Stenographic Transcript
Before the

Subcommittee on Personnel

COMMITTEE ON
ARMED SERVICES

UNITED STATES SENATE

HEARING TO RECEIVE TESTIMONY ON THE DEPARTMENT OF DEFENSE'S EFFORTS TO ENSURE SERVICEMEMBERS' ACCESS TO SAFE, HIGH-QUALITY PHARMACEUTICALS

TUESDAY, APRIL 30, 2024

Washington, D.C.

ALDERSON COURT REPORTING
1029 VERMONT AVE, NW
10TH FLOOR
WASHINGTON, DC 20005
(202) 289-2260
www.aldersonreporting.com

HEARING TO RECEIVE TESTIMONY ON THE DEPARTMENT OF DEFENSE'S EFFORTS TO ENSURE SERVICEMEMBERS' ACCESS TO SAFE, HIGH-QUALITY PHARMACEUTICALS

Tuesday, April 30, 2024

U.S. Senate
Committee on Armed Services
Subcommittee on Personnel
Washington, D.C.

The subcommittee met, pursuant to notice, at 2:30 p.m. in Room SR-232A, Russell Senate Office Building, Hon. Elizabeth Warren, chairman of the subcommittee, presiding.

Committee Members Present: Warren [presiding], Kaine, and Scott.

OPENING STATEMENT OF HON. ELIZABETH WARREN, U.S. SENATOR FROM MASSACHUSETTS

Senator Warren: This hearing will come to order.

We welcome everyone to today's hearing to receive testimony on the efforts of the Department of Defense to ensure servicemembers' access to prescription drugs that are safe, high quality, and effective.

We owe our servicemembers and their families the best possible health care. This is a morale issue, it is a recruiting issue, and ultimately, it is a national security issue.

DoD spends about $5 billion every year on pharmaceuticals. That is about 2 percent of the entire U.S. commercial pharmaceutical market. Now to make these purchases, DoD must navigate many of the same challenges as civilian health systems.

For example, according to the FDA, almost half of the drugs on DoD's operational medicines list -- a list that contains drugs necessary for warfighting that are essential for meeting the medical needs of servicemembers -- about half those drugs are in shortage. This includes the blood thinner heparin, a common anesthesia drug called midazolam, and morphine for pain management. The impact of these drug shortages can be devastating. A shortage could mean using a drug with worse side effects, or it could mean having to use

the second- or third-line treatment for an illness, rather than the treatment that is most effective.

While there are many factors that can cause shortages from spikes in demand to natural disasters to inspection failures -- most drugs in shortage share a common feature: they are generics. That means they are no longer protected by patents, and they can be made by any manufacturer with approval from the FDA. Despite this, most generic drugs have very little competition. In fact, 40 percent of the generic drugs sold in the United States have just one manufacturer.

Why? Because the profit margin for some generic drugs is so low that American manufacturers just are not interested in making them. As a result, more of DoD's generic drug supply is coming from foreign manufacturers who can produce the drugs at even lower costs.

DoD's reliance on overseas manufacturers is not limited to finished drug products. The ingredients used to make the medicines, called active pharmaceutical ingredients, or APIs, and the ingredients used to make APIs, known as key starting materials, or KSMs, are also increasingly sourced from abroad.

The COVID-19 pandemic exposed the risks we face by importing more and more of our commercial drug supply overall. DoD relies on those imported drugs and that gives

potential adversaries the power to restrict DoD's access, which can result in harm to our servicemembers, to their families, and to our national security. In addition, the U.S. has less and less visibility into and oversight of foreign manufacturers and their manufacturing practices, and that is particularly true with China.

These problems have concerned me for a long time, and that is why I partnered with Senator Rubio to secure language in the fiscal year 2023 NDAA requiring DoD to develop guidance for risk management of the Department's pharmaceutical supply chain, to report on supply chain vulnerabilities, and to establish a working group to develop policies for allocating scarce pharmaceutical resources.

When a drug does not work properly it can have serious consequences for servicemembers. Bloomberg reported last year that an outside lab tested tacrolimus, an immunosuppressant used to treat soldiers who have lost limbs in combat. The results revealed that some generic versions of the drug might not work. Worse yet, they could cause kidney failure or seizures.

So last summer, in accordance with Senator Rubio's and my provision, DoD entered into a cooperative agreement with an independent lab to conduct a pilot study to test the quality of 12 finished drugs in the military drug supply. And in November, DoD revealed that 27 percent of the drugs

on the FDA's Essential Medicines List are at, quote, "Very High Risk" because they are either dependent on Chinese manufacturers using Chinese ingredients or were derived from unknown sources.

So we are holding this hearing today to learn more about these challenges and to discuss DoD's capacity to address them.

I want to thank Ranking Member Scott for his commitment to improve the quality of life for our servicemembers and for their families. And to our witnesses, I say welcome and thank you for appearing today.

We will have two panels. The first panel consists of officials from the Department of Defense who will explain how DoD is currently addressing drug shortages and DoD's existing capabilities for biomedical research and development. I am pleased to have the opportunity to introduce them, which I will do in just a minute, but I want to see if Senator Scott has any remarks he would like to make first.

STATEMENT OF HON. RICK SCOTT, U.S. SENATOR FROM FLORIDA

Senator Scott: Sure. First I want to thank Chair Warren for doing this. I think this is a very important issue. I think any of us that would have a health issue, we would want to make that our kids and our grandkids, that they had the best medicine out there. And it sure does not seem like we are doing that.

For several years I have raised concerns over the pharmaceutical supply chain in this country. The COVID pandemic exposed the vulnerabilities in our supply chains and the dangers of continuing to be reliant on Communist China for medicines and other critical products. I do not know if anybody, logically, would ever want to be dependent on Communist China for anything.

While the pandemic is over, these problems continue. America is far too dependent on Communist China and other foreign producers, and our supply chains will be massively disrupted when Xi decides to invade Taiwan. I do not think it is a question of if. I think it is a question of when.

If we do not take action to fix this now, the supply chain disruption that will occur when Communist China strikes Taiwan will be extreme and cause unbearable pain for the United States and every American family. No one will be safe from the impact of supply chain disruption if we

continue down our current path. Prices will skyrocket even higher; product shortages will be widespread and severe. I mean, I just cannot imagine that we are buying essential items like medicines, technology, household goods, you name it. Everything is going to be affected, and I do not know why we buy anything from Communist China.

But today we want to focus on medicine and the pharmaceutical supply chains that our military depends on. I am glad we have this opportunity to discuss how pharmaceutical safety, quality, and supply chain issues affect our warfighters. I think we all agree that America's dependence on Communist China and other foreign producers for medicines is a significant problem, and it does not appear to being addressed.

I have been fighting for legislation to get this fixed. My American Drugs Act will create a strong incentive for companies to invest in domestic pharmaceutical production, address the ongoing drug shortages, and work to prevent future ones, and shift away from reliance on Communist China. The American Drugs Act seeks to fix this problem by leveraging the buying power of the Federal Government and requiring Federal health programs to purchase American-manufactured generic drugs if there are two or more manufacturers of a generic drug. I think this bill is needed, given the issues we face today, and as the Chair

said, it is not a little bit of money that our defense industry is buying. It is billions of dollars every year.

The Department of Defense recently conducted a pharmaceutical supply chain study, as required by 860 of the fiscal year 2020 National Defense Authorization Act, and I want to thank Chair Warren for leading that effort. This study revealed the Department has a high dependence on foreign material and foreign trade agreements to maintain current pharmaceutical capabilities. I do not know anybody in their right mind who trusts anything made in China. The report shows that 54 percent of the pharmaceutical ingredients that encompassed the products on the FDA's Essential Medicines List, being the critical pharmaceuticals that the Department should have access to, are from sources that are at a high risk of disruption. Who would do that? Only a quarter of the drugs on the list have domestic manufacturers.

As I mentioned earlier, during COVID we learned the hard way that relying on non-allied countries for our medical supply chain poses a real danger. For that reason it is imperative that we work to ensure DoD's supply chains are independent from non-allied nations for necessary pharmaceutical treatments. In the future these supply chains could easily cease to exist, and I assume they will when China invades Taiwan.

I am also working on legislation that would have the DoD work with manufacturers to build up our domestic pharmaceutical manufacturing base. If we have a drug shortage of antibiotics, where about 90 percent of the key inputs to make those drugs come from China, it becomes a readiness issue because our strength comes from a ready and health warfighter.

About 90 percent of the drugs dispensed at the pharmacy are generic drugs, but a country like China-controlled generic drug manufacturing makes us more dependent as we ramp up for possible conflict.

Today I look forward to hearing from both the Defense Logistics Agency and the Department of Defense Health Agency to discuss the findings of the Department's pharmaceutical supply chain study and their ongoing work to study and secure these supply chains.

In addition to focusing on pharmaceutical supply chains' security we must address the specific medical countermeasure needs of the warfighter. The Walter Reed Army Institute of Research has a Pilot Bioproduction Facility that can aid the transition phase from research and development to early-stage clinical trials for warfighter-specific vaccines and biologics. While this effort is small in scale, it is important that we discuss the success that General Bailey and his team have found in keeping our

warfighter healthy and combat ready.

History shows us that infectious diseases have a high morbidity rate in theaters of war. As we look towards the pacing threat in the Pacific I would like to understand the medical challenges that our troops will face, what innovative tools and improve medical countermeasures in advance of a contingency.

Lastly, we will discuss the ongoing pilot program on quality and safety of pharmaceuticals. The Department of Defense Uniformed Services University of the Health Sciences is leading a pilot program to assess pharmaceutical product quality in the military health system pharmaceutical supply chain. While this pilot program is in the early stages, we utilize the military health system as a representative example to conduct a thorough review of the pharmaceutical supply chain to include a risk assessment analysis of our domestic manufacturing capacity and analytical testing of drug products from various suppliers.

I am deeply concerned by our lack of resiliency and transparency in this area. I look forward to hearing the results of this study over the coming years. And I want to thank all of you for being here, and I simply do not understand how we ever got ourselves dependent on China and why we are not doing more to get it done.

Senator Warren: Thank you very much. Thank you,

Senator Scott.

As I said, our first panel is going to be about drug shortages and R&D for the Department of Defense. And from my left to my right we have Dr. Mark Dertzbaugh, Principal Assistant for Research and Technology for the U.S. Army Medical Research and Development Command; we have with us Dr. Martinez-López -- it is good to see you -- the Honorable Dr. Lester Martinez-López, Assistant Secretary of Defense for Health Affairs at the Department of Defense -- welcome; Dr. David Smith, Deputy Assistant Secretary of Defense for Health Readiness, Policy and Oversight at the Department of Defense; and Mr. Matthew R. Beebe, who is Legislative Affairs Director at the Defense Logistics Agency.

And I understand, Dr. Lester Martinez-López, that you are going to give a joint statement to get us started?

Dr. Martinez-López: And Mr. Beebe, as well.

Senator Warren: All right. And then Mr. Beebe will speak. Thank you. You are recognized, Dr. Lester Martinez-López.

JOINT STATEMENT OF HON. LESTER MARTINEZ-LÓPEZ, ASSISTANT SECRETARY OF DEFENSE FOR HEALTH AFFAIRS, DEPARTMENT OF DEFENSE; DAVID J. SMITH, M.D., DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR HEALTH READINESS POLICY AND OVERSIGHT, DEPARTMENT OF DEFENSE; AND MARK DERTZBAUGH, M.D., PRINCIPAL ASSISTANT FOR RESEARCH AND TECHNOLOGY, UNITED STATES ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND

Dr. Martinez-López: Chairwoman Warren, Ranking Member Scott, and distinguished members of the Senate Armed Services Committee, I am pleased to represent the Office of the Secretary of Defense to discuss the Department of Defense's commitment to ensure access to safe and effective pharmaceutical products we procure and use in the Military Health System.

In this testimony we will inform the Committee about the Department's initiative to maintain a secure pharmaceutical supply chain, assuring our MHS beneficiaries receive the highest quality pharmaceutical products available.

Over the past few decades, production of most American generic drugs, and particularly the ingredients needed to make them, has moved overseas. With this movement, national security supply chain concerns arise. Similar to civilian health care groups and other parts of the U.S. government, the Department's core areas of concern are unstable sourcing

of pharmaceutical and/or active pharmaceutical ingredients and the availability of domestic manufacturing for contingency scenarios.

Consistent with the National Biodefense Strategy, Section 3.5, "Guidance on Agile Therapeutic Development and production," and Executive Order 14017, "America's Supply Chains," the Department is taking a range of actions to address these vulnerabilities. Specifically reference to the MHS policy efforts, the Department's pharmacy and medical logistics teams established a Pharmacy Supply Chain Risk Management Working Group. This group leverage existing and new assessments of all aspects of the supply chain, with focal areas on the critical pharmaceuticals for beneficiary care that are on the Joint Deployment Formulary. We have begun the development of policies and procedures based on this effort to enable allocation of resources in the case of supply chain disruption.

Another effort to generate insights, led by the Uniformed Services University of the Health Sciences, we are evaluating aspects of the MHS pharmaceutical supply chain, to include domestic manufacturing capability, documentation of the supply chain, and supply chain security and resilience. Our objective, through our research initiative, is to generate meaningful and actionable information on drug and active pharmaceutical ingredient supply chain

resiliency. Using the MHS as a representative example, this study will conduct a thorough environmental scan of the pharmaceutical supply landscape, including a risk assessment, analysis of the domestic manufacturing capacity, and examination of the pharmaceutical supply chain, analytical testing of drug products from various suppliers, and study of proposed scoring systems and the associated policy considerations. Through this study the MHS will gain insights into which manufacturers, and associated supply chains meet reliability essential to the Department's Joint Deployment Formulary.

In addition to the USU-led work, the Defense Health Agency Research and Development focuses on developing novel solutions at Walter Reed Institute of Research. At WRAIR, structural and computational biologists harness the latest generation in electron microscopy, the next generation in sequencing, monoclonal antibody generation, machine learning technologies and novel adjuvants in design of the next-generation vaccine candies, which are then tested in preclinical models.

Through a range of efforts evaluating the supply chain vulnerability and resiliency we hope to drive more effective care while preparing for any potential shortfalls in supply chain.

In conclusion, I would like to sincerely thank you for

your continued support of military medicine and for inviting me here to discuss the important issues surrounding the health of our warfighters and our DoD beneficiaries. I look forward to your questions.

[The prepared joint statement of Dr. Martinez-López, Dr. Smith, and Dr. Dertzbaugh follows:]

Senator Warren: Thank you, Mr. Secretary. Mr. Beebe?

STATEMENT OF MATTHEW R. BEEBE, DIRECTOR OF ACQUISITION (J7), DEFENSE LOGISTICS AGENCY

Mr. Beebe: Good afternoon, Madam Chair, Ranking Member Scott, and distinguished members of the Senate Armed Services Personnel Subcommittee. Thank you for the opportunity to testify today. My name is Matt Beebe. I am the Senior Procurement Executive for the Defense Logistics Agency, or DLA, a Department of Defense combat support agency. I am grateful to have the chance to speak to you today about some of the work DLA is doing to improve visibility and transparency within the DoD pharmaceutical supply chain and ensure that our military servicemembers have access to safe, high quality pharmaceuticals.

DLA's mission is to deliver readiness and lethality to the warfighter always, and support or nation through quality, proactive, global logistics. In support of that mission, DLA manages the full spectrum of pharmaceuticals for the military and their dependents all over the world, to include supply to military hospitals.

Although our military customers set pharmaceutical requirements based upon the needs of today's warfighters, it is DLA who purchases those products and manages critical end-to-end supply chain logistics to ensure that military servicemembers get the pharmaceuticals they need, when they need them. We accomplish this by leveraging commercial

capabilities and contracting with commercial distribution companies who use their global networks of sources to deliver FDA-approved medicines to servicemembers at military treatment centers or wherever they are located throughout the world.

In line with our logistics mission and to better serve our customers and the warfighter, DLA is always seeking to improve our ability to identify, manage, and mitigate logistical and supply chain risks, including those impacting pharmaceutical supply chains.

One area of focus in this issue is foreign dependency of pharmaceuticals. A 2021 report by the DoD inspector general identified that due to the dependency of the U.S. commercial pharmaceutical market on ingredients from foreign suppliers, a disruption of the supply chain of those ingredients to domestic manufacturers had the potential to cause drug shortages, which could ultimately compromise the standards of care for military servicemembers.

Similarly, in November 2023, DoD submitted a report in response to Section 860 of the National Defense Authorization Act for fiscal year 2023, regarding risks in DoD pharmaceutical supply chains. In that report, DoD identified the defense supply chain for pharmaceuticals is highly dependent upon foreign or unknown sources, in large part due to the global nature of the pharmaceutical supply

chain for both finished products and active pharmaceutical ingredients, or APIs.

DoD identified several pervasive information gaps that hinder its ability to obtain visibility and transparency in these supply chains, particularly the lack of readily available and authoritative data on the sources of finished generic drugs, their APIs, and other key ingredients. Having this information would significantly improve our ability to illuminate the complex pharmaceutical supply chain and help DoD ensure that our military servicemembers continue to have access to safe, high-quality pharmaceuticals.

As the provider of critical pharmaceutical products to our nation's warfighters, we are steadfastly committed to working with the Department, other Federal agencies, and Congress to strengthen our collective ability to identify, mitigate, and prevent risks in the pharmaceutical supply chain.

DoD and the Department sincerely appreciate your interest in these issues. I look forward to addressing your questions.

[The prepared statement of Mr. Beebe follows:]

Senator Warren: Thank you, Mr. Beebe.

I am going to start with the first round of questions. The Defense Health Agency provides care for about 9 million people in the military health system, and that includes by dispensing prescription drugs to servicemembers and to their families.

Earlier this month, the American Society of Health System Pharmacists announced that there were a record 323 active drug shortages during the first quarter of 2024. That is an all-time high in the United States.

Dr. Martinez, you are in charge of ensuring the health and safety of our servicemembers. When DHA cannot get a critical drug because it is in shortage, can you just explain to everyone what options you have to ensure that servicemembers and their families are receiving the care they need?

Dr. Martinez-López: Chairwoman, thank you for the question. You know, the health of our beneficiaries is of most importance to all of us, and when you face the issue of not having the drug, the right drug for that patient then your choices are to go and look at alternate drugs that may not be exactly the same one for that condition or for that patient. It may have a different side effect profile.

So let me give you an example. Amoxicillin may be a drug. It is an antibiotic, made overseas, and used

everywhere for basic infections. But let's say I do not have it. Now I have to take other antibiotic, and at the same time I am trying to combat resistance of antibiotic. I am using an antibiotic that is not indicated for that condition. So there I lose twice, once because I am not giving the right antibiotic to my patients but on top of that I am losing ground on my fight against antibiotic resistance.

In other events, like in an epinephrine injection, that can be life or death. We do not have hours to decide what the alternate is. So that may translate into a life, right on the spot.

So this creates a conundrum for all health care professionals, and it is not just us. It is across the nation we are facing this.

Senator Warren: Okay. So worse health outcomes for the patient and worse health outcomes for the system overall, is what I am hearing you say.

According to the FDA, one of the leading factors contributing to drug shortages is quality issues. For example, an FDA inspection of a manufacturing plant in India revealed a, quote, "cascade of failure" at the plant's quality control unit. Investigators found problems with systems to prevent microbial contamination, to keep processing areas sterile, and to protect critical production

documents, including they found a trash bag full of records that had been torn and doused in acid. The plant temporarily closed, resulting in widespread shortages of common chemotherapy drugs across the United States, affecting both civilian and servicemembers.

As more of our drug supply chain moves overseas, these kinds of quality concerns are going to become even more common. So last summer, DoD launched a pilot with an independent lab to test drug products for safety and effectiveness. For example, it will test whether the drug contains any contaminants, whether it contains the correct dosage, and whether it has the expected potency.

The pilot study is going to look at 12 drugs on DoD Operational Medicines List, which includes drugs that are necessary for warfighting, and its Predeployment Medicines List, which includes drugs that help servicemembers control chronic conditions to meet standards for deployment. Together the pilot will test medicines needed to stabilize wounds, alleviate pain, and treat infections.

Dr. Smith, can you share why DoD thought it was necessary to conduct this pilot study?

Dr. Smith: Thank you for the question, Senator Warren. As we have noted, we are most concerned about ensuring the access to safe and effective drugs, and as you noted we are doing a number of studies, the 860 study that we have

referred to and then also the study for the Uniformed Services University, that is evaluating, in particular, a quality scoring tool by DeBastiani, that was published in the Journal of the American Pharmacy Association just last year as an additional factor for us to consider as we purchase medications on the market. And you pointed out the various FDA recalls and the issues that have been coming up.

Additionally, we have heard that within the generics, where there are multiple manufacturers using the same API, that there may be a variance in those generics. So we thought with all of those factors it would be useful to conduct this pilot study that you referred to, that ultimately will look at 42 drugs from our Joint Deployment Formulary, to see if we can differentiate between the generics and make us actually a better buyer and actually reward manufacturers that produce the product that is spot on. Over.

Senator Warren: Good. So you are talking about a study that you are doing because you hear a lot of problems out there, and also this may help you figure out how to respond to those going forward. Is that a fair summary?

Dr. Smith: I think that is fair.

Senator Warren: Good. Good. So when DoD is making decisions about purchasing drugs, price is often the most important consideration, but it should not be the only

consideration. Whether a drug is made by a reliable manufacturer or whether its active ingredients are made, and where they are made should also inform purchasing decisions.

The Defense Logistics Agency is responsible for procuring pharmaceuticals on behalf of the Military Health System, but DHA can put requirements on the purchases. Dr. Martinez, if DoD identifies significant risks to the safety of its drug supply chain will DHA add requirements on drug quality to ensure that we are buying effective, safe, the best drugs for our servicemembers?

Dr. Martinez-López: Senator, based on the information the pilots give us, I think we will be in a position to, if that is indicated, to make it so.

Senator Warren: Okay. So you can put that into your requirements, and you are telling me that if you are concerned about quality you will put it into your requirements.

Dr. Martinez-López: Yes.

Senator Warren: For the drug. Good. That is what I want to hear. You know, I am glad that DoD has taken steps to evaluate drug quality, and the Department should be prepared to use this information to improve quality and accessibility of the prescription drugs that our servicemembers need. Thank you.

Senator Scott?

Senator Scott: Thank you. Mr. Beebe, how many different drugs do you buy in a year? How many different ones?

Mr. Beebe: Well, our catalog probably is in the tens of thousands of items. Of course, that is not all different drugs. In some cases it is dosage differences, application differences.

Senator Scott: Okay. Tens of thousands. All right. And do you personally believe that we should not buy things from Communist China?

Mr. Beebe: I agree basically, or in reality we follow existing regulation on how and where to buy materials, whether it be pharmaceuticals or other items.

Senator Scott: Sure. But do you believe that we should not buy from Communist China?

Mr. Beebe: I agree, sir.

Senator Scott: Okay. So in the last 12 months, how many drugs have we stopped buying from Communist China?

Mr. Beebe: When we buy pharmaceuticals we buy with a preference towards domestic or safe, assured sources, although in many cases we do not know where the sources are. Normally we buy from domestic or our trading partners, but we do not always have visibility of where the ingredients of those pharmaceuticals come from, which is why it was so important for us initiate the study and identify where we

believe the sources of the ingredients are.

Senator Scott: But today you could just say, "I am not going to buy anything that has an ingredient that comes from Communist China. You could say, "I am not going to buy anything that has an ingredient from Communist China. I am not going to buy anything that is packaged in Communist China. I am not going to buy anything that is in any way in the supply chain impacted in Communist China." You could do that today, right?

Mr. Beebe: Actually, I do not believe the regulation actually supports that, in that very often the final product is manufactured domestically or from an ally, and if it is substantially transformed in those countries it is in accordance with trade agreements in the Buy American Act.

Senator Scott: So what is the limitation? Why can you not make that decision today?

Mr. Beebe: Because often the final product is manufactured either domestically or with an ally --

Senator Scott: But you could set that as a standard and then it is a requirement -- you could set the standard that whatever you buy can have nothing, anywhere in the supply chain, comes from Communist China. You could decide that today.

Mr. Beebe: If that standard exists, yes, but that is not for DLA to decide. We have to follow existing

regulations and policy and --

Senator Scott: Who set regulations that said you could not -- the Secretary of Defense testified the other day that we should not buy anything from Communist China. So what regulation would it be?

Mr. Beebe: That would establish that?

Senator Scott: Yeah. What regulation would stop you from being able to do it today?

Mr. Beebe: I cannot say what that regulation would be, but I certainly support being part of the discussion with the Department of Defense.

Senator Scott: Why don't you just do it. Just do it and see what happens. Why don't you just say tomorrow, you just do it. Like I am a business guy. I negotiated contracts with people. I ran the largest hospital company in the country. I was the biggest buyer of pretty much everything in health care on the provider side. And once I signed a contract I said our hospitals could not buy anything that day. They said, like that, and we are not going to buy those gloves, that drug, that device. Why don't you just do it?

Mr. Beebe: We do not buy end products from China unless it is the only source available and we can justify the waiver.

Senator Scott: So you believe that if there is a

product that there is a supplier in the United States today, you do not buy anything made in China if there is supplier of that product today?

Mr. Beebe: If the end product is available domestically, that is where we will buy it, yes.

Senator Scott: Do all of you believe that? So if come back and tell you that there are suppliers here that compete with China, that cannot get contracts with you, you will be shocked.

Mr. Beebe: If we are talking about the end product, yes.

Senator Scott: What is the difference?

Mr. Beebe: Well, much of what we are talking about is the active pharmaceutical ingredients that originate from China that get molded into a final product. When we buy the final product we are buying it from the United States or a domestic trading partner, and we cannot, until recently, see whether or not there were some ingredients from China or other country of concern. It was not visible, and we are working to make it visible.

Senator Scott: But why don't you just say, starting today you will not contract, just put it out there, you are not going to contract with anybody if anything -- not just the active ingredients -- there is no part of the process where Communist China is involved in it. There is none. Or

Russia, Iran, but primarily Communist China. Why don't you just do it right now?

Mr. Beebe: If we made that absolute then we would be creating a sufficient amount of non-availability for our health professionals.

Senator Scott: But if you do not do it today, when are you going to do it? I mean, if you do not start today, I mean, when are you going to do it? If you do 10,000, why don't you start off with 1,000 and see how bad it is? I mean, I am just a business guy, and I did not buy from my competition. This is not competition. These people are trying to kill us. Oh, they are killing us. I mean, Chinese precursors are killing 70,000 people with fentanyl a year. So why don't you just do it?

What I am trying to understand is, I think all of you agree Communist China wants to destroy our way of life. I think we all would, right? Does anybody disagree?

[No response.]

Senator Scott: Nobody disagrees. So let's do it today. What I do not understand is why don't we do it today? I just do not get it. Can somebody explain to me why we do not?

Dr. Smith: Sir, there are some of the APIs that only originate from China, that are critical to medications that we use on a daily basis. And so that would be one of the

impediments that needs to be resolved to be able to go that direction, sir.

Senator Scott: So, Dr. Smith, how many is that?

Dr. Smith: I am aware on the Joint Deployment Formulary, and this is specifically China, and as Mr. Beebe pointed out we have an issue with provenance on a fair percentage of our Joint Deployment, but I am aware, I believe -- and I can take it for the record -- 27 drugs that the APIs are specifically only sourced from China.

Senator Scott: And have we put out a bid for Americans to say, will somebody do it, on those, those 27?

Dr. Smith: As part of our work on 860, it is part of what we are going through to confirm and work solutions to this issue. But we are well aware that there is a substantial amount of the APIs, the active pharmaceutical ingredients, that are coming from Mainland China. Over.

Senator Scott: So that is not 27 out of 10,000, right?

Dr. Smith: I should probably take it for the record, sir, and we can give you the information. But I think it is 27 out of 920, or so.

Senator Scott: Okay. I am sorry.

Senator Warren: No, no. That is fine.

Senator Scott: I just want to understand why we do not do it today. I mean, in business we would just say, guys, we had a nice meeting. We found out that these people are

trying to destroy it. And we just say, okay, guys. We all decide, as of today, we will not do business with them. We do that in business all the time. I do not know why we just do not do that. I do not know what the limitation is. If there is a limitation, I want to all -- the Secretary of Defense has told me he does not want to buy anything from China.

Dr. Martinez-López: Sir, if I may, the main limitation we have right now, like Dr. Smith said, is that some of these drugs, the API is only made in China, and that is in the global market. So if we decide not to buy Chinese, I man, I think the number is around 5 percent of it, that we know of, of all the drugs in the formulary, that the API comes from China. And we do not know about 20-something percent of them where the API comes from. So that creates a conundrum. So if we could source it some other place, that would be great.

Senator Scott: Okay. So why would we not do this. There are all these different options. Number one, what I would do is just say I am not going to do it, and everybody has to sign a contract that they will not do it, and let's see what happens. I guess they will come back and tell us, right. Or we could say you have got 90 days to tell us where all your ingredients come from, and then we could make a decision. But, I mean, in my business life I would not

say, "Let's do a study." I would say, "No, I am not going to do it."

I am just trying to figure out, if there is an impediment, just tell me what it is. Are you in the same position I am?

Senator Warren: Yes, and I want to follow up on your point. Okay, I just want to follow up on this about the risks we run from having overseas manufacturing that is either in China or some other nation that is not an allied nation, because they all pose this risk and we need to worry about it.

I mentioned in my opening remarks that Senator Rubio and I got a provision in the fiscal year 2023 NDAA for DoD to put together a report, and it came out last November, about drug supply chain risks in military, and evaluated 211 drugs. And it found that half of those were either at high or very high risk because the active pharmaceutical ingredients, the APIs, for those drugs are sourced from China or non-Trade Agreement Act countries, or are just simply unknown, nobody knows where they are coming from.

So you identified, Mr. Beebe, that 27 APIs are sourced exclusively from China, but I would just point out that is only a little over 10 percent of the drugs. It is not half the drug we are talking about here. We have got a lot more drugs that if you right that it is only 27, then we have got

a lot of other drugs that are being sourced overseas, that we think there is a substantial risk.

And so the question becomes whether or not we should bring that manufacturing back to the United States. Is that in our national defense?

So let me put that question to you, Mr. Beebe. Should we be manufacturing these drugs domestically, and what is the risk if we keep running these manufacturing facilities overseas for China or non-Trade Agreement Act countries?

Mr. Beebe: So yes, ma'am. First of all, Dr. Smith is the one that made reference to the 27 --

Senator Warren: Sorry. Sorry.

Mr. Beebe: -- but I will go ahead and address the question first. So yes, we studied the FDA Essential Medicine List, and that is what was the basis for the report that identified a high amount of APIs sourced in China or other non-TA countries. Since then we have doubled that population, adding some of the highest volume pharmaceuticals that are purchased by our medical treatment facilities, as well as the overlap with the Joint Deployment Formulary, to expand the amount that we have reviewed, and the results are essentially the same, by percentage, as in same percentage of those coming from countries of high risk as well as the same percentage of unknown, which is, to me, equally troubling that I do not even know how to

characterize the risk.

Do I support bringing more domestic capacity? Absolutely. I mean, not only does domestic capacity mean that we have better access, but it also means that the government can better influence prioritization when there needs to be decisions of priority.

Senator Warren: Okay.

Mr. Beebe: That is very important too. Yes, ma'am.

Senator Warren: So let's talk a little bit about what is involved in increasing domestic manufacturing of these pharmaceuticals. Last summer, DoD released its inaugural DoD Biodefense Posture Review. This outlined the Department's capabilities to counter biothreats and identify domestic manufacturing as a priority reform initiative. According to the Posture Review, we have reduced drug manufacturing here in the United States so much that we simply do not have the commercial capacity to manufacture what our troops need. And because the Department's, quote, "unique biodefense demands" are small and not commercial competitive, reliable domestic manufacturing partners are actually hard to find.

But that is not the end of the story. DoD has its own manufacturing capabilities, capabilities with a proven track record of success. In 2017, DoD's Advanced Development and Manufacturing Biopharmaceutical Facility to help manufacture

medical countermeasures became fully operational. DoD has a second biomanufacturing facility at the Walter Reed Army Institute for Research, WRAIR. The Walter Reed facility has developed many vaccines that DoD relies on today to protect our troops from a number of diseases, including Zika, Ebola, and adenoviruses.

So Dr. Dertzbaugh, you help oversee WRAIR, and WRAIR has developed many essential products that both servicemembers and civilian populations use today. Can you explain why WRAIR was the best place to develop these discoveries rather than just leaving it to private industry?

Mr. Dertzbaugh: Thank you, Chairwoman, for the question. I appreciate the opportunity to talk about DHA R&D's infectious disease research capabilities. Our two laboratories, the Walter Reed Army Institute of Research and then the U.S. Army Medical Research Institute of Infectious Diseases, have the capabilities and the subject matter experts to get after these infectious disease threats that our servicemembers might encounter when they are deployed overseas or fighting an adversary or even in training. So those capabilities help us find countermeasures for solutions to medical infectious disease threats that are not commercially viable in the U.S. because there is no market for this. There is no threat to the U.S. population, in general.

Senator Warren: All right. That is very helpful. Thank you. Because WRAIR's Pilot Biopharmaceutical Facility has been crucial in addressing these potential threats and keeping our servicemembers safe, especially when private sector is not in a position to fulfill that role.

As DoD considers how to implement the recommendations it has identified on domestic manufacturing, the Department should also think about how to replicate the capabilities at facilities like WRAIR to strengthen supply chain resilience and to keep our members safe and bring that manufacturing home. Thank you.

Senator Kaine?

Senator Kaine: Thank you, Madam Chair and Ranking Member Scott, and I appreciate the witnesses being here. I have two questions that I would like to ask. While reliance on APIs from foreign countries that are adversaries presents significant threats, the good news in this challenge is that we are not alone. Not every other country is an adversary. We have networks of alliances, unlike any of our adversaries.

And so I wonder whether, and maybe I will start with you Mr. Secretary, have we discussed this challenge with nations with whom we have close economic, military, diplomatic ties, and explored ways we can deal with those challenges in a joint way?

Dr. Martinez-López: Thank you for the question, Senator. The answer is yes. Actually, we talked with a couple of allies, trying to figure out their ability to produce all the drugs that could use. And to their amazement and my amazement --

[Audio interruption.]

Dr. Martinez-López: -- we have to have a secure chain of supply. I owe it to my servicemembers --

[Audio interruption.]

Senator Kaine: -- within the DoD, from antidepressants to --

Dr. Smith: It is a wide range. Yes, sir.

Senator Kaine: What are we expecting to learn from this, and I suspect that if we do learn something from this data, the application is not just the military application. This would be good information in the civilian space, whether it is Medicare or civilian. It would be really good to have that.

Dr. Smith: Yes sir, and I think as I had mentioned, we are looking at this quality tool that was actually proffered by a group of academic pharmacists last year to see whether or not, indeed, we can differentiate by manufacturer. So we are looking at all the in a particular drug and then doing this additional -- I mean, clearly looking at all of the good work that FDA and the regulatory piece does, but then

adding onto it testing, looking at potency, looking at the dose, and also looking at contaminants that may be used as fillers, et cetera, in the product.

And then if we find anything we have also contracted with three other academic institutions to do validation of that work. And if it pans out, we think it will help us direct our buying towards those manufacturers that produce what we would define as the highest quality products. But it is a pilot, and that is why we have characterized it that way, because we do not know, and I do not think this has ever been tested, if you will.

Senator Kaine: I am talking about the timing of the pilot and when do you expect it to start, you know, getting good information back?

Dr. Smith: It is to run 2 years. We started the actual work in November. They have just finished contracting with the -- or I believe it is finished, but they are in the process with these third-party or additional partners. So we should start seeing beginning information. As Senator Warren said and you have, we are doing the first 12 right now. But our intention is to do about 42 different drugs. So I would anticipate that clearly by early next year we will start flowing in, but the whole project is scheduled over a 2-year period.

Senator Warren: Thank you. Senator Scott?

Senator Scott: Secretary, let's think about -- because I think you are right, what you were talking about how we can use this whole buying power idea. So let's think about it. I have checked with the Chair to see if she would be okay with this. But could you prepare a letter that we would send out to basically all of the health care community -- you know, we could do it through like the hospital association, pharmaceutical, everybody -- and say this is the problem, you guys have the buying power, we believe we ought to create a domestic market. And so everybody starts doing their part.

So, the way I would think about doing it is, number one, if the Chair is okay with this, we would do it with you, and send a letter out to the entire health care community. I think they would probably read it if it came from you and from us, and talk about what you are doing, the concern that you have addressed today. And then maybe wait 30 or 60 days, and then invite all the associations together on a conference call to answer their questions, and get ideas from them about what we could do to help build a domestic market.

Dr. Martinez-López: Senator, that is a very intriguing proposition. I have not thought about it. But really I would like to be part of it, but it has to be really the whole government. So ask for help from HHS and other

agencies. HHS has the lead for the country in this particular issue. And obviously I would have to clear it with the Secretary to make sure that it is appropriate. And if it is, we will pursue it.

Senator Scott: So let's do this. If it is okay with the Chair, let's start with us. If we can get other people to sign on, HHS, all these people, that is great. If they do not, let's go forward if we can. If not, we can do it, if the Chair is okay with it. And then after that let's do a call and tell them why this does not work.

Dr. Martinez-López: Senator, you may well know, we need to ask, but if I get that from my Secretary then I will be more than glad to lead the effort.

Senator Scott: Let me know, because he said in testimony that he did not want to buy anything from Communist China.

And then, Mr. Beebe, I think we all would like to have something happen. So could you come back, maybe -- I do not know what is appropriate, whatever you think is appropriate -- and maybe meet with the Chair and me and our staff and just say, okay, what is the limitation and what can we do today. And if you tell us there is a limitation, then I think at least the three of us that are here, I think we are all on the same page -- and it is just crazy that we are doing this to ourselves, and being dependent on China -- we

are all on Armed Services, and we will work hard to get it affixed to the NDAA. I do not know if that makes sense to you. Is that doable? Thirty or 60 days, is that realistic?

Mr. Beebe: Yes, sir. I mean, absolutely, we want to be part of the solution. The illumination we are doing to try to identify the sources is the beginning of having some information to use towards that dialogue, to figure out how we can move the market or adjust the market. And I will be glad to respond.

Senator Scott: Let's try to do it in 30 days. The NDAA is coming up this year pretty quick now, because it is May 1 tomorrow, right. But the faster you can do it, the three of us will work with you.

Mr. Beebe: I would offer that because that is very much a policy discussion that we would want to include the other stakeholders from the Department.

Senator Scott: Sure. But, I mean, we have Paul on our team, and I know you have great people on your team. We will work with you. But the faster we do it, there is a greater chance the three of us can get it in the NDAA this year.

Senator Warren: Let's make sure we have got Mr. Dertzbaugh on this, as well, since I see WRAIR is the model for when the market has a complete breakdown and cannot produce what it is that our military needs.

Mr. Dertzbaugh: Ma'am, if I may speak, that is true to a point, I would say. We certainly have the ability in our production facility to make small quantities of vaccines. It does not have the ability to make any drug products, though. And we are still reliant on commercial manufacturers to produce large quantities of those materials if we are going to use them.

Senator Warren: I understand that you are small, but successful. But I also understand, and I hope you are hearing here, all of you are hearing, how committed we are to redomesticating our pharmaceutical supply chain and production. And I think you are going to be part of that, as well. Good. We good? Senator Kaine, you good?

Senator Kaine: I am good.

Senator Warren: All right. Thank you all. I appreciate you being here today. And I ask for Panel 2 to come in. Thank you.

[Pause.]

Senator Warren: Thank you. Thank you for being with us. The second panel will feature testimony that clarifies DHA's existing authorities to insulate servicemembers from drug shortages and offers additional solutions.

We have with us today, again from my left, Dr. Melissa Barber, a postdoctoral fellow at the Yale Collaboration for Regulatory Rigor, Integrity, and Transparency; Dr. Bryce

H.P. Mendez, a Specialist in Defense Health Care Policy at the Congressional Research Service; and Mr. Victor A. Suarez, a retired U.S. Army colonel, and Founder and Principal Growth Partner of Blu Zone Bioscience & Supply Chain Solutions, LLC.

So I will start the first round of questioning here.

Most of the time, DoD will continue to purchase drugs from the commercial drug market.

Oh, I am so sorry. I am so eager to get to them. I apologize. If we could we still start with our testimony. Dr. Barber, would you like to start us, please?

STATEMENT OF MELISSA BARBER, Ph.D., POSTDOCTORAL FELLOW

Dr. Barber: Chair Warren, Ranking Member Scott, and members of the Subcommittee, thank you for the invitation to testify today. I am a postdoctoral fellow at Yale University, researching pharmaceutical markets.

Both here and in my written testimony I will endeavor to report, as precisely and honestly as I can, evidence from the academic and policy literature on drug market failures and other remedies. My remarks today reflect my own views, not the view of my employer or any other organization.

No one here today disputes that the military faces challenges in ensuring a reliable supply of safe, high-quality pharmaceuticals. No one here today disputes the unacceptable risks this creates for the health and well-being of servicemembers and their families, as well as operational readiness. So the task before us then is to unravel the root causes of challenges in the supply chain and to develop solutions.

First, military procurement of medicines is exposed to many of the problems seen in broader commercial markets for medicines, including increasing costs and supply and stability. Supply chains for many drugs are vulnerable to interruption. We do not even know the scale of the problem. A recent report by DoD noted that they could not determine

the API source of 22 percent of drugs. But within the academic literature we find that approximately one-third of generic active pharmaceutical ingredients produced for use in U.S. markets were manufactured by a single facility, and an additional third were manufactured by only two or three facilities.

This Committee may not have jurisdiction over industrial policy, but it still must reckon with the downstream results of decades of policy decisions that have resulted in the concentration and offshoring of most pharmaceutical production.

Second, economists widely agree that markets for medicines do not always behave like typical markets and are far from being few or competitive. We should leave our idealized, orderly supply and demand curves in the cloakroom. They will not be of much use to us this afternoon as theoretical lenses. We have to instead understand these markets on their own terms and through rigorous analysis of empirical data.

Markets for medicines for military use are even more unusual. One factor is many are national monopolies and monopsonies because they involve hyper-specialized goods, often produced in quantities too small to be manufactured cost-effectively by more than one company. A review of DoD contracts shows many such hyper-specialized products, all

the way from anthrax vaccines, battlefield-suitable analgesic auto-injector kits and nerve agent antidotes, to the specialized medicines used by California sea lions that the U.S. Navy trains for defense purposes. When there is only one buyer and seller, the DoD is not bidding in a competitive market. The DoD is the market, and that demands that we think about market problems and market solutions in a nuanced, context-specific way.

Third, for some drugs there is an irreconcilable mismatch between commercial incentives and defense needs, which cannot be solved with purely market-based solutions. Pharmaceutical companies are incentivized to manufacture a drug if it gives them a good return on investment. A supply line that manufactures an expensive cancer drug that serves a wide market is just more profitable than manufacturing drugs with small markets, like anthrax vaccines or drugs with low margins, like off-patent antibiotics.

In contrast, the military is conscious of costs but is ultimately incentivized to purchase drugs that meet operational needs and protect the health of servicemembers. Sometimes, but not always, these incentives overlap, and when they do not, one often-tried solution to bridge that gap is to pay pharmaceutical companies enough that it becomes worth their while to manufacture the drugs the military needs. For products used mostly or only by the

military, we have seen time and time again that the expected demand has not been sufficient to generate a healthy number of bidders.

We therefore have to be realistic about when the DoD will be able to buy itself out of market failures. The DoD just does not have the spending power to fundamentally change the incentives that govern the commercial market to serve defense needs. DoD spending, as many have spoken today, accounts for less than 2 percent of overall spend in the United States.

These limitations of using commercial markets to ensure a resilient supply chain for military needs bring me to my final point. When it comes to medicines for military use, we live, and have always lived, in a mixed economy. By this I mean that the public and private sectors have both played an important role in developing, manufacturing, and supplying medicines in the United States for over 160 years. The private sector has efficiently supplied DoD with many needed medicines.

However, for many other medicines where the military is the sole market, or the commercial market has struggled to meet military needs, the military has brought manufacturing in house. The history of the military producing medicine stretches back to at least the Civil War, when pharmaceutical manufacturing facilities were established in

Philadelphia and Astoria to stabilize supply chains for the Union army, with many other examples outlined in my written testimony.

The public sector, more generally, has solved puzzles that the private sector was not incentivized to explore, like how to manufacture penicillin, and the public sector in the United States continues to successfully manage products as complex as vaccines and monoclonal antibodies today.

We cannot afford to hold onto the hope that markets will always sort themselves out. At present, government creation of manufacturing capacity is usually done reactively, with initiatives created in response to particular crises. As one example, it took over 10 years and $100 million for DoD to bring adenovirus vaccine manufacturing back online after Wyeth, the sole supplier, held DoD to ransom, to renovate the facility at excessive cost.

I bring up this history to dispel any misconceptions about military drug production as a new idea, rather than as an idea older than the Department of Defense itself. In my written testimony I detail independent review after independent review, recommending that the military build on past successes and existing capacity and bring the manufacturing of priority products back in house. I also detail decades of bipartisan support for this from the

Congressional Record.

Today I echo their conclusions in recommending that Congress introduce legislation establishing clear options for creating a government-owned facility to manufacture priority health products to meet unmet DoD needs. Thank you.

[The prepared statement of Dr. Barber follows:]

Senator Warren: Thank you, Dr. Barber. Mr. Mendez.

STATEMENT OF BRYCE H.P. MENDEZ, SPECIALIST IN DEFENSE HEALTH CARE POLICY, CONGRESSIONAL RESEARCH SERVICE

Mr. Mendez: Good afternoon, Chairwoman Warren, Ranking Member Scott, and members of the Subcommittee. Thank you for inviting the Congressional Research Service to testify today.

This afternoon I will summarize my written statement by starting with a brief overview of the medical research and development capabilities of the Department of Defense, or DoD, followed by a summary of why and how the Department aims to use those capabilities to develop drugs. I will conclude by identifying considerations that Congress may face with regard to DoD medical research, development, and manufacturing of these products.

The U.S. military has a long history of contributing to the discovery of novel drugs and other medical countermeasures. Early and well-known contributions took place during and shortly after the Spanish American War when Army medical research efforts supported the discoveries of typhoid, yellow fever, and malaria vaccines. The lessons learned from the Spanish American War, and other conflicts throughout our nation's history, have laid the groundwork for Congress and DoD to invest in, build, and sustain military medical research and development capabilities. Today, DoD uses these capabilities to protect servicemembers

from health threats, respond to medical capability requirements of the joint force, meet the needs of the National Defense Strategy, and to also respond to congressionally directed research topics.

DoD medical research and development enterprise includes a number of entities like the Defense Health Agency, the military departments, Defense Advanced Research Projects Agency, and the Chemical and Biological Defense Program, among others. Congress appropriates research funding to these entities, who are then responsible for resourcing, performing, or sponsoring medical research projects.

Two of these entities, in particular, provide DoD with capabilities to develop drugs using different approaches. One capability is the Pilot Bioproduction Facility at the Walter Reed Army Institute of Research in Maryland. This government-owned facility provides a test ground for Federal agencies, academia, and private companies to pursue early development and small-scale production of drugs so that they can be transitioned into advanced clinical trials.

Another capability is the Advanced Development and Manufacturing Biopharmaceutical Facility in Florida, administered by the Chemical and Biological Defense Program. The contractor-owned, contractor-operated facility, which became operational in 2017, provides DoD with priority

access and surge capacity to produce medical countermeasures.

When DoD discovers a potential drug candidate, the Department is generally subject to Food and Drug Administration, or FDA, requirements and procedures for review, approval, and clearance. Since at least 1997, Congress has provided DoD with an ability to request a presidential waiver of certain FDA requirements, including those for administering investigational new drugs, or off-label uses of a drug, and informed consent for certain products authorized for emergency use.

In 2017, Congress provided the Secretary of Defense with the ability to make requests to the FDA Commissioner for expedited review, approval, and clearance of certain medical products when there is an existing or potential military emergency. These authorities provide frameworks for DoD and FDA to share information and to collaborate and coordinate on the development of safe and effective medical products that serve the military's needs.

Turning now to the role of Congress, I wanted to highlight two issues that this Subcommittee may face. First, Congress could consider defining or clarifying the role that DoD should have in conducting in-house drug manufacturing. A question that Congress could consider is whether or not DoD should be in the business of

manufacturing drugs or other medical products, and if so, for what purpose and to what extent?

Second, Congress could consider assessing DoD's medical research development and manufacturing approach to better understand its effect on industry participation or engagement with the Department. Congress has given DoD certain authorities and tools that it may use to generate interest and incentivize industry to work with the military. These authorities and tools include unique contracting mechanisms, technology transfer opportunities, and a process for expedited FDA reviews and approvals. Congress could evaluate whether DoD has used these authorities and tools as Congress intended and explore how they might attract, influence, or deter companies from doing business with the military.

This concludes my remarks. Thank you for the opportunity to testify, and I look forward to your questions.

[The prepared statement of Mr. Mendez follows:]

Senator Warren: Thank you, Mr. Mendez. Colonel Suarez.

STATEMENT OF COLONEL VICTOR A. SUAREZ, USA (RET.), FOUNDER AND PRINCIPAL GROWTH PARTNER, BLU ZONE BIOSCIENCE & SUPPLYY CHAIN SOLUTIONS, LLC

Colonel Suarez: Good afternoon, Chairwoman Warren, Ranking Member Scott, and distinguished members of this Committee. Thank you for the opportunity to speak with you today.

My name is Vic Suarez, and I have recently retired from the U.S. Army after 27 1/2 years of active service, as a medical service and acquisition corps officer, specializing in the advanced development of biologics, managing the medical supply chain, and meeting America's finest sons and daughters as a commander four times, twice in the combat zone.

During the past 10 years I have been heavily involved in advanced development of biodefense medical countermeasures, served as the Chief of Staff at the Walter Reed Army Institute of Research, and was selected by General Gus Perna to serve at Operation Warp Speed, from 2020 to 2021 as the Lead Vaccine Program Manager. I am speaking today primarily in my role as a Founder of Blu Zone Bioscience, a life science consulting firm.

When I left active duty 6 months ago, my principal goal was to affiliate with organizations that were mission-aligned with my responsibilities in the DoD, including

enhancing national security and protecting human health, and to that end supporting domestic companies that could support those two missions. To this end, I partnered with two organizations, the Council on Strategic Risks and the Securing America's Medicines and Supply coalition. Both organizations are focused on ensuring access to essential medicines for patients and the warfighter.

On November 27, 2023, the Department of Defense, in response to the fiscal year 2023 National Defense Authorization Act, Section 860, provided the Senate and House Armed Services Committee an interim risk report on the Department's reliance on overseas-derived pharmaceuticals. A significant finding was that 54 percent of the national drug codes sourced from the DoD had active pharmaceutical ingredients, or APIs, and excipients non-API, that came from non-Trade Agreement Act compliant countries, including China.

This recent finding presents a clear and present danger to national security. It should compel us to explore better legislative and trade policies that strengthen our Federal acquisitions, economic, and health security to reduce our reliance on overseas essential medicines, their key starting materials, and API. We must manufacture more of these materials domestically to ensure high-quality manufacturing processes and products, including a reliable and resilient

material medical supply chain supporting this essential industry.

A major contributing factor to this national security and health security risk is a little-known but controversial court case titled Acetris Health, LLC v. United States. In this case, the United States Court of Appeals for the Federal Circuit overruled a long-standing precedent regarding the origin of a drug by ruling that a drug could be considered to be manufactured or substantially transformed in the U.S. and sold to the Federal Government, even if its API and all of its components, to include excipients, were manufactured in TAA-banned countries.

Today, a Chinese firm could make all the API and precursor materials for a medicine, ship it to a U.S. subsidiary that does packaging and final labeling, and still be able to label it as American made. This would be considered an American-made drug and principally illustrates this loophole.

In my testimony today I wish to highlight a dysfunctional market where generic drug companies compete in a race to the bottom in generic drug pricing and manufacturing, a principal driver of drug shortages, which just 2 weeks ago, as you mentioned earlier, Senator, was reported by the American Society of Health System Pharmacists, that our nation is at an all-time high, since

2001, of 323 known drug shortages.

Overwhelming downward pressure in generic drug costs with no consideration for supply reliability or quality leads domestic manufacturers to operate at approximately 50 percent utilization capacity. Many of these domestic companies are closing plants and essential medicine production lines, or being acquired by foreign entities, which will only downgrade our nation's ability to independently provide health care for its citizens during a global pandemic or during a national security event.

Finally, I want to applaud the Department of Defense efforts to assess these strategic risks through both the assessment of the origin supply chain at the Defense Logistics Agency as well as the Uniformed Services University Pharmaceutical Assessment of Quality Pilot Study, or PhaQS, as both these efforts will provide more transparency and potentially enable millions of our service men and women, their families, and other TRICARE retiree, like me, confidence that when they go to a military treatment facility in the U.S. or serve in combat that they will always have access to the highest quality medicines, at the most affordable prices, something that is possible if we are willing to disrupt the status quo.

Thank you for your attention as I raise these significant considerations concerning our nation's

overreliance on non-Trade Agreement Act nations for our pharmaceuticals, and I encourage Congress, and this Committee, in particular, to closely monitor and support the DoD's efforts to care for our warfighters, their families, and retired military.

I look forward to your questions.

[The prepared statement of Colonel Suarez follows:]

Senator Warren: Thank you, Colonel Suarez. I appreciate it.

I am going to start the questions here. Most of the time DoD will continue to purchase drugs from the commercial drug market, but there are some instances when it makes sense for DoD to produce the medication itself, for example, when DoD is the only customer. An example is the adenovirus vaccine. While adenovirus typically causes mild cold or flu-like symptoms, it is a major cause of serious respiratory illness among servicemembers, particularly during basic training. And that is why WRAIR developed an adenovirus vaccine which it then licensed to private industry.

But because there is not a broad market for the adenovirus vaccine, it has sometimes been difficult to find a manufacturer that was willing to produce it. In fact, for over a decade, DoD was unable to vaccinate new recruits for adenovirus because the manufacturer decided to stop producing the vaccine, and there was no other manufacturer who was interested in doing this.

Mr. Mendez, you have studied the defense health care system closely. First, let's start with, how did this disruption affect the health of servicemembers?

Mr. Mendez: Thank you for the question, Senator. And that is correct. DoD exhausted their last supply of the

adenovirus vaccine in about 1998, 1999. At that time, DoD estimated that the absence of that supply of vaccine would lead to about over 10,000 preventable infections from the adenovirus, over 4,200 medical visits of recruits in the recruit training pipeline, who are at risk for adenovirus, and over 850 hospitalizations, within a year, to an extent DoD did observe that in the absence of the vaccine.

Senator Warren: Okay. So in other words people got sick, they had to go to the doctor. There were deaths associated with this adenovirus. And all of that potentially affects warfighter readiness. You have got all these young people who are together, and the disease is moving among them, right? The virus is moving among them.

So Dr. Barber, you are an expert on pharmaceutical manufacturing. What did it take to finally get a new manufacturer to produce the adenovirus vaccine for DoD?

Dr. Barber: After stocks were depleted in 1999, DoD does what it usually does. It put out a tender, and the previous manufacturer that had pulled out of the market, Wyeth, they agreed to do a tech transfer, but only if DoD would reimburse them for it, which is quite the demand given, as we heard today, DoD developed that vaccine and had done tech transfer to them free of charge in the first place.

Only one manufacturer even considered bidding at the

time, Greer, but they withdraw because they asked DoD for $10 million up front, and DoD could not agree to it at the time.

All in all, it is estimated that it took about $100 million and 10 years for new vaccines to become available again.

Senator Warren: You know, this is just stunning. DoD, as you say, does the research, develops the vaccine, gives it away to try to be able to get a manufacturer going, and they end up paying a private manufacturer, I think you said $100 million. Is that about right?

Dr. Barber: In the end, yes.

Senator Warren: In the end, in order to build a facility to manufacturer this vaccine that we need, on top of the money they paid to purchase the vaccine from the manufacturer, all because DoD is at the mercy of private actors who just are not interested in marketing these products for a relatively small market.

Mr. Mendez, is the adenovirus vaccine the only example of a product that the private market has been unwilling to manufacture for DoD/

Mr. Mendez: No. The adenovirus is not a unique case. DoD has many challenges in finding a lot of medical countermeasures, over many decades. Current challenges that they experience and are working through include products to

address anthrax, botulism, cholera, hemorrhagic fevers, tularemia, and other health threats.

Senator Warren: All right. You know, this is a real problem, when the market just does not meet what it is that DoD needs, and this is going to continue. We are going to continue to have medications that DoD requires in order to keep servicemembers healthy, and that simply are not profitable for private industry to come in and produce.

Dr. Barber, what would be the advantages if DoD decided to manufacture these drugs itself?

Dr. Barber: A public manufacturer is likely, depending on the drug, to be enormously cost saving. To bring back the adenovirus example, the current contract with Teva is worth about $38 million per year. That is actually a lot of money to pay for a single vaccine. As a point of comparison, it is about 80 percent annually of how much California has budgeted to build an entire insulin factory.

A report by the Army estimated adenovirus factory startup cost at $100 million, with annual costs to $10 million per year. So that works out to DoD breaking even from building and running a manufacturing facility in just 3 years.

Besides costs, by manufacturing their own drugs, DoD could ensure reliable supply and support wider strategic aims and restoring domestic production capacity.

Senator Warren: Okay. So you pencil this out and discover at least for some of these drugs it would be cheaper for DoD to manufacture it themselves, and it would have the added benefit of you know what your supply chain is, there would not be any secrets in the supply chain, and we would have a reliable source for these drugs.

This is why I am introducing a new bill, the Keep DoD's Drug Supply Secure Act, to direct DoD to manufacture the drugs, devices, vaccines, and other medical products when there is a risk of shortage or quality concerns. This bill gives us an opportunity to resolve drug shortages, to secure the pharmaceutical supply chain, and to ensure safe and effective drugs for our servicemembers. Thank you.

Senator Scott.

Senator Scott: Thank you, Chair. Colonel Suarez, So you heard the testimony before, and Mr. Beebe said there are about 10,000 drugs that they buy. Does that sound about right?

Colonel Suarez: When we are talking about national drug codes, we are talking in the thousands. So between 5,000 to 10,000 that they can source from within the industry for pharmaceuticals.

Senator Scott: All right. So today, is there just even one of those that they could just say, "Today I'm not going to buy anything else from China?" Do you know of any

one of them that they could do that?

Colonel Suarez: No, but I think the fundamental issue that they could probably do that is with help from the Congress to address the loophole I mentioned in my opening statement. The Department tried to do this -- and I am talking the VA -- back in 2019, and they were challenged in court when they wanted to execute an executive order to buy American products. And they were challenged by this company, Acetris Health, to say, well, we make this product overseas, and then we do the final packaging and labeling in the United States, and we are going to call it United States. Well, that is not how precedent was defined for a Made in America drug. That was always defined by where the API was made.

Senator Scott: So you think we have to have a law that says that Made in America means something different than what that court case said?

Colonel Suarez: Yes. I think this is an opportunity --

Senator Scott: Can you get that to us?

Colonel Suarez: Yes.

Senator Scott: And I will work on that. Okay. So let's say we get that fixed. Is there anything else that would prevent us from somebody in Mr. Beebe's position from just saying, "Today we are not buying any more"? What else

would there be? Any other limitation?

Colonel Suarez: I think some of the challenges that could be there is especially in those areas where we are solely reliant on a supply chain that is only made in China, for example. So right now if you look at the API Innovation Center, they have really done some studies where they have looked at the supply chain. They call out 60 vital medicines in the United States. They estimate of the 60 vital medicines in the United States, about 20 percent of them are solely sourced with APIs from China, and then for key starting materials, it is about 45 percent of those vital medicines are solely sourced -- that means there is no other supplier.

Senator Scott: Just go back, on solving the problem. Is the only limitation is if we get a law passed that says that Made in America means X, that it is all produced here, we do not use any of their ingredients, blah-blah-blah, and no packaging, nothing, so is that going to give the Department of Defense the ability to fix it today?

Colonel Suarez: I think when that loophole is closed I think it gives a clear pathway to do what you are suggesting.

Senator Scott: Okay. And that is the only limitation.

Colonel Suarez: I do not think that is the only limitation.

Senator Scott: What else would it be?

Colonel Suarez: I think an understanding that having quality differentiation in the marketplace other than cost is another big hurdle for us to try to grapple with. And this is dealing with the status quo --

Senator Scott: Oh, are you saying that they decide based on price and nothing else?

Colonel Suarez: What I am suggesting is that the marketplace for generic small-molecule pharmaceuticals is primarily based on a cost basis, and no real measure of quality in that decision matrix.

Senator Scott: So I am a business guy. In business, I would not buy just based on price.

Colonel Suarez: Correct.

Senator Scott: Do you think we do that?

Colonel Suarez: Unfortunately, that is where the market is going for that commodity.

Senator Scott: Why?

Colonel Suarez: Because what has happened over the last couple of decades -- and this really happened around late 2021, when we voted for China to be a Most Favored Nation, and they all of a sudden grew their economy and we started to transition our manufacturing overseas -- what they found was they used their most competitive advantages, and that is access to cheap labor and their inability to

really focus on environmental concerns in manufacturing.

So they could lower the price of goods very low, to the point where they could target specific industries, like the pharmaceutical industry, and even specific drugs, and actually push some of our companies either out of business or from stopping making critical medicines.

Senator Scott: So is there anything else we need to do to stop it?

Colonel Suarez: I think part of it also is you could leverage Defense Production Act to incentivize and pass legislation for funding to actually bolster our domestic supply chains and manufacturing in the United States. You created incentives for the marketplace to say, hey, there is an initial incentive, just like the CHIPS and Science Act, to manufacture in the United States.

Senator Scott: So why do they not do it now. We have got the Defense Production Act right now. Why don't they just do it?

What I do not get is everybody -- I think we have all come to the conclusion China is bad. They want to destroy our way of life. Why are we buying their crap?

Colonel Suarez: Part of it is because in the past 20-plus years they have done a very masterful job of integrating into our biotech and biopharma and many pharmaceutical manufacturing industries. They started with

early innovative companies, when they are small biotechs and they are desperate because they are cash strapped. So they basically hire them as contract research organizations. And they develop those drugs and products throughout the life of that drug application. So as that company matures and it gets licensure, their entire supply chain might be dependent on materials from China.

Senator Scott: So do we need to prevent China from being able to invest in our pharmaceutical industry?

Colonel Suarez: What I would suggest to the Congress is that they place limits on those known companies that have either stolen intellectual property or have a bad intent to take American technology --

Senator Scott: Do we need legislation, or can they do that on their own right now?

Colonel Suarez: Well, so companies can make those decisions --

Senator Scott: No. Can the Department of Defense prevent a Chinese company from investing?

Colonel Suarez: I do not know if the Department could do that directly without getting challenged in court.

Senator Scott: I do not get this. I mean, we do not buy stealth bombers from China, so why do we buy drugs from China?

Colonel Suarez: So what I would offer is that when you

look at things like the Berry Amendment, those were originally designed, like in 1941, and they focused on important things like textiles and food and all those to support defense purchasing of those critical commodities.

What I would suggest is either you amend that to include pharmaceuticals and medicines, or you address the loophole that I mentioned, and once you can do that -- and this is not an original idea from me. The API Innovation Center pointed this out about 18 months ago. So what I would say is once we fix that through legislation, a lot of the other things that you are suggesting can more easily occur without challenges in court.

Senator Scott: Okay. So if we want to solve this, name the list. We have got to change that court case, and that is one.

Colonel Suarez: Yeah, so that is one. The second one is I would encourage the DoD to continue monitoring this quality assessment pilot so that we can better understand that health care systems actually can buy low-cost drugs that are of high quality, because some initial data shows that that is very possible. And then the third thing --

Senator Scott: We do it in the private sector every day, so it is all possible.

Colonel Suarez: Yes. Yes, sir.

Senator Scott: We would not have to have a study. I

mean, that is pretty basic stuff.

Colonel Suarez: The study actually generates the data that is irrefutable that you could use to justify the decisions. So yes, sir.

Senator Scott: We do it every day, because we like our products to work. Every manufacturing company buys based on quality, because it likes their end product to work.

Colonel Suarez: Yes, in normal markets you are absolutely correct, sir. That is how normal markets work. Unfortunately, in the pharmaceutical industry that has not been the standard.

Senator Scott: Because we did not do any testing.

Colonel Suarez: No. It is not that we did not do any testing. It is that the regulatory agency had a very difficult time, as we transitioned our manufacturing over to Asia, mostly India and China, we lost an ability to actually regulate and inspect those manufacturing plants.

Senator Scott: Yeah, but we can inspect it afterwards.

Colonel Suarez: Right. But the problem is we have such a big backlog right now, and now when they are checking these facilities they are finding egregious problems. And that is why some of those plants are shutting down as they remediate those problems, and thus that increases more drug shortages. And that is part of what we are seeing right now.

Senator Scott: Okay. So we have got the court case, assess, what else?

Colonel Suarez: And then I think really provide incentives to industry to domestically manufacture more essential medicines here, not only the finished product, the API, and the key starting materials.

Senator Scott: Well, I think it will happen, except for what Dr. Barber is talking about. I mean, some things are going to be so small you cannot do it. But there is enough money, if it is big enough, right.

Colonel Suarez: Correct.

Senator Scott: If we say we are going to have a domestic product, we can do it. I do not disagree with what you are saying. There are going to be some markets that are not going to be big enough, and this is going to be cheaper. And there are two options. One, pay somebody to do it, like what you said, or do it ourselves.

Colonel Suarez: May I add one other thing, too? There are some really good initiatives that are happening in the United States right now, for example, in Senator Kaine's state, for example, with Civica RX, a public benefit corporation, working with Phlow and AMPAC, where they are actually going after these most essential medicines. That is a model that actually could be expanded across the country to address those critical, essential, low-cost

generic medicines.

So I think we are starting to see more and more examples like what we see in the commonwealth of Virginia that could actually help correct the market over time, so that we can actually address these critical risks.

Senator Scott: Thank you.

Senator Warren: Good. Thank you. Dr. Barber?

Dr. Barber: It was just to say that in terms of market share, DoD's fund really is quite, quite low. I mean, $7 billion is not very much in multinational corporation terms, in terms of global markets. So it really is a drop in the bucket, and the market power just is not there for most products.

Senator Scott: I mean, I agree. That makes sense. But you would think if everybody worked together, like if all of our allies were part of this, which we should be able to do, there are still going to be things that make sense, that you cannot get. Somebody is not going to have an incentive because there is not enough profit margin. But if we could get everybody to buy together, we could, in theory.

Dr. Barber: A major limitation is the data still is not there in terms of where provenance is, and thank you for bringing up the Acetris case. It is incredibly important, and I would encourage the Committee to reach out to the DLA for legal counsel in terms of kind of what their powers are.

I have been doing API research for a long time in terms of capacity building and distribution, and I am heartened that in the last 3 years people have started to take it really seriously in terms of initiatives to not supply. But they are still very ad hoc. There is no systematic mapping. FDA is not doing it. EMA is not doing it. The WHO is not doing it. We have to show data with everyone, with our allies, with all countries. So it has to be an international effort to map how many factors are making a given drug, where are they, what is the capacity. We need to do this systematically. We cannot rely on ad hoc measures.

Senator Warren: You know, I very much appreciate that. What I think we are hearing over and over is we need to bring pharmaceutical manufacturing back to the United States, and that it is a critical national defense issue. It is also critically important for the health of our people.

And I hear this break into two parts. One is commercial manufacturing, which as you rightly point out, we do not have the right incentives in place. We do not even have the right information in place to require meaningful domestic manufacturing and meaningful insight into the supply chain, to know that we are safe in the drugs that we are getting and into the APIs that we are getting. And that

is one part of the problem.

And then the other part of the problem is the manufacturing challenges for what are much more modestly scaled projects that we are going to have to move to military manufacturing. Otherwise, we are just not going to get this stuff, or we will pay prices that are so outrageous that we would have been a lot better off -- it would have been cheaper to have built it internally.

And so I think those are the two challenges we face, and I know that we both want to work on here.

I want to thank all of our witnesses for their testimony today. I also want to thank Jon Clark, Gary Leeling, Noah Sisk, and Katie Magnus, for their work in helping put today's hearing together.

We have a letter from the National Association of Manufacturers. They have asked that it be included in the record. Any objection?

Without objection on that.

[The information follows:]

[SUBCOMMITTEE INSERT]

Senator Warren: With that, do we have a period of time for questions? Nope. Alright. We have got 7 days for questions for anybody who wants them. You will have 30 days to reply to those if there are answers that are needed.

And with that, this hearing is adjourned. Thank you all.

[Whereupon, at 4:10 p.m., the hearing was adjourned.]

WORD INDEX

< $ >
$10 63:*2* 64:*19*
$100 48:*14* 63:*4, 11* 64:*19*
$38 64:*14*
$5 2:*12*
$7 74:*9*

< 1 >
1 41:*12*
1,000 29:*9*
1/2 56:*9*
10 32:*23* 48:*13* 56:*15* 63:*5*
10,000 29:*8* 30:*17* 62:*3* 65:*17, 21*
12 4:*24* 22:*13* 25:*17* 38:*21*
14017 13:*6*
160 47:*17*
18 71:*9*
1941 71:*2*
1997 53:*6*
1998 62:*1*
1999 62:*1, 17*

< 2 >
2 2:*13* 38:*15* 42:*16* 47:*9* 58:*23*
2:30 1:*12*
20 67:*9* 69:*22*
2001 59:*1*
2017 34:*24* 52:*25* 53:*12*
2019 66:*6*
2020 8:*5* 56:*19*
2021 18:*12* 56:*20* 68:*21*
2023 4:*9* 18:*19, 21* 32:*13* 57:*8, 9*
2024 1:*5* 20:*9*
20-something 31:*14*
211 32:*15*
22 45:*1*
27 4:*25* 30:*8, 11, 17, 20* 32:*21, 25* 33:*11* 56:*9* 57:*8*
2-year 38:*24*

< 3 >
3 64:*21* 75:*3*
3.5 13:*5*
30 1:*5* 39:*18* 41:*10* 77:*3*
323 20:*8* 59:*1*

< 4 >
4,200 62:*4*
4:10 77:*7*
40 3:*9*
42 23:*13* 38:*21*
45 67:*11*

< 5 >
5 31:*12*
5,000 65:*21*
50 59:*4*
54 8:*11* 57:*13*

< 6 >
6 56:*23*
60 39:*18* 41:*3* 67:*7, 8*

< 7 >
7 77:*2*
70,000 29:*13*

< 8 >
80 64:*16*
850 62:*6*
860 8:*4* 18:*20* 22:*25* 30:*12* 57:*10*

< 9 >
9 20:*3*
90 9:*4, 8* 31:*23*
920 30:*20*

< A >
ability 18:*8* 19:*4, 9, 16* 37:*3* 42:*2, 4* 53:*7, 13* 59:*8* 67:*19* 72:*16*
able 27:*8* 30:*1* 47:*5* 58:*16* 63:*9* 70:*9* 74:*16*
abroad 3:*22*
absence 62:*2, 7*
absolute 29:*3*
Absolutely 34:*3* 41:*4* 72:*9*
academia 52:*18*
academic 37:*21* 38:*5* 44:*9* 45:*2*
ACCESS 1:*2* 2:*6* 4:*1* 8:*14* 12:*12* 17:*13* 19:*11* 22:*24* 34:*4* 53:*1* 57:*6* 59:*21* 68:*25*
accessibility 24:*23*
accomplish 17:*25*
accounts 47:*9*
Acetris 58:*5* 66:*9* 74:*23*
acid 22:*2*
acquired 59:*7*
ACQUISITION 17:*1* 56:*10*
acquisitions 57:*21*
Act 7:*16, 20* 8:*5* 18:*21* 26:*14* 32:*19* 33:*9* 57:*10, 16* 60:*1* 65:*8* 69:*10, 14, 17*
action 6:*21*
actionable 13:*24*
actions 13:*7*
active 3:*19* 13:*1, 25* 19:*1* 20:*9* 24:*2* 28:*14, 24* 30:*15* 32:*17* 45:*3* 56:*9, 23* 57:*14*
actors 63:*17*
actual 38:*16*
ad 75:*5, 11*
add 24:*8* 73:*18*
added 65:*4*
adding 33:*18* 38:*1*
addition 4:*3* 9:*17* 14:*12*
additional 23:*5* 37:*24* 38:*18* 42:*22* 45:*5*
Additionally 23:*8*
address 5:*7* 7:*18* 9:*18* 13:*8*

33:*13* 64:*1* 66:*4* 71:*6* 73:*25* 74:*5*
addressed 7:*14* 39:*17*
addressing 5:*14* 19:*20* 36:*3*
adenovirus 48:*14* 61:*7, 8, 12, 15, 18* 62:*1, 4, 5, 10, 16* 63:*19, 22* 64:*13, 18*
adenoviruses 35:*6*
adjourned 77:*5, 7*
adjust 41:*8*
adjuvants 14:*18*
administered 52:*23*
administering 53:*9*
Administration 53:*5*
advance 10:*7*
Advanced 34:*24* 52:*7, 20, 21* 56:*11, 16*
advantages 64:*9* 68:*24*
adversaries 4:*1* 36:*16, 20*
adversary 35:*20* 36:*18*
Affairs 11:*9, 13* 12:*2*
affect 7:*11* 61:*23*
affiliate 56:*24*
affixed 41:*2*
afford 48:*9*
affordable 59:*22*
afternoon 17:*3* 45:*17* 51:*3, 7* 56:*4*
agencies 19:*15* 40:*1* 52:*18*
Agency 9:*13* 11:*13* 14:*13* 17:*2, 8, 9* 20:*3* 24:*4* 52:*7, 8* 59:*14* 72:*14*
agent 46:*2*
Agile 13:*5*
ago 56:*23* 58:*23* 71:*9*
agree 7:*11* 25:*11, 16* 29:*16* 45:*12* 63:*2* 74:*14*
agreed 62:*20*
agreement 4:*22* 32:*19* 33:*9* 57:*16* 60:*1*
agreements 8:*8* 26:*14*
ahead 33:*13*
aid 9:*21*
aims 51:*11* 64:*25*
aligned 56:*25*
alleviate 22:*19*
alliances 36:*19*
allied 32:*9*
allies 37:*3* 74:*16* 75:*8*
allocating 4:*13*
allocation 13:*16*
all-time 20:*10* 58:*25*
ally 26:*12, 18*
Alright 77:*2*
alternate 20:*21* 21:*11*
amazement 37:*5*
amend 71:*5*
Amendment 71:*1*
America 6:*17* 66:*13, 16* 67:*16*
American 3:*13* 6:*24* 7:*16, 20, 22* 12:*20* 20:*7* 23:*4* 26:*14* 51:*18, 21* 58:*16, 24* 66:*8* 70:*13*
American-made 58:*17*
Americans 30:*10*
America's 7:*11* 13:*6* 56:*12* 57:*5*
amount 29:*4* 30:*15* 33:*16, 21*
Amoxicillin 20:*24*
AMPAC 73:*22*
analgesic 46:*2*
analysis 10:*16* 14:*4* 45:*19*
analytical 10:*17* 14:*6*
and/or 13:*1*
anesthesia 2:*22*
announced 20:*8*
annual 64:*19*
annually 64:*16*
answer 37:*2* 39:*19*
answers 77:*4*
anthrax 46:*1, 16* 64:*1*
antibiotic 20:*25* 21:*2, 3, 4, 6, 7*
antibiotics 9:*4* 46:*17*
antibodies 48:*8*
antibody 14:*17*
anticipate 38:*22*
antidepressants 37:*10*
antidotes 46:*2*
anybody 6:*14* 8:*9* 28:*23* 29:*17* 77:*3*
API 23:*9* 31:*10, 13, 15* 45:*1* 57:*23* 58:*11, 13* 66:*14* 67:*5* 71:*8* 73:*6* 75:*1*
APIs 3:*20* 19:*2, 7* 29:*23* 30:*9, 15* 32:*18, 21* 33:*16* 36:*16* 57:*15* 67:*10* 75:*25*
apologize 43:*10*
Appeals 58:*6*
appear 7:*14*
appearing 5:*11*
applaud 59:*11*
application 25:*6* 37:*15* 70:*5*
appreciate 19:*19* 35:*13* 36:*14* 42:*16* 61:*2* 75:*13*
approach 54:*4*
approaches 52:*14*
appropriate 40:*3, 19*
appropriates 52:*9*
approval 3:*8* 53:*6, 14*
approvals 54:*11*

approximately 45:*2* 59:*4*
April 1:*5*
area 10:*20* 18:*11*
areas 12:*25* 13:*13* 21:*25* 67:*3*
Armed 1:*8* 12:*9* 17:*4* 41:*1* 57:*11*
Army 9:*20* 11:*5* 12:*7* 35:*2, 15, 16* 43:*3* 48:*2* 51:*19* 52:*16* 56:*9, 18* 64:*18*
Asia 72:*16*
asked 63:*1* 76:*16*
aspects 13:*12, 20*
assess 10:*11* 59:*12* 73:*2*
assessing 54:*3*
assessment 10:*16* 14:*4* 59:*13, 15* 71:*18*
assessments 13:*12*
Assistant 11:*5, 8, 10* 12:*2, 4, 6*
associated 14:*7, 9* 62:*10*
Association 23:*4* 39:*8* 76:*15*
associations 39:*18*
assume 8:*24*
assured 25:*20*
assuring 12:*17*
Astoria 48:*1*
attention 59:*24*
attract 54:*13*
Audio 37:*6, 9*
authoritative 19:*6*
authorities 42:*21* 53:*16* 54:*7, 9, 12*
Authorization 8:*5* 18:*21* 57:*10*
authorized 53:*11*
auto-injector 46:*2*
availability 13:*2*
available 12:*19* 19:*6* 27:*23* 28:*4* 63:*5*
aware 30:*4, 7, 14*

< B >
back 28:*7* 31:*22* 33:*4* 38:*14* 40:*18* 47:*24* 48:*15, 24* 64:*12* 66:*6* 67:*14* 75:*15*
backlog 72:*20*
bad 29:*9* 69:*20* 70:*12*
bag 22:*1*
Bailey 9:*25*
Barber 42:*24* 43:*11* 44:*1, 3* 49:*7* 50:*1* 62:*14, 17* 63:*12* 64:*9, 11* 73:*8* 74:*7, 8, 21*
base 9:*3*
based 13:*15* 17:*21* 24:*11* 68:*7, 10, 13* 72:*6*
basic 21:*1* 61:*11* 72:*1*
basically 25:*11* 39:*6* 70:*3*
basis 29:*25* 33:*15* 68:*10*
battlefield-suitable 46:*1*
Beebe 11:*12, 16, 17* 16:*1* 17:*1, 3, 6* 19:*22* 20:*1* 25:*1, 4, 11, 16, 19* 26:*10, 17, 24* 27:*6, 9, 22* 28:*4, 10, 13* 29:*3* 30:*5* 32:*21* 33:*6, 10, 13* 34:*8* 40:*17* 41:*4, 14* 65:*16*
Beebe's 66:*24*
beginning 38:*19* 41:*6*
begun 13:*15*
behalf 24:*5*
behave 45:*13*
believe 25:*9, 14* 26:*1, 10* 27:*25* 28:*6* 30:*8* 38:*17* 39:*9*
beneficiaries 12:*17* 15:*3* 20:*18*
beneficiary 13:*13*
benefit 65:*4* 73:*21*
Berry 71:*1*
best 2:*8* 6:*7* 24:*10* 35:*10*
better 18:*6* 23:*15* 34:*4, 5* 54:*4* 57:*19* 71:*18* 76:*7*
bid 30:*10*
bidders 47:*3*
bidding 46:*5* 62:*25*
big 68:*4* 72:*20* 73:*10, 15*
biggest 27:*16*
bill 7:*24* 65:*7, 10*
billion 2:*12* 74:*10*
billions 8:*2*
Biodefense 13:*4* 34:*12, 19* 56:*16*
Biological 52:*8, 23*
biologics 9:*23* 56:*11*
biologists 14:*15*
biomanufacturing 35:*2*
biomedical 5:*15*
biopharma 69:*24*
Biopharmaceutical 34:*25* 36:*2* 52:*22*
Bioproduction 9:*20* 52:*15*
Bioscience 43:*4* 56:*2, 22*
biotech 69:*24*
biotechs 70:*1*
biothreats 34:*13*
bipartisan 48:*25*
bit 8:*1* 34:*9*
blah-blah-blah 67:*17*
blood 2:*21*
Bloomberg 4:*15*
Blu 43:*4* 56:*2, 21*

bolster 69:*11*
bombers 70:*23*
bottom 58:*21*
botulism 64:*1*
break 75:*19*
breakdown 41:*24*
breaking 64:*20*
bridge 46:*22*
brief 51:*8*
bring 33:*4* 36:*10* 47:*12* 48:*14*, *18*, *23* 64:*12* 75:*15*
bringing 34:*2* 74:*23*
broad 61:*14*
broader 44:*21*
brought 47:*22*
Bryce 42:*25* 51:*1*
bucket 74:*12*
budgeted 64:*17*
build 9:*2* 39:*20* 48:*22* 51:*23* 63:*13* 64:*17*
Building 1:*13* 64:*21* 75:*2*
built 76:*8*
business 27:*14* 29:*10* 30:*24* 31:*2*, *3*, *25* 53:*25* 54:*14* 68:*12* 69:*5*
buy 7:*6* 25:*2*, *9*, *12*, *15*, *19*, *22* 26:*3*, *4*, *6*, *7*, *14*, *21* 27:*4*, *18*, *20*, *22* 28:*2*, *5*, *15* 29:*10* 31:*6*, *11* 40:*15* 47:*5* 65:*17*, *25* 66:*7* 68:*13* 70:*23* 71:*19* 74:*20*
buyer 23:*15* 27:*16* 46:*5*
buying 7:*3*, *21* 8:*2* 24:*9* 25:*18* 28:*16* 38:*7* 39:*3*, *9* 66:*25* 69:*21*
buys 72:*6*

< **C** >
California 46:*3* 64:*17*
call 39:*19* 40:*10* 66:*11* 67:*7*
called 2:*22* 3:*19*
cancer 46:*14*
candidate 53:*3*
candies 14:*19*
capabilities 5:*15* 8:*9* 18:*1* 34:*13*, *23* 35:*14*, *17*, *21* 36:*8* 51:*9*, *11*, *24*, *25* 52:*14*
capability 13:*21* 52:*1*, *15*, *21*
capacity 5:*6* 10:*17* 14:*4* 34:*2*, *3*, *17* 48:*11*, *23* 53:*1* 59:*5* 64:*25* 75:*2*, *10*
care 2:*9* 12:*24* 13:*14* 14:*23* 18:*18* 20:*3*, *15* 21:*13* 27:*17* 39:*6*, *14* 43:*1* 51:*2* 59:*9* 60:*4* 61:*21* 71:*19*
cascade 21:*22*
case 13:*16* 58:*5*, *6* 63:*22* 66:*17* 71:*14* 73:*1* 74:*23*
cases 25:*6*, *21*
cash 70:*2*
catalog 25:*4*
cause 3:*3* 4:*19* 6:*23* 18:*17* 61:*9*
causes 44:*18* 61:*8*
cease 8:*24*
Center 67:*6* 71:*9*
centers 18:*4*
certain 53:*8*, *10*, *14* 54:*7*
certainly 27:*10* 42:*2*
cetera 38:*3*
chain 4:*11* 6:*10*, *22*, *25* 7:*10* 8:*4*, *20* 9:*15* 10:*13*, *16* 12:*17*, *23* 13:*10*, *12*, *17*, *20*, *22*, *25* 14:*5*, *21*, *24* 17:*12*, *23* 18:*9*, *15*, *23* 19:*1*, *10*, *18* 22:*6* 24:*8* 26:*8*, *22* 32:*15* 36:*9* 37:*7* 42:*11* 43:*5* 44:*18* 47:*12* 56:*3*, *12* 58:*1* 59:*13* 65:*4*, *5*, *12* 67:*4*, *7* 70:*6* 75:*24*
chains 6:*11*, *18* 7:*8* 8:*21*, *24* 9:*16*, *18* 13:*7* 14:*10* 18:*10*, *22* 19:*5* 44:*23* 48:*1* 69:*12*
Chair 6:*3* 7:*25* 8:*6* 17:*3* 36:*13* 39:*4*, *13* 40:*6*, *9*, *20* 44:*3* 65:*15*
chairman 1:*14*
Chairwoman 12:*8* 20:*17* 35:*12* 51:*3* 56:*4*
challenge 36:*17*, *22*
challenged 66:*6*, *8* 70:*21*
challenges 2:*15* 5:*6* 10:*5* 36:*25* 44:*13*, *18* 63:*23*, *24* 67:*2* 71:*12* 76:*3*, *9*
chance 17:*9* 41:*20*
change 47:*7* 71:*14*
characterize 34:*1*
characterized 38:*9*
charge 20:*11* 62:*23*
cheap 68:*25*
cheaper 65:*3* 73:*15* 76:*8*
checked 39:*4*
checking 72:*20*
Chemical 52:*8*, *23*
chemotherapy 22:*4*
Chief 56:*17*
China 4:*6* 6:*13*, *15*, *17*, *22* 7:*6*, *12*, *20* 8:*10*, *25* 9:*5* 10:*23* 25:*10*, *15*, *18* 26:*4*, *5*, *7*, *8*,

22 27:*4*, *22* 28:*2*, *8*, *15*, *18*, *25* 29:*1*, *16*, *24* 30:*5*, *9*, *16* 31:*7*, *10*, *14* 32:*9*, *19*, *22* 33:*9*, *16* 40:*16*, *25* 57:*17* 65:*25* 67:*4*, *10* 68:*21* 69:*20* 70:*7*, *8*, *23*, *24* 72:*16*
China-controlled 9:*9*
Chinese 5:*2*, *3* 29:*13* 31:*11* 58:*13* 70:*19*
CHIPS 69:*14*
choices 20:*21*
cholera 64:*1*
chronic 22:*17*
Circuit 58:*7*
citizens 59:*9*
Civica 73:*21*
Civil 47:*24*
civilian 2:*16* 12:*23* 22:*5* 35:*9* 37:*16*, *17*
clarifies 42:*20*
clarifying 53:*22*
Clark 76:*12*
clear 40:*2* 49:*3* 57:*18* 67:*21*
clearance 53:*6*, *14*
clearly 37:*24* 38:*22*
clinical 9:*22* 52:*20*
cloakroom 45:*16*
close 36:*23*
closed 22:*3* 67:*20*
closely 60:*3* 61:*22*
closing 59:*6*
coalition 57:*5*
codes 57:*14* 65:*20*
cold 61:*8*
collaborate 53:*17*
Collaboration 42:*24*
collective 19:*16*
colonel 43:*3* 55:*1* 56:*1*, *4* 60:*7* 61:*1* 65:*15*, *19* 66:*2*, *18*, *21* 67:*2*, *20*, *24* 68:*2*, *8*, *14*, *16*, *19* 69:*9*, *22* 70:*10*, *16*, *20*, *25* 71:*16*, *24* 72:*2*, *8*, *13*, *19* 73:*3*, *11*, *18*
combat 4:*18* 10:*1* 17:*8* 21:*3* 56:*13* 59:*20*
come 2:*3* 9:*5* 25:*24* 28:*6* 31:*22*, *24* 40:*18* 42:*17* 64:*8* 69:*20*
comes 9:*6* 26:*3*, *22* 31:*14*, *15* 47:*13*
coming 3:*15* 10:*21* 23:*7* 30:*16* 32:*20* 33:*23* 41:*11*
Command 11:*6* 12:*7*
commander 56:*13*
commercial 2:*14* 3:*24* 17:*25* 18:*1*, *14* 34:*17*, *19* 42:*5* 43:*8* 44:*21* 46:*10* 47:*7*, *11*, *21* 61:*4* 75:*20*
commercially 35:*23*
Commissioner 53:*13*
commitment 5:*8* 12:*12*
committed 19:*14* 42:*10*
Committee 1:*8*, *15* 12:*10*, *15* 45:*7* 56:*6* 57:*11* 60:*3* 74:*24*
commodities 71:*4*
commodity 68:*17*
common 2:*22* 3:*5* 22:*4*, *8*
commonwealth 74:*3*
Communist 6:*12*, *15*, *17*, *22* 7:*6*, *12*, *19* 25:*10*, *15*, *18* 26:*4*, *5*, *6*, *8*, *22* 27:*4* 28:*25* 29:*1*, *16* 40:*16*
community 39:*6*, *15*
companies 7:*17* 18:*2* 46:*12*, *23* 52:*18* 54:*14* 57:*2* 58:*20* 59:*6* 69:*5* 70:*1*, *11*, *16*
company 27:*15* 45:*24* 66:*9* 70:*5*, *19* 72:*6*
comparison 64:*16*
compel 57:*19*
compete 28:*7* 58:*20*
competition 3:*9* 29:*11*
competitive 34:*20* 45:*14* 46:*6* 68:*24*
complete 41:*24*
complex 19:*9* 48:*8*
compliant 57:*16*
components 58:*11*
compromise 18:*17*
computational 14:*15*
concentration 45:*10*
concern 12:*25* 28:*19* 39:*17*
concerned 4:*7* 10:*19* 22:*23* 24:*16*
concerning 59:*25*
concerns 6:*9* 12:*23* 22:*7* 65:*10* 69:*1*
conclude 51:*12*
concludes 54:*16*
conclusion 14:*25* 69:*20*
conclusions 49:*2*
condition 20:*22* 21:*5*
conditions 22:*17*

conduct 4:*23* 10:*15* 14:*2* 22:*21* 23:*12*
conducted 8:*3*
conducting 53:*23*
conference 39:*19*
confidence 59:*19*
confirm 30:*13*
conflict 9:*11*
conflicts 51:*21*
Congress 19:*16* 49:*3* 51:*12*, *23* 52:*9* 53:*7*, *12*, *20*, *22*, *24* 54:*3*, *6*, *11*, *13* 60:*2* 66:*4* 70:*10*
Congressional 43:*2* 49:*1* 51:*2*, *5*
congressionally 52:*4*
conscious 46:*18*
consent 53:*10*
consequences 4:*15*
consider 23:*5* 53:*22*, *24* 54:*3*
consideration 23:*25* 24:*1* 59:*3*
considerations 14:*8* 51:*12* 59:*25*
considered 58:*9*, *17* 62:*25*
considers 36:*6*
Consistent 13:*4*
consists 5:*12*
consulting 56:*22*
contains 2:*19* 22:*11*
contaminants 22:*11* 38:*2*
contamination 21:*24*
context-specific 46:*8*
contingency 10:*7* 13:*3*
continue 6:*16* 7:*1* 19:*11* 43:*7* 61:*4* 64:*5*, *6* 71:*17*
continued 15:*1*
continues 48:*7*
continuing 6:*12*
contract 27:*18* 28:*22*, *23* 31:*21* 64:*13* 70:*3*
contracted 38:*4*
contracting 18:*1* 38:*17* 54:*9*
contractor-operated 52:*24*
contractor-owned 52:*24*
contracts 27:*15* 28:*8* 45:*25*
contrast 46:*18*
contributing 21:*20* 51:*15* 58:*3*
contributions 51:*17*
control 21:*23* 22:*16*
controversial 58:*4*
conundrum 21:*13* 31:*16*
cooperative 4:*22*
coordinate 53:*18*
core 12:*25*
corporation 73:*22* 74:*10*
corps 56:*10*
correct 22:*11* 61:*25* 68:*14* 72:*9* 73:*11* 74:*4*
cost 48:*17* 64:*12*, *19* 68:*3*, *10*
cost-effectively 45:*24*
costs 3:*16* 44:*22* 46:*18* 59:*2* 64:*19*, *23*
Council 57:*4*
counsel 74:*25*
counter 34:*13*
countermeasure 9:*19*
countermeasures 10:*6* 35:*1*, *21* 51:*17* 53:*2* 56:*17* 63:*24*
countries 8:*19* 26:*13* 32:*19* 33:*9*, *17*, *23* 36:*16* 57:*16* 58:*12* 75:*8*
country 6:*10* 9:*9* 27:*16* 28:*19* 36:*18* 40:*1* 73:*25*
couple 37:*3* 68:*20*
course 25:*5*
court 58:*5*, *6* 66:*7*, *17* 70:*21* 71:*12*, *14* 73:*1*
COVID 6:*10* 8:*18*
COVID-19 3:*23*
crap 69:*21*
crazy 40:*24*
create 7:*16* 39:*10*
created 48:*12* 69:*13*
creates 21:*13* 31:*15* 44:*15*
creating 29:*4* 49:*4*
creation 48:*11*
crises 48:*13*
critical 6:*13* 8:*13* 13:*13* 17:*22* 19:*13* 20:*13* 21:*25* 29:*24* 69:*6* 71:*4* 73:*25* 74:*5* 75:*16*
critically 75:*17*
crucial 36:*3*
current 7:*1* 8:*9* 63:*24* 64:*13*
currently 5:*14*
curves 45:*15*
customer 61:*7*
customers 17:*20* 18:*7*

< D >
D.C 1:*10*
daily 29:*25*
danger 8:*20* 57:*18*
dangers 6:*12*
data 19:*6* 37:*15* 45:*19* 71:*20*

72:2 74:21 75:7
daughters 56:13
David 11:10 12:3
day 27:3, 19 71:23 72:5
days 31:23 39:18 41:3, 10 77:2, 3
deal 36:24
dealing 68:5
death 21:10
deaths 62:9
DeBastiani 23:3
decade 61:17
decades 12:20 45:9 48:25 63:24 68:20
decide 21:10 26:22, 25 31:2, 11 68:6
decided 61:18 64:9
decides 6:19
decision 26:16 31:25 68:11
decisions 23:24 24:3 34:6 45:9 70:17 72:4
deeply 10:19
Defense 2:5 5:13 8:1, 3, 5 9:12, 13 10:10 11:3, 8, 9, 10, 12, 13 12:2, 3, 4, 5, 11 14:12 17:2, 7, 8 18:20, 23 20:3 24:4 27:3, 11 31:6 33:5 43:1 46:4, 10 47:8 48:20 51:1, 9 52:3, 6, 7, 8, 23 53:12 57:8, 9 59:11, 13 61:21 67:19 69:10, 17 70:18 71:4 75:16
DEFENSE'S 1:1 12:12
define 38:8
defined 66:12, 13
defining 53:22
deliver 17:14 18:3
demand 3:4 45:15 47:2 62:21
demands 34:19 46:6
DEPARTMENT 1:1 2:5 5:13 8:3, 7, 14 9:13 10:9 11:3, 9, 11 12:3, 5, 11 13:7 14:10 17:8 19:15, 19 24:21 27:11 36:7 41:16 48:20 51:9, 10 53:4 54:6 57:8 59:11 66:5 67:19 70:18, 20
departments 52:7
Department's 4:10 9:14 12:16, 25 13:9 34:13, 18 57:12
dependence 7:12 8:7
dependency 18:11, 13
dependent 5:2 6:14, 17 9:10 10:23 18:24 40:25 70:6
dependents 17:18
depending 64:11
depends 7:8
depleted 62:17
deployed 35:19
Deployment 13:14 14:11 22:17 23:13 30:4, 7 33:20
Deputy 11:10 12:3
derived 5:3
Dertzbaugh 11:4 12:5 15:6 35:7, 12 41:23 42:1
design 14:18
designed 71:2
desperate 70:2
Despite 3:8
destroy 29:16 31:1 69:20
detail 48:21, 25
deter 54:14
determine 44:25
devastating 2:24
develop 4:10, 12 35:10 44:19 51:11 52:14 70:4
developed 35:4, 8 61:11 62:22
developing 14:13 47:16
development 5:16 9:22 11:6 12:7 13:5, 15 14:13 34:24 51:9, 13, 24 52:5, 19, 21 53:18 54:4 56:11, 16
develops 63:8
device 27:20
devices 65:9
DHA 20:12 24:6, 8 35:13
DHA's 42:21
dialogue 41:7
difference 28:12
differences 25:6, 7
different 20:23 25:2, 5 31:19 38:21 52:14 66:16
differentiate 23:14 37:22
differentiation 68:3
difficult 61:15 72:15
diplomatic 36:24
direct 38:7 65:8
directed 52:4
direction 30:2
directly 70:21
Director 11:13 17:1
disagree 29:17 73:13
disagrees 29:19
disasters 3:4
discover 65:2
discoveries 35:11 51:19
discovers 53:3
discovery 51:16

discuss 5:*6* 7:*9* 9:*14*, *24* 10:*8* 12:*11* 15:*2*
discussed 36:*22*
discussion 27:*10* 41:*15*
disease 35:*14*, *18*, *22* 62:*12*
diseases 10:*2* 35:*5*, *17*
dispel 48:*18*
dispensed 9:*8*
dispensing 20:*5*
disputes 44:*12*, *14*
disrupt 59:*23*
disrupted 6:*19*
disruption 6:*22*, *25* 8:*15* 13:*17* 18:*15* 61:*23*
distinguished 12:*9* 17:*4* 56:*5*
distribution 18:*1* 75:*2*
DLA 17:*8*, *10*, *17*, *22* 18:*7* 26:*25* 74:*24*
DLA's 17:*14*
doable 41:*3*
doctor 62:*9*
documentation 13:*21*
documents 22:*1*
DoD 2:*12*, *15* 3:*25* 4:*9*, *22*, *25* 5:*14* 9:*2* 15:*3* 17:*11* 18:*12*, *19*, *22* 19:*3*, *10*, *19* 22:*8*, *13*, *20* 23:*23* 24:*7*, *20* 32:*13* 34:*11*, *12*, *22* 35:*1*, *4* 36:*6* 37:*10* 43:*7* 44:*25* 45:*24* 46:*5*, *6* 47:*4*, *5*, *8*, *18* 48:*14*, *16* 49:*5* 51:*10*, *13*, *23*, *25* 52:*5*, *13*, *25* 53:*3*, *7*, *17*, *23*, *25* 54:*6*, *12* 56:*25* 57:*14* 61:*4*, *6*, *7*, *17*, *25* 62:*1*, *7*, *16*, *17*, *20*, *22* 63:*1*, *2*, *7*, *16*, *21*, *23* 64:*5*, *6*, *9*, *20*, *23* 65:*3*, *8* 71:*17*
DoD's 2:*18* 3:*14*, *17* 4:*1* 5:*6*, *14* 8:*21* 34:*24* 54:*3* 60:*4* 65:*7* 74:*9*
doing 6:*4*, *8* 10:*24* 17:*10* 22:*25* 23:*19* 37:*23* 38:*20* 39:*11*, *12*, *16* 40:*25* 41:*5* 54:*14* 61:*20* 75:*1*, *6*, *7*
dollars 8:*2*
domestic 7:*17* 8:*16* 9:*2* 10:*17* 13:*2*, *21* 14:*4* 18:*16* 25:*20*, *22* 28:*17* 34:*2*, *3*, *10*, *14*, *20* 36:*7* 39:*10*, *21* 57:*2* 59:*4*, *5* 64:*25* 69:*11* 73:*13* 75:*23*
domestically 26:*12*, *18* 28:*5* 33:*7* 57:*24* 73:*4*
dosage 22:*12* 25:*6*
dose 38:*2*
doubled 33:*17*
doused 22:*2*
downgrade 59:*8*
downstream 45:*9*
downward 59:*2*
Dr 11:*4*, *7*, *8*, *10*, *14*, *16*, *18* 12:*8* 15:*5*, *6* 20:*11*, *17* 22:*20*, *22* 23:*22* 24:*6*, *11*, *18* 29:*23* 30:*3*, *4*, *12*, *18* 31:*8*, *9* 33:*10* 35:*7* 37:*1*, *7*, *12*, *19* 38:*15* 39:*22* 40:*11* 42:*23*, *25* 43:*11* 44:*3* 49:*7* 50:*1* 62:*14*, *17* 63:*12* 64:*9*, *11* 73:*8* 74:*7*, *8*, *21*
drive 14:*22*
driver 58:*22*
drop 74:*11*
drug 2:*22*, *23*, *25* 3:*15*, *18*, *24* 4:*14*, *19*, *24* 5:*14* 7:*18*, *24* 9:*3*, *10* 10:*18* 11:*2* 13:*24* 14:*6* 18:*17* 20:*9*, *13*, *20*, *25* 21:*20* 22:*6*, *9*, *10* 24:*1*, *8*, *19*, *21* 27:*20* 32:*15*, *24* 34:*15* 37:*23* 42:*4*, *22* 43:*8* 44:*9* 46:*13*, *14* 48:*19* 53:*3*, *4*, *10*, *23* 57:*14* 58:*8*, *17*, *20*, *21*, *22* 59:*1*, *2* 61:*5* 64:*12* 65:*8*, *11*, *20* 66:*13* 70:*5* 72:*23* 75:*10*
drugs 2:*6*, *18*, *19*, *21* 3:*5*, *8*, *10*, *12*, *16*, *25* 4:*24*, *25* 7:*16*, *20*, *23* 8:*16* 9:*5*, *8*, *9* 12:*21* 19:*7* 20:*5*, *21* 22:*4*, *13*, *14*, *16*, *24* 23:*13*, *24* 24:*10*, *23* 25:*2*, *6*, *18* 30:*8* 31:*10*, *13* 32:*16*, *18*, *23*, *25* 33:*1*, *7* 37:*4* 38:*22* 43:*7* 44:*23* 45:*1* 46:*9*, *16*, *19*, *24* 51:*11*, *16* 52:*14*, *19* 53:*9* 54:*1* 61:*4* 64:*10*, *23* 65:*2*, *6*, *9*, *13*, *17* 69:*4* 70:*4*, *23* 71:*19* 75:*24*
due 18:*13*, *25*
duty 56:*23*
dysfunctional 58:*20*

< E >
eager 43:*9*
earlier 8:*18* 20:*7* 58:*23*
early 10:*13* 38:*22* 51:*17* 52:*18* 70:*1*
early-stage 9:*22*

easily 8:*24* 71:*11*
Ebola 35:*5*
echo 49:*2*
economic 36:*23* 57:*21*
economists 45:*12*
economy 47:*14* 68:*22*
effect 20:*23* 54:*5*
effective 2:*7* 3:*2* 12:*12* 14:*22* 22:*24* 24:*9* 53:*18* 65:*13*
effectiveness 22:*10*
effects 2:*25*
efficiently 47:*18*
effort 8:*6* 9:*23* 13:*16, 18* 40:*13* 75:*9*
EFFORTS 1:*2* 2:*5* 13:*9* 14:*21* 51:*19* 59:*12, 16* 60:*4*
egregious 72:*21*
either 5:*2* 26:*18* 32:*9, 16* 69:*5* 70:*12* 71:*5*
electron 14:*16*
Elizabeth 1:*14* 2:*1*
EMA 75:*6*
emergency 53:*11, 16*
empirical 45:*19*
employer 44:*11*
enable 13:*16* 59:*17*
encompassed 8:*12*
encounter 35:*19*
encourage 60:*2* 71:*17* 74:*24*
endeavor 44:*7*
end-to-end 17:*23*
engagement 54:*6*
enhancing 57:*1*
enormously 64:*12*
ENSURE 1:*2* 2:*6* 8:*21* 12:*12* 17:*12, 23* 19:*10* 20:*14* 24:*9* 47:*11* 57:*24* 64:*24* 65:*12*
ensuring 20:*11* 22:*23* 44:*13* 57:*6*
entered 4:*22*
enterprise 52:*5*
entire 2:*13* 39:*14* 64:*17* 70:*6*
entities 52:*6, 10, 13* 59:*7*
environmental 14:*2* 69:*1*
epinephrine 21:*9*
equally 33:*25*
especially 36:*4* 67:*3*
essential 2:*19* 5:*1* 7:*3* 8:*13* 14:*10* 33:*14* 35:*8* 57:*6, 22* 58:*1* 59:*6* 73:*5, 23, 25*
essentially 33:*22*
establish 4:*12* 27:*6*
established 13:*10* 47:*25*
establishing 49:*3*
estimate 67:*8*
estimated 62:*2* 63:*4* 64:*18*
et 38:*3*
evaluate 24:*21* 54:*12*
evaluated 32:*15*
evaluating 13:*20* 14:*21* 23:*2*
event 59:*10*
events 21:*9*
everybody 31:*20* 39:*8, 10* 69:*19* 74:*15, 20*
evidence 44:*8*
exactly 20:*22*
examination 14:*5*
example 2:*17* 10:*15* 14:*1* 20:*24* 21:*21* 22:*10* 48:*13* 61:*6, 7* 63:*19* 64:*13* 67:*5* 73:*20, 21*
examples 48:*2* 74:*3*
excessive 48:*16*
excipients 57:*15* 58:*12*
exclusively 32:*22*
execute 66:*7*
Executive 13:*6* 17:*7* 66:*7*
exhausted 61:*25*
exist 8:*24*
existing 5:*15* 13:*11* 25:*12* 26:*25* 42:*21* 48:*23* 53:*15*
exists 26:*24*
expand 33:*21*
expanded 73:*24*
expect 38:*13*
expected 22:*12* 47:*1*
expecting 37:*13*
expedited 53:*14* 54:*11*
expensive 46:*14*
experience 63:*25*
expert 62:*14*
experts 35:*18*
explain 5:*13* 20:*14* 29:*21* 35:*10*
explore 48:*5* 54:*13* 57:*19*
explored 36:*24*
exposed 3:*23* 6:*11* 44:*20*
extent 54:*2* 62:*6*
extreme 6:*23*

< F >

face 3:*23* 7:*25* 10:*5* 20:*19* 51:*13* 53:*21* 76:*9*
faces 44:*12*
facilities 33:*8, 20* 36:*9* 45:*6* 47:*25* 72:*21*
Facility 9:*21* 34:*25* 35:*2, 3* 36:*2* 42:*3* 45:*4* 48:*16* 49:*4* 52:*15, 17, 22, 24*

59:*20* 63:*14* 64:*21*
facing 21:*15*
fact 3:*9* 61:*16*
factor 23:*5* 45:*21* 58:*3*
factors 3:*3* 21:*19* 23:*11* 75:*9*
factory 64:*17, 18*
failure 4:*20* 21:*22*
failures 3:*5* 44:*9* 47:*5*
fair 23:*21, 22* 30:*6*
families 2:*8* 4:*3* 5:*10* 20:*6, 15* 44:*16* 59:*18* 60:*4*
family 6:*24*
far 6:*17* 45:*14*
faster 41:*12, 19*
Favored 68:*21*
FDA 2:*17* 3:*8* 21:*19, 21* 23:*7* 33:*14* 37:*25* 53:*5, 8, 13, 17* 54:*11* 75:*6*
FDA-approved 18:*3*
FDA's 5:*1* 8:*12*
feature 3:*5* 42:*20*
Federal 7:*21, 22* 19:*15* 52:*17* 57:*20* 58:*7, 10*
fellow 42:*24* 44:*2, 5*
fentanyl 29:*13*
fever 51:*20*
fevers 64:*1*
fight 21:*7*
fighting 7:*15* 35:*20*
figure 23:*20* 32:*3* 37:*3* 41:*7*
fillers 38:*3*
final 26:*11, 17* 28:*15, 16* 47:*13* 58:*15* 66:*10*
Finally 59:*11* 62:*15*
find 34:*21* 35:*21* 38:*4* 45:*2* 61:*15*
finding 57:*13, 18* 63:*23* 72:*21*
findings 9:*14*
fine 30:*22*
finest 56:*12*
finished 3:*18* 4:*24* 19:*1, 6* 38:*16, 17* 73:*5*
firm 56:*22* 58:*13*
first 5:*12, 19* 6:*3* 11:*2* 20:*2, 9* 33:*10, 14* 38:*20* 43:*6* 44:*20* 53:*22* 61:*22* 62:*23*
fiscal 4:*9* 8:*5* 18:*21* 32:*13* 57:*9*
fix 6:*21* 7:*20* 67:*19* 71:*10*
fixed 7:*15* 66:*23*
FLORIDA 6:*2* 52:*22*
flowing 38:*23*
flu-like 61:*9*
focal 13:*13*
focus 7:*7* 18:*11* 69:*1*
focused 57:*6* 71:*2*
focuses 14:*13*
focusing 9:*17*
follow 25:*11* 26:*25* 32:*6, 7*
followed 51:*10*
follows 15:*6* 19:*22* 49:*7* 54:*19* 60:*7* 76:*19*
Food 53:*4* 71:*3*
force 52:*2*
foreign 3:*15* 4:*5* 6:*18* 7:*12* 8:*8* 18:*11, 14, 24* 36:*16* 59:*7*
Formulary 13:*14* 14:*11* 23:*14* 30:*5* 31:*13* 33:*21*
forward 9:*12* 10:*20* 15:*4* 19:*20* 23:*21* 40:*8* 54:*17* 60:*6*
found 9:*25* 21:*23* 22:*1* 30:*25* 32:*16* 68:*24*
Founder 43:*3* 56:*2, 21*
four 56:*13*
frameworks 53:*16*
free 62:*23*
front 63:*2*
fulfill 36:*5*
full 17:*17* 22:*1*
fully 35:*1*
fund 74:*9*
fundamental 66:*2*
fundamentally 47:*6*
funding 52:*10* 69:*11*
future 7:*19* 8:*23*

< G >
gain 14:*8*
gap 46:*23*
gaps 19:*3*
Gary 76:*12*
General 9:*25* 18:*13* 35:*25* 56:*18*
generally 48:*4* 53:*4*
generate 13:*18, 24* 47:*2* 54:*7*
generates 72:*2*
generation 14:*16, 17, 19*
generic 3:*8, 10, 12, 15* 4:*18* 7:*23, 24* 9:*9, 10* 12:*21* 19:*7* 45:*3* 58:*20, 21* 59:*2* 68:*9* 74:*1*
generics 3:*6* 23:*8, 10, 15*
getting 38:*13* 70:*21* 75:*25*
give 11:*15* 20:*24* 24:*12* 30:*19* 67:*18*

given 7:*25* 54:*6* 62:*22* 75:*10*
gives 3:*25* 46:*13* 63:*8* 65:*11* 67:*21*
giving 21:*6*
glad 7:*9* 24:*20* 40:*13* 41:*9*
global 17:*16* 18:*2, 25* 31:*11* 59:*10* 74:*11*
gloves 27:*20*
go 20:*21* 30:*1* 33:*13* 40:*8* 59:*19* 62:*9* 67:*14*
goal 56:*23*
going 7:*5* 11:*2, 15* 20:*2* 22:*7, 13* 23:*21* 26:*3, 4, 6, 7* 27:*20* 28:*23* 29:*7, 8* 30:*13* 31:*20* 32:*1* 42:*7, 12* 61:*3* 63:*9* 64:*5* 65:*25* 66:*11* 67:*18* 68:*17* 73:*9, 12, 14, 15, 23* 74:*17, 18* 76:*4, 5*
good 11:*7* 17:*3* 23:*18, 23* 24:*19* 36:*17* 37:*16, 17, 25* 38:*14* 42:*13, 14* 46:*13* 51:*3* 56:*4* 73:*19* 74:*7*
goods 7:*4* 45:*22* 69:*2*
govern 47:*7*
Government 7:*21* 12:*24* 34:*5* 39:*25* 48:*10* 58:*10*
government-owned 49:*4* 52:*17*
grandkids 6:*6*
grapple 68:*4*
grateful 17:*9*
great 31:*17* 40:*7* 41:*18*
greater 41:*20*
Greer 63:*1*
grew 68:*22*
ground 21:*7* 52:*17*
groundwork 51:*22*
group 4:*12* 13:*11* 37:*21*
groups 12:*24*
Growth 43:*4* 56:*2*
guess 31:*22*
guidance 4:*10* 13:*5*
Gus 56:*19*
guy 27:*14* 29:*10* 68:*12*
guys 30:*24* 31:*1* 39:*9*

< H >
H.P 43:*1* 51:*1*
half 2:*17, 21* 32:*16, 23*
happen 40:*18* 73:*7*
happened 68:*19, 20*
happening 73:*19*
happens 27:*13* 31:*22*
hard 8:*19* 34:*21* 41:*1*
harm 4:*2*
harness 14:*15*
health 2:*9, 16* 6:*5* 7:*22* 9:*7, 13* 10:*10, 12, 14* 11:*9, 11* 12:*2, 4, 14, 24* 13:*19* 14:*12* 15:*3* 20:*3, 4, 7, 11, 18* 21:*13, 16, 17* 24:*5* 27:*17* 29:*5* 39:*6, 14* 43:*1* 44:*15* 46:*20* 49:*5* 51:*2* 52:*1, 6* 57:*1, 21* 58:*4, 5, 24* 59:*9* 61:*21, 23* 64:*2* 66:*9* 71:*19* 75:*17*
healthy 10:*1* 47:*2* 64:*7*
hear 23:*19* 24:*20* 75:*19*
heard 23:*8* 62:*22* 65:*16*
HEARING 1:*1* 2:*3, 4* 5:*5* 9:*12* 10:*20* 21:*18* 42:*10* 75:*14* 76:*14* 77:*5, 7*
heartened 75:*2*
heavily 56:*15*
held 48:*16*
help 19:*10* 22:*16* 23:*20* 34:*25* 35:*7, 21* 38:*6* 39:*20, 25* 66:*3* 74:*4*
helpful 36:*1*
helping 76:*14*
hemorrhagic 64:*1*
heparin 2:*22*
hey 69:*13*
HHS 39:*25* 40:*1, 7*
high 2:*7* 5:*2* 8:*7, 15* 10:*2* 17:*13* 20:*10* 32:*16, 17* 33:*16, 23* 44:*13* 58:*25* 71:*20*
higher 7:*2*
highest 12:*18* 33:*18* 38:*8* 59:*21*
highlight 53:*21* 58:*19*
highly 18:*24*
HIGH-QUALITY 1:*3* 19:*11* 57:*24*
hinder 19:*4*
hire 70:*3*
History 10:*2* 47:*23* 48:*18* 51:*15, 22*
hoc 75:*5, 11*
hold 48:*9*
holding 5:*5*
home 36:*11*
Hon 1:*13* 2:*1* 6:*1* 12:*1*
honestly 44:*8*
Honorable 11:*7*
hope 14:*22* 42:*9* 48:*9*

hospital 27:*15* 39:*7*
hospitalizations 62:*6*
hospitals 17:*19* 27:*18*
hours 21:*10*
house 47:*23* 48:*24* 57:*11*
household 7:*4*
human 57:*1*
hurdle 68:*4*
hyper-specialized 45:*22*, *25*

< I >
idea 39:*3* 48:*19*, *20* 71:*8*
idealized 45:*15*
ideas 39:*20*
identified 18:*13*, *23* 19:*3* 32:*21* 33:*16* 36:*7*
identifies 24:*7*
identify 18:*8* 19:*16* 25:*25* 34:*13* 41:*6*
identifying 51:*12*
illness 3:*1* 61:*10*
illuminate 19:*9*
illumination 41:*5*
illustrates 58:*17*
imagine 7:*3*
immunosuppressant 4:*17*
impact 2:*23* 6:*25*
impacted 26:*8*
impacting 18:*9*
impediment 32:*4*
impediments 30:*1*
imperative 8:*21*
implement 36:*6*
importance 20:*19*
important 6:*4* 9:*24* 15:*2* 23:*25* 25:*25* 34:*8* 47:*16* 71:*3* 74:*23* 75:*17*
imported 3:*25*
importing 3:*24*
improve 5:*9* 10:*6* 17:*10* 18:*8* 19:*8* 24:*22*
inability 68:*25*
inaugural 34:*11*
incentive 7:*16* 69:*14* 74:*19*
incentives 46:*10*, *21* 47:*7* 69:*13* 73:*4* 75:*21*
incentivize 54:*8* 69:*10*
incentivized 46:*12*, *19* 48:*5*
include 10:*16* 13:*21* 17:*19* 41:*15* 54:*9* 58:*11* 63:*25* 71:*6*
included 76:*16*
includes 2:*21* 20:*4* 22:*14*, *16* 52:*6*
including 14:*3* 18:*9* 22:*1* 35:*5* 44:*22* 53:*8* 56:*25* 57:*16*, *25*
increases 72:*23*
increasing 34:*10* 44:*22*
increasingly 3:*21*
incredibly 74:*23*
independent 4:*23* 8:*22* 22:*9* 48:*21*, *22*
independently 59:*9*
India 21:*21* 72:*16*
indicated 21:*4* 24:*13*
industrial 45:*8*
industries 69:*3*, *25*
industry 8:*2* 35:*11* 54:*5*, *8* 58:*2* 61:*13* 64:*8* 65:*22* 69:*4* 70:*9* 72:*10* 73:*4*
infections 21:*1* 22:*19* 62:*3*
infectious 10:*2* 35:*14*, *16*, *18*, *22*
influence 34:*5* 54:*14*
inform 12:*15* 24:*3*
information 13:*24* 19:*3*, *8* 24:*11*, *22* 30:*19* 37:*16* 38:*14*, *19* 41:*7* 53:*17* 75:*22* 76:*19*
informed 53:*10*
ingredient 13:*25* 26:*3*, *5*
ingredients 3:*18*, *19*, *20* 5:*3* 8:*12* 12:*21* 13:*1* 18:*14*, *16* 19:*2*, *7* 24:*2* 25:*23* 26:*1* 28:*14*, *18*, *24* 30:*16* 31:*24* 32:*18* 45:*3* 57:*15* 67:*17*
in-house 53:*23*
initial 69:*14* 71:*20*
initiate 25:*25*
initiative 12:*16* 13:*23* 34:*14*
initiatives 48:*12* 73:*19* 75:*4*
injection 21:*9*
Innovation 67:*5* 71:*8*
innovative 10:*6* 70:*1*
inputs 9:*5*
INSERT 76:*20*
insight 75:*23*
insights 13:*18* 14:*9*
inspect 72:*17*, *18*
inspection 3:*4* 21:*21*
inspector 18:*12*
instances 61:*5*
Institute 9:*20* 14:*14* 35:*3*, *15*, *16* 52:*16* 56:*18*
institutions 38:*5*
insulate 42:*21*
insulin 64:*17*
integrating 69:*24*
Integrity 42:*25*
intellectual 70:*12*
intended 54:*13*
intent 70:*12*
intention 38:*21*

interest 19:*20* 54:*8*
interested 3:*14* 61:*20* 63:*17*
interim 57:*11*
internally 76:*8*
international 75:*9*
interruption 37:*6, 9* 44:*24*
intriguing 39:*22*
introduce 5:*17* 49:*3*
introducing 65:*7*
invade 6:*19*
invades 8:*25*
invest 7:*17* 51:*23* 70:*9*
investigational 53:*9*
Investigators 21:*23*
investing 70:*19*
investment 46:*13*
invitation 44:*4*
invite 39:*18*
inviting 15:*1* 51:*5*
involve 45:*22*
involved 28:*25* 34:*10* 56:*15*
Iran 29:*1*
irreconcilable 46:*9*
irrefutable 72:*3*
issue 2:*9, 10, 11* 6:*5* 9:*6* 18:*11* 20:*19* 30:*6, 14* 40:*2* 66:*2* 75:*16*
issues 7:*10, 25* 15:*2* 19:*20* 21:*20* 23:*7* 53:*21*
items 7:*4* 25:*5, 13*
its 19:*4* 22:*15* 24:*2, 8* 34:*11, 22* 54:*5* 58:*11* 59:*9*

< J >
J7 17:*2*
job 69:*23*
joint 11:*15* 12:*1* 13:*14* 14:*10* 15:*5* 23:*13* 30:*4, 7* 33:*20* 36:*25* 52:*2*
Jon 76:*12*
Journal 23:*4*
jurisdiction 45:*7*
justify 27:*23* 72:*3*

< K >
Kaine 1:*15* 36:*12, 13* 37:*10, 13* 38:*12* 42:*13, 14*
Kaine's 73:*20*
Katie 76:*13*
keep 21:*24* 33:*8* 36:*10* 64:*7* 65:*7*
keeping 9:*25* 36:*4*
key 3:*20* 9:*4* 19:*7* 57:*22* 67:*11* 73:*6*
kidney 4:*20*
kids 6:*6*
kill 29:*12*
killing 29:*12, 13*
kind 74:*25*
kinds 22:*7*
kits 46:*2*
know 6:*14* 7:*5* 8:*9* 20:*18* 24:*20* 25:*21* 31:*3, 4, 13, 14* 33:*25* 38:*10, 13* 39:*7* 40:*11, 14, 19* 41:*2, 18* 44:*24* 63:*7* 64:*3* 65:*4, 25* 70:*20* 75:*13, 24* 76:*10*
known 3:*20* 59:*1* 70:*11*
knows 32:*20*
KSMs 3:*21*

< L >
lab 4:*16, 23* 22:*9*
label 53:*10* 58:*16*
labeling 58:*15* 66:*10*
labor 68:*25*
laboratories 35:*15*
lack 10:*19* 19:*5*
laid 51:*22*
landscape 14:*3*
language 4:*9*
large 18:*24* 42:*6*
largest 27:*15*
Lastly 10:*8*
late 68:*21*
latest 14:*15*
launched 22:*8*
law 66:*15* 67:*15*
lead 40:*1, 13* 56:*20* 62:*3*
leading 8:*6* 10:*11* 21:*19*
leads 59:*4*
learn 5:*5* 37:*13, 14*
learned 8:*18* 51:*21*
learning 14:*17*
leave 45:*14*
leaving 35:*11*
led 13:*18*
Leeling 76:*13*
left 11:*4* 42:*23* 56:*23*
legal 74:*25*
legislation 7:*15* 9:*1* 49:*3* 69:*11* 70:*14* 71:*10*
Legislative 11:*12* 57:*20*
lenses 45:*17*
lessons 51:*20*
Lester 11:*8, 14, 18* 12:*1*
lethality 17:*14*
letter 39:*5, 14* 76:*15*
leverage 13:*11* 69:*10*
leveraging 7:*21* 17:*25*
licensed 61:*12*
licensure 70:*6*
life 5:*9* 21:*10, 11* 29:*16* 31:*25* 56:*22* 69:*21* 70:*4*
likes 72:*7*
limbs 4:*17*
limitation 26:*15* 31:*4, 5, 8* 40:*21,*

22 67:*1*, *15*, *23*, *25* 74:*21*
limitations 47:*11*
limited 3:*17*
limits 70:*11*
line 18:*6* 46:*14*
lines 59:*7*
lions 46:*3*
list 2:*18* 5:*1* 8:*13*, *16* 22:*14*, *16* 33:*15* 71:*14*
literature 44:*9* 45:*2*
little 3:*9* 8:*1* 32:*23* 34:*9*
little-known 58:*4*
live 47:*14*
lived 47:*14*
LLC 43:*5* 56:*3* 58:*5*
located 18:*4*
logically 6:*14*
logistical 18:*9*
Logistics 9:*13* 11:*13* 13:*10* 17:*2*, *7*, *16*, *23* 18:*6* 24:*4* 59:*14*
long 4:*7* 51:*15* 75:*1*
longer 3:*6*
long-standing 58:*7*
look 9:*12* 10:*3*, *20* 15:*3* 19:*20* 20:*21* 22:*13* 23:*13* 54:*17* 60:*6* 67:*5* 71:*1*
looked 67:*7*
looking 37:*20*, *23*, *24* 38:*1*, *2*
loophole 58:*18* 66:*4* 67:*20* 71:*7*
López 11:*19*
lose 21:*5*
losing 21:*7*
lost 4:*17* 72:*16*
lot 23:*19* 32:*24* 33:*1* 63:*23* 64:*14* 71:*10* 76:*7*
low 3:*13* 46:*17* 69:*2* 74:*9*
low-cost 71:*19* 73:*25*
lower 3:*16* 69:*2*

< M >
M.D 12:*3*, *6*
ma'am 33:*10* 34:*8* 42:*1*
machine 14:*17*
Madam 17:*3* 36:*13*
Magnus 76:*13*
main 31:*8*
Mainland 30:*16*
maintain 8:*8* 12:*16*
major 58:*3* 61:*9* 74:*21*
making 3:*14* 23:*23* 69:*6* 75:*9*
malaria 51:*20*
man 31:*12*
manage 18:*8* 48:*7*
management 2:*23* 4:*10* 13:*11*
Manager 56:*20*
manages 17:*17*, *22*
managing 56:*11*
manufacture 34:*17*, *25* 46:*12*, *24* 48:*6* 49:*4* 57:*23* 63:*21* 64:*10* 65:*3*, *8* 69:*15* 73:*4*
manufactured 7:*23* 26:*12*, *18* 45:*4*, *5*, *23* 58:*9*, *12*
manufacturer 3:*7*, *11* 24:*2* 37:*22* 61:*16*, *18*, *19* 62:*16*, *19*, *25* 63:*9*, *10*, *14*, *16* 64:*11*
manufacturers 3:*13*, *15*, *17* 4:*5* 5:*3* 7:*24* 8:*17* 9:*2* 14:*9* 18:*16* 23:*9*, *16* 38:*7* 42:*6* 59:*4* 76:*16*
manufactures 46:*14*
manufacturing 4:*5* 9:*3*, *10* 10:*17* 13:*2*, *21* 14:*4* 21:*21* 32:*8* 33:*4*, *7*, *8* 34:*10*, *14*, *16*, *20*, *23*, *25* 36:*7*, *10* 46:*15* 47:*16*, *22*, *25* 48:*11*, *15*, *24* 51:*14* 52:*22* 53:*24* 54:*1*, *4* 57:*24* 58:*22* 62:*15* 64:*21*, *23* 68:*23* 69:*1*, *12*, *25* 72:*6*, *15*, *17* 75:*15*, *20*, *23* 76:*3*, *5*
map 75:*9*
mapping 75:*5*
margin 3:*12* 74:*19*
margins 46:*17*
Mark 11:*4* 12:*5*
market 2:*14* 18:*14* 23:*6* 31:*11* 35:*23* 39:*10*, *21* 41:*8*, *24* 43:*8* 44:*9* 46:*6*, *7*, *15* 47:*5*, *7*, *21* 58:*20* 61:*5*, *14* 62:*19* 63:*18*, *20* 64:*4* 68:*17* 74:*4*, *8*, *12*
market-based 46:*11*
marketing 63:*17*
marketplace 68:*3*, *9* 69:*13*
markets 44:*6*, *21* 45:*4*, *12*, *13*, *18*, *20* 46:*16* 47:*11* 48:*9* 72:*8*, *9* 73:*14* 74:*11*
Martinez 11:*18* 20:*11* 24:*7*
Martinez-López 11:*7*, *8*, *14*, *16* 12:*1*, *8* 15:*5* 20:*17* 24:*11*, *18* 31:*8* 37:*1*, *7* 39:*22* 40:*11*
Maryland 52:*16*
MASSACHUSETTS 2:*2*
massively 6:*18*
masterful 69:*23*

material 8:*8* 58:*1*
materials 3:*21* 25:*12* 42:*6* 57:*23*, *24* 58:*14* 67:*11* 70:*7* 73:*6*
matrix 68:*11*
Matt 17:*6*
matter 35:*17*
Matthew 11:*12* 17:*1*
matures 70:*5*
mean 2:*24*, *25* 7:*3* 29:*7*, *8*, *10*, *12* 30:*24* 31:*25* 34:*3* 37:*24* 41:*4*, *17* 47:*15* 70:*22* 72:*1* 73:*8* 74:*9*, *14*
meaningful 13:*24* 75:*22*, *23*
means 3:*6* 34:*4* 66:*16* 67:*12*, *16*
measure 68:*10*
measures 75:*12*
mechanisms 54:*10*
medical 2:*20* 8:*20* 9:*18* 10:*5*, *6* 11:*6* 12:*7* 13:*10* 33:*19* 35:*1*, *16*, *22* 51:*8*, *13*, *16*, *19*, *24* 52:*1*, *5*, *11* 53:*1*, *15*, *18* 54:*1*, *3* 56:*10*, *12*, *16* 58:*1* 62:*4* 63:*23* 65:*9*
Medicare 37:*17*
medication 61:*6*
medications 23:*6* 29:*24* 64:*6*
medicine 6:*7* 7:*7* 15:*1* 33:*15* 47:*23* 58:*14* 59:*6*
medicines 2:*18* 3:*19* 5:*1* 6:*13* 7:*4*, *13* 8:*13* 18:*3* 22:*14*, *15*, *18* 44:*20*, *22* 45:*13*, *20* 46:*3* 47:*13*, *17*, *19*, *20* 57:*5*, *7*, *22* 59:*21* 67:*8*, *9*, *12* 69:*6* 71:*6* 73:*5*, *23* 74:*1*
meet 14:*10* 22:*17* 40:*20* 46:*19* 47:*22* 49:*5* 52:*2* 64:*4*
meeting 2:*20* 30:*25* 56:*12*
Melissa 42:*23* 44:*1*
Member 5:*8* 12:*8* 17:*3* 36:*14* 44:*3* 51:*4* 56:*5*
Members 1:*15* 12:*9* 17:*4* 36:*10* 44:*4* 51:*4* 56:*5*
men 59:*18*
Mendez 43:*1* 50:*1* 51:*1*, *3* 54:*19* 55:*1* 61:*21*, *24* 63:*19*, *22*
mentioned 8:*18* 32:*12* 37:*19* 58:*23* 66:*4* 71:*7* 73:*24*
mercy 63:*16*
met 1:*12*
MHS 12:*17* 13:*9*, *20* 14:*1*, *8*
microbial 21:*24*
microscopy 14:*16*
midazolam 2:*22*
mild 61:*8*
military 4:*24* 7:*8* 10:*12*, *14* 12:*13* 15:*1* 17:*12*, *18*, *19*, *20*, *23* 18:*3*, *18* 19:*10* 20:*4* 24:*5* 32:*15* 36:*23* 37:*15* 41:*25* 44:*12*, *20* 45:*20* 46:*18*, *25* 47:*1*, *12*, *13*, *20*, *22*, *23* 48:*19*, *22* 51:*15*, *24* 52:*7* 53:*16* 54:*8*, *15* 59:*19* 60:*5* 76:*5*
military's 53:*19*
million 20:*3* 48:*14* 63:*2*, *5*, *11* 64:*14*, *19*, *20*
millions 59:*17*
mind 8:*10*
minute 5:*17*
misconceptions 48:*18*
mismatch 46:*10*
mission 17:*14*, *17* 18:*6* 56:*24*
missions 57:*3*
mitigate 18:*8* 19:*17*
mixed 47:*14*
model 41:*23*
models 14:*20*
modestly 76:*3*
molded 28:*15*
money 8:*1* 63:*15* 64:*15* 73:*10*
monitor 60:*3*
monitoring 71:*17*
monoclonal 14:*17* 48:*8*
monopolies 45:*21*
monopsonies 45:*22*
month 20:*7*
months 25:*17* 56:*23* 71:*9*
morale 2:*9*
morbidity 10:*3*
morphine 2:*23*
move 41:*8* 76:*4*
moved 12:*22*
movement 12:*22*
moves 22:*6*
moving 62:*13*
multinational 74:*10*
multiple 23:*9*

< N >
name 7:*4* 17:*6* 56:*8* 71:*14*
nation 17:*15* 21:*15* 32:*9*, *10* 58:*25* 68:*22*
national 2:*10* 4:*3* 8:*5* 12:*22* 13:*4* 18:*20* 33:*5* 45:*21* 52:*3* 57:*1*, *9*, *13*, *19* 58:*3*

59:*10* 65:*19* 75:*16* 76:*15*
nations 8:*22* 36:*23* 60:*1*
nation's 19:*14* 51:*22* 59:*8, 25*
natural 3:*4*
nature 18:*25*
navigate 2:*15*
Navy 46:*4*
NDAA 4:*9* 32:*13* 41:*2, 11, 20*
necessary 2:*19* 8:*22* 22:*15, 21*
need 17:*24, 25* 20:*16* 24:*24* 32:*10* 34:*18* 40:*12* 63:*14* 69:*7* 70:*8, 14* 75:*10, 14*
needed 7:*25* 12:*21* 22:*18* 47:*19* 77:*4*
needs 2:*20* 9:*19* 17:*21* 30:*1* 34:*6* 41:*25* 46:*10, 20, 25* 47:*8, 12, 22* 49:*5* 52:*2* 53:*19* 64:*5*
negotiated 27:*14*
nerve 46:*2*
networks 18:*2* 36:*19*
new 13:*12* 48:*19* 53:*9* 61:*17* 62:*15* 63:*5* 65:*7*
news 36:*17*
nice 30:*25*
Noah 76:*13*
non-allied 8:*19, 22*
non-API 57:*15*
non-availability 29:*4*
non-TA 33:*17*
non-Trade 32:*19* 33:*9* 57:*16* 60:*1*
Nope 77:*2*
normal 72:*8, 9*
Normally 25:*22*
noted 22:*23, 24* 44:*25*
notice 1:*12*
novel 14:*13, 18* 51:*16*
November 4:*25* 18:*19* 32:*14* 38:*16* 57:*8*
nuanced 46:*8*
number 22:*25* 31:*12, 19* 35:*5* 39:*12* 47:*2* 52:*6*

< O >

objection 76:*17, 18*
objective 13:*23*
observe 62:*7*
obtain 19:*4*
obviously 40:*2*
occur 6:*22* 71:*12*
offer 41:*14* 70:*25*
offers 42:*22*
Office 1:*13* 12:*10*
officer 56:*10*
officials 5:*13*
off-patent 46:*17*
offshoring 45:*10*
often-tried 46:*22*
Oh 29:*12* 43:*9* 68:*6*
Okay 21:*16* 24:*14* 25:*8, 17* 30:*21* 31:*1, 18* 32:*7* 34:*7* 39:*5, 13* 40:*5, 9, 21* 62:*8* 65:*1* 66:*22* 67:*23* 71:*13* 73:*1*
older 48:*20*
once 21:*5* 27:*17* 71:*7, 10*
ones 7:*19* 25:*3*
one-third 45:*2*
ongoing 7:*18* 9:*15* 10:*8*
online 48:*15*
OPENING 2:*1* 32:*12* 66:*4*
operate 59:*4*
Operation 56:*19*
operational 2:*18* 22:*14* 35:*1* 44:*17* 46:*20* 52:*25*
opportunities 54:*10*
opportunity 5:*16* 7:*9* 17:*6* 35:*13* 54:*17* 56:*6* 65:*11* 66:*19*
options 20:*14* 31:*19* 49:*3* 73:*16*
order 2:*3* 13:*6* 63:*13* 64:*6* 66:*7*
orderly 45:*15*
organization 44:*11*
organizations 56:*24* 57:*4, 6* 70:*3*
origin 58:*8* 59:*13*
original 71:*8*
originally 71:*2*
originate 28:*14* 29:*24*
ought 39:*10*
outcomes 21:*16, 17*
outlined 34:*12* 48:*2*
outrageous 76:*6*
outside 4:*16*
overall 3:*25* 21:*18* 47:*9*
overlap 33:*20* 46:*21*
overreliance 60:*1*
overruled 58:*7*
overseas 3:*17* 12:*22* 20:*25* 22:*6* 32:*8* 33:*1, 9* 35:*20* 57:*22* 66:*10* 68:*23*
overseas-derived 57:*12*
oversee 35:*7*
oversight 4:*4* 11:*11* 12:*5*
overview 51:*8*
Overwhelming 59:*2*
owe 2:*8* 37:*8*

< P >

p.m 1:*12* 77:*7*
Pacific 10:*4*
pacing 10:*4*
packaged 26:*6*
packaging 58:*15* 66:*10* 67:*18*
page 40:*24*
paid 63:*15*
pain 2:*23* 6:*23* 22:*19*
pandemic 3:*23* 6:*11*, *16* 59:*10*
panel 5:*12* 11:*2* 42:*16*, *20*
panels 5:*12*
pans 38:*6*
part 18:*25* 27:*10* 28:*24* 30:*12* 39:*11*, *24* 41:*5* 42:*12* 69:*9*, *22* 72:*24* 74:*16* 76:*1*, *2*
participation 54:*5*
particular 23:*2* 37:*23* 40:*2* 48:*13* 52:*13* 60:*3*
particularly 4:*6* 12:*21* 19:*5* 61:*10*
partner 28:*17* 43:*4* 56:*2*
partnered 4:*8* 57:*3*
partners 25:*22* 34:*20* 38:*19*
parts 12:*24* 75:*19*
pass 69:*10*
passed 67:*15*
patents 3:*7*
path 7:*1*
pathway 67:*21*
patient 20:*20*, *23* 21:*17*
patients 21:*6* 57:*7*
Paul 41:*17*
Pause 42:*18*
pay 46:*23* 64:*15* 73:*16* 76:*6*
paying 63:*10*
pencil 65:*1*
penicillin 48:*6*
people 20:*4* 27:*15* 29:*11*, *13* 30:*25* 40:*6*, *7* 41:*18* 62:*8*, *12* 75:*3*, *18*
percent 2:*13* 3:*9* 4:*25* 8:*11* 9:*4*, *8* 31:*12*, *15* 32:*23* 45:*1* 47:*9* 57:*13* 59:*5* 64:*16* 67:*9*, *11*
percentage 30:*7* 33:*22*, *23*, *24*
performing 52:*11*
period 38:*24* 77:*1*
Perna 56:*19*
personally 25:*9*
Personnel 1:*9* 17:*5*
pervasive 19:*3*
Ph.D 44:*1*
PhaQS 59:*16*
pharmaceutical 2:*14* 3:*19* 4:*11*, *13* 6:*10* 7:*8*, *10*, *17* 8:*4*, *9*, *11*, *23* 9:*3*, *14*, *17* 10:*11*, *12*, *15* 12:*13*, *17*, *18* 13:*1*, *20*, *25* 14:*3*, *5* 17:*11*, *20* 18:*10*, *14*, *22*, *25* 19:*1*, *9*, *13*, *17* 28:*14* 30:*15* 32:*17* 39:*8* 42:*11* 44:*6* 45:*3*, *11* 46:*12*, *23* 47:*25* 57:*14* 59:*15* 62:*14* 65:*12* 69:*4*, *25* 70:*9* 72:*10* 75:*15*
PHARMACEUTICALS 1:*3* 2:*13* 8:*13* 10:*9* 13:*13* 17:*13*, *17*, *24* 18:*12*, *23* 19:*12* 24:*5* 25:*13*, *19*, *24* 33:*19* 34:*11* 44:*14* 57:*12* 60:*2* 65:*22* 68:*9* 71:*6*
Pharmacists 20:*8* 37:*21* 58:*25*
pharmacy 9:*8* 13:*9*, *10* 23:*4*
phase 9:*21*
Philadelphia 48:*1*
Phlow 73:*22*
piece 37:*25*
pilot 4:*23* 9:*20* 10:*8*, *11*, *13* 22:*8*, *13*, *18*, *21* 23:*12* 36:*2* 38:*9*, *13* 52:*15* 59:*15*
71:*18*
pilots 24:*12*
pipeline 62:*5*
place 31:*16* 35:*10* 51:*18* 62:*24* 70:*11* 75:*21*, *22*
plant 21:*21* 22:*2*
plants 59:*6* 72:*17*, *22*
plant's 21:*22*
played 47:*15*
please 43:*11*
pleased 5:*16* 12:*10*
plus 69:*23*
point 32:*7*, *22* 42:*2* 47:*13* 64:*15* 69:*3* 75:*20*
pointed 23:*6* 30:*6* 71:*9*
policies 4:*13* 13:*15* 57:*20*
Policy 11:*11* 12:*4* 13:*9* 14:*8* 27:*1* 41:*15* 43:*1* 44:*9* 45:*8*, *9* 51:*2*
population 33:*18* 35:*24*
populations 35:*9*
pose 32:*10*
poses 8:*20*
position 24:*12* 32:*5* 36:*5* 66:*24*
possible 2:*9* 9:*11* 59:*22* 71:*21*, *23*
postdoctoral

42:*24* 44:*1*, *5*
Posture 34:*12*, *15*
potency 22:*12* 38:*1*
potential 4:*1* 14:*23* 18:*16* 36:*3* 53:*3*, *15*
potentially 59:*17* 62:*11*
power 4:*1* 7:*21* 39:*3*, *9* 47:*6* 74:*12*
powers 74:*25*
practices 4:*5*
precedent 58:*7* 66:*12*
precisely 44:*8*
preclinical 14:*20*
precursor 58:*14*
precursors 29:*13*
Predeployment 22:*15*
preference 25:*20*
prepare 39:*5*
prepared 15:*5* 19:*22* 24:*22* 49:*7* 54:*19* 60:*7*
preparing 14:*23*
prescription 2:*6* 20:*5* 24:*23*
Present 1:*15* 48:*10* 57:*18*
presents 36:*16* 57:*18*
presidential 53:*8*
presiding 1:*14*, *15*
pressure 59:*2*
pretty 27:*16* 41:*11* 72:*1*
prevent 7:*18* 19:*17* 21:*24* 66:*24* 70:*8*, *19*
preventable 62:*3*
previous 62:*19*
price 23:*24* 68:*7*, *13* 69:*2*
Prices 7:*1* 59:*22* 76:*6*
pricing 58:*21*
primarily 29:*1* 56:*21* 68:*10*
Principal 11:*4* 12:*6* 43:*4* 56:*2*, *23* 58:*22*
principally 58:*17*
prioritization 34:*5*
priority 34:*6*, *14* 48:*24* 49:*5* 52:*25*
private 35:*11* 36:*4* 47:*15*, *18* 48:*5* 52:*18* 61:*12* 63:*10*, *16*, *20* 64:*8* 71:*22*
proactive 17:*16*
probably 25:*4* 30:*18* 39:*15* 66:*3*
problem 7:*13*, *20* 39:*9* 44:*24* 64:*4* 67:*14* 72:*19* 76:*1*, *2*
problems 4:*7* 6:*16* 21:*23* 23:*19* 44:*21* 46:*7* 72:*21*, *23*
procedures 13:*15* 53:*5*
process 28:*24* 38:*18* 54:*10*
processes 57:*25*
processing 21:*25*
procure 12:*13*
Procurement 17:*7* 44:*20*
procuring 24:*5*
produce 3:*16* 23:*16* 37:*4* 38:*7* 41:*25* 42:*6* 53:*1* 61:*6*, *16* 62:*16* 64:*8*
produced 45:*3*, *23* 67:*16*
producers 6:*18* 7:*12*
producing 47:*23* 61:*19*
product 7:*2* 10:*11* 23:*16* 26:*11*, *17* 28:*1*, *3*, *4*, *10*, *15*, *16* 38:*3* 63:*20* 66:*9* 72:*7* 73:*5*, *13*
production 7:*17* 12:*20* 13:*6* 21:*25* 42:*3*, *12* 45:*11* 48:*19* 52:*19* 59:*7* 64:*25* 69:*10*, *17*
products 3:*18* 6:*13* 8:*12* 10:*18* 12:*13*, *18* 14:*6* 17:*22* 19:*1*, *13* 22:*9* 27:*22* 35:*8* 38:*8* 42:*4* 45:*25* 46:*25* 48:*7*, *24* 49:*5* 51:*14* 53:*11*, *15*, *19* 54:*1* 57:*25* 63:*18*, *25* 65:*9* 66:*8* 70:*4* 72:*6* 74:*13*
professionals 21:*14* 29:*5*
proffered 37:*20*
profile 20:*23*
profit 3:*12* 74:*19*
profitable 46:*15* 64:*8*
program 10:*8*, *11*, *13* 52:*9*, *23* 56:*20*
programs 7:*22*
project 38:*23*
Projects 52:*8*, *12* 76:*4*
properly 4:*14*
property 70:*12*
proposed 14:*7*
proposition 39:*23*
protect 21:*25* 35:*4* 46:*20* 51:*25*
protected 3:*6*
protecting 57:*1*
proven 34:*23*
provenance 30:*6* 74:*22*
provide 52:*13* 53:*16* 59:*9*, *16* 73:*3*
provided 53:*7*, *12* 57:*10*
provider 19:*13* 27:*17*
provides 20:*3* 52:*17*, *25*
provision 4:*22* 32:*13*

public 47:*15* 48:*4, 6* 64:*11* 73:*21*
published 23:*3*
pulled 62:*19*
purchase 7:*22* 23:*6* 43:*7* 46:*19* 61:*4* 63:*15*
purchased 33:*19*
purchases 2:*15* 17:*22* 24:*6*
purchasing 23:*24* 24:*3* 71:*4*
purely 46:*11*
purpose 54:*2*
purposes 46:*4*
pursuant 1:*12*
pursue 40:*4* 52:*18*
push 69:*5*
put 24:*6, 14, 16* 28:*22* 30:*10* 32:*14* 33:*6* 62:*18* 76:*14*
puzzles 48:*4*

< Q >
quality 2:*7* 4:*24* 5:*9* 7:*10* 10:*9, 12* 12:*18* 17:*13, 16* 21:*20, 23* 22:*7* 23:*3* 24:*9, 16, 21, 22* 37:*20* 38:*8* 44:*14* 59:*3, 15, 21* 65:*10* 68:*3, 11* 71:*18, 20* 72:*7*
quantities 42:*3, 6* 45:*23*
quarter 8:*16* 20:*9*
question 6:*20* 20:*18* 22:*22* 33:*3, 6, 14* 35:*13* 37:*1* 53:*24* 61:*24*
questioning 43:*6*
questions 15:*4* 19:*21* 20:*2* 36:*15* 39:*19* 54:*18* 60:*6* 61:*3* 77:*2, 3*
quick 41:*11*
quite 62:*21* 74:*9*
quo 59:*23* 68:*5*
quote 5:*1* 21:*22* 34:*18*

< R >
R&D 11:*3*
R&D's 35:*14*
race 58:*21*
raise 59:*24*
raised 6:*9*
ramp 9:*11*
ran 27:*15*
range 13:*7* 14:*21* 37:*12*
Ranking 5:*8* 12:*8* 17:*3* 36:*13* 44:*3* 51:*3* 56:*5*
ransom 48:*16*
rate 10:*3*
reach 74:*24*
reactively 48:*12*
read 39:*15*
readily 19:*5*
readiness 9:*6* 11:*11* 12:*4* 17:*14* 44:*17* 62:*11*
ready 9:*6* 10:*1*
real 8:*20* 64:*3* 68:*10*
realistic 41:*3* 47:*4*
reality 25:*11*
really 37:*17* 39:*23, 24* 67:*6* 68:*20* 69:*1* 73:*3, 19* 74:*9, 11* 75:*4*
reason 8:*20*
recalls 23:*7*
RECEIVE 1:*1* 2:*4* 12:*18*
receiving 20:*15*
reckon 45:*8*
recognized 11:*18*
recommendations 36:*6*
recommending 48:*22* 49:*2*
record 20:*8* 30:*8, 18* 34:*24* 49:*1* 76:*17*
records 22:*1*
recruit 62:*5*
recruiting 2:*10*
recruits 61:*17* 62:*4*
redomesticating 42:*11*
reduce 57:*21*
reduced 34:*15*
Reed 9:*19* 14:*14* 35:*2, 3, 15* 52:*16* 56:*18*
reference 13:*8* 33:*11*
referred 23:*1, 12*
reflect 44:*10*
reform 34:*14*
regard 51:*13*
regarding 18:*21* 58:*8*
regulate 72:*17*
regulation 25:*12* 26:*10* 27:*5, 7, 9*
regulations 27:*1, 2*
regulatory 37:*25* 42:*25* 72:*14*
reimburse 62:*21*
relatively 63:*18*
released 34:*11*
reliability 14:*10* 59:*3*
reliable 24:*1* 34:*20* 44:*13* 57:*25* 64:*24* 65:*6*
reliance 3:*17* 7:*19* 36:*15* 57:*12, 22*
reliant 6:*12* 42:*5* 67:*4*
relies 3:*25* 35:*4*
rely 75:*11*
relying 8:*19*
remarks 5:*18* 32:*12* 44:*10* 54:*16*
remediate 72:*23*
remedies 44:*10*
renovate 48:*16*
replicate 36:*8*
reply 77:*4*
report 4:*11* 8:*11* 18:*12, 19, 22* 32:*14* 33:*15* 44:*8, 25* 57:*11* 64:*18*
reported 4:*15*

58:24
represent 12:10
representative 10:14 14:1
request 53:7
requests 53:13
require 75:22
required 8:4
requirement 26:20
requirements 17:21 24:6, 8, 15, 17 52:2 53:5, 8
requires 64:6
requiring 4:9 7:22
research 5:15 9:20, 21 11:5, 6 12:6, 7 13:23 14:13, 14 35:3, 14, 15, 16 43:2 51:2, 5, 8, 13, 19, 24 52:4, 5, 7, 9, 11, 16 54:4 56:18 63:8 70:3 75:1
researching 44:6
resilience 13:23 36:9
resiliency 10:19 14:1, 22
resilient 47:12 57:25
resistance 21:3, 8
resolve 65:11
resolved 30:1
resources 4:13 13:16
resourcing 52:11
respiratory 61:10
respond 23:21 41:9 52:1, 3
response 18:20 29:18 48:12 57:9
responsibilities 56:25
responsible 24:4 52:10
restoring 64:25
restrict 4:1
result 3:14 4:2
resulted 45:10
resulting 22:3
results 4:18 10:21 33:22 45:9
RET 56:1
retired 43:3 56:8 60:5
retiree 59:18
return 46:13
revealed 4:18, 25 8:7 21:22
review 10:15 34:12, 15 45:24 48:21, 22 53:6, 14
reviewed 33:21
reviews 54:11
reward 23:16
RICK 6:1
right 8:10 11:4, 17 20:20 21:6, 11 25:8 26:9 29:2, 17 30:17 31:9, 23 32:25 36:1 38:21 39:2 41:12 42:15 62:13 63:11 64:3 65:18, 23 67:5 69:17 70:15 72:19, 20, 24 73:10, 20 75:21, 22
rightly 75:20
Rigor 42:25
rigorous 45:19
risk 4:10 5:2 8:15 10:16 13:11 14:3 32:10, 17 33:2, 8, 23 34:1 57:11 58:4 62:5 65:10
risks 3:23 18:9, 21 19:17 24:7 32:8, 15 44:15 57:4 59:12 74:5
role 36:5 47:16 53:20, 23 56:21
Room 1:13
root 44:18
round 20:2 43:6
Rubio 4:8 32:12
Rubio's 4:21
ruling 58:8
run 32:8 38:15
running 33:8 64:21
Russell 1:13
Russia 29:1
RX 73:21

< S >
SAFE 1:2 2:7 6:25 12:12 17:13 19:11 22:24 24:9 25:20 36:4, 10 44:13 53:18 65:12 75:24
safety 7:10 10:9 20:12 22:9 24:7
saving 64:12
saying 66:25 68:6 73:14
says 66:16 67:15
scale 9:24 44:24
scaled 76:4
scan 14:2
scarce 4:13
scenarios 13:3
scheduled 38:24
science 56:22 69:14
Sciences 10:10 13:19
scoring 14:7 23:3
Scott 1:16 5:8, 18 6:1, 3 11:1 12:9 17:4 24:25 25:1, 8, 14, 17 26:2, 15, 19 27:2, 7, 12, 25 28:6, 12, 21 29:6, 19 30:3, 10, 17, 21, 23 31:18 36:14 38:25 39:1 40:5, 14 41:10, 17 44:3 51:4 56:5 65:14, 15, 23 66:15, 20, 22 67:14, 23 68:1, 6, 12, 15, 18 69:7, 16 70:8, 14, 18, 22 71:13, 22, 25 72:5, 12, 18 73:1, 7, 12 74:6, 14
sea 46:3

second 3:*1* 35:*2* 42:*20* 45:*12* 54:*3* 71:*16*
Secretary 11:*8*, *10* 12:*2*, *4*, *11* 16:*1* 27:*3* 31:*5* 36:*22* 39:*1* 40:*3*, *12* 53:*12*
secrets 65:*5*
Section 13:*5* 18:*20* 57:*10*
sector 36:*5* 47:*18* 48:*4*, *5*, *6* 71:*22*
sectors 47:*15*
secure 4:*8* 9:*16* 12:*16* 37:*7* 65:*8*, *11*
Securing 57:*5*
security 2:*10* 4:*3* 9:*18* 12:*23* 13:*22* 57:*1*, *19*, *21* 58:*3*, *4* 59:*10*
see 5:*18* 11:*7* 23:*14* 27:*13* 28:*17* 29:*9* 31:*22* 37:*21* 39:*4* 41:*23* 74:*2*, *3*
seeing 38:*19* 72:*24*
seeking 18:*7*
seeks 7:*20*
seen 44:*21* 47:*1*
seizures 4:*20*
selected 56:*18*
seller 46:*5*
Senate 1:*7*, *13* 12:*9* 17:*4* 57:*10*
SENATOR 2:*2*, *3* 4:*8*, *21* 5:*18* 6:*1*, *3* 10:*25* 11:*1*, *17* 16:*1* 20:*1* 21:*16* 22:*22* 23:*18*, *23* 24:*11*, *14*, *19*, *25* 25:*1*, *8*, *14*, *17* 26:*2*, *15*, *19* 27:*2*, *7*, *12*, *25* 28:*6*, *12*, *21* 29:*6*, *19* 30:*3*, *10*, *17*, *21*, *22*, *23* 31:*18* 32:*6*, *12* 33:*12* 34:*7*, *9* 36:*1*, *12*, *13* 37:*2*, *10*, *13* 38:*12*, *20*, *25* 39:*1*, *22* 40:*5*, *11*, *14* 41:*10*, *17*, *22* 42:*8*, *13*, *14*, *15*, *19* 50:*1* 55:*1* 58:*23* 61:*1*, *24* 62:*8* 63:*7*, *13* 64:*3* 65:*1*, *14*, *15*, *23* 66:*15*, *20*, *22* 67:*14*, *23* 68:*1*, *6*, *12*, *15*, *18* 69:*7*, *16* 70:*8*, *14*, *18*, *22* 71:*13*, *22*, *25* 72:*5*, *12*, *18* 73:*1*, *7*, *12*, *20* 74:*6*, *7*, *14* 75:*13* 77:*1*
send 39:*6*, *14*
Senior 17:*7*
sense 41:*2* 61:*6* 74:*14*, *17*
sequencing 14:*17*
serious 4:*14* 61:*9*
seriously 75:*4*
serve 18:*6* 47:*8* 53:*19* 56:*19* 59:*20*
served 56:*17*
serves 46:*14*
Service 43:*2* 51:*2*, *5* 56:*9*, *10* 59:*17*
SERVICEMEMBERS 1:*2* 2:*6*, *8*, *20* 4:*2*, *15* 5:*9* 17:*12*, *24* 18:*3*, *18* 19:*10* 20:*5*, *12*, *15* 22:*5*, *16* 24:*10*, *24* 35:*9*, *19* 36:*4* 37:*8* 42:*21* 44:*16* 46:*20* 51:*25* 61:*10*, *23* 64:*7* 65:*13*
Services 1:*8* 10:*10* 12:*10* 13:*19* 17:*5* 23:*2* 41:*1* 57:*11* 59:*14*
set 17:*20* 26:*19*, *20* 27:*2*
severe 7:*2*
share 3:*5* 22:*20* 53:*17* 74:*9*
shift 7:*19*
ship 58:*14*
shocked 28:*9*
shortage 2:*21*, *24* 3:*5* 9:*4* 20:*13* 65:*10*
shortages 2:*24* 3:*3* 5:*14* 7:*2*, *18* 11:*3* 18:*17* 20:*9* 21:*20* 22:*3* 42:*22* 58:*22* 59:*1* 65:*11* 72:*24*
shortfalls 14:*23*
shortly 51:*18*
show 75:*7*
shows 8:*11* 10:*2* 45:*25* 71:*20*
shutting 72:*22*
sick 62:*9*
side 2:*25* 20:*23* 27:*17*
sign 31:*21* 40:*7*
signed 27:*18*
significant 7:*13* 24:*7* 36:*17* 57:*13* 59:*25*
significantly 19:*8*
Similar 12:*23*
Similarly 18:*19*
simply 10:*22* 32:*20* 34:*17* 64:*7*
sincerely 14:*25* 19:*19*
single 45:*4* 64:*15*
sir 25:*16* 29:*23* 30:*2*, *19* 31:*8* 37:*12*, *19* 41:*4* 71:*24* 72:*4*, *9*
Sisk 76:*13*
skyrocket 7:*1*
small 9:*23* 34:*19* 42:*3*, *8* 45:*23* 46:*16* 63:*18* 70:*1* 73:*9*
small-molecule 68:*9*
small-scale 52:*19*
Smith 11:*10* 12:*3* 15:*6* 22:*20*, *22* 23:*22* 29:*23* 30:*3*, *4*, *12*, *18*

31:9 33:10 37:12, 19 38:15
Society 20:7 58:24
sold 3:10 58:10
soldiers 4:17
sole 47:21 48:15
solely 67:4, 10, 12
solution 41:5 46:22
solutions 14:14 30:13 35:22 42:22 43:5 44:19 46:7, 11 56:3
solve 71:13
solved 46:11 48:4
solving 67:14
somebody 29:21 30:11 66:24 73:16 74:18
sons 56:12
sorry 30:21 33:12 43:9
sort 48:10
sound 65:17
source 27:23 31:16 45:1 65:6, 21
sourced 3:21 30:9 32:18, 21 33:1, 16 57:14 67:10, 12
sources 5:4 8:14 18:2, 24 19:6 25:20, 21 26:1 41:6
sourcing 12:25
space 37:16
Spanish 51:18, 21
speak 11:18 17:9 42:1 56:6
speaking 56:20
Specialist 43:1 51:1
specialized 46:3
specializing 56:10
specific 9:18, 23 69:3, 4
Specifically 13:8 30:5, 9
spectrum 17:17
Speed 56:19
spend 47:9
spending 47:6, 8
spends 2:12
spikes 3:4
spoken 47:8
sponsoring 52:11
spot 21:12 23:16
SR-232A 1:13
stability 44:23
stabilize 22:18 48:1
staff 40:20 56:17
stages 10:13
stakeholders 41:16
standard 26:19, 20, 24 72:11
standards 18:18 22:17
start 20:2 29:7, 9 36:21 38:13, 19, 23 40:6 43:6, 10, 11 61:3, 22
started 11:15 38:15 68:23 69:25 75:3
starting 3:21 28:21 51:8 57:22 67:11 73:6 74:2
starts 39:10
startup 64:19
state 73:21
STATEMENT 2:1 6:1 11:15 12:1 15:5 17:1 19:22 44:1 49:7 51:1, 7 54:19 56:1 60:7 66:5
States 3:10 6:24 12:7 20:10 22:4 28:1, 16 33:4 34:16 47:10, 17 48:7 58:5, 6 66:11, 12 67:8, 9 69:12, 15 73:20 75:16
status 59:23 68:5
steadfastly 19:14
stealth 70:23
steps 24:20
sterile 21:25
stocks 62:17
stolen 70:12
stop 27:7 61:18 69:8
stopped 25:18
stopping 69:6
story 34:22
strapped 70:2
Strategic 57:4 59:12 64:24
Strategy 13:4 52:3
strength 9:6
strengthen 19:16 36:9 57:20
stretches 47:24
strikes 6:23
strong 7:16
structural 14:15
struggled 47:21
studied 33:14 61:21
studies 22:25 67:6
study 4:23 8:4, 7 9:15 10:21 14:2, 7, 8 22:13, 21, 25 23:1, 12, 19 25:25 32:1 59:15 71:25 72:2
stuff 72:1 76:6
stunning 63:7
Suarez 43:3 55:2 56:1, 4, 8 60:7 61:1 65:15, 19 66:2, 18, 21 67:2, 20, 24 68:2, 8, 14, 16, 19 69:9, 22 70:10, 16, 20, 25 71:16, 24 72:2, 8, 13, 19 73:3, 11, 18
Subcommittee 1:9, 12, 14 17:5 44:4 51:4 53:21 76:20
subject 35:17 53:4
submitted 18:19
subsidiary 58:15
substantial 30:15 33:2

substantially 26:*13* 58:*9*
success 9:*24* 34:*24*
successes 48:*23*
successful 42:*9*
successfully 48:*7*
sudden 68:*22*
sufficient 29:*4* 47:*2*
suggest 70:*10* 71:*5*
suggesting 67:*22* 68:*8* 71:*11*
summarize 51:*7*
summary 23:*21* 51:*10*
summer 4:*21* 22:*8* 34:*11*
supplied 47:*18*
supplier 28:*1*, *2* 48:*15* 67:*13*
suppliers 10:*18* 14:*6* 18:*15* 28:*7*
supply 3:*15*, *24* 4:*11*, *24* 6:*10*, *11*, *18*, *21*, *25* 7:*8*, *10* 8:*4*, *20*, *21*, *23* 9:*15*, *16*, *17* 10:*12*, *16* 12:*17*, *23* 13:*6*, *10*, *12*, *17*, *20*, *22*, *25* 14:*3*, *5*, *9*, *21*, *23* 17:*12*, *19*, *23* 18:*9*, *10*, *15*, *22*, *23*, *25* 19:*5*, *9*, *17* 22:*6* 24:*8* 26:*8*, *22* 32:*15* 36:*9* 37:*8* 42:*11* 43:*4* 44:*13*, *18*, *22*, *23* 45:*15* 46:*13* 47:*12* 48:*1* 56:*12* 57:*5* 58:*1* 59:*3*, *13* 61:*25* 62:*2* 64:*24* 65:*4*, *5*, *8*, *12* 67:*4*, *7* 69:*12* 70:*6* 75:*4*, *24*
supplying 47:*17*
SUPPLYY 56:*3*
support 15:*1* 17:*8*, *15*, *16* 27:*10* 34:*2* 48:*25* 57:*2* 60:*3* 64:*24* 71:*4*
supported 51:*19*
supporting 57:*2* 58:*1*
supports 26:*11*
Sure 6:*3*, *7* 25:*14* 40:*3* 41:*17*, *22*
surge 53:*1*
surrounding 15:*2*
suspect 37:*14*
sustain 51:*23*
symptoms 61:*9*
system 10:*12*, *14* 12:*14* 20:*4*, *8* 21:*17* 24:*6* 58:*24* 61:*22*
systematic 75:*5*
systematically 75:*11*
systems 2:*16* 14:*7* 21:*24* 71:*19*

< T >
TAA-banned 58:*12*
tacrolimus 4:*16*
Taiwan 6:*19*, *23* 8:*25*
take 6:*21* 21:*2* 30:*8*, *18* 62:*15* 70:*13* 75:*3*
taken 24:*20*
talk 34:*9* 35:*13* 39:*16*
talked 37:*2*
talking 23:*18* 28:*10*, *13* 32:*24* 38:*12* 39:*2* 65:*19*, *20* 66:*6* 73:*8*
target 69:*3*
task 44:*17*
team 9:*25* 41:*18*
teams 13:*10*
tech 62:*20*, *23*
technologies 14:*18*
technology 7:*4* 11:*5* 12:*6* 54:*10* 70:*13*
tell 28:*7* 31:*22*, *23* 32:*4* 40:*10*, *22*
telling 24:*15*
temporarily 22:*3*
tender 62:*18*
tens 25:*4*, *8*
terms 45:*18* 74:*8*, *10*, *11*, *22*, *25* 75:*1*, *4*
test 4:*23* 22:*9*, *10*, *18* 52:*17*
tested 4:*16* 14:*19* 38:*11*
testified 27:*3*
testify 17:*6* 44:*5* 51:*5* 54:*17*
TESTIMONY 1:*1* 2:*5* 12:*15* 40:*15* 42:*20* 43:*10* 44:*7* 48:*3*, *21* 58:*19* 65:*16* 76:*12*
testing 10:*17* 14:*6* 38:*1* 72:*12*, *14*
Teva 64:*13*
textiles 71:*3*
thank 5:*8*, *11* 6:*3* 8:*6* 10:*22*, *25* 11:*18* 14:*25* 16:*1* 17:*5* 20:*1*, *17* 22:*22* 24:*24* 25:*1* 35:*12* 36:*2*, *11*, *13* 37:*1* 38:*25* 42:*15*, *17*, *19* 44:*4* 49:*5* 50:*1* 51:*4* 54:*16* 55:*1* 56:*6* 59:*24* 61:*1*, *24* 65:*13*, *15* 74:*6*, *7*, *22* 76:*11*, *12* 77:*5*
theaters 10:*3*
theoretical 45:*17*
theory 74:*20*
Therapeutic 13:*5*
thing 71:*21* 73:*18*
things 25:*9* 71:*1*, *3*, *11* 73:*8* 74:*17*
think 6:*4*, *5*, *19*, *20* 7:*11*, *24* 23:*22* 24:*12* 29:*15*, *17* 30:*19* 31:*12* 33:*2* 36:*8* 37:*19* 38:*6*, *10* 39:*1*, *2*, *3*, *12*, *15* 40:*17*, *19*, *23*

42:12 46:7 63:10 66:2, 15, 18 67:2, 20, 21, 24 68:2, 15 69:9, 19 73:3, 7 74:2, 15 75:14 76:9
thinner 2:22
third 45:5 46:9 71:21
third-line 3:1
third-party 38:18
Thirty 41:3
thorough 10:15 14:2
thought 22:20 23:11 39:23
thousands 25:5, 8 65:20
threat 10:4 35:24
threats 35:18, 22 36:3, 17 52:1 64:2
three 38:5 40:23 41:13, 20 45:5
ties 36:24
time 4:7 21:3 31:3 43:7 47:1 61:4 62:1 63:1, 3 72:15 74:4 75:1 77:1
times 56:13
timing 38:12
titled 58:5
today 5:5, 11 7:7, 25 9:12 17:6, 10 26:2, 9, 16, 23 27:8 28:1, 3, 22 29:6, 7, 20, 21 30:24 31:2 35:4, 9 39:17 40:22 42:16, 23 44:5, 10, 12, 14 47:9 48:8 49:2 51:6, 25 56:7, 21 58:13, 19 62:22 65:23, 24 66:25 67:19 76:12
today's 2:4 17:21 76:14
told 31:6
tomorrow 27:13 41:12
tool 23:3 37:20
tools 10:6 54:7, 9, 12
top 21:6 63:14
topics 52:4
torn 22:2
track 34:23
trade 8:8 26:14 57:20
trading 25:22 28:17
training 35:20 61:11 62:5
trains 46:4
transfer 54:10 62:20, 23
transformed 26:13 58:10
transition 9:21 68:23
transitioned 52:20 72:15
translate 21:11
transparency 10:20 17:11 19:4 42:25 59:17
trash 22:1
treat 4:17 22:19
treatment 3:1, 2 18:4 33:19 59:20
treatments 8:23
trials 9:22 52:20
TRICARE 59:18
tried 66:5
troops 10:5 34:18 35:5
troubling 33:25
true 4:6 42:1
trusts 8:10
try 41:6, 10 63:9 68:4
trying 21:3 29:12, 15 31:1 32:3 37:3
Tuesday 1:5
tularemia 64:2
Turning 53:20
twice 21:5 56:13
two 5:12 7:23 35:14 36:15 45:5 52:13 53:21 57:3 73:16 75:19 76:9
typhoid 51:20
typical 45:13
typically 61:8

< U >
U.S 1:7 2:1, 13 4:4 6:1 11:5 12:24 18:13 35:16, 23, 24 43:3 45:4 46:4 51:15 56:9 58:10, 14 59:20
ultimately 2:10 18:17 23:13 46:19
unable 61:17
unacceptable 44:15
unbearable 6:23
understand 10:4, 23 11:14 29:15, 20 30:23 42:8, 9 45:18 54:5 71:18
understanding 68:2
Unfortunately 68:16 72:10
Uniformed 10:10 13:19 23:1 59:14
Union 48:2
unique 34:19 54:9 63:22
unit 21:23
United 3:10 6:24 12:7 20:10 22:4 28:1, 16 33:4 34:16 47:10, 17 48:7 58:5, 6 66:11 67:8, 9 69:12, 15 73:20 75:15
University 10:10 13:19 23:2 44:6 59:15
unknown 5:4 18:24 32:20 33:24
unmet 49:5
unravel 44:18
unstable 12:25

unusual 45:*21*
unwilling 63:*20*
USA 56:*1*
use 2:*25* 12:*13* 18:*2* 24:*22* 29:*25* 35:*9* 37:*4* 39:*3* 41:*7* 42:*7* 45:*3*, *16*, *20* 47:*13* 51:*11* 53:*11* 54:*7* 67:*17* 72:*3*
useful 23:*11*
uses 51:*25* 53:*10*
usually 48:*11* 62:*18*
USU-led 14:*12*
utilization 59:*5*
utilize 10:*14*

< **V** >
VA 66:*6*
vaccinate 61:*17*
vaccine 14:*19* 48:*14* 56:*20* 61:*8*, *12*, *15*, *19* 62:*1*, *2*, *7*, *16*, *22* 63:*8*, *14*, *15*, *19* 64:*15*
vaccines 9:*23* 35:*4* 42:*3* 46:*1*, *16* 48:*8* 51:*20* 63:*5* 65:*9*
validation 38:*5*
variance 23:*10*
various 10:*18* 14:*6* 23:*7*
versions 4:*18*
viable 35:*23*
Vic 56:*8*
Victor 43:*2* 56:*1*
view 44:*11*
views 44:*10*
Virginia 74:*3*
virus 62:*13*
visibility 4:*4* 17:*11* 19:*4* 25:*23*
visible 28:*19*, *20*
visits 62:*4*
vital 67:*7*, *9*, *12*
volume 33:*18*
voted 68:*21*
vulnerabilities 4:*12* 6:*11* 13:*8*
vulnerability 14:*22*
vulnerable 44:*23*

< **W** >
wait 39:*17*
waiver 27:*24* 53:*8*
Walter 9:*19* 14:*14* 35:*2*, *3*, *15* 52:*16* 56:*17*
want 5:*8*, *17* 6:*3*, *6*, *14* 7:*7* 8:*6* 10:*21* 24:*20* 30:*23* 31:*5*, *6* 32:*6*, *7* 40:*15* 41:*4*, *15* 59:*11* 69:*20* 71:*13* 76:*10*, *11*, *12*
wanted 53:*20* 66:*7*
wants 29:*16* 77:*3*
war 10:*3* 47:*24* 51:*18*, *21*
warfighter 9:*7*, *19*, *22* 10:*1* 17:*15* 18:*7* 57:*7* 62:*11*
warfighters 7:*11* 15:*3* 17:*21* 19:*14* 60:*4*
warfighting 2:*19* 22:*15*
Warp 56:*19*
Warren 1:*14*, *15* 2:*1*, *3* 6:*4* 8:*6* 10:*25* 11:*17* 12:*8* 16:*1* 20:*1* 21:*16* 22:*22* 23:*18*, *23* 24:*14*, *19* 30:*22* 32:*6* 33:*12* 34:*7*, *9* 36:*1* 38:*20*, *25* 41:*22* 42:*8*, *15*, *19* 44:*3* 50:*1* 51:*3* 55:*1* 56:*4* 61:*1* 62:*8* 63:*7*, *13* 64:*3* 65:*1* 74:*7* 75:*13* 77:*1*
Washington 1:*10*
way 8:*19* 26:*7* 29:*16* 36:*25* 38:*10* 39:*12* 46:*1*, *8* 69:*21*
ways 36:*24*
weeks 58:*23*
welcome 2:*4* 5:*10* 11:*9*
well 11:*16* 25:*4* 28:*13* 30:*14* 33:*20*, *24* 40:*11* 41:*23* 42:*13* 44:*15*, *16* 59:*14* 66:*9*, *12* 70:*16* 73:*7*
well-known 51:*17*
wide 37:*12* 46:*15*
widely 45:*12*
wider 64:*24*
widespread 7:*2* 22:*3*
willing 59:*23* 61:*16*
wish 58:*19*
withdraw 63:*1*
witnesses 5:*10* 36:*14* 76:*11*
women 59:*18*
wonder 36:*21*
words 62:*8*
work 4:*14*, *19* 7:*18* 8:*21* 9:*2*, *15* 14:*12* 17:*10* 30:*12*, *13* 37:*25* 38:*6*, *16* 40:*10* 41:*1*, *13*, *19* 54:*8* 66:*22* 72:*6*, *7*, *9* 76:*10*, *13*
worked 74:*15*
working 4:*12* 9:*1* 13:*11* 19:*15* 28:*20* 63:*25* 73:*22*
works 64:*20*
world 17:*18* 18:*5*
worry 32:*10*
worse 2:*25* 4:*19* 21:*16*, *17*
worth 46:*24* 64:*14*
wounds 22:*19*
WRAIR 14:*14* 35:*3*, *7*, *10* 36:*9* 41:*23* 61:*11*
WRAIR's 36:*2*

written 44:*7* 48:*2, 21* 51:*7*
Wyeth 48:*15* 62:*20*

< X >
Xi 6:*19*

< Y >
Yale 42:*24* 44:*5*
Yeah 27:*7* 71:*16* 72:*18*
year 2:*12* 4:*9, 16* 8:*2, 5* 18:*21* 23:*5* 25:*2* 29:*14* 32:*13* 37:*21* 38:*23* 41:*11, 21* 57:*9* 62:*6* 64:*14, 20*
years 6:*9* 10:*21* 38:*15* 47:*17* 48:*13* 56:*9, 15* 63:*5* 64:*22* 69:*23* 75:*3*
yellow 51:*20*
young 62:*12*

< Z >
Zika 35:*5*
Zone 43:*4* 56:*2, 14, 21*