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Dr. Eric Lander, Director
Office of Science and Technology Policy
Executive Office of the President
Eisenhower Executive Office Building
1650 Pennsylvania Avenue
Washington, DC 20504

Dear Dr. Lander:

We are writing to recommend that President Biden’s Administration form a federal interagency research initiative coordinated by the Office of Science and Technology Policy to support open-access alternative protein research and development.

As outlined below, alternative proteins offer the kind of solution that President Biden sought in his letter to you dated January 15, 2021, in which he asked for recommendations to “refresh and reinvigorate our national science and technology strategy to set us on a strong course for the *next 75* years, so that our children and grandchildren may inhabit a healthier, safer, more just, peaceful, and prosperous world.”¹

The Two Types of Alternative Proteins

Two types of alternative proteins present tremendous potential for reducing risk of future pandemics, creating jobs, and tackling the climate crisis: plant-based and cultivated.

Plant-based products consist of the same basic components as animal-based products (namely protein, fat, vitamins, minerals, and water) derived directly from plants and modified to biomimic the full sensory experience of their animal-based counterparts. Next-generation plant-based meat, made popular by American companies such as Beyond Meat and Impossible Foods, looks, cooks, and tastes like conventional meat. The emerging field of science around precision fermentation offers exciting new areas of research that will lead to new ingredients in plant-based proteins.

¹ The White House. *A Letter to Dr. Eric S. Lander, the President’s Science Advisor and nominee as Director of the Office of Science and Technology Policy* (Jan. 2021), <https://rb.gy/hhsw6x>.

Creating a sustainable, secure, and just food system.

Cultivated meat (also called cell-cultured or cultured meat) is animal meat produced by growing cells from animals. At scale, cultivated meat production will look similar to the fermentation process in beer breweries. Production begins with a small sample of cells from an animal. The cells from this sample are grown by feeding them a nutrient-rich cell culture medium in a bioreactor. During cultivation, the cells multiply many times over, producing muscle, fat, and other components of meat. Some cultivated meat products are grown on scaffolds — biodegradable or edible structures made of food-grade materials — that support the development of a desirable texture and three-dimensional shape. These materials are already widely used in the food industry, and their safety is well documented. The resulting meat looks, tastes, and cooks like conventional meat.

As you may know, both of these alternative protein technologies are still in their infancy. Plant-based meat only accounts for approximately one percent of meat sales in the United States, and cultivated meat has not yet reached markets, except for in Singapore where JUST Inc., an American startup, sold the world's first-ever cultivated meat to the public in December 2020.

Job Creation Potential

As this nascent industry grows, new jobs and economic growth will occur throughout the supply chain. Farmers will be needed to grow crops for plant-based and cultivated meat inputs. In addition, a large number of skilled jobs including engineers, biologists, food scientists, nutritionists, and biochemists will be created, and new manufacturing plants will be required for the production of the necessary tools and equipment involved. The Breakthrough Institute estimates that the alternative protein industry can create 200,000 jobs by 2030.²

Public Sector Research Needed

However, for the United States to lead in innovating and manufacturing these cutting-edge food technologies, we must invest in open-access research and development. Private research is making important gains, but these gains are not sufficient. It can be duplicative or primarily confer benefits to individual companies. Other countries are actively supporting the development of the plant-based and cultivated meat industries, and the United States will fall behind if we do not invest in critical alternative protein research now.

Recommendation: Interagency Alternative Protein Initiative

We advise that OSTP recommend to President Biden that he create an interagency initiative, principally between the United States Department of Agriculture (USDA) and the National Science Foundation (NSF), and coordinated by OSTP. Both USDA and NSF are rich with the expertise needed to fill crucial white-spaces in these emerging technology areas, and they would benefit from cooperating with one another. This recommendation builds upon the Good Food Institute's response to OSTP's 2019 Request for Information on the Bioeconomy when we first proposed the idea of an interagency alternative protein initiative.

² Shah, Saloni and Dan Blaustein-Rejto. *Federal Support for Alternative Protein for Economic Recovery and Climate Mitigation*. Breakthrough Institute. The Breakthrough Institute, (May 2020), <https://rb.gv/jwtzpc>.

The interagency initiative we are recommending would be similar in structure to the National Nanotechnology Initiative. It could identify and perform the research and development that will remove the technological barriers currently facing the alternative protein sector and ensure interagency coordination in such research efforts to improve efficiency, minimize duplication of effort, and grow workforce talent. To help reduce the risk of future pandemics, create jobs, and tackle the climate crisis, key components of this initiative could include:

- Intramural research at federal agencies, including USDA and the NSF.
- Extramural grant programs explicitly for alternative proteins research with some funds reserved for 1890 Land Grant Universities and other Minority-Serving Institutions.
- Establishment of alternative protein research centers and academic majors at universities with some funds reserved for 1890s and other Minority-Serving Institutions.
- Workforce training to support workers during the decarbonization transition.
- A nationwide network connecting research nodes, with multidisciplinary funding mechanisms that cut across existing agency boundaries.
- Collaboration with industry.

We have also proposed to the Office of Management and Budget that President Biden include \$100 million in alternative protein research funding in his FY22 budget request to carry out this research and to make grants available to land-grant universities that partner with agencies on research.

How This Recommendation Relates to President Biden’s Key Questions

Below, we address President Biden’s five questions from his January 15 letter to you and explain how federal interagency cooperation on open-access research funding for alternative protein innovation would offer solutions to the challenges each of his questions raises.

1. “What can we learn from the pandemic about what *is* possible—or what *ought to be possible*— to address the widest range of needs related to our public health?”

As a follow up question, President Biden asked more specifically, “How can we dramatically improve our ability to rapidly address threats from pathogens, including emerging pandemics, potential bioweapons, and antibiotic resistance?”

Alternative protein production methods mitigate the risks of three public health threats that are routinely downplayed relative to their enormous potential impact: outbreaks of zoonotic disease, antibiotic resistance, and food-borne illness. Alternative proteins can help address each of these threats, but public research is needed to accelerate industry growth and scale. While some remarkable products are on the market, nearly all plant-based meats widely available today are burgers and nuggets. Very few plant-based seafood options are widely available, and cultivated meat is only in the market with limited distribution in Singapore. Additionally, the prices of alternative proteins are not yet competitive with conventional animal products. A coordinated research effort across the

federal government will help the private sector address these challenges, so that everyone has access to alternative proteins and these public health benefits can be fully realized.

The United Nations Environment Programme has found that one of the most likely causes of the next pandemic is animal protein production.³ Plant-based and cultivated meat are completely unsusceptible to zoonotic disease because they do not involve live animals.

Over 70 percent of all antibiotics are used for conventional animal agriculture.⁴ This widespread use of antibiotics is leading to more and more antibiotic-resistant superbugs that already kill between 500,000 and 700,000 people a year, with the rate of multidrug resistance growing worse in low and middle income countries.^{5,6} By 2050, it is estimated that these superbugs could kill 10 million people per year and cost the global economy more than \$8 trillion per year.^{7,8} Alternative proteins require no antibiotics, so their risk of contributing to antibiotic resistance is also zero.

Further, due to their safe, clean, and controlled modes of production, alternative protein can also be made without risk of contamination with bacteria like *Salmonella* and *E. coli*, common culprits of serious foodborne illness. Alternative proteins improve our ability to address threats from pathogens by preventing the situations and conditions that accelerate their development.

2. “How can breakthroughs in science and technology create powerful new solutions to address climate change—propelling market-driven change, jump-starting economic growth, improving health, and growing jobs, especially in communities that have been left behind?”

Just as the goal with renewable energy is to make it interchangeable with conventional energy, so too plant-based and cultivated meat are focused on market-driven change by producing products that taste the same or better to consumers and that cost the same or less, thus requiring no intentional behavior change.

Global demand for meat is projected to rise 50 percent between 2013 and 2050, and if there were no change in meat production methods, such an increase would cause an additional 5 to 10 gigatonnes CO₂-eq per year from livestock and related activities alone.⁹ Fortunately, alternative proteins can provide the meat, eggs, dairy, and seafood that consumers want while combating the climate crisis by

³ UN Environment Programme and International Livestock Research Institute, *Preventing the next pandemic - Zoonotic diseases and how to break the chain of transmission*, (2020), <https://rb.gy/330y36>.

⁴ Ritchie, H. *How do we reduce antibiotic resistance from livestock?*, Our World in Data (2017), <https://rb.gy/fccrv3>.

⁵ Jacobs, A. *Denmark raises antibiotic-free pigs. Why can't the U.S.?*, The New York Times (2019), <https://rb.gy/rqqrn>.

⁶ Van Boeckel, T.P. and Ramanan Laxminarayan. *Global trends in antimicrobial resistance in animals in low- and middle-income countries*, Center For Disease Dynamics, Economics & Policy (2019), <https://rb.gy/h2oqeh>.

⁷ World Health Organization, *No time to wait: Securing the future from drug-resistant infections* (2019), <https://rb.gy/bogaic>.

⁸ O'Neill, J. *Antimicrobial resistance: Tackling a crisis for the health and wealth of nations*, Review on Antimicrobial Resistance (2014), <https://rb.gy/ii2ay0>.

⁹ This was calculated by increasing 2012 emissions (7.1 gigatonnes CO₂-eq) by 52 percent to estimate 10.8 gigatonnes CO₂-eq in 2050. P.J. Gerber et al., *Tackling Climate Change Through Livestock: A Global Assessment of Emissions and Mitigation Opportunities*, FAO (2013), <http://www.fao.org/3/i3437e/i3437e.pdf>.

significantly reducing emissions and freeing up significant amounts of land for additional climate mitigation strategies, food security, and protection of biodiversity.

Due to their efficiency, alternative proteins would also prevent and counteract one of humanity's most destructive actions: clearing forests and grasslands for animal feed. Animal agriculture takes up 77 percent of all agricultural land on Earth despite supplying only 17 percent of humanity's food supply. Studies show that cultivated meat would use land 60 to 300 percent more efficiently than poultry and 2,000 to 4,000 percent more efficiently than beef. The cropland no longer necessary for animal feed could be used to mitigate climate change through reforestation, rewilding, soil conservation, regenerative ranching, or renewable energy production. Plant-based meat is similarly far more efficient and far less carbon intensive, emitting 30-90 percent less greenhouse gas emissions than conventional meat.¹⁰

Alternative protein research coordinated across federal agencies can also help usher in a new era of American food innovation and drive sustainable economic growth. Secretary of Agriculture Tom Vilsack has recognized the economic benefit of investing in public research, stating that, "Studies have shown that every dollar invested in agricultural research creates \$20 in economic activity."¹¹ For example, USDA-funded research at the University of Missouri was the basis of the technology used in Beyond Meat's first products and helped form the foundation for the company's ongoing approach to innovation. Thanks to this foundational public research, Beyond Meat had the best-performing public offering by a major U.S. company in almost two decades in May 2019, and consumers in 80 countries across six continents can now buy Beyond Meat in restaurants and supermarkets.

In a 2020 report, the Breakthrough Institute calls for a federal interagency research initiative for alternative proteins, similar to the National Nanotechnology Initiative. The Breakthrough Institute estimates that even a \$50 million investment in alternative protein research could create 2,000 new jobs and add nearly \$1.5 billion to the US economy over 10 years (a 30x return). Further investment in research could fuel technological progress and allow the industry to scale, creating more than 200,000 new jobs by 2030 that are higher-paying than average and contribute to local economies.¹²

Prioritizing 1890s and other Minority-Serving Institutions in the interagency research initiative will help ensure that communities that have historically have been left behind will benefit from this new alternative protein economy while simultaneously increasing diversity in the science, technology, engineering, and agriculture professions.

¹⁰ The Good Food Institute, Plant-based meat for a growing world, <https://rb.gy/hocct3> & Cultivated meat LCA and TEA: Policy recommendations, <https://rb.gy/6b2bbt>.

¹¹ Press Release, USDA Secretary Announces Creation of Foundation for Food and Agricultural Research, *USDA* (July 23, 2014), <https://bit.ly/37u0Vkj>.

¹² Shah, Saloni and Dan Blaustein-Rejto. *Federal Support for Alternative Protein for Economic Recovery and Climate Mitigation*. Breakthrough Institute. The Breakthrough Institute, (May 2020), <https://rb.gy/jwtzpc>.

3. “How can the United States ensure that it is the world leader in the technologies and industries of the future that will be critical to our economic prosperity and national security, especially in competition with China?”

The United States will fall behind if we do not invest in critical alternative protein research now. China is already a major exporter of plant protein and has massive processing capacity. As of 2016, China had the capacity to process as much as 79 percent of global soy protein isolate, 50 percent of global textured soy protein, and 23 percent of global soy protein concentrate — key components of many plant-based meat products.¹³ Additionally, China surpassed U.S. total public expenditures on agriculture R&D in 2008. Since then, China has increased its funding in that category, while U.S. public investments have continued to decline.¹⁴ An interagency research initiative is the most efficient way to ensure that the United States leads in alternative protein research.

Former Secretary of Agriculture Sonny Perdue has rightly pointed out that if the United States does not facilitate innovation in alternative proteins, “We’re going to see these technologies go to places around the world that are more conducive to their development, and frankly China may be one of those.”¹³ China is now the global leader in production of solar panels and lithium-ion batteries because the government invested in these industries early on. The U.S. government should learn from the past and ensure that the United States leads the world in alternative protein innovation by investing in interagency public research.

Other countries are actively supporting the development of the plant-based and cultivated meat industries, and our bioeconomy will suffer if we do not do the same. For example, the European Union announced in July 2019 that it is directing approximately \$15.7 million for plant protein research (including research into mycoproteins, which are fungi).¹⁵ The Netherlands spent \$2.3 million on cultivated meat research from 2005 to 2009 and is currently spending \$6.6 million on a five-year research project to improve plant-based meat manufacturing technology.¹⁶ Canada, Germany, India, Israel, Japan, and Singapore are making similar investments.

4. “How can we guarantee that the fruits of science and technology are fully shared across America and among all Americans?”

Public investment in research will stimulate economic growth and create jobs in both rural and urban communities. In rural communities, new economic opportunities will be created for farmers. For example, because alternative protein products convert otherwise inexpensive feedstocks such as legumes, grains, sugars, and amino acids into meat, they will create opportunities for farmers to grow

¹³ Secretary Sonny Perdue, BIO Virtual Fireside Chat (Sept. 22, 2020), <https://bit.ly/3toIQv3>.

¹⁴ American Farm Bureau Federation, *Investing in the Future of Farming* (Sept. 2019), <https://www.fb.org/market-intel/investing-in-the-future-of-farming/>.

¹⁵ European Commission, *A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system* (May 20, 2020), https://ec.europa.eu/info/sites/info/files/communication-annex-farm-fork-green-deal_en.pdf.

¹⁶ Elie Dolgin, *Sizzling interest in lab-grown meat belies lack of basic research*, 566 *Nature* 161-62 (2019), <https://go.nature.com/2ShIzji>.

crops for a higher-value market. For example, instead of selling crops for animal feed at commodity prices, farmers will have the option of selling inputs for alternative protein products at greater profit.

While many of these jobs will be in rural areas, many will also be in cities, and urban economies will benefit as well. This is why Eric Adams, Brooklyn Borough President, stated in his February 2021 *New Agrarian Economy* report that, “The City should support the development of new plant-based protein companies to boost economic growth, create jobs, and provide sustainable and secure protein to New Yorkers.”¹⁷ Finally, as alternative proteins become more established in the market, a diversity of products will be developed to match local preferences from available ingredients.

5. “How can we ensure the long-term health of science and technology in our nation?”

By investing in alternative protein innovation and launching this interagency research initiative, the U.S. government would create an array of new opportunities that will draw the best and brightest scientific minds to work in government and academic research laboratories. As a multidisciplinary, cutting-edge area of research, alternative proteins are an attractive area of inquiry for young scientists who want to make a positive impact on the world.

There are tremendous opportunities for public funding of open-access science. Examples include figuring out the best proteins for various plant-based meats, how to isolate those proteins, and how to manufacture the products. These processes will continue to have significant room for improvement in order to make the products more efficiently, and thus more affordable and environmentally friendly.

New workforce training and educational opportunities also will open up in a variety of important fields. Product formulation and manufacturing will require engineers (bioengineers, chemical engineers, mechanical engineers, and tissue engineers), biologists (cell biologists, molecular biologists, and plant biologists), food scientists, nutritionists, and biochemists (specializing in protein chemistry). Skilled scientific, technical, and manufacturing trade jobs will also be needed to build and repair equipment, operate manufacturing facilities, etc. Other fields such as artificial intelligence are also being harnessed by leading alternative protein researchers and manufacturers.

Additionally, publicly funded research can have spillover effects that have unanticipated benefits. Research might yield an unexpected result that is meaningless to an individual company but could benefit another area of science or industry. The scale and price points needed for cultivated meat, for example, are driving innovation in growth factor production. Growth factors are components of cell culture media that are used in the biomedical industry as well. Developing cheaper methods to produce growth factors for cultivated meat could also lead to price reductions and efficiency gains in the production of growth factors and other cell media components for biomedical labs and companies.

¹⁷ Adams, Eric, *New Agrarian Economy* (2021), <https://rb.gy/hwkhck>.

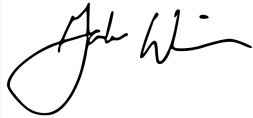
Congressional Support Building

As noted by House Appropriations Committee Chair Rosa DeLauro (D-CT) in the April 2021 House agriculture appropriations subcommittee hearing, “The United States can continue to be a global leader on alternative protein science, and these technologies can play an important role in combating climate change and adding resiliency to our food system.”¹⁸ An interagency research initiative focused on alternative proteins can build the foundation for a healthier, safer, more just, peaceful, and prosperous world through addressing the risks of climate change, antibiotic resistance, and zoonotic disease, while creating new jobs and ensuring that America remains a global leader in innovation.

Conclusion

Thank you for considering this proposal. We welcome the opportunity to work with you to develop a recommendation to President Biden to create this interagency research initiative for alternative proteins. If you have questions or would like to discuss additional details, please contact us at gabrielw@gfi.org, or 603-290-9629.

Sincerely,



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¹⁸ House Committee on Appropriations. *Chair DeLauro Statement at the U.S. Department of Agriculture - The Year Ahead Hearing* (April 2021), <https://rb.gv/xugnhb>.