EXPLORING THE NANOVACCINE INSTITUTE AT IOWA STATE UNIVERSITY

BIOMATERIALS FORUM

OFFICIAL NEWSLETTER OF THE SOCIETY FOR BIOMATERIALS

SECOND QUARTER 2024 • VOLUME 46, ISSUE 2

ALSO INSIDE

HOW MIGHT NEW FEDERAL CHANGES IMPACT HEALTHCARE?

Biomaterials Forum, the official news magazine of the Society For Biomaterials, is published quarterly to serve the biomaterials community. Society members receive *Biomaterials Forum* as a benefit of membership. Non-members may subscribe to the magazine at the annual rate of $48. For subscription information or membership inquiries, contact the Membership Department at the Society office (email: info@biomaterials.org) or visit the Society's website, biomaterials.org.

Editorial contributions to *Biomaterials Forum* are always welcome. Contributions should be sent to the Executive Editor and are subject to the terms and conditions of the Editorial and Publication Release. Authors should refer to the Author Guidelines, which are available on the Society's website, when writing submissions. The publisher accepts no responsibility for return or safety of artwork, photographs or manuscripts. Submission of editorial content does not guarantee acceptance or publication.

Address corrections should be sent to *Biomaterials Forum*, 1120 Route 73, Suite 200, Mt. Laurel, NJ 08054.

Requests for advertising information should be directed to Meg Ryan at mmryan@ahint.com or 856-380-6850. Information is also available on the Society's website, biomaterials.org.

Scientific photos may be submitted for cover consideration in future issues. Submit color photo, no larger than 4" x 6", along with credit information and scientific description, to the Executive Editor.

BIOMATERIALS FORUM

The official news magazine of the **SOCIETY FOR BIOMATERIALS** • Volume 46, Issue 2

SPECIAL INTEREST GROUP REPORTERS

BioInterfaces	TBD
Biomaterials & Medical Products Commercialization	Subramanian Gunasekaran • guna@encoll.com
Biomaterials Education	Jeremy Mercuri • jmercur@g.clemson.edu
Biomaterial-Tissue Interaction	Patrick L. McGee • patrickmcgee.dds@outlook.com
Cardiovascular Biomaterials	Astha Khanna • akhanna@gravertech.com
Dental/Craniofacial Biomaterials	TBD
Drug Delivery	Eun Ji Chung • eunchung@usc.edu
Engineering Cells & Their Microenvironments	Silviya Zustiak • silviya.zustiak@slu.edu
Immune Engineering	Yaoying Wu • yw195@duke.edu
Nanomaterials	Mahboubeh Nabavinia • NABAVINIAM20@ecu.edu
Ophthalmic Biomaterials	Frances Lasowski • lasowsfj@mcmaster.ca
Orthopaedic Biomaterials	Roche C. de Guzman • roche.c.deguzman@hosftra.edu
Surface Characterization & Modifications	TBD
Tissue Engineering	Jessica M. Gluck • jmgluck@ncsu.edu

If interested in filling a vacancy above, please reach out to your SIG Chair.
Contact information can be found on individual SIG pages as found **here**.

Contents

ON THE COVER

Researchers at the Nanovaccine Institute at Iowa State University. Read about their work on page 8.

THE TORCH

NEWS & UPDATES

FEATURES

From the Editor

By Roger Narayan, MD, PhD, Biomaterials Forum Executive Editor

Welcome to the second-quarter issue of Biomaterials Forum!

This issue highlights several research and policy developments shaping the biomaterials community. Our feature article, authored by Rizia Bardhan, Ratul Chowdhury, Molly Kozminsky, Surya Mallapragada, Balaji Narasimhan, Nigel Reuel, Don Sakaguchi, Jing Wang and Qun Wang, provides an overview of the Nanovaccine Institute at Iowa State University, which addresses several global health challenges using nanotechnology and other disciplines. The institute's research includes therapeutic and vaccine efforts that span several areas, including infectious diseases, cancer, neural disorders and antimicrobial resistance. Their work includes the development of nano-based, room-temperature-stable vaccines and nanoparticle-based therapies for the treatment of several medical conditions, including COVID-19, influenza and pneumonia. The article explores the institute's bedside-to-bench-and-back methodology, which emphasizes the rapid translation of nanomedicine research into clinical applications.

In Government News, Carl Simon provides an in-depth analysis of recent government policy shifts and their potential impact on biomaterials research. Evolving regulations on the Affordable Care Act, Medicare and private insurance coverage options may influence patient access to biomaterial-based innovations.

Grant Scull and the SFB National Student Chapter described the Society's initiatives to support student researchers. Their updates highlight recent efforts to facilitate student participation in major events, including the World Biomaterials Congress in Daegu, South Korea, and six Fall Regional Meetings across the U.S. The chapter has also launched a new initiative allowing select student competition winners to receive awards covering Annual Meeting registration costs and has expanded outreach through webinars such as "How to Establish a Student Chapter" and "Industry vs. Academia Careers."

Meanwhile, AIMBE shares key updates on its advocacy efforts. The Friends of NIBIB coalition, introduced in this issue, represents a significant step toward strengthening support for biomedical imaging and bioengineering research. AIMBE also announced the inaugural class of Emerging Leaders in Medical and Biological Engineering (MBE), which recognized 17 exceptional professionals who will engage in a mentorship program with AIMBE Fellows. This initiative is designed to foster leadership in biomedical innovation.

As we look ahead, I encourage you to engage with the Society For Biomaterials community, whether by attending the 2025 Annual Meeting in Chicago, collaborating with colleagues or mentoring young researchers. The Biomaterials Forum remains committed to facilitating dialogue and progress in the biomaterials field.

I extend my sincere gratitude to the authors, society leaders, and staff who contributed to this issue. As always, please do not hesitate to reach out to me at roger_narayan@ncsu.edu if you have updates to share or would like to contribute an article for an upcoming issue.

Yours truly,
Roger Narayan
Editor, Biomaterials Forum

If you have any questions,

require any information or have suggestions for improved services, please feel free to contact the Society's Headquarters office:

SOCIETY FOR BIOMATERIALS
1120 Route 73, Suite 200 • Mount Laurel, NJ 08054
Phone: 856-439-0826 • Fax: 856-439-0525
Email: info@biomaterials.org

From the President

By Sarah Stabenfeldt, SFB President

Dear SFB Members,

Biomaterials. Scientific excellence. Community. Education. Training. These pillars have defined SFB for more than 50 years, shaping a society dedicated to advancing science and supporting one another. Now, more than ever, we must lean in and strengthen these foundations, ensuring that our mission continues to thrive despite the challenges we face.

Our community is more than just a network of researchers — it is a source of mentorship, collaboration and shared purpose. Scientific discovery does not happen in isolation, nor does meaningful education and training. I encourage each of you to reach out — to colleagues, to trainees and to those who may need guidance or encouragement. A simple act of support, whether through mentorship, collaboration or connection, can make a lasting impact.

Together we can ensure that SFB remains a place where innovation flourishes, where knowledge is shared freely and where every member feels valued and empowered. Let's commit to strengthening our bonds, fostering inclusivity and building a future that reflects the very best of our scientific community.

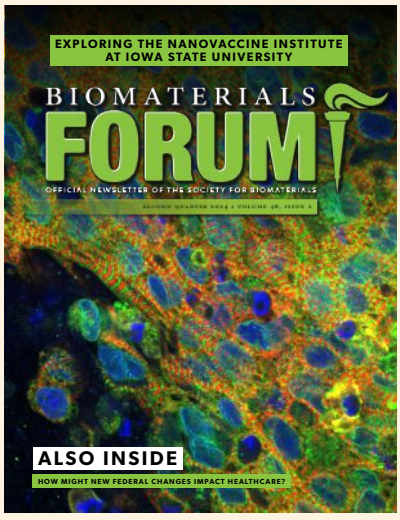
One of the best ways to connect with our community is by attending the 2025 Annual SFB Meeting in Chicago, April 9–12, 2025. This special 50th anniversary meeting will celebrate SFB's rich history while looking ahead to the future, guided by the theme: "Half a Century of Progress: Crafting Resilience in Mind & Matter." Under the leadership of our program chairs, Drs. Natelie Artzi and Kaitlyn Sadtler, this year's meeting will feature an innovative and impactful program that you won't want to miss.

I look forward to gathering with you in Chicago to celebrate, collaborate and advance our shared mission!

All the best,

Sarah E. Stabenfeldt, PhD
Professor of Biomedical Engineering, Arizona State University
President of Society For Biomaterials

CALL FOR COVER ART



WE WANT TO FEATURE YOUR EXCITING BIOMATERIALS ARTWORK ON THE COVER OF *BIOMATERIALS FORUM!*

Deadline: Accepted on a rolling basis.

Instructions: Please email artwork (digital images, artistic creations, etc.) to info@biomaterials.org, to the attention of the Executive Editor of the *Biomaterials Forum*. All artwork with biomaterials relevance that have not appeared as a *Forum* cover are welcome. Multiple submissions are permissible.

Description: Selected artwork will appear as the cover of a future issue of *Biomaterials Forum* along with a brief "On the Cover" description of the subject and name/affiliation of the creator.

Format: High-resolution electronic version in .gif, .tiff or .jpeg file format.

Student Chapter News

The National Student Chapter has been busy in the past year helping to prepare for the World Biomaterials Congress held in Daegu, South Korea, and the Fall Regional Meetings held at six sites throughout the U.S. The National Chapter published a "How to Navigate the Meetings" flier to help student attendees make the most of their time at these meetings; they also supported SFB's Executive Board and Student Chapters with any needs as they arose.

We are happy to report that between the World Biomaterials Congress and the six Regional Meetings, more than 30 students and postgrads received presentation and travel support awards. Congratulations to all awardees!

Additionally, the Student Chapter hosted several webinars, including "How to Establish a Student Chapter" and "Industry vs Academia Careers," for all students to participate in and expanded our social media presence. Please come visit us on X: @sfb_students and on Instagram: sfbstudents.

Finally, we began a new initiative this year in which the winners of select student competitions could win an award to cover the cost of Annual Meeting registration! Student competitions could include any visual representation of their research beyond a traditional publication or presentation, be it a work of art, a column or news article or a recorded three-minute thesis presentation. We are hoping to continue with this initiative to help subsidize some of the meeting costs for students to attend meetings in the future, pending Student Chapter interest.

With a very active 2024 in the rearview, we are excited to continue to serve the SFB student community with new initiatives, events, and webinars in 2025!

Sincerely,

Grant and the SFB National Student Chapter Officers

CONNECT WITH US!

CALLING ALL BOOKWORMS!

If you'd like to contribute a review of your recent favorite read to the ***Biomaterials Forum***, send it for consideration to the Editor at ***Roger_narayan@ncsu.edu***. If it's approved, it will be published in a future Forum Book Review column!

Highlight Your Institution at AIMBE's Annual Event

AIMBE's Annual Event, happening March 29–31, 2025, in Washington, D.C., brings together more than 300 leading medical and biological engineers. This gathering provides a unique opportunity for academic institutions and labs to connect, share their work and foster new collaborations.

OPPORTUNITIES TO GET INVOLVED

Participating as a sponsor or exhibitor allows you to:

- Share your research and initiatives with a community of top engineers and AIMBE Fellows
- Build connections with potential collaborators in the field of medical and biological engineering
- Highlight your institution's projects through booth displays or sponsorships

Flexible options are available, including exhibit booths starting at $325 and sponsorship opportunities for sessions such as the Earl Bakken Lecture, the Emerging Leaders Luncheon or the Induction Ceremony. Sponsors receive recognition in event materials and throughout the program.

For more details or to secure your spot, contact program@aimbe.org.

AIMBE LAUNCHING NEW COALITION GROUP

AIMBE is excited to announce the launch of Friends of the National Institute of Biomedical Imaging and Bioengineering (FoNIBIB) — a coalition dedicated to supporting the mission of the National Institute of Biomedical Imaging and Bioengineering (NIBIB).

NIBIB, one of the 27 Institutes and Centers at the National Institutes of Health (NIH), focuses on advancing technology development to transform how we understand, prevent, detect, diagnose and treat diseases. Through FoNIBIB, AIMBE and partner organizations will advocate for NIBIB's critical initiatives, increase public awareness of its research and support the training of the next generation of interdisciplinary researchers.

FoNIBIB's advocacy efforts include:

- Congressional Visits: Organizing campus tours for congressional staff, featuring technology demonstrations, lab visits and presentations by NIBIB grantees
- Engagement with NIBIB Leadership: Facilitating discussions on research advancements, priorities and future initiatives between NIBIB leaders and FoNIBIB representatives.
- Advocacy Campaigns: Leading letter-writing initiatives to encourage lawmakers to increase funding for NIBIB
- Congressional Briefings: Hosting Capitol Hill events to highlight NIBIB's impact on research and human health.
- Public Outreach: Educating the public about NIBIB's contributions to health and wellness through impactful research.

FoNIBIB aims to amplify the critical work of NIBIB and ensure it receives the recognition and support it needs to continue advancing biomedical imaging and bioengineering for public health.

AIMBE ANNOUNCES INAUGURAL CLASS OF EMERGING LEADERS

The American Institute for Medical and Biological Engineering (AIMBE) is proud to announce the selection of 17 exceptional professionals as the inaugural class of Emerging Leaders in Medical and Biological Engineering (MBE). These individuals were chosen for their distinguished achievements in MBE and their potential to advance biomedical innovation and equity. They will be formally recognized during AIMBE's Annual Meeting, March 29–31, 2025, in Washington, DC.

AIMBE's Emerging Leaders Program aims to:

- Increase engagement with underrepresented professionals in MBE
- Recognize outstanding rising leaders in the field
- Serve as a pipeline for diverse leaders to join AIMBE's College of Fellows

Participants in this three-year program will be paired with AIMBE Fellow mentors, offering them guidance and opportunities to build connections with leaders in the field. Emerging Leaders are expected to attend at least one AIMBE Annual Event during their program to network with Fellows and further their professional development. Look for a list of the AIMBE Emerging Leaders in the Q3 2024 issue of *SFB Forum*.

A MESSAGE FROM AIMBE PRESIDENT DR. LOLA ENIOLA-ADEFESO

"Through our Emerging Leaders Program, AIMBE is committed to fostering an inclusive pipeline of leaders in medical and biological engineering. This program not only recognizes outstanding talent but also ensures that diverse perspectives are represented within our field. "We are excited to welcome this inaugural class of Emerging Leaders and look forward to the impact they will make in advancing biomedical innovation and equity," said Dr. Eniola-Adefeso, Dean of Engineering at the University of Illinois Chicago.

AIMBE celebrates these 17 leaders and their dedication to shaping the future of medical and biological engineering. Stay tuned for updates on their contributions and the impact of the Emerging Leaders Program!

Exploring the Nanovaccine Institute at Iowa State University

By Rizia Bardhan, Ratul Chowdhury, Molly Kozminsky, Surya Mallapragada, Balaji Narasimhan, Nigel Reuel, Don Sakaguchi, Jing Wang, Qun Wang

IOWA STATE UNIVERSITY

The Nanovaccine Institute was created at Iowa State University in 2017, building upon research partnerships with institutions across the U.S. We use nano-based technologies to tackle emerging and re-emerging diseases that impact human and animal health. Our research is a transdisciplinary merger of cell biology, immunology, nanotechnology, biomaterials science, microbiology, neuroscience, protein engineering, cancer biology, clinical science, gerontology and social science. We design nanovaccines and nanomedicines with an iterative "bedside-to-bench-and-back" methodology, enabling efficient and cost-effective translation of next-generation nano-based products to benefit global health. Our research focuses on:

Respiratory infections: nano-based, room-temperature-stable vaccines and therapeutics against influenza, pneumonia, RSV, pneumonic plague, anthrax and COVID-19.

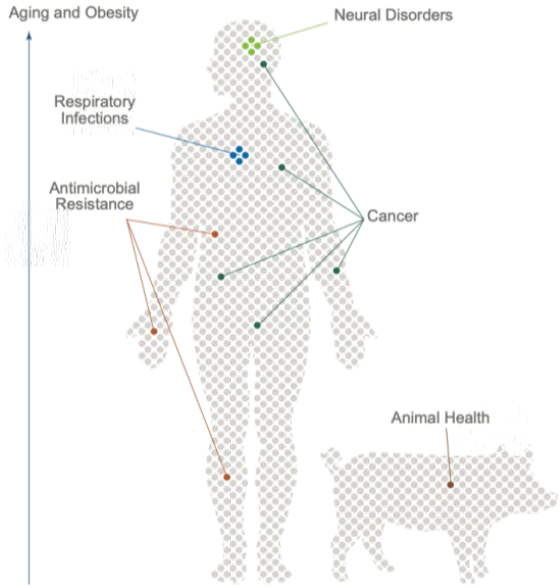
Cancer: in vitro models and diagnostics, nanoparticle-based therapies and immunotherapies against pancreatic, head and neck, breast, brain, prostate and pediatric cancers.

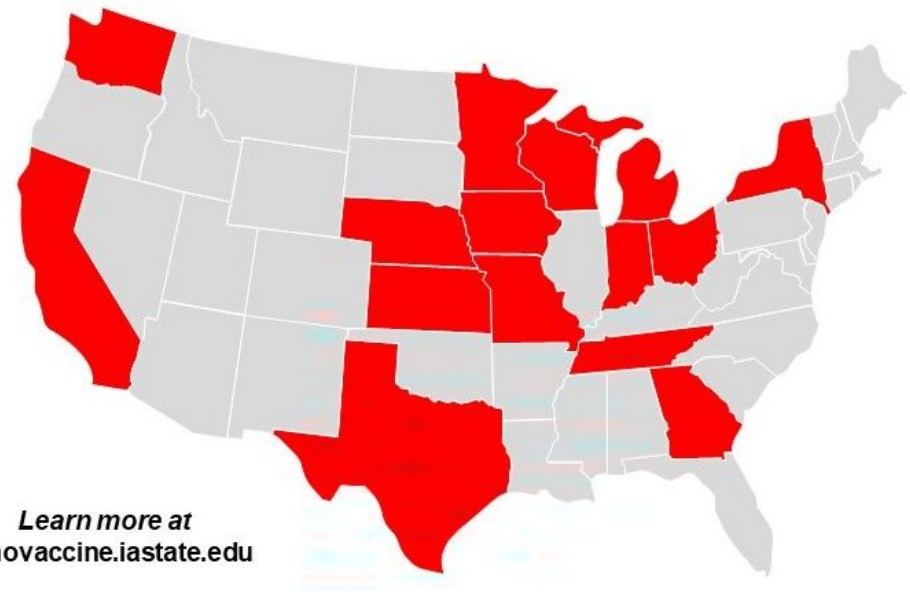
Neural disorders: novel immunoassays and nanomedicine- and stem cell-based therapies for Alzheimer's, Parkinson's, stroke, and chronic traumatic encephalopathy.

Antimicrobial resistance: dose-sparing nanomedicines based on amphiphilic biomaterials to treat chronic diseases with fewer off-target effects and improved patient compliance.

Animal health: single-dose vaccines against PRRS and influenza (swine), avian influenza and infectious bronchitis (poultry), bovine respiratory disease and Johne's disease (cattle) and equine herpes virus (horses).

Aging and obesity: tailored nanovaccines for aging and obesity using metabolically optimized biomaterials and nano-based wearables and biosensors for older adults to prevent adverse events.





Learn more at
nanovaccine.iastate.edu

85 Researchers at 26 Institutions

CA Berkeley National Lab
RAND Corp.
GA Univ. of Georgia
IA Genvax Technologies
Immuno Nano Med, Inc.
Iowa State Univ.
Mazen Animal Health
PathoVacs, Inc.
PK Biosciences Corp.
Skroot Laboratory, Inc.
Univ. of Iowa
USDA Nat'l Centers Animal Health
IN Indiana Univ.
KS Kansas State Univ.
MI Michigan State Univ.
MN Mayo Clinic
MO Univ. of Missouri
NE Univ. of Nebraska Medical Center
NY Univ. at Buffalo
OH Ohio State Univ.
TN St. Jude Children's Research Hosp.
TX Southwest Research Institute
Zeteo Biomedical, LLC
WA Univ. of Washington
WI Imbed Biosciences, Inc.
Univ. of Wisconsin-Madison

Exploring the Nanovaccine Institute at Iowa State University (Continued)

MISSION: MENTORSHIP, CAREER TRAINING, SCIENTIFIC ADVANCEMENT

We provide early career training and development of critical thinking skills for students. We offer collaborative (open) laboratories and shared core facilities, micro-credentialing, personalized mentoring and seed funding to support interdisciplinary teams. Our strong track record of joint publications, patents, co-mentored students and postdocs, integrated systems approach and partnerships are fueling scientific advances and accelerating technologies towards clinical trials.

Going forward, our focus is on: (i) scale-up, process development, and cGMP manufacture of lead candidates; (ii) new products for underserved populations; and (iii) improving pandemic preparedness. We welcome collaborations and partnerships that accelerate the translation of exciting scientific discoveries to clinical trials and life-saving products.

Clockwise from top left: Nanovaccine Institute researchers working in collaborative open labs; using spray drying to synthesize nanovaccines; using confocal microscopy to study neuronal cells; studying drug release kinetics from nanoparticles; using Raman spectroscopy to study metabolite profiles.

Exploring the Nanovaccine Institute at Iowa State University (Continued)

THE TEAM

The research team comprises researchers across several disciplines. The members include:

Rizia Bardhan: therapeutic nanoparticles for targeted drug delivery; nanoparticles for imaging immune markers with CT and PET, and Raman spectroscopy; metabolic profiling using Raman-based omics; pregnancy, cancer, IBD and infectious disease.

Ratul Chowdhury: protein design using structure-aware AI/optimization models; protein-protein interactions, immune-metabolic modeling and nanoparticle release kinetics.

Molly Kozminsky: micro- and nanotechnology to manufacture high-throughput *in vitro* models of tumor microenvironment (TME); in vitro models of bone marrow, prostate, and pancreatic TME and T cell-dendritic cell interactions; DNA-based cell and ligand patterning.

Surya Mallapragada: self-assembling block copolymeric biomaterials and bioinspired materials for vaccine and gene and miRNA delivery; biomaterial-me, dilated stem cell control via electrical stimulation for nerve regeneration; degradable graphene-polymer composite materials to guide neurite outgrowth and stem cell differentiation.

Balaji Narasimhan: biodegradable polyanhydride-based nanovaccines and nanomedicines; room-temperature-stable, single-dose, needle-free nanovaccines against respiratory infections; cancer immunotherapy; dose-sparing nanomedicines to treat Parkinson's disease, stroke, lymphatic filariasis and AMR bacteria; nanovaccines for underserved populations, including aged, obese, pregnant and pediatric.

NANOVACCINE INSTITUTE

Nigel Reuel: rapid prototyping of proteins as functional materials; biomaterial-coated nanoprobes to optimize enzymes for selective degradation of natural and engineered biomaterials; cell-free protein synthesis; single-walled carbon nanotubes and biosensors; biofilm reduction and plastic degradation.

Don Sakaguchi: stem cell biology, polymeric scaffolds and biomaterials, and cellular engineering to control somatic stem cell differentiation; electric and magnetic field stimulation to modulate neural and mesenchymal stem cell differentiation for neural tissue repair.

Jing Wang: leucine-rich repeat peptides as cancer therapeutics; bio-inspired elastin-like polypeptide nanoparticles for drug delivery.

Qun Wang: biomaterials and nanotechnology-based organoids for drug discovery; biomaterial-mediated organoid and stem cell reprogramming; oral formulations targeting intestinal mucosa; artificial virus-like nanocarrier oral delivery systems; IBD, diabetes and colorectal cancer.

Government News

HOW MIGHT GOVERNMENT CHANGES IMPACT THE HEALTHCARE INDUSTRY? PART 1

By Carl G. Simon, Jr., PhD

Upon his inauguration Jan. 20, 2025, President Donald Trump undertook a slate of sweeping changes in healthcare policies. The new administration reinstated its policy on reducing government intervention, easing regulations and introducing alternatives to the Affordable Care Act (ACA).

One of the *Forum*'s objectives is to keep SFB members abreast of the technology and development in biomaterial science; as such, it is important to remain on top of the governmental changes that may impact the healthcare industry in general.

THE HEALTHCARE LANDSCAPE WILL LIKELY LOOK VERY DIFFERENT IN THE YEARS TO COME.

While the numerous proposed changes have come in rapid succession and may change quickly, at the time of publication, these are some of the latest developments in the new administration's direction affecting the U.S. healthcare landscape.

1. ROLLBACK OF ACA PROVISIONS

The Affordable Care Act (ACA), a cornerstone of healthcare reform over the past decade, has remained a central point of contention in U.S. politics. Under the new administration, there has been a concerted effort to roll back key provisions of the ACA, particularly those related to the individual mandate and Medicaid expansion. The individual mandate, which required individuals to have health insurance or face a penalty, has been weakened further, with plans to remove its enforcement in favor of more flexible options.

The administration has also sought to reduce the number of states participating in Medicaid expansion, advocating for a more localized approach to healthcare that gives individual states more control over funding and eligibility.

2. INCREASE IN PRIVATE INSURANCE OPTIONS

The new administration has placed significant emphasis on expanding private insurance coverage options. This includes creating a more competitive marketplace where private insurers have greater flexibility in offering plans that cater to a broader range of consumer needs. Key reforms include expanding short-term, limited-duration health plans, which provide more affordable alternatives to traditional insurance but offer fewer benefits.

Critics argue that such measures could lead to a two-tiered system, where individuals with fewer resources or pre-existing conditions may struggle to find adequate coverage. However, supporters maintain that greater competition would reduce premiums and increase consumer choice in the healthcare market.

3. MEDICARE AND SOCIAL SECURITY REFORM

Medicare and Social Security reform remain central topics for the new administration. While the stated goal is to protect Medicare for seniors, there is an ongoing effort to reduce the cost burden through privatization and introduce market-based reforms. Proposals aim to improve the efficiency of Medicare Advantage plans by offering seniors more flexibility and choice in how they receive care. There are also plans to combat fraud and inefficiency within the Medicare system, with a focus on streamlining operations and improving transparency.

WHAT'S NEXT FOR U.S. HEALTHCARE?

The U.S. healthcare system is poised for significant change under the new administration. With a strong emphasis on market-driven reforms, the reduction of government intervention, and an expansion of private insurance options, the healthcare landscape will likely look very different in the years to come.

Contact: Carl Simon, carl.simon@nist.gov

Read part 2 of this article in SFB Forum Q3, coming soon.

Society For Biomaterials

50TH

Half a Century of Progress

ANNUAL MEETING & EXPOSITION

APRIL 9-12, 2025 • HILTON CHICAGO

CRAFTING RESILIENCE IN MIND & MATTER