sphere that you've identified and are willing to talk about?
- c) Being a mechie, I've got to ask: any machines you use in your work that work particularly well? Or,
- d) *don't* work particularly well?
- e) It's clear from your emphasis that you value collaborative work highly. Does the collaboration tend to guide your focus area? If not, how do you identify the diseases that you work on?

Thanks for taking the time to do this AMA.

[Avatar 5](#)

Thank you - v sorry for delay in answering . Some of the worlds best TB scientists are in South Africa - one is Dr. Val Mizrahi..we just recently published some work in collaboration with several other labs around the world.<http://www.ncbi.nlm.nih.gov/pubmed/27283217>

- a. there are many software tools we use for modeling big and small datasets in pharmacology - no magic tool that always works but generally they can be used for hypothesis generation.
- b. Nothing is perfect - we always need the next big thing - today its deep learning tomorrow ?
- c/d. I use a desktop computer, an ipod, iphone, laptop computers for work sometimes at the same time - they work well.
- e. Collaborations can be different flavors, some provide skills you cannot do- I dont have a lab, dont have a way to make molecules etc. Others can be intellectual, working with experts deep in an area I can provide a different perspective. sometimes the collaboration is additive, sometimes synergistic, rarely subtractive. Identifying diseases is almost random when people reach out to me.. thanks for the deep questions!

Could you please comment on how you stayed so focused and disciplined? Were there any methods you did that you liked or found useful while studying and later on for working? I'm an aspiring clinical neuropsychologist who founded a platform that educates the public about mental health. I delayed my undergraduate admission by a couple of years to pursue this endeavor (and it's been somewhat successful), and I know the road ahead of me is long and harsh.

I'd really love some inspiration and tips, if you'd be kind enough to share them!

Thank you so much for the AMA!

[BlackRosette](#)

Thank you - I am not focused.. thats why I do what I do - I look broadly at the problems I work on. Would love to go deep into a problem but then the insights I have would not happen.

I was not a good student upto 18 - only had one A level in UK and not a great grade - Biology. Practical undergraduate was what got me back on track, how you learn is important. It was only later I got hooked writing.

Keep up the good work.

Hi Sean! I'm a volunteer for the Rare Genomics Institute. We help rare disease patients crowdfund for the genomic sequencing they need for diagnosis, and we also connect them with scientists and

physicians who can help them navigate the results. Would you be willing to do an interview about your work for our blog?

[coolbromeliad](#)

Hello, thank you for the question. Short answer is I would be honored to do an interview (after July). Back in 2012 I entered the competition you co-organized and won several prizes on behalf of rare disease foundations.. One of these led to the development of a KO mouse for Sanfilippo D.. this will be critical for testing Enzyme Replacement Treatments in future - Thank you!

What can be done to improve reporting of clinical observations and findings, particularly those that were withdrawn or removed during development?

[rum\\_pirate](#)

Thank you - There are probably many answers to this. One is that there needs to be openness on reporting such findings and failures and two is how we capture such data in databases and keep it around for future generations to mine. Such serendipity is something we have kind of removed from R&D in drug discovery.

Has your approach to curing these rare diseases ever been frustrated by "treatment-based" ideology often supported by governments/insurance companies such as in the U.S.A.?

[RAGE\\_CAKES](#)

Thank you - not sure what this means. Sorry.

May I ask what your take is on the recent developments concerning facilities not being able to replicate supposed well known/established tests that confirm medicines work? There were a few others that got alot more attention. Notably in the field of phycology. There were a few others regarding gene therapy as well. What do you think is going on right now? ( I wish I could word that better... I really hope you know what I am referring to. )

[sthdown](#)

Thank you - data reproducibility is a big issue thats taken many a long time to realize is actually key to why drug discovery success is poor. There are many other factors that get less attention like how we dispense liquids / drugs can also impact the data we get.

Hi Dr Sean,

I am pursuing PhD in drug delivery and want to explore drug discovery side ? In your opinion, what should I be ready to learn ? programming, advanced chemistry, proteins ?

Any idea on Vitiligo ? I guess it occurs due to genetic change that inhibit formation of melanin in certain parts on skin. Considering this, isn't it possible to find which part of genes are responsible for this and find a molecule that can work ? I want to know, if I have to to do research on this, how long it may take ? Sorry for my Naive questions.

[micropanda](#)

Thank you I would learn as much as you can about all of the topics. If I was you I would research this disease and what you could do to offer a treatment.

1. Do you think the prospect of getting personalized treatment based on genomics is over-hyped? Since there is a big gap from identifying the genetic code to actually knowing what to do with it.
2. What do you have to say to Social Scientists who seem to paint pharmaceutical companies (in particular, Big Pharma) as "greedy capitalists".

I've always wanted to ask someone in your position for his/her opinion on this. Thanks!!

[OldSparky](#)

Thank you - we have been slow to get to the personalized treatments but its happening. I definitely think big pharma have done themselves no favors on how they are portrayed / perceived. Probably the less said the better.

Hi! Thank you for doing this! While I was in the military I was diagnosed with HNPP. A sort of variety of charcot-marie-tooth. Do you have and experience with this? My doctors that I have gone to have no idea what to do with me and it's frustrating. I'm in pain a lot and have asked for medical Marijuana but they haven't given me a straight answer as to whether or not it would be helpful. Thank you again for taking your time to do this!

[justin62096](#)

please contact the Hereditary Neuropathy Foundation - we can put you in touch with the physicians that specialize in this <http://www.hnf-cure.org/about-us/contact/>

Do you think you could go into more detail about what it is your modeling computationally/using machine learning. Have your models been used in industry or is it more so theoretical?

[Prot00ls](#)

Thank you - Yes I have initially started in industry where my models were used to predict drug drug interactions and how molecules behave in terms of their molecular properties. More recently my Bayesian machine learning models have been used to help identify new molecules for Tuberculosis, Ebola and Chagas disease. e.g. <http://f1000research.com/articles/4-1091/v2>

Current Aberdonian student; just wanted to say your story is an inspiration. Do you have any advice for graduates in today's scientific climate? And who was your favorite lecturer?

[ojibwabirdpole](#)

Thank you - Happy to inspire. Study as much as you can and do the best you can and do what you enjoy - look to get experience wherever you can even outside the UK. I did not really have a favorite, my advisor was the late Prof. Gabrielle Hawksworth.

Hey Saun! I'm currently a sophomore in college and am interested in working as a biomedical engineer/researcher. What do you envision the future of medicine to be like and the implications of

DNA editing concepts like Crisp?

[Awin1997](#)

Thank you - There is always opportunities for game changing breakthroughs that can come from anywhere and anyone CRISPR may be one with huge impact. Study hard and do not get discouraged.

I've always wondered do you think were are creating more diseases or are we just discovering more diseases faster than we cure/treat them. My though that its like violance in the world, we tend to think the world is more dangerous but in actuality it is the same if not safer but we just hear about it more

[stefantababy](#)

Thank you - There are > 7000 diseases. We are good at finding diseases and slower at treating them.

What's your opinion of Moderna Therapeutics spin-off Elpidera that focuses on rare diseases?

[theddman](#)

First I heard of it - could be seen as a way to move some projects out from under the big company..so as not to distract?

As someone who it's fascinated by the potential of nanotechnology and nanorobotics in medicine, I was wondering... how do you feel these two fields could potentially help you in administering these drugs? (Not having to have such reaction neutral drugs due to 'delivery' directly to problem areas etc.) Also, what new technology excites you the most in terms of working together at this point?

[TheHarvesterOfSouls](#)

Thank you - Yes definitely important for ideas around better drug delivery. Deep learning has grabbed lots of attention - application in drug discovery, rare diseases etc could be of interest.

Hi Doctor, thanks so much for the work you do AND this AMA. My question is maybe tangential to your field, but I have always been fascinated with Morgellons. Is it real or not? And if not, how did your field go about determining that, conclusively? And how as a society can we stop the spread of psuedoscience like that?

[themoderation](#)

Thank you - Sorry not sure what this is!

Curious as to what makes Lyme disease something that isn't really recognized (at least where I am from - Canada). I have heard people having to travel to the US to receive treatments for something that looks like it is a debilitating (although slowly) disease.

[alKaszL](#)

Thank you - US east coast its a big thing. thats why its of interest here but in few other places.

What are your thoughts on pharmaceutical big business? More specifically, what is your professional stance on drug pricing (ie of course companies should be monetarily rewarded for drugs but where's the line of price gauging)?

[mandamorgan77](#)

Thank you - Costs should be proportionate to R&D and support of future efforts.

As a brain hemorrhage via AVM survivor, will any of your companies be researching the various causes of AVMs? I've been unsure of why I was born with one where it was, and haven't been able to get an answer from any doctors.

[jakill101](#)

Thank you - you never know what might be the next project.

How do you and your colleague scientists deal with difficult questions on Twitter?

[ScienceLit16](#)

Thank you - I try to answer them. Sometimes the trolling can get you really in the mindset of why do I bother.. Generally more good than bad interactions.

Have you done any work on Erdheim Chester disease? If so, what is the short term outlook for a cure? Long term? What is the biggest challenge with this disease?

[masanarchy](#)

Thank you - Sorry - I have not but will look it up!

Please add Hidradenitis Suppurativa to your list of overlooked disorders. Nobody seems to know what causes or cures it, and severe cases are absolutely life ruining. Thank you.

[BookMD](#)

Thank you - will do

What are some sources you would recommend for open access academic articles and studies?

[ilvtfu](#)

Thank you Well there are many PLOS, F1000Res, etc..too many to list!

I accidentally misread your name as "Skin Evans".

Obviously that's not the case, but how do you feel your life might be different if that was your name?

[I-heart-to-fart](#)

Thank you - I would prefer Sean Connery

What is your honest opinion about Elizabeth Holmes?

[anonymouspatentclerk](#)

Thank you - She still has lots to learn...as we all do. You make mistakes learn, move on.

Hi Sean! I suffer from a relatively unknown disease called urticarial vasculitis. My body breaks out in painful hives, and I get massive bouts of swelling on anything that gets used a lot. At this point, the only option I have outside permanent steroid use is getting xolair injections once a month to slow my symptoms. My question is, where does someone like me go to find better alternatives? It's been 2 years and it feels like I've hit a wall.

[mw19078](#)

thank you - Try researching on PubMed, Google.. is there a disease foundation.. if not form one.. tell people about disease and why there needs to be better treatments. We all have a voice.

Sean, thanks for doing this AMA! I have a family member that's been dealing with numerous rare diseases and we can't seem to find a medical institution which is really take on their case as it's fairly complex. I've suggested we look into institutions that are more research oriented but am having a difficult time finding anywhere that is doing research into what they've got (autonomic nervous system and gastroparesis). Is there a good site or central repository we could look into that would possibly help us locate someone actively doing research in those areas?

[Hi Im Baman](#)

Thank you - If they are undiagnosed I would suggest the NIH

Did any of those two companies pan out?

[Kevin0wens](#)

Thank you - still early stage.

Hi -- curious what makes something considered a rare or neglected disease? Is this classification based on a set criteria or more of a subjective label? CMT is something I encounter in clinical practice fairly commonly so I'm curious how it earns that label.

[DoctorKynes](#)

Thank you - please see the wikipedia definition of a rare disease listed earlier - CMT is definitely a rare disease.

Hi -- curious what makes something considered a rare or neglected disease? Is this classification based on a set criteria or more of a subjective label? CMT is something I encounter in clinical practice fairly commonly so I'm curious how it earns that label.

[DoctorKynes](#)

Thank you [https://en.wikipedia.org/wiki/Rare\\_disease](https://en.wikipedia.org/wiki/Rare_disease)

What's the back story to why you decided to start two companies to help cure rare / neglected diseases?

[delphinhugi](#)

Thank you - Meeting a rare disease parent and my suggestion she should start a company in 2011 to go after small business grants.. She did a few months later and we started. Jill also introduced me to other rare disease parents from other diseases and since then its just grown - to the point where it will become my major focus from Aug 1.

What are your thoughts on Martin Shkreli's defence that he needed to raise the price of his drug so high? He says the drug was too cheap, only 2000 people took it so profits were very low, and because it treats rare disease no one was searching for a better drug. He says without raising the price no one would have researched a new drug, and that he simply gives the drug away for free to those without insurance. Sound plausible?

[BedriddenSam](#)

Thank you - Please see my earlier comment.

I'm a medicinal chemist about to publish some interesting stuff on Leishmaniasis and Chagas disease. Basically I have developed what is essentially the same drug but for a tiny modification at the last step that makes it very selective for either disease. What should I do next to take it further? The data is quite good and the compounds are very cheap to make

[kingofthecrows](#)

Thank you - Hope you filed a provisional patent. Talk to your tech transfer people if in academia to see if they know of anyone that would be interested in commercializing. Failing that find someone yourself that would collaborate to go after small business grants and go after funding.

Do you work closely with universities to combine research efforts? I'm currently studying structure-based drug design and wondering how research generated at the university level is built upon/used in the industry? Also thanks for doing this AMA!

[thatxanderkid](#)

Thank you - Yes - I thrive off such collaborations - I write grants with academics to fund their work and develop products / molecules. So that project you work on could one day become a full fledged project which a start up licenses - and maybe you will be working on it or founding the company.

Good morning, and thank you for taking time out of your day to answer all these questions.

My question is pharmaceutical in nature. I'm only assuming because of your background you may have some insight into why I've suddenly developed this sensitivity.

I'm a chronic pain sufferer, and have early onset degenerative disc disease. I've been through 2 failed back surgeries, and because of poor surgical technique, and surgical error, I have many nerve issues now too. As a result I'm on a pretty heavy pain medication regime including 75mcg of fentanyl every 48hrs.

The fentanyl made such a huge difference. I wake up with enough pain relief, I no longer need help out of bed. However, after using 75mcg for 3 years, out of the blue, I started to develop intense headaches, dizziness, and throwing up. These symptoms only dissipate after removing my fentanyl patch, I feel better in about 3 hours.

My pain management team thought maybe it was a bad patch at first, and had me try another, same issue. The a different box/lot number, same issue. They then had me try 50 mcg fentanyl, but the negative symptoms still persisted. At 25mcg of fentanyl, I had no negative symptoms, but my back pain was no longer being relived. My doctor's want to switch me back to oxycontin, but in the past it hasn't provided the best pain relief.

I'm just wondering if you've ever heard of something like this, or because of your background, if you'd know why someone would suddenly develop a reaction to a medication they've taken for years. I understand if you're unable to assist me, and want to thank you, for the work you're doing with rare diseases.

[MystyDikship](#)

THank you - sorry to hear about this. Did you change something in your diet or start taking any over the counter medicines that could perhaps change the metabolism of the drug. Perhaps these could be the issue. I would definetly talk to physician and if possible get a few opinions.

Hello, my girlfriend has lemularichthosis (may not be completely correct spelling), and it is a very rare skin disease. Have you done any work with this illness and if so what were your findings/conclusions?

[Captainflando](#)

Thank you - very sorry to hear that - I have not worked on it. You can share more if you like.. (twitter handle = collabchem)

Hello and thanks for doing this. A few years back I was diagnosed with dermatomyositis after a battery of tests, and a couple months of both know what was going on with my body. It was very disheartening being told that the medical community doesn't know what exactly causes this disease and that there is no cure. At the time I was 24, and I pretty thought my quality of life was going down the tubes fast. I was prescribed 60mg of Prednisone and a bit of methotrexate and fossomax and steroid cream for the itch. I gained 100 lbs from the Prednisone, and a slew of other conditions started popping up while on treatment. I had GERD, Hand Foot and Mouth, and gall stones which I think all related to the horses share of steroids I was taking. Eventually I moved to Washington state, and I cycled off of the drugs. My symptoms went away, but when I stay outside for a bit too long I get itchy spots. I didn't find that when I used cannabis salves on inflamed areas of my skin it gets rid of the itch almost instantaneously, and with continued use the itchy patch goes away. I've done this about 6 different occasions, because the first time I thought it was a fluke. I guess my question is whether or not you have any thoughts about my condition and experience, as well as whether or not there is something I should be excited for as far as new treatment and what to look forward to thanks again.

[SicSemperTyrinator](#)

Thank you - I do not know much about this disease - I would look for a community around the disease

to learn more about research or use PubMed.

What regulatory changes would you recommend in the FDA approval process?

What if any changes would you make with regards to the advantages already in place for orphan drug manufacturers?

[windslashz](#)

Thank you - I would definitely not have any recommendations for the FDA. I would say at the very least we need to keep what we have and expand to consider repurposed drugs for rare diseases and provide incentives to do that.

Hi Sean,

I'm a little late to the discussion but hopefully my question is still seen.

I work at a clinical research center at a prominent children's hospital. We have a very broad patient population and are involved in quite a bit of rare disease research. I myself work on NBIA (which Martin Shkreli got involved for a second before he got kicked out of Retrophin) and Tuberos Sclerosis. Over the past several years our NIH funding has dried up considerably, which is true for all clinical research centers. As a result, we're working more and more with pharmaceutical company-led investigations. Given the for-profit nature of pharmaceutical companies how do you think this will affect clinical research, for better or worse?

Also, any thoughts on families lobbying for compassionate use of untested drugs in instances of rare and progressive diseases? How does your company handle that?

Thanks!

[VerenValtaan](#)

Thank you - sorry to hear about the funding - I have no problem with academia and pharma working together - I am all for it. We just have to translate ideas better - if this makes it happen great. If I had a drug that would / might work for someone I would definitely want them to use it as long as its safe. I see no problem with that and I cannot understand why companies would want it any other way. We develop drugs to treat patients.

My question is regarding Loin Pain Haematuria Syndrome. (Not sure if you've had any experience with it). I know some doctors don't believe in it, but my renal professor does. ( And the renal colic/blood is certainly real to me )

How do you pick which conditions to focus on? ( Like - how does one get their condition researched?)

Or if you know of any research being done/planned...

Thank you very much

PS below is the link to the LPHS wiki if anyone wants to read up on it. My quick explanation is that it's a kidney condition, that no one knows what causes/how to fix it. Main symptoms are blood in urine (not so bad), and kidney pain (both the chronic all the time kind, and the same acute spasms you get when you have kidney stones). On the plus side it's not fatal. Silver lining and all that :D

[https://en.m.wikipedia.org/wiki/Loin\\_pain\\_hematuria\\_syndrome](https://en.m.wikipedia.org/wiki/Loin_pain_hematuria_syndrome)

[Tangelyno](#)

Thank you - this is new to me - thanks for sharing!

Hey Sean ! I'm a grad student from India and am going to pursue my Masters in Neuroscience from King's College London. I have visited pharmaceutical industries like Pfizer, Abott,etc., here in India and from what I witnessed the scientists looked bored out of their minds and the work seemed to be quite mechanical and drab. Does your industrial experience differ from this outlook ? If yes, how so?

Also, it's great that you're getting funded for researching such rare and neglected diseases, but how do you manage to attract funding towards this often overlooked cause?

[ballmagneto](#)

Thank you - sorry to hear about what you witnessed - all I can say after a recent tour of Genentech in the US was that the passion the scientists showed was infectious. It could be each company and person is different. There is money out there - you just have to look to find it. E.g. DOD funds rare disease work in the US.

I and some of my family members have acute intermittent porphyria, a rare disease caused by a genetic mutation. I'm not a doctor or a scientist, so I'm not sure I'm using the right terminology for any of this, but do you think genetic modification will be a viable treatment option within the next few decades? And is it something that could theoretically be done to an adult patient? Like, being able to add/grow an enzyme that a person was born without? Or is genetic modification only possible in the embryonic stage?

[icouldbethecrocodile](#)

Thank you - I do not know the disease - but enzyme replacement therapy would be one way to treat it [https://en.wikipedia.org/wiki/Acute\\_intermittent\\_porphyria](https://en.wikipedia.org/wiki/Acute_intermittent_porphyria)

Do you have a favorite Pokemon? Does it happen to be Ekans?

[\\_Jaster](#)

Thank you - Pikachu

Hi Sean,

I'm coming at things from an opposite perspective from you. I'm a machine learning PhD student that is increasingly interested in medical applications. Any advice for how someone like myself could go about collaborating with people looking to develop new drugs and treatments? This has been especially tricky for me, since I go to a top 10 machine learning school (UT Austin), but we are still building our medical school and hospital, so there isn't a huge academic medical arm for us yet.

[upper\\_bounded](#)

Thank you - I would suggest you do some outreach to increase your visibility in your institute and basically put it out there that you are willing to collaborate. Your advisor should be able to connect you.

Otherwise I would basically see if you can give a talk about your work at nearby schools. Perhaps try to connect with faculty on twitter, linkedin etc...use as many approaches as you can

Hello -

I am very curious to know your salary and how many orphan drug patents you currently hold or have helped to "re-orphan" for new, off-label uses. How do you feel about the fact that, in general, most people are chasing rare diseases because that is where the money is. How do you feel about the need for new generation antibiotics? Why do you think things like this do not attract much attention from top scientists such as yourself? Do you feel it comes down to issues like money?

[Alwayson13](#)

Currently hold zero patents for rare diseases but working on that :) - same with the salary - not driven by \$ if I was I would be doing something else rather than this. You do not have to be a top scientist to work on these problems. The general public can make a contribution, parents can contribute. I have seen rare disease patients help to make discoveries around their own diseases.

Thanks for the AMA! I was wondering how closely have you worked with MDs and in what capacity? I'm currently a med student and have started my own company but I've noticed not a lot of MDs seem to be involved in projects like this. For me I think it combines research and entrepreneurship and would love to keep being involved in this kind of thing, so I'm wondering if in your experience you have engaged with MDs doing similar things or perhaps employed some in your companies?

[lostthesis](#)

Thank you - Yes I have worked with one MD at LABioMed - Dr. Patricia Dickson, with her colleagues we have managed to get 3 grants in a few years. I am also working with other MDs there and elsewhere on several projects. Many MDs want to find someone that can help with the company / entrepreneurial / grant side. They have phenomenal ideas we absolutely should be tapping into and commercializing - sometimes their research institutes take them for granted. I have a recent experience of a great MD, great science, submitted to a journal ground breaking work with a molecule for a disease but had not submitted provisional. Not all Universities / institutes have the capabilities to see the value of what their scientists and MDs are doing .

My niece was born with PKD yesterday at Brigham women's hospital in boston. They gave her just minutes to live but she's pulled through the night. Now she's in the ICU and running some more tests. They say her kidneys will not function and that it's one in a million that she'll live more than 2 weeks.

What can we do? Her mom is trying to stay objective, but the father is getting attached to the one in a million. Are there any organizations that might be able to help?

[RMCPhoto](#)

Thank you - very sorry. PKD can mean many things please can you spell out. Did you look to see if there is a foundation already that can provide support and advice. Did the physician provide any contacts.

Dr. Ekins, Thank you for doing this AMA. Do you have any plans on doing further research and publishing data on Hashimoto's thyroiditis, which has reached almost epidemic levels in middle age

females?

The medical community seems to be uneducated about the one simple test (TPO AB) that could help so many women and treatment for their symptoms range from antidepressants to antibiotics (I wish I was joking) and their condition goes undiagnosed for years. Thank you!!

[Seychel](#)

Thank you - no plans to work on this disease but no you have brought it to my attention.. thank you!

This may be sort of a selfish question because myself and one of my siblings are public health majors... But in terms of the human resources for your company I can see how degrees in business, management, finance etc. would be valuable (as they are in most all companies) but what about a degree in public health? What niche could someone with a degree in public health fill in a corporate structure, specifically in your line of work?

[fumetiti](#)

Thank you - I think the qualification could be useful from the neglected disease side and rare disease. Just having that knowledge could be useful for grant writing etc.

How do you see the FDA's involvement changing as healthcare becomes more patient-centric? Traditional clinical trials can cost 1-2B for a single indication over many, many years, but especially for progressive, chronic diseases like CMT, there is a wealth of information to be gathered in a day-to-day setting (small changes in gait, speech, memory), without all the overhead and bureaucracy of validated indications.

[kcm](#)

Thank you - I definitely think we need to rapidly improve some of the clinical endpoints for diseases and implement in clinical trials. Some of them are so archaic like the 6MWT and 9 hole peg test.

Do you think the balance is correct between patient risk and barrier-to-entry for testing new drugs for rare diseases?

Would you say the cost of developing and testing a drug is truly around \$500m - \$1bn, as is often claimed? If so, is it possible to make development of treatments for rare diseases more feasible? That is, if we assume that politicians cannot be persuaded to massively increase public funding.

[JB\\_UK](#)

Thank you - each disease is different and I think that is taken into account.

No not all drugs cost this much to develop. Probably could do many for under \$10M each, especially for rare diseases.

As a new grad student interested in infectious diseases (more specifically, neglected tropical diseases) I am somewhat worried about funding when it comes to NTDs. While Ebola and Zika outbreaks have given some of the spotlight to NTDs, there are many others that still need attention but are not as eye-catching as Ebola or Zika like dengue or yellow fever. What's your take on research and funding for NTDs?

[oldzealand](#)

Thank you - yes the funding and political situation is precarious. I think it challenges us to be creative, to do more with less. There are many routes to achieve some impact. Can we use computers to do more. Can we do more by collaborations.

Have you've done any research into PAPA Syndrome, and if you have do you know how I can get into contact with you or where I can get more information in contacting one of your companies? We are already working with the NIH with this directly for about a year now but I wanted to see if there were any other drugs we should be taking a look at in order to treat this. Thank you

[champagon\\_2](#)

Thank you - I have not worked on this and I can look it up - feel free to reach out to me outside this forum you can find me easily on twitter (collabchem)

My nephew was just diagnosed with Alexander Disease or dysmyelinogenic leukodystrophy and my family is absolutely heartbroken about it. Is there any hope? From what little I've seen there's no study or even hint of a cure or help that will keep him alive. Only something like 200 cases in the United states currently and it doesn't appear there's anyone really looking at it.

[B0NERSTORM](#)

Thank you - Very sorry - Actually I have heard of this disease. It is closely related to Giant Axonal Neuropathy and there is definitely work going on. please reach out to me at twitter (collabchem) and I can connect to others.