

# Report to the Board of Trustees on Council of Experts Activities

2022

2022

FISCAL YEAR





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On behalf of the Council of Experts (CoE) and USP staff, I am pleased to present the fiscal year 2022 (FY22) CoE annual report. This is the second annual report of the 2020–2025 cycle and describes the activities and achievements of the CoE, its Expert Committees (ECs), and Expert Panels (EPs) from July 2021 through June 2022.

In a tumultuous world affected by pandemic, war, and insecurity, USP’s mission to improve public health globally is a bedrock and a personal source of inspiration and optimism. As I reflect on our hard work responding to the disruptors of FY22, I am proud of our accomplishments, firmly rooted in science and achieving positive impact for patients and consumers worldwide. USP staff, scientists, and Expert Bodies are using cutting-edge approaches to evolve and expand our standards and solutions that help to ensure the quality of medical and other health-related products and services.


As I often state, “just” writing the standard is not, and never has been, enough. We use the full breadth and depth of USP’s expertise and capacity, implementing capability-building programs to help stakeholders effectively use our solutions, advocating and mobilizing support for policies and investments that strengthen global quality and public health. We continue to advocate for diversity, equity, inclusion, and belonging (DEIB), which are central to our public health mission and make USP stronger as an organization.

I want to highlight six of our many FY22 activities and accomplishments, which are explained in detail in the pages that follow, and the key factors that have contributed to our successes.

**We have developed priority standards and solutions guided by USP’s Science Quality Framework (SQF).** The SQF, which the CoE helped to develop, establishes a consistent set of focus areas and principles organized in the following five strategic topic areas: evolving and expanding standards, product and substance performance, emerging modalities, technologies, and quality environment. I am proud to present the roadmaps we have developed for the following SQF-related priority areas:

 **Impurities:** USP recently posted a Prospectus for USP General Chapter <477> *User-Determined Reporting Thresholds* that provides an approach for determining the appropriate numeric reporting threshold value for organic impurities test procedures in monographs. This approach aligns with guidelines


from the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH). In addition, USP has announced a format change for presenting relative retention times for organic impurities in monographs. We are working with the U.S. Food and Drug Administration (FDA) on developing new approaches for controlling harmful mutagenic impurities in USP Small Molecules monographs.

 **Dissolution:** A second-generation Reference Standard (RS) is under development that would provide significant improvements for customers conducting performance verification testing when using USP Apparatus 1 or 2. A revision to USP General Chapter <711> *Dissolution*, published in *Pharmacopeial Forum (PF)* 48(2) [Mar.–Apr. 2022], adds the option of a stationary basket as an alternative

to sinkers when using the Apparatus 2 dissolution vessel. A major proposed revision to USP General Chapter <1724> *Semisolid Drug Products—Performance Tests* was published in *PF* 48(3) [May–June 2022]. The proposal would expand the chapter’s scope to include in vitro permeation tests and in vitro release tests. This major revision will support the recent FDA guidances on performance tests for products applied to the skin, including sunscreens. In addition, the proposed new USP General Chapter <1002> *Filters and Membranes* is under development and includes recommendations on how to select and qualify filters and membranes for dissolution testing and other analytical techniques.


 **Advanced Manufacturing:** Technical guides on control strategy as well as three proposed new standards for

the physical properties of material used in pharmaceutical continuous manufacturing (PCM) have been identified for development. We anticipate that these and future guides could be developed into documentary standards (DSs) as they mature in industry, potentially positioning USP as the industry leader in control strategy development, as USP is committed to reducing industry barriers to, and cost of, widespread PCM adoption.


 **Medicine Supply Map (MSM):** USP’s Pharmaceutical Supply Chain Center debuted the [MSM](#), which helps to improve visibility into the upstream drug supply chain so that vulnerabilities can be predicted and addressed before potential disruptions occur. This early-warning system can be applied whether disruptions are due to global health crises, natural disasters, geopolitical events, or quality-related issues in manufacturing. MSM can help


governments, manufacturers, distributors, and providers identify and address vulnerabilities, lower quality risks, reduce the frequency and duration of potential drug shortages, and protect patients. In this context, USP is reexamining how we prioritize the development of new standards to focus on those that can help strengthen the resilience of the medicine supply chain as well as help mitigate recalls and shortages. We published new USP General Chapter <1083> *Supplier Qualification in PF* 47(5) [Sep.–Oct. 2021] and are evaluating the comments received. Proposed new general chapters that contain standards for monitoring devices, time, temperature, humidity, and qualification of storage areas are anticipated to be published in *PF* in FY23. The CoE has been presented with ten new opportunities for standards revision or creation and has provided input on those USP should pursue.

**We have expanded USP’s COVID-19 vaccines mission priority work.** Because quality vaccines save lives and build trust in vaccination efforts, and standards can help support the development and validation of quality COVID-19 vaccines, USP created the following toolkits to help navigate USP’s DSs supporting quality assessments for vaccine attributes:

 **Quality Assessment Toolkits:** Released in FY22, the Quality Assessment Toolkits are designed to serve as a resource for national control laboratories that need to develop and validate test methods and regulators overseeing the reception and distribution of vaccines in their countries. Organized based on the various COVID-19 vaccine platforms for authorized COVID-19 vaccines, the toolkits are being used by governments worldwide to ensure vaccine quality, build capacity, and increase access to vaccines. As of June 2022, 280 unique users had accessed the resource and more than 500 stakeholders from 71 countries attended the first four USP webinars on COVID-19 vaccine quality

and USP’s COVID-19 Vaccines Quality Assessments Toolkits. Webinars will continue to be presented, and the toolkits will be expanded to include additional platforms to support global access to COVID-19 vaccines.

 **U.S. COVID-19 Vaccine Handling Toolkit and International COVID-19 Vaccine Handling Guide:** To support the public health response to the pandemic and help increase access to quality-assured COVID-19 vaccines worldwide, USP published the “COVID-19 Vaccine Handling Toolkit” and “International COVID-19 Vaccine Handling Guide.” These two resources bring to the front lines of the

 **Complex Generics:** USP has initiated a Complex Generics Project led by a cross-functional team. The scope of this initiative includes developing DSs and physical materials needed by manufacturers and vendors of complex generics. These standards are for products with complex active pharmaceutical ingredients (APIs), formulations, routes of delivery, dosage forms, and drug-device combination products. USP’s initial work included stakeholder engagement surveys to identify the target areas for support as well as engagement with FDA and the Center for Research on Complex Generics to align our focus areas. For physical materials, this includes qualitative and quantitative identification standards for extractables and leachables and biorelevant dissolution media. The Complex Generics Project team is also evaluating the introduction of standards for complex excipients.

vaccination effort operational strategies to address potential efficiency gaps while maintaining safety and quality. They have helped accelerate the pace of vaccinations while maintaining quality, preventing vaccine waste, and avoiding mix-ups with other vaccines. In a survey conducted in October 2021, USP found that 78% of regulators reported improved capacity for regulatory approval of COVID-19 vaccines thanks to our vaccine handling materials. Our resources continue to be widely used, positively regarded, and referred to by practitioners and pharmacists domestically and globally. The team continues to update these publications as new vaccines and information become available.

**We are committed to diversity, equity, inclusion, and belonging.** USP is committed to creating a culture where everyone feels fully empowered and valued and can contribute their full potential to accomplish our mission to help build quality foundations for a healthier world. Our vision is for a future with safe and equal access to improved health regardless of race, gender, belief, geographic, economic, or socioeconomic factors. The following are concrete examples of our work in this area:



**Addressing Health Equity:**

USP is working to address long-standing public health disparities amplified by COVID-19 that have contributed to inequitable access to quality medicine and vaccines and disproportionately impacted underserved populations and geographies around the globe. Through the recently convened Health Equity Advisory Group, USP identified opportunities to address these challenges and developed Health Equity Guiding Principles to support USP staff and Expert Volunteers involved in the standards-setting process.

engineers, public health professionals, and clinicians from underrepresented populations to participate, with flexible hours, on ECs or EPs for one year. We launched a Call for Candidates (C4C) for qualified individuals to apply to the SEF program. Our aim is to place a Scientific Expert Fellow in each of the ECs that compose the CoE. Participants will have a clearly defined scope of work, including expectations to develop drafts and final versions of white papers, trade articles, and other important documents. In addition, each will have formal mentorships with EC leadership and USP staff.



**Redesigned our Scientific Expert Fellows (SEF) Program:**

The SEF program aims to promote a more diverse and inclusive Expert Body. The program provides opportunities for scientists,



**New EP Reporting to CoE:**

The CoE has unanimously voted to form a DEIB EP to help the CoE implement its DEIB strategy for Expert Volunteers. This will include implementing the Health

Equity Guiding Principles developed by the Health Equity Advisory Group and monitoring progress in DEIB to inform future Expert Volunteer recruitment. The next steps include launching a C4C to invite qualified candidates to apply to serve on the DEIB EP.



**National Urban Fellows Partnership:**

For a second year, USP is partnering with the National Urban Fellows, a leadership accelerator program for diverse mid-career professionals committed to equity, public service, and social impact. Two USP–National Urban Fellows have been selected. Their activities will include working with USP’s Equity Office to advance the Global Science and Standards Division’s DEIB strategy and with USP staff to support the DEIB EP and other related efforts



**We have launched two initiatives related to environmental sustainability:**

USP’s Improving the Pharmaceutical Environmental Footprint Initiative seeks to further USP’s leadership role in reducing the environmental impact of pharmaceutical manufacturing and quality testing across the supply chain. The initiative team has ideated more than 60 opportunities for standards, advocacy, and capability building, and engaged stakeholders to further understand their needs. Additionally, USP’s Animal Testing Initiative continued to promote and

advance the reduction, refinement, and replacement (3R) approach to animal test requirements. USP’s decades-long 3R approach has significantly reduced the requirements for animal testing in high-impact general chapters and monographs for biological products.



**We have envisioned the introduction of digital standards:**

CoE members and USP staff have collaborated on USP’s long-term vision for USP standards to comprise digital, documentary, and physical components in varying combinations. In this forward-looking scenario,

instruments and robotics in laboratories of the future would be able to read the *United States Pharmacopeia–National Formulary (USP–NF)*, run automated tests, and perform automated data analyses, potentially resulting in improved efficiencies and increased accessibility to USP Standards. CoE members have volunteered to participate in a new digital RS subgroup to develop the proposed USP digital RS program. The CoE and USP staff have deliberated about the subgroup’s anticipated work plan, including the potential need for compendial process updates to enable the development of digital RSs



**We have worked to expand the Pharmacopeial Discussion Group (PDG):**

USP, along with our partners in the *European Pharmacopoeia (Ph.Eur.)* and *Japanese Pharmacopoeia (JP)*, has led efforts for the first major reforms of the PDG since its founding over

30 years ago. The most significant of these reforms is to begin a process for integrating additional pharmacopeias from regions not yet represented in the PDG. This milestone decision marks a critical step in the PDG’s commitment to expanding recognition of harmonized pharmacopeial standards. The PDG

adopted a framework for accession of new members that includes a pilot phase as well as entry criteria for new members. In November 2021, PDG invited other world pharmacopeias that were not yet represented to apply to join a one-year pilot phase, which will commence during the PDG annual meeting in October 2022.

Throughout FY22, USP leveraged its enterprise communications framework to raise the profile of the organization’s activities in key areas while continuing to advance USP’s broader strategy to deliver impact through standards development, advocacy, and capability building. The enterprise communications framework connects USP’s impact to the following four key external priority areas whose themes are echoed throughout this report and will extend far into the cycle:



**Medicines Supply Chain:**

USP standards ensure access to safe, quality medicines people can trust. USP is working with stakeholders to modernize pharmaceutical manufacturing to help produce more medicines in more places and strengthen the supply chain. We are also using data to better understand and fix weaker links in the supply chain through USP’s MSM.

the definition of quality and supports regulatory confidence. Through our work with independent scientific experts from industry, government, and academia, our standards enable manufacturers to take a discovery to scale and expand the availability of trusted, quality-assured medicines.

products. Our standards and related programs promote common approaches to quality and the adoption of new medicine modalities, advanced therapies, and manufacturing technologies.



**Advancing Innovation:**

USP standards accelerate innovation, build trust and confidence in medical breakthroughs, and advance the quality of medical



**Global Health:**

USP is working with governments, industry, and other stakeholders to improve patient access to safe, quality medicines, and reduce the potential for substandard and falsified medicines in low- and middle-income countries.



**Science of Quality:**

Our rigorous science informs

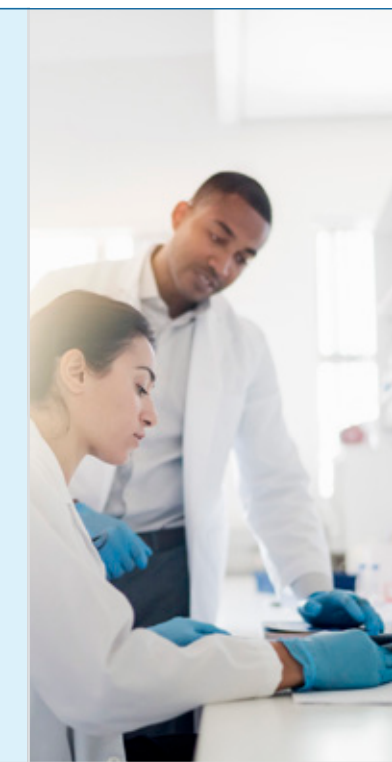
Our activities and accomplishments have been supported by the strong relationship with the FDA and other regulatory agencies globally, our collaboration with scientists around the world, and insights obtained from our industry stakeholders worldwide. Indeed, our impact in FY22 was made possible by the numerous hours—estimated at 69,634—that were generously contributed by our Expert Volunteers and augmented by our dedicated staff.

In these extraordinary and often unsettling times, I send my deepest thanks and well wishes to all of our Expert Volunteers for everything you do to support USP’s global mission to help build quality foundations for a healthier world. I warmly invite you to read the following pages, which tell the story of how our collaborative activities in FY22—guided by the organizational goals defined by USP’s Success Sharing Plan and the [2020–2025 Convention Resolutions](#)—have benefited consumers, patients, and other global stakeholders by helping to improve and protect public health in the U.S. and around the world.



**Jaap Venema, Ph.D.**

USP Chief Science Officer & Chair, USP Council of Experts





**CoE Overview:** The CoE, consisting of the 29 EC Chairs plus USP’s Chief Science Officer, who serves as CoE Chair, is one of USP’s three governing bodies. Its members direct the scientific standards-setting initiatives for the organization and ensure that these efforts align with USP’s Resolutions, policies, and strategies. The CoE oversaw the activities of numerous global scientific experts who served on ECs, EPs, and Joint Standards-Setting Subcommittees (JS3s) in FY22.



**USP Standards Approved in FY22:** Expert Volunteers play a vital role in approving DSs for publication and RSs for release. Expert Volunteers ballot on all regular DS revisions, new RSs (F Lots), and a sampling of Replacement and Continuation (R&C) Lots.

**Pharmaceutical Analytical Impurities (PAIs):** Manufacturers can use USP PAIs in analytical testing to detect, identify, and measure impurities. USP PAIs are released through a quality process designed to ensure identity and quality for analytical applications. PAI products are different from official USP RSs, but together they can help to provide a comprehensive solution for research and analytical needs across the drug life cycle. Their use can help control impurities, to consistently produce safe and effective products, so patients have access to quality medicines.



## USP GOVERNING BODIES AND RELATED GROUPS

Board of Trustees (BoT)	USP Convention	CoE	Expert Bodies Under the CoE
<p><b>10 members</b> elected by the USP Convention, three at-large members appointed by the BoT, and the USP CEO, responsible for:</p> <ul style="list-style-type: none"> <li>USP’s policies</li> <li>USP’s finances</li> <li>USP’s strategic direction</li> </ul>	<p><b>473 organizations</b> invited by Council of the Convention and BoT, responsible for:</p> <ul style="list-style-type: none"> <li>Resolutions that guide USP policies and initiatives</li> <li>Adoption of USP Bylaws</li> <li>Election of the BoT and CoE</li> </ul>	<p><b>29 Chairs</b> of USP ECs, elected by the USP Convention, plus USP’s Chief Science Officer, who serves as CoE Chair, responsible for:</p> <ul style="list-style-type: none"> <li>USP scientific and standards-setting decisions</li> <li>Standards-setting work of USP’s Expert Bodies</li> <li>Adherence to the direction set forth by the BoT and USP Convention</li> </ul>	<p><b>ECs</b> Scientific experts who create, revise, review, and approve standards for a specific topic area. EC members are elected by the CoE and serve a five-year term.</p> <p><b>EPs</b> Advisory bodies formed to supplement EC expertise on specific topics. Each has a specific charge and is dissolved upon completion of its work. Members may include EC members and may serve on multiple EPs.</p> <p><b>JS3s</b> Representatives from ECs who serve on subcommittees formed to address issues that affect multiple standards-setting areas.</p>
<p><b>USP Staff:</b> Individuals who support and shepherd the work of all governing bodies and related groups</p>			

## FY22 BALLOTTED AND APPROVED STANDARDS, BY THE NUMBERS

<b>95</b> DS Ballots	<b>586</b> DS Items Balloted	
<b>392</b> New or Revised DSs Approved	<b>169</b> Modernized DSs Approved	
<b>52</b> USP-NF, Food Chemicals Codex (FCC), and Supplements DSs Omitted	<b>424</b> RS R&C Lots Released	<b>53</b> RS F Lots Released

## PAIs IN FY22

<b>170</b> New Products	<b>17</b> Replacements	<b>193</b> Total in USP Catalog
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# FY22 CoE Key Activities and Accomplishments



The CoE met ten times during FY22. In addition to leading and managing the work of ECs, CoE members drive USP’s bold strategic direction for science, facilitate robust scientific dialogue, evaluate public input on USP standards, uphold and champion policies and practices that ensure the integrity of the standards-setting process, and help to identify and mentor the next generation of USP Expert Volunteers. The following are highlights of the CoE’s key activities and accomplishments during FY22, guided by the organizational goals that are defined by the 2020–2025 Convention Resolutions.



### Refined the Standards

#### Engagement Model:

A new standards engagement model was developed and refined that focuses on earlier and broader engagement with stakeholders. The model was socialized internally and with the CoE, and four workstreams were created to further implement guardrails, the ecosystem, external socialization, and knowledge hub pilots. These activities are designed to increase opportunities for stakeholders to help prioritize and shape USP standards from an early stage, while preserving the formal compendial process in alignment with Resolution III, on quality standards; and Resolution XIV, on culture of excellence.



### Emphasized Management

#### of Conflicts of Interest and Adherence to USP’s

#### Standards of Conduct and Code of

**Ethics:** The CoE has emphasized the importance of managing conflicts of interest and understanding and adhering to USP’s Standards of Conduct and Code of Ethics as critical responsibilities shared by all of us. Our conflict of interest management program’s key

principles—disclosure, transparency, and recusal from voting—are critical for ensuring integrity in the development of USP standards. New resources and programmatic improvements have been delivered to help Expert Volunteers continuously educate themselves about managing conflicts of interest as well as understanding and adhering to USP’s Standards of Conduct and Code of Ethics. A revised [Standards of Conduct brochure](#) for Expert Volunteers was adopted, distributed, and posted on USP.org. A Code of Ethics refresher training for Expert Volunteers and USP staff was rolled out, and a holistic Standards of Conduct manual for USP staff was being drafted. These activities support Resolution XIV, on culture of excellence.



### Envisioned the Digital RS

#### Program:

CoE members and USP staff explored USP’s long-term vision for USP standards to comprise digital, documentary, and physical components in varying combinations at its January 26, 2022, meeting. In this forward-looking scenario, machines and robotics in laboratories of the future would be

enabled to read *USP–NF*, run automated tests, and perform automated data analyses, potentially resulting in improved efficiencies, accessibility to USP standards, and outcomes from laboratory research, pharmaceutical manufacturing, and production. CoE members have volunteered to participate in a new digital RS subgroup to develop the proposed digital RS program. The CoE and USP staff deliberated on the subgroup’s anticipated work plan, including the potential need for compendial process updates to enable the development of digital RSs. This work helped to fulfill Resolution VI, on the digital transformation of standards; and Resolution XIV, on culture of excellence.



### Advanced Health Equity:

The CoE has supported a phased approach as part of its DEIB efforts, starting with the formation of a Health Equity Advisory Group to provide ongoing counsel for the health equity initiative. The Advisory Group has identified opportunities to address long-standing public health disparities and helped to develop the USP Health Equity Guiding Principles. These tenets serve

as a reference that Expert Volunteers can use for ongoing DEIB awareness and to explore ways of incorporating health equity metrics into our standards-development and prioritization work. The CoE provided feedback on these principles at its February 16–17, 2022, meeting and participated in health equity breakout discussions, which included conversations about potential workstreams for implementing DEIB activities. The Health Equity Advisory Group anticipates sharing a summary report of its insights and recommendations with the CoE. These efforts align Resolution III, on quality standards; and Resolution XIV, on culture of excellence.



### Supported Formation of a New DEIB EP:

The CoE recommended the formation of a DEIB EP that reports to the CoE, at its April 20, 2022, meeting. The EP will help the CoE implement its DEIB strategy for Expert Volunteers. This will include implementing USP’s Health Equity Guiding Principles developed by the Health Equity Advisory Group and monitoring progress in DEIB to inform future Expert Volunteer recruitment. The next steps include launching a C4C to invite qualified candidates to apply to serve on the DEIB EP. These activities are in alignment with Resolution XIV, on culture of excellence.



### Redesigned the Scientific Expert Fellows Program:

The CoE provided input on USP’s redesigned SEF program at its February 16–17, 2022, meeting. The program provides opportunities for scientists, engineers, public health professionals, and clinicians from underrepresented populations to participate, with flexible hours, on ECs or EPs for one year. Under

the redesigned SEF program, participants will have a clearly defined scope of work, including expectations to develop drafts and final versions of white papers, trade articles, and other important documents. Additionally, each will have formal mentorships with EC leadership and USP staff. The goal is that the fellows will share what they have learned about USP within their organizations and consider serving as a USP Expert Volunteer after their participation in the SEF program ends. In March 2022, USP launched a C4C for qualified individuals to apply to the SEF program in accordance with Resolution XIV, on culture of excellence.



### Next Generation Scientists

#### Program:

USP’s Next Generation Scientists Program is designed to engage and empower emerging leaders in science and innovation to make progress in fast-moving scientific areas that are mission critical to USP. This USP-funded research grant is meant for graduate and post-doc students who are completing cutting-edge research in the fields of pharmaceutical medicines, dietary supplements, and foods. After a thorough application review process, USP is excited to announce that this year’s grant recipient is Ishaan Duggal for his research proposal about the disintegration and dissolution of 3D printed solid oral dosage forms. Ishaan is a Ph.D. student in the department of pharmaceuticals at the University of Texas at Austin and has an M.S. in pharmaceuticals from the University of Minnesota as well as a B.Pharm. from the University Institute of Pharmaceutical Scientists in India. He was the recipient of the University Grant Commission-sponsored Networking Resource Center Fellowship in 2018, has co-authored several publications related to this subject matter, and has a wealth of

relevant research experience. USP looks forward to Ishaan’s work in identifying critical process parameters affecting the disintegration and dissolution of 3D printed solid oral dosage forms. The Next Generation Scientists Program helps to fulfill Resolution VII, on education and training for industry and healthcare professionals.



### Launched Initiatives

#### Related to Environmental Sustainability:

USP launched two initiatives related to sustainability. USP’s Improving the Pharmaceutical Environmental Footprint Initiative seeks to further our leadership role in reducing the environmental impact of pharmaceutical manufacturing and quality testing across the supply chain, while ensuring quality medicines. An inventory analysis found three decades of positive impact through USP’s modernization and harmonization work. The initiative team has ideated more than 60 opportunities for standards, advocacy, and capability building, and has begun engaging stakeholders to further understand their needs.

USP’s Animal Testing Initiative continues to promote and advance the reduction, refinement, and replacement (3R) approach to animal test requirements. USP’s decades-long 3R approach has significantly reduced the requirements for animal testing in high-impact general chapters and monographs for biological products. The team is considering replacing or providing alternatives to the remaining animal tests in *USP* monographs and general chapters. These activities align with Resolution II, on efficiency in standards development and revision; and Resolution III, on being a recognized scientific leader in public quality standards.

# The Global Science and Standards Division's Scientific Affairs Team FY22 Highlights



The Scientific Affairs team serves as the voice of science to grow USP's relevance and use of our solutions both globally and regionally. In FY22, the team supported several regional, program, and divisional priorities, including the following:



### Scaling Scientific Engagement:

The Scientific Affairs team supported the scaling of scientific engagement across all regions for key USP priorities, including nitrosamines and other pharmaceutical impurities, performance verification testing, monoclonal antibodies, advanced therapies, quantitative nuclear magnetic resonance (qNMR), USP General Chapter <1220> Analytical Procedure Life Cycle, and pharmacopeial reference materials. Scientific engagement activities included organizing and presenting virtual and in-person conferences and webinars, disseminating scientific research, and establishing technical collaborations. Attendees across all USP scientific events increased to more than 30,000, representing 60% growth on a year-over-year basis in 2020 to 2021, with 25% of that growth stemming from the Scientific Affairs team's engagements. The team also increased its digital presence and engagement on LinkedIn, ending FY22 averaging more than 32,000 impressions

and 359 reactions per week. These stakeholder outreach events help fulfill Resolution VII, on education and training for industry and healthcare professionals.



### Envisioning Future Engagement Capabilities:

The Scientific Affairs team helped establish a new vision for the future of USP stakeholder engagement throughout the life cycle of science and standards solutions. The approach emphasizes problem-solving while recognizing that a standard may not always be the most suitable, or the first, solution to a public health problem, and that there may be other paths to success. USP's new engagement vision is to provide greater clarity and transparency and to facilitate more robust, dynamic, and continuous stakeholder engagement in the following four phases:

- An early, exploratory phase when stakeholders participate in open dialogue to identify public health and quality challenges
- A pre-compendial phase when USP

works with stakeholders to build consensus and alignment around a developing standard

- A compendial phase that includes USP's traditional notice and comment process
- A post-publication phase that focuses on raising awareness and implementing, training, and generating feedback to guide future revisions

These activities support Resolution III, on developing innovative and agile approaches to address current and future needs of industry, regulators, practitioners, consumers, and patients.



### Piloting USP Knowledge Hub Online Communities:

The Scientific Affairs team helped increase early scientific engagement in two knowledge hub online community pilots in FY22. The Nitrosamine Exchange and the Multi-Attribute Method Exchange have attracted more than 1,700 members from 75 countries and over 160,000 page views. Results from these pilots

*"I'm very proud of the Scientific Affairs team's FY22 accomplishments supporting USP's medicine quality mission as the voice of science. In only three years, the team has grown into our shoes, serving as a twenty-four seven, 365-days-a-year, scientific engagement engine attracting new and diverse stakeholders to USP's medicine quality mission."*

—Jeff Moore, Ph.D., Senior Director, Scientific Affairs & Strategy



validated that USP can build robust online communities that bring unique value to USP and its stakeholders. These online communities provide places for stakeholders to exchange knowledge and best practices twenty-four seven in any language and spurred additional follow-on interactions with USP outside of the communities. The pilots have attracted new, more diverse individuals and influence to USP. More than 60% of community members were new to USP and more than 80% were from outside the U.S. In a recent survey of the Nitrosamines Exchange community members, 83% of respondents indicated that their experience in the online community positively changed their opinion of USP. This work addresses Resolution II, on the efficient sharing of information that is critical to standards development and revision.



### Initiating PDG Strategic Workstreams:

PDG partners, including USP, the Ph.Eur., and JP, initiated strategic workstreams

to reform how PDG engages regulators, industry, and other pharmacopeias. The most significant of these reforms involved a pilot to expand the global membership of PDG. New pilot members are anticipated to be announced in early FY23. This work supports Resolution XI, on pharmacopeial cooperation and convergence.



### Investing in the Next Generation Scientists Program:

USP's Next Generation Scientists Program is designed to engage and empower emerging leaders in science and innovation to make progress in fast-moving scientific areas that are mission critical to USP. This USP-funded research grant is meant for graduate and post-doc students who are completing cutting-edge research in the fields of pharmaceutical medicines, dietary supplements, and foods. This year's grant recipient is a Ph.D. student in the department of pharmaceutics at the University of Texas at Austin,

whose research proposal relates to the disintegration and dissolution of 3D printed solid oral dosage forms. The Next Generation Scientists Program relates to Resolution V, on innovation; and Resolution VII, on education and training.

# USP-India, Hyderabad FY22 Highlights



USP-India supports USP's global standards-setting efforts and pursues collaborative opportunities with policy makers, regulators, professional and manufacturing associations, and leaders in India's pharmaceutical and food sectors. USP-India staff supported key USP activities in FY22, including the following:

**Synthesizing 1,000 Compounds:** USP-India scientists and staff reached the remarkable milestone of having synthesized 1,000 compounds since the Synthetics Laboratory's inception in September 2011. This achievement is a testament to the team's ability to synthesize structurally complex targets and supply quality materials expeditiously. Most of the synthesized compounds have become USP RS materials used by the global pharmaceutical industry, including several that relate to COVID-19 drugs and were synthesized on a high-priority basis to strengthen the global drug supply chain. These API-related compounds are from diverse chemical

classes of molecules such as statins, beta-lactams, tetracyclines, sartans, carbohydrates, nucleosides, antivirals, antibiotics, and complex heterocycles. The remaining compounds have moved into USP's PAIs catalog or serve research and development purposes. To reach this milestone, scientists at the Synthetics Laboratory worked closely with cross-functional teams at USP-India, including the Analytical Research & Development Laboratory staff, who monitor chemical reactions and purify and characterize the compounds; procurement team members, who identify the vendors for raw materials; quality assurance staff, who review documentation; and members of the logistics team, who ship the materials

to USP-U.S. This achievement helped to fulfill Resolution II, efficiency in standards development and revision; Resolution III, on quality standards; and Resolution XIV, on culture of excellence.

**Focusing on DEIB:** USP-India conducted a staff survey on DEIB that helped identify areas that require continued focus, such as increasing gender diversity, removing hierarchies, extending equal opportunities to all staff, and encouraging a speak-up culture. USP-India's anticipated next steps include human resources priorities designed to help bring a DEIB culture change to USP-India. This work helped to fulfill Resolution XIV, on culture of excellence.

**Supporting USP's Global Standards-Setting Efforts and Exploring New Research Opportunities:**

In FY22, USP-India finalized its Science Roadmap, supported two emerging standards published in *PF*, explored new areas for characterizing raw materials and vaccine components used in biologics, successfully completed three microgrant projects, and supported a pilot project evaluating organic impurities for mutagenic potential. USP-India staff collaborated on analytical research into the levels of nitrate and nitrite—key contributing factors in drug safety and quality concerns related to nitrosamine impurity formation—in excipients, the so-called “inactive” ingredients in medicines that play an essential role in delivering APIs to their targets. USP-India supported the development and release of new RSs (F Lots) as well as R&C Lots, DSs, and PAIs that manufacturers can use in analytical testing to detect, identify, and measure impurities. These activities helped to fulfill Resolution I, on collaboration with stakeholders on health

priorities; Resolution III, on quality standards; and Resolution XII, on evidence generation to inform policy.



**Leading Stakeholder Outreach:** USP-India staff conducted webinars, workshops, virtual Quality Forums, and training and education courses for more than 1,000 participants in FY22. Webinar topics included elemental impurities, peptide and heparin quality management systems, fundamentals of dissolution, analytical method validation and transfer, and corrective and preventive actions in response to non-conforming products, processes, and services. Workshop topics focused on excipient composition, organic impurities, PCM, and biologics. Virtual Quality Forums included information on PAIs, complex generics, emerging standards, and regulatory actions related to nitrosamines in medicines. Educational and training programs included instruction on RSs, analytical procedures, bioassays, vaccine good manufacturing practices, and data assurance throughout a product's life cycle. USP-India staff also serve as speakers and panelists at external national and international forums. These activities helped to fulfill Resolution III, on being a scientific leader in quality standards; Resolution VII, on education and training; and Resolution XV, on expanding USP's public health impact by reaching more people in more geographies with USP standards, capability building, and advocacy.



*“We are proud of the work USP-India has done contributing to global standards-setting efforts. The synthesis of several impurities, including nitrosamines, ties in with the solution-oriented approach for addressing pressing public health challenges. Our zeal to explore new areas and technologies was demonstrated by completing three microgrant projects. We delivered multiple USP Education courses, and our high-impact workshops reflected strong collaboration with regulators, industry, and academia. These helped create meaningful platforms for sharing knowledge and charting a path forward.”*  
—Girish Kapur, M.Pharm., M.B.A., Vice President, India Site Operations



USP Biologics develops and modernizes standards for diverse therapeutic products, from peptides and proteins to vaccines and cell and gene therapies. The Biologics program is expanding standards development to cover quality testing throughout the overall biopharmaceutical product life cycle. Expert Volunteers serve on the following ECs: Biologics Monographs 1–Peptides & Oligonucleotides (BIO1), Biologics Monographs 2–Proteins (BIO2), Biologics Monographs 3–Complex Biologics and Vaccines (BIO3), Biologics Monographs 4–Antibiotics (BIO4), and Biologics Monographs 5–Advanced Therapies (BIO5). Throughout FY22, the Biologics program worked to fulfill Resolution IV, which calls for USP to develop standards and other solutions to support innovation in the efficient development and manufacturing of quality biologics and advanced therapies to increase access to these medicines. Work related to additional Resolutions is noted below.

**Key Activities in Biologics**

**Therapeutic Peptides Standards:** The BIO1 EC advanced numerous standards in support of therapeutic peptides. The EC published new and revised monographs for Bivalirudin, Bivalirudin for Injection, Teriparatide, Teriparatide Injection, and Glucagon and approved the respective Reference Standard Candidate Evaluation Packages. High-quality starting material is essential to produce a quality therapeutic peptide. To support the stakeholders in this area, the BIO1 EC developed and published for public comment new *USP General Chapter <1504> Quality Attributes of Starting Materials for the Chemical Synthesis of Therapeutic Peptides*. This work supports Resolution III, on quality standards that provide innovative and agile approaches to address stakeholders’ current and future needs.

**Oligonucleotide Standards:** The BIO1 EC evaluated new physical standards for the starting material for oligonucleotides and phosphoramidites, as well as provided guidance on testing these new standards in development. Starting material quality is a critical component of producing a quality

therapeutic oligonucleotide product. In support of the growing therapeutic class of oligonucleotides, the BIO1 EC held a virtual roundtable with 13 invited stakeholders on May 4, 2022, to understand the challenges industry faces and obtain input on where standards would be beneficial. This work addresses Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution III, on quality standards that address stakeholders’ current and future needs.

**Draft Guidelines for Vaccine Quality:** USP staff and members of the Biologics ECs identified a need for a common set of methods to determine vaccine quality and to help build public trust and confidence in innovative vaccine products. Vaccine experts from USP’s ECs released a series of draft guidelines, including “Analytical Procedures for mRNA Vaccines Quality” in February 2022 and “Analytical Procedures for Viral Vectors Vaccine Quality” in April 2022. USP has received public comments from a broad set of global stakeholders, including vaccine manufacturers, biopharma companies, regulators, and

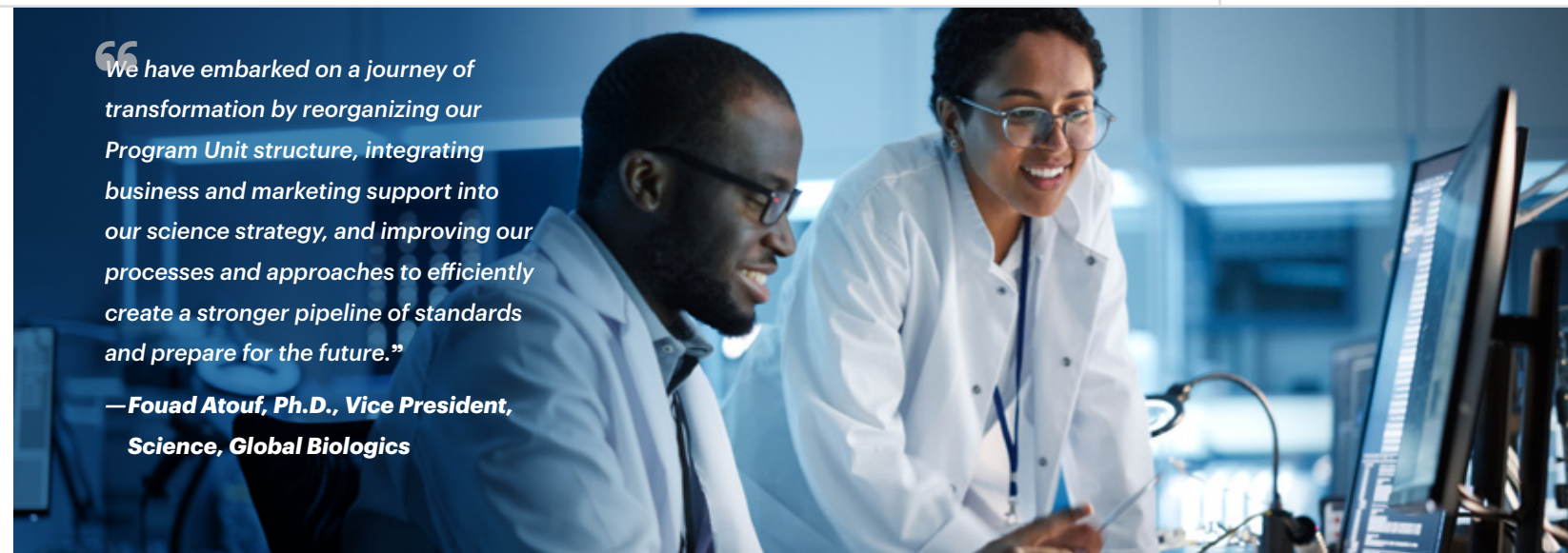
vendors. This work relates to Resolution I, on collaboration with stakeholders on health priorities; and Resolution III, on quality standards that provide innovative and agile approaches to address stakeholders’ current and future needs.

**Cell and Gene Therapy Product Standards:** The BIO5 EC explored standards for gene therapies, gene-modified cell therapies, non-oligonucleotide-based gene editing, tissue engineering, and mRNA and cell therapies. Additionally, subcommittee activities continued on a major revision of *USP General Chapter <1047> Gene Therapy Products*, which will focus on elements common to various gene therapies. This work addresses Resolution II, on efficiency in standards development and revisions to continuously optimize their impact.

**Adeno-Associated Virus (AAV) Gene Therapy EP:** USP selected the Chair and members of the new AAV Gene Therapy EP of the BIO5 EC in February 2022. This EP was formed to develop a new general chapter with best practices for AAV vector design, manufacturing, quality

“We have embarked on a journey of transformation by reorganizing our Program Unit structure, integrating business and marketing support into our science strategy, and improving our processes and approaches to efficiently create a stronger pipeline of standards and prepare for the future.”

— Fouad Atouf, Ph.D., Vice President, Science, Global Biologics



control, and regulatory considerations. The EP will also advise on suitable physical RSs that could accelerate the development of gene therapies. This work relates to Resolution V, on exploring the development of quality standards and solutions to help stakeholders safeguard the quality of promising healthcare innovations that address patient and public health needs.

**Microbial Assay Transition:** The BIO4 EC made progress transitioning antibiotics with microbial assays to analytical-based methods for potency assignment. A subcommittee of the BIO4 EC developed a protocol for the bridging studies laboratories use to transition to analytical-based methods. The first protocol was developed for chlortetracycline hydrochloride and is anticipated to be applied to other antibiotics as well. USP is exploring external collaborations for microbial assay transition based on the protocol. These activities address Resolution I, on collaboration with stakeholders; and Resolution V, on innovation.

**Protein Therapeutics Standards:** The BIO2 EC approved a new performance standard for methoxy polyethylene glycol aldehyde used in the production of pegylated protein therapeutics. This supports ongoing work related to the quality of raw and starting materials that are a critical part of pharmaceutical manufacturing. The USP monoclonal antibody 001, 002, and 003 RSs were updated with information on charge variant analysis using analytical techniques such as capillary isoelectric focusing and imaged capillary isoelectric focusing. Additionally, a proposed new *USP General Chapter <1023> Evaluation Strategy for Trace Elements in Cell Culture Media Used in the Manufacture of Recombinant Therapeutic Proteins* has been written and approved for publication in *PF*. This chapter addresses a common concern among stakeholders and provides strategies to address it. These activities address Resolution I, on collaboration with stakeholders on health priorities.

**Heparin Species Identification Methods:** The BIO3 EC Heparin Subcommittee made progress on

species identification methods for unfractionated heparins. The Subcommittee evaluated the data from nuclear magnetic resonance (NMR) and disaccharide analyses for porcine-, ovine-, and bovine-derived heparin. The NMR and disaccharide methods will be posted at USP.org for public comment. This work relates to Resolution II, on efficiency in standards development.

**USP Biologics Supported Virtual Stakeholder Outreach Events:** The following stakeholder outreach events align with Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution VII, on education and training for industry and healthcare professionals:

- “Shaping Tomorrow’s Solutions to Today’s Biologics Quality Challenges,” a stakeholder forum held on August 10 and 12, 2021, with more than 100 attendees. The event provided an opportunity for USP staff to engage with industry leaders and regulators and helped shape the development of quality standards that support in-process analysis of biologics.

“The BIO1 EC progressed its work plan of activities focused on documentary and reference standards associated with therapeutic peptides and oligonucleotides. Stakeholder engagement was a strategic area of emphasis.”

—Michael R. De Felippis, Ph.D.,  
Chair, BIO1 EC



- “AAV Roundtable” on AAV-based gene therapy products, held on December 7 and 9, 2021, with 17 panelists from industry and government. Panelists shared best practices for analytical testing of AAV-based products and discussed challenges, bottlenecks, and opportunities for standardization with 67 registered participants from industry and government.
- “Implementation of At-Line and In-Line Analytical Tools for Biomanufacturing Process Development and Monitoring,” a roundtable held on February 24, 2022, with 15 invited experts. USP staff noted a need for best practices on adopting tools that enable rapid, real-time quality measurements to support decision making and lower manufacturing costs.
- “USP Workshop on Therapeutic Peptides and Oligonucleotides,” held on February 28–March 4, 2022. More than 300 attendees participated in the event, which featured presentations and panel discussions with industry members and regulators on quality and regulatory

approaches to support peptide and oligonucleotide products.

- “USP Standards to Support Quality of COVID-19 Vaccines for the Global Community,” held on March 7, 2022, as part of the World Vaccine Congress. More than 370 representatives from industry, associations, academia, and regulatory authorities participated in this event, which included a panel discussion on vaccine development, quality, and manufacturing. Additionally, during the World Vaccine Conference in Washington, DC, on April 20, 2022, USP shared information on the recently published mRNA and viral vector vaccine guidelines to raise awareness of this work and identify future partnerships that might accelerate delivering quality methods to the public.

**USP Biologics Supported Education/ Training Courses:** The following activities help to fulfill Resolution VII, on education and training for industry and healthcare professionals:

- USP’s Work Supporting Multi-Attribute Methods for Biologics, available as an on-demand course.
- Challenges of Bioassay Development and Specification Assessment for Biosimilar Product with Multiple Mechanisms of Action, an on-demand course.
- USP General Chapter <129> *Analytical Procedures for Recombinant Therapeutic Monoclonal Antibodies*, an on-demand course.
- “Quality Control of Vaccines Manufacturing,” a live webcast from September 13–14, 2021.
- “Residual DNA Testing,” a live webcast from September 28, 2021.
- “Development and Validation of Bioassays for Advanced Therapies,” presented by USP Biologics and General Chapters staff as a virtual training session on January 19–20, 2022. Some 200 regulators from the Asia-Pacific Economic Cooperation (APEC) region attended via the USP-APEC Center of Excellence for Advanced Therapies.

## FY22 Highlights: Biologics

- |  |  |
|--|--|
| 1 New General Chapter in the Compendium            | 1 Major General Chapter Revision Published in PF |
| 1 Major General Chapter Revision in the Compendium | 2 New Monographs Published in PF                 |
| 4 Monograph Revisions in the Compendium            | 6 Monograph Revisions Published in PF            |
| 2 Monograph Modernizations in the Compendium       | 3 Monograph Modernizations Published in PF       |
| 3 New RSs (F Lots) Released                        |  |
| 1 New General Chapter Published in PF              |  |

“The BIO5 EC has emphasized engaging stakeholders to raise awareness and explain USP’s growing collection of standards for raw and ancillary materials.”

—Mehrshid Alai, Ph.D., Chair, BIO5 EC



The Small Molecules group develops and revises monographs for drug substances and associated manufactured dosage forms for human and veterinary use.

Monographs for diagnostic imaging agents are also included in this category.

Expert Volunteers serve on the following ECs: Small Molecules 1, Small Molecules 2, Small Molecules 3, Small Molecules 4 (SM4), Small Molecules 5, and Over-the-Counter (OTC) Methods and Approaches. Together, the Small Molecules group is a champion for quality medicine by providing high-quality, up-to-date standards and unique services across the product development life cycle to small molecule manufacturers and regulatory agencies worldwide.

### Key Activities in Small Molecules

#### Safeguarding Patients from Nitrosamine Impurities in Medicines:

Small Molecules and General Chapters collaborated with USP laboratories and Expert Volunteers serving on USP's Nitrosamine Impurities Joint Subcommittee (JS) to develop *USP General Chapter <1469> Nitrosamine Impurities*, which became official on December 1, 2021. This chapter provides information, tools, and recommendations to help users understand potential sources of nitrosamine impurities, assess risk, and establish control strategies and suitable methods to control nitrosamines in pharmaceutical products. USP continued its activities in stakeholder engagement activities for <1469>, including pharmacopeial education training in all regions. This work addresses Resolution III, on being a recognized scientific leader in public quality standards to help protect patient and consumer safety; and Resolution VII, on education and training.

#### Global Substance Registration System (G-SRS) and Dictionary of U.S. Adopted Names (USAN) and International Drug Names:

The Small Molecules Chemical Information team, in collaboration with the Information Technology and Reference Standards Evaluation teams, continued to work toward developing USP's G-SRS as the central repository of chemical information across all USP publications. The team's contributions supported the relaunch of the *USP Dictionary of USAN and International Drug Names* with new features on March 28, 2022. New features include a new user interface and improved search and retrieval of nonproprietary drug names, chemical structures, and commonly used codes. This work addresses Resolution XIV, on operational excellence, continuous improvement, stakeholder responsiveness, and transparency.

#### USP Nitrosamine Exchange Pilot:

USP explored how to establish and leverage online knowledge hub communities as a new way to engage

stakeholders in scientific knowledge exchange on topics of strategic interest to USP. By the end of FY22, the Nitrosamine Exchange pilot had grown to more than 1,500 members. The vision is for this community of stakeholders to participate in real-time conversations and share knowledge, information, and challenges about nitrosamine impurities. These efforts align with Resolution I, on collaboration with stakeholders on health priorities; Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution XIII, on coalition building to advance public health and patient safety.

#### OTC Drug Product Standards:

OTC drugs play an important role in maintaining patients' well-being. Products marketed under the FDA OTC Monographs do not go through FDA's premarket approval process and frequently lack specific drug product compendial standards. USP, FDA, and the Consumer Healthcare Products Association have committed

“Providing quality and accessible medicines is our priority.... More than ever, the COVID-19 pandemic has not delayed our work as we continue to work through all challenges to establish the necessary standards with our monographs.”

—Kim Huynh-Ba, M.S., Chair, SM4 EC

to work collaboratively to develop and implement a path forward on establishing product-specific compendial standards. The Small Molecules group published a *Stimuli* article in *PF* 48(3), titled “Over the Counter Drug Product Standards: Challenges and Potential Paths Forward.” This article summarizes the challenges to creating standards for OTC products, past efforts, current approaches, and a potential path forward developed within this collaborative effort. The article is a call to action to engage with stakeholders on future directions. This work addresses Resolution I, on collaboration with FDA and other stakeholders on health priorities; and Resolution II, on the efficient sharing of information that is critical to standards development.

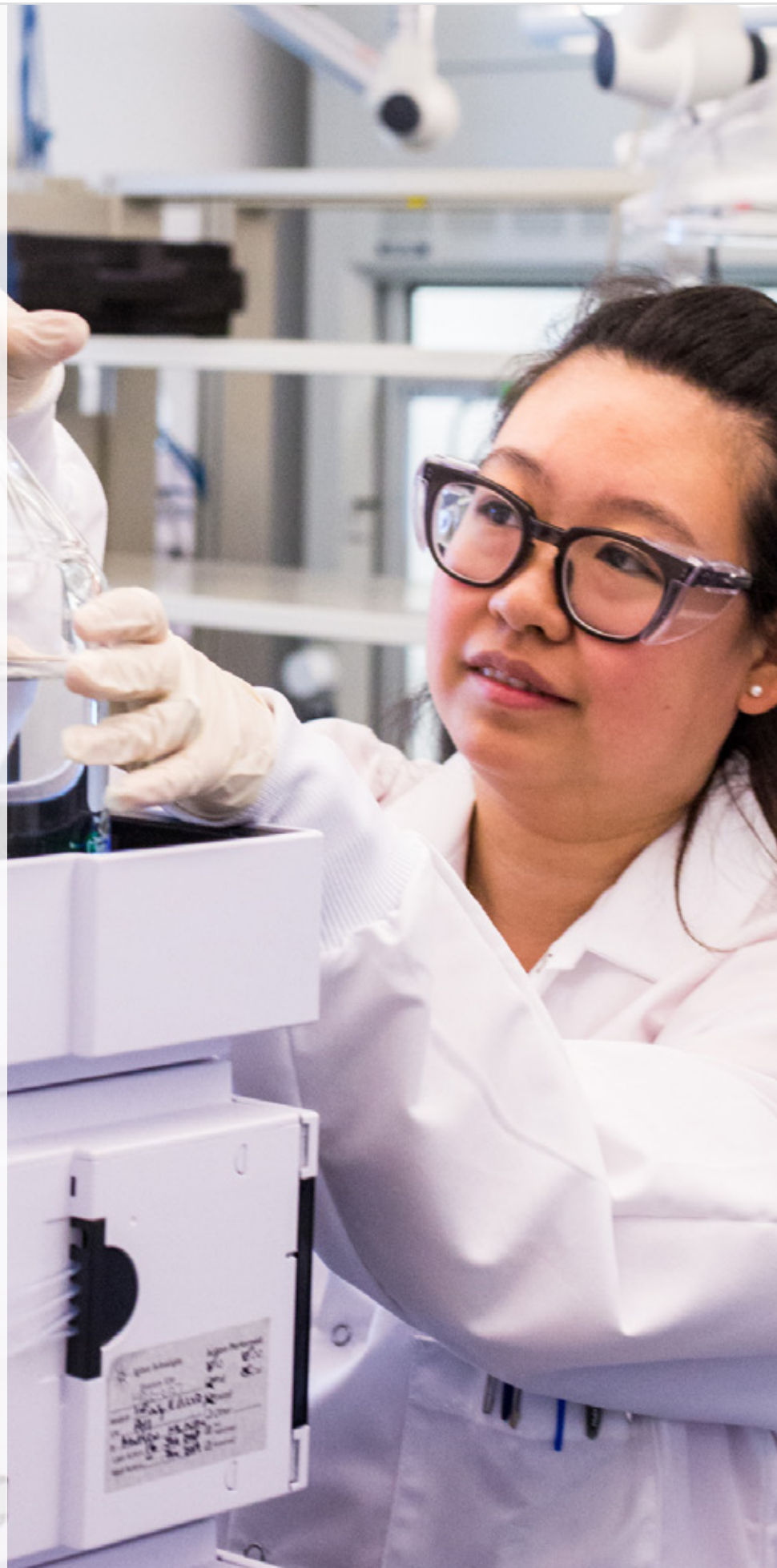
**Emerging Standards:** The Small Molecules group published a *Stimuli* article in *PF* 48(3), titled

“USP's Iterative Approach to Standards Development and the ‘Emerging Standards’ Concept.” This paper outlines why iterative approaches to standards development are increasingly important and introduces the concept of an “emerging standard” as a standard under development that is made available at an earlier stage for stakeholder input and contributions. Emerging standards are intended to improve USP's official standards elaboration process by increasing transparency and allowing for broader stakeholder participation prior to formal notice and comment through publication in *PF*. The first two examples of emerging standards were published along with this article. These activities align with Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution V, on the development of innovative standards and solutions.



“Throughout FY22, the Small Molecules group made significant contributions to the development of quality standards and solutions that guide the quality of medical products throughout the supply chain. I’m proud of the passion and commitment of the Small Molecules team and our work that has helped to ensure access to safe, quality medicines people can trust.”

—Edwin L. Gump, Ph.D., Vice President, USP Small Molecules



In support of the *Stimuli* article on emerging standards, the Small Molecules group and the Analytical Development Laboratory staff have been actively engaging industry stakeholders on the emerging standards concept. An overview of emerging standards was presented to members of the Mid-West Compendial Discussion Group on June 15, 2022, and to members of the New Jersey Pharmaceutical Quality Control Association on June 21, 2022. This concept was also shared with the FDA during the FDA-USP Quarterly Meeting on May 10, 2022. These efforts helped to fulfill Resolution VII, on education and training for industry and healthcare professionals.

**Prescription/Non-Prescription (PNP) Stakeholder Open Forum:**

More than 150 participants from industry, regulatory agencies, associations, and academia attended USP’s virtual PNP Stakeholder Forum on April 11-12, 2022. Attendees had an opportunity to engage and exchange information and perspectives with presenters on compendial issues related to PNP drug quality standards and improved USP standards. Topics included USP updates and standards prioritization, cases for monograph modernization, mechanisms for enhanced stakeholder engagement, and an introduction to *USP General Chapter <1220> Analytical*

*Procedure Life Cycle*. These efforts align with Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution III, on quality standards that help to safeguard consumers and meet stakeholders’ needs.

**Analytical Method Validation Training:**

USP Small Molecules staff from USP-India offered analytical method validation training at the Federation of Asian Biotech Associations’ virtual workshop on chromatography techniques. The training emphasized the importance of properly validating methods to ensure the quality of pharmaceutical products. This activity helped to fulfill Resolution VII, on education and training for industry and healthcare professionals.



**FY22 Highlights: Small Molecules**

- 121 Monograph Modernizations Published in the Compendium
- 16 New Monographs Published in the Compendium
- 109 Monograph Revisions Published in the Compendium
- 71 Monograph Modernizations Published in *PF*
- 31 New Monographs Published in *PF*
- 39 Monograph Revisions Published in *PF*

The Dietary Supplements and Herbal Medicines (DSHM) group helps protect and improve the health of millions of people who use DSHM. Expert Volunteers who serve on the Botanical Dietary Supplements and Herbal Medicines (BDSHM) and Non-Botanical Dietary Supplements (NBDS) ECs develop and revise monographs, general chapters, and USP RSs for the *USP–NF, Dietary Supplements Compendium (DSC) Online, and Herbal Medicines Compendium*. Expert Volunteers who serve on the Dietary Supplements Admission Evaluation and Labeling EC determine the admissibility of dietary supplement articles for monograph development, monitor the literature on the safety of dietary ingredients, and contribute to projects related to safety assessments of DSHM ingredients.

**Key Activities in Dietary Supplements and Herbal Medicines**

**Delta-8-THC Product Impurities:** USP is reviewing information on the identity of impurities in synthesized delta-8-THC products and developing analytical methods to separate these impurities using chromatographic methods. This work extends the Cannabis EP’s commentary on the public health concerns regarding delta-8-THC to facilitate systematic scientific studies supported by quality research materials and methods. These activities support Resolution X, which encourages USP to leverage its scientific expertise and convening power to collaborate with stakeholders and develop fit-for-purpose scientific resources and solutions that will help address quality-related concerns as well as support additional scientific research on cannabis, cannabis-derived products, and cannabis-related compounds.

**Cannabis-Related Outreach:** The following activities support Resolution X:

- USP submitted comments on the discussion draft of the Cannabis Administration and Opportunity Act. These comments emphasized the need for requirements for public quality standards for legally marketed cannabis-derived products.
- USP provided public comments to the FDA draft guidance on cannabis quality considerations for clinical research and to state regulators on a proposed rule and state bill.
- USP submitted comments about cannabis quality attributes to Health Canada, the National Conference on Weights & Measures, and the American Council of Independent Laboratories. These comments highlight the quality parameters that are relevant for measuring cannabinoids.
- USP staff shared cannabis quality perspectives with the state Cannabis Regulators Association and trade groups.

- USP staff presented pharmacopeial perspectives on quality considerations for cannabis-derived compounds at a virtual botanical science seminar held by FDA’s Center for Drug Evaluation and Research on September 28, 2021.

**Quality Specifications for Cannabidiol (CBD):** The BDSHM EC and its Cannabis EP developed proposed quality specifications for CBD as a drug substance. The monograph proposal for CBD as a drug substance was published in *PF 48(1)* [Jan.–Feb. 2022] for public comment. The proposal includes analytical methods and acceptance criteria for CBD identification, quantitative estimation, and contaminant limits. USP laboratories are continuing work on providing appropriate RSs to limit impurities. This work supports Resolution X, on cannabis, cannabis-derived products, and cannabis-related compounds.

**Probiotics Progress:** USP made significant progress on the development of a probiotic genomic DNA RS. USP staff co-chaired a session titled “Challenges and Solutions in Probiotic Strain Identification” on August 30, 2021, at the virtual 2021 AOAC Annual Meeting. USP also held an Open Forum on probiotic enumeration using Analytical Procedure Life Cycle Management on June 16, 2022. These activities support Resolution II, on the efficient sharing of information that is critical to standards development; Resolution III, on being a scientific leader in quality standards; and Resolution VII, on education and training.

**New EP Increases International Activities:** DSHM initiated a new EP focused on botanicals from the Pan-American region to join the existing South Asia and East Asia EPs, increasing USP’s international activities related to the development of botanical monographs. This work addresses Resolution II, on the efficient development, revision, and sharing of information that is critical to standards development; and Resolution XV, on expanding USP’s public health impact by reaching more people in more geographies with USP standards, capability building, and advocacy.

**Modern Analytical Methods:** DSHM continued its work on the Modern Analytical Methods JS composed of experts in qNMR, chemometrics, high-performance thin-layer chromatography, and mass spectrometry as well as USP staff from the Food Ingredients EC,

Digital & Innovation division, and Regions & Program Operations/Scientific Affairs. The JS’s long-term goal is to enhance compendial use of Modern Analytical Methods techniques. These activities are in accordance with Resolution I, on collaboration with stakeholders on health priorities; and Resolution III, on identifying emerging trends and developing innovative and agile approaches in evolving global regulatory environments

**Selected Published Papers:** Staff collaborated on the following articles, in alignment with Resolution I, on collaborating with FDA, industry, and other stakeholders on health priorities:

- A paper titled “Pharmacopeial Standards for the Quality Control of Botanical Dietary Supplements in the United States,” published in the *Journal of Dietary Supplements* in October 2021. The article included perspectives from the European Directorate for the Quality of Medicines & HealthCare, Health Canada, the *Chinese Pharmacopoeia*, and the *American Herbal Pharmacopoeia*.
- An article titled “Development and Validation of a Species-Specific PCR Method for the Identification of Ginseng Species Using Orthogonal Approaches,” which was published in the peer-reviewed international journal *Planta Medica* in August 2021. The paper resulted from a collaboration between USP, FDA, and industry laboratories and investigated the orthogonal use of DNA-based methods and chromatographic methods for

“To further increase diversity, equity, inclusion, and belonging regarding the expertise needed by the BDSHM EC, the BDSHM Pan-American Expert Panel was formed this cycle and has already held three meetings. This Expert Panel brings expertise from ten countries on scientific, cultural, manufacturing, and regulatory aspects to our EC, complementing the input from our existing East Asia and South Asia Expert Panels.”

—Robin Marles, Ph.D., Chair, BDSHM EC

“I am proud of USP’s cannabis quality guidelines and analytical tools for regulators and industry. Given the increasing use of different kinds of cannabis products for medical purposes, these USP resources help ensure patient safety and enable research with well-characterized materials.”

—Nandakumara D. Sarma, Ph.D., Director, Dietary Supplements & Herbal Medicines Standards



the identification of three ginseng species. The paper presented the strengths and challenges associated with genomic methods.

- An article titled “What Should Clinicians Know about Dietary Supplement Quality?” was published in the *AMA Journal of Ethics* in May 2022. The article outlines how clinicians can evaluate dietary supplement product quality, assess manufacturers’ adherence to public quality standards, and encourage use of verification and certification programs.

**DSHM Group Virtual Events:** USP hosted or cosponsored the following stakeholder events in alignment with Resolution I, on collaboration with stakeholders on health priorities; Resolution II, on efficiency in standards development and revision; Resolution III, on identifying emerging trends and developing innovative and agile approaches in evolving global regulatory environments; and Resolution VII, on education and training for industry and healthcare professionals:

- “2021 Virtual USP Dietary Supplements and Herbal Medicines Stakeholder Forum” on September 14–15, 2021, attended by 230 individuals from industry, academia,

and regulatory agencies. This event focused on dietary supplement analytical methods, quality specifications, analysis, and homology of new dietary ingredients. It also provided an opportunity to gather stakeholder feedback for current and future standards-setting efforts.

- “6th International qNMR Summit” on October 5–7, 2021, attended by some 330 individuals from 28 countries. USP and the Center for Natural Product Technologies at the University of Illinois Chicago cosponsored this event, which surveyed the latest advances in qNMR applications and methodologies, with a special emphasis on education. The inaugural George Hanna Award for Advancement of qNMR was presented. A paper titled “The qNMR Summit 5.0: Proceedings and Status of qNMR Technology,” which provides an overview of the prior summits, was published in *Analytical Chemistry* with a USP-produced supplementary cover that underscores the significance of the event. A follow-on workshop, the USP qNMR Symposium, held on November 16–17, 2021, attracted more than 450 participants, chiefly from Asia and Southeast Asia.

- “Modernization of USP Amino Acid Monographs,” an Open Forum on March 21, 2022, attended by 65 individuals from industry, academia, and regulatory agencies. Subject matter experts presented information on the history of USP amino acid modernization efforts, concerns related to amino acid impurities, and USP Histidine monograph revision plans.

- “Impurities and Contaminants in Dietary Ingredients and Dietary Supplements,” an Open Forum on April 21, 2022, attended by 165 individuals from industry, academia, and regulatory agencies. Topics included the need for a general chapter on impurities and contaminants in dietary ingredients and dietary supplements as well as the complexity of dietary supplement identity and purity testing from the perspective of a contract testing laboratory. The program included a panel discussion on risk assessment and risk management and a questions and answers (Q&A) session.

- “Comparing Probiotic Plate Count Methods,” an Open Forum on June 16, 2022, attended by 175 individuals from industry, academia, and regulatory agencies. Topics

included USP’s approach to probiotic enumeration, an overview of USP General Chapter <1220> *Analytical Procedure Life Cycle* for colony-forming unit enumeration of probiotics, and a comparison of probiotic plate count methods using the analytical procedure life cycle management framework. The program included a panel discussion and Q&A session.

**DSHM Expands Its International**

**Activities:** USP staff participated in the following activities in alignment with Resolution XV, on expanding its public health impact by reaching more people in more geographies with USP standards, capability building, and advocacy:

- An invitation for staff to serve as a technical expert to help the Food and Agriculture Organization of the United Nations/World Health Organization International Food Safety Authorities Network (INFOSAN) develop globally harmonized terminology and quality requirements for dietary supplements among the regulators. USP staff contributed to the planning of the INFOSAN regulators conference and presented perspectives on dietary supplement quality.
- The development of future workshops on dietary supplement quality following USP staff presentations to, and discussions with, the Republic of Korea’s National Institute of Food and Drug Safety and Brazil’s National Health Surveillance Agency. USP staff also participated on a panel about botanical products with regulators from Latin America.



“This year, the DSHM group has concentrated on important topics that affect the quality of dietary supplements, including amino acids, probiotics, and impurities and contaminants. Our work in these areas and outreach to stakeholders will lead to improved standards and ingredients in the marketplace.”

—Kit Goldman, Ph.D., Director, Dietary Supplements & Herbal Medicines – Science

**FY22 Highlights: Dietary Supplements and Herbal Medicines**

**Submitted to PF**

- 22 New Monographs
- 8 Monograph Modernizations
- 4 Omissions
- 3 Revision Bulletins
- 20 Monograph Revisions

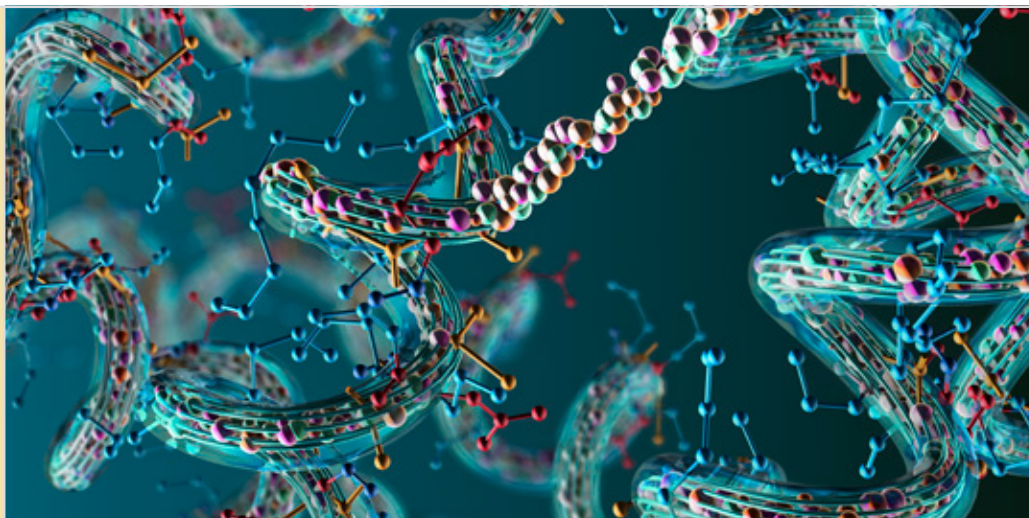
**Published in the Compendium**

- 1 New General Chapter
- 56 New Monographs, Modernizations, and Revisions
- 2 Omissions
- 13 Errata
- 9 New RSs (F Lots) Released

DSC Online was updated in 2022 with 11 new and 6 modernized admission evaluation summaries, 4 revised illustrations, and 11 new illustrations.

“The NBDS EC supported capacity building and innovation by modernizing monographs with analytical challenges (amino acids, fish oils), continued its work on the Modern Analytical Methods Joint Subcommittee, and contributed to fully renovated USP General Chapters <761> Nuclear Magnetic Resonance Spectroscopy and <1761> Applications of Nuclear Magnetic Resonance Spectroscopy.”

—Guido F. Pauli, Ph.D., Chair, NBDS EC



Excipients—considered “inactive” ingredients in medicine—actually play an essential role in delivering APIs to their targets and can comprise up to 90% of a medication. Therefore, they are critically important to how well a drug functions in the body and can cause great harm to patients if their quality is poor. The Excipients group helps ensure that excipients are fit for purpose and addresses potential threats from the complexities of global supply chains and quality deficiencies that may arise in the absence of appropriate good manufacturing practices (GMPs). Expert Volunteers who serve on the Simple Excipients (SE) and Complex Excipients (CE) ECs develop new—and revise existing—monographs and their associated RSs for pharmaceutical excipients. Expert Volunteers on the Excipients Test Methods (ETM) EC are responsible for developing and updating excipient-related general chapters.

### Key Activities in Excipients

#### Talc Monograph Revisions and

**Supporting General Chapters:** USP staff continued to work with the SE EC, ETM EC, and Talc EP to update the USP Talc monograph, including a proposed title change and updating or removing related tests. The USP Talc monograph revision and proposed new supporting USP General Chapters <901> *Detection of Asbestos in Pharmaceutical Talc* and <1901> *Theory and Practice of Asbestos Detection in Pharmaceutical Talc* were published in PF 48(2). These efforts align with Resolution II, on efficient standards development and revision; and Resolution III, on quality standards that help to safeguard consumers and meet stakeholders’ needs.

#### Developing Monographs for Ultrapure and Highly Pure Soybean Lecithin:

The CE EC developed and published new monographs for Soybean Phosphatidylcholine, an ultrapure form of soybean lecithin, in PF 46(6) [Nov.–Dec. 2020] and Soybean Phospholipids, a highly pure form of soybean lecithin, in PF 48(2). These soybean lecithin products are used

in many pharmaceutical applications, including injectable dosage forms, and require an analytical control strategy for testing that differs from those currently used for testing lecithin. This work aligns with Resolution V, on the development of innovative standards and solutions.

#### Exploring Complex Excipients:

Using an iterative approach, the ETM EC developed two proposed new general chapters that cover synthetic polymeric excipients: USP General Chapter <313> *Molecular Weight and Polymer Chain Length Determination for Polypropylene Glycol Fatty Ethers* and USP General Chapter <314> *Molecular Weight Determination for Copolymers Containing Alkyl Methacrylate or Alkyl Acrylate*. Both were published for public comment in PF 47(5). In addition, the ETM EC is in the preliminary stages of developing a new USP General Chapter <312> *Molecular Weight Determination for Alginates*, which covers natural polymeric excipients. Public input on the <312> prospectus, published October 29, 2021, was shared with the ETM EC. The General Chapter <312> proposal is

anticipated to be published in PF 48(6) [Nov.–Dec. 2022]. These efforts help to fulfill Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution III, on developing innovative and agile approaches to address current and future needs of industry, regulators, practitioners, consumers, and patients.

#### Monograph Standards for Polymeric

**Excipients:** Pharmaceutical polymeric excipients made from lactide, lactic acid, glycolide, or glycolic acid monomers (LG polymers) are used in many complex extended-release drug products and medical devices approved by FDA. However, generic drug products that include LG polymers have yet to gain FDA approval due to many complexities in formulation, characterization, and evaluation of test products. USP has been working to develop monographs for these excipients and provide advanced quality testing methods to facilitate excipient selection and regulatory evaluation. The CE EC published a new monograph for DL-Lactide and Glycolide (50:50) Copolymer 12000

Acid in PF 48(3) and submitted a new monograph for DL-Lactide and Glycolide (50:50) Copolymer 12000 Ethyl Ester for publication to PF 48(6). Additionally, Excipients staff presented an update highlighting the key challenges of developing LG Polymer monograph specifications at the 2022 Excipient World Conference & Expo in May 2022. This work relates to Resolution V, on exploring the development of quality standards and solutions to help stakeholders safeguard the quality of promising healthcare innovations that address patient and public health needs.

#### Methanol Contamination in Hand

**Sanitizers:** The SE EC posted Revision Bulletins for the Isopropyl Alcohol and Azeotropic Isopropyl Alcohol monographs on July 30, 2021, with a six-month extended implementation time. This provides stakeholders the time to implement additional changes with regard to the Limit of Volatile Impurities test, which includes the addition of methanol as a specified impurity and the use of a RS to quantify methanol. These efforts align with Resolution II, on

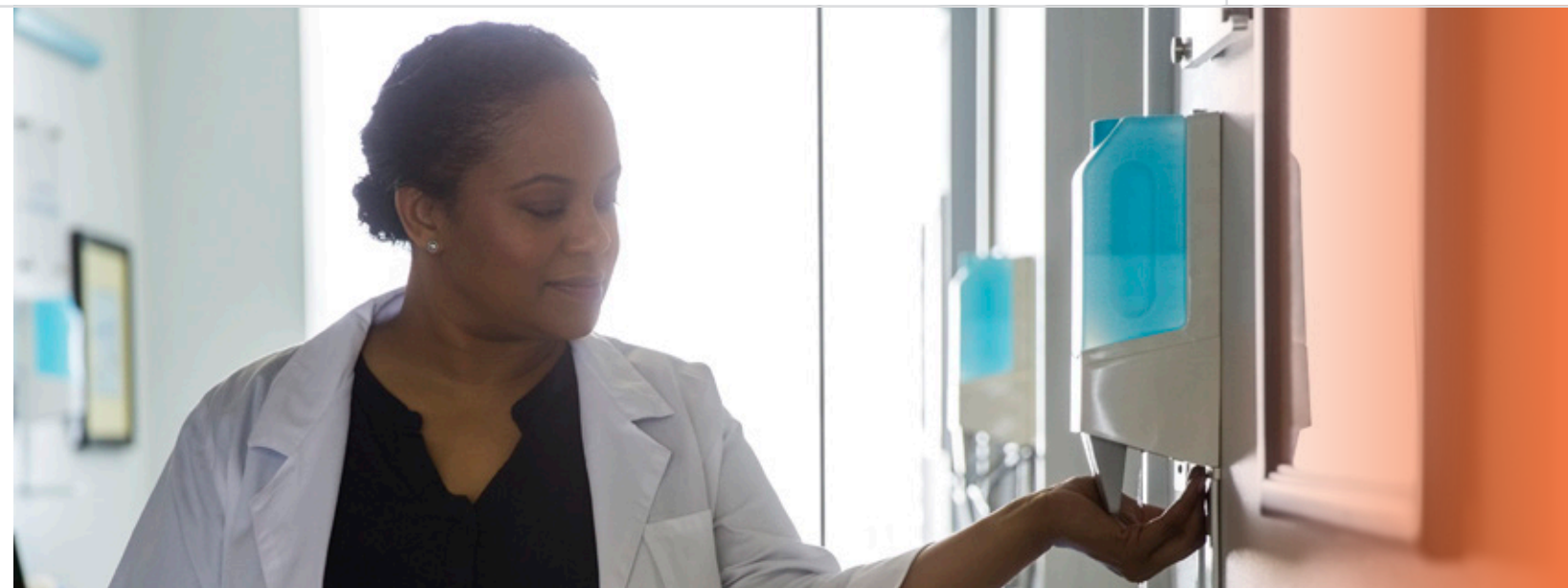
the efficient sharing of information that is critical to standards development; Resolution III, on quality standards that help to safeguard consumers and meet stakeholders’ needs; and Resolution VIII, on collaboration with global regulators and other partners to strengthen regulatory systems.

#### PDG Harmonization of Petrolatum

**and White Petrolatum:** The PDG has finalized the development of these two new harmonized standards among the *Ph.Eur.*, *JP*, and *USP*. With the support of stakeholders, an appropriate analytical procedure and limit for polycyclic aromatic hydrocarbons (PAH), which are toxic carcinogens, have been established. The harmonized test method was developed based on comprehensive comparative studies and extensive sample testing. The PAH specification limits also accommodate regulatory requirements in the three regions. This work supports Resolution XI, on pharmacopeial cooperation and convergence.

“The Simple Excipients EC has been able to work through the continuing challenges caused by the COVID-19 pandemic to ensure continued excipient quality and address supply chain issues. For example, the Isopropyl Alcohol and Azeotropic Isopropyl Alcohol monographs were updated to avoid exposing people to methanol and potentially significant side effects, such as blindness and death.”

—Eric J. Munson, Ph.D., Chair, SE EC





“The Complex Excipients EC is working on solutions to bring quality products to patients without disrupting the supply chain.”

—Otilia Koo, Ph.D., Chair, CE EC

**Excipient Composition and Organic Impurities:**

USP, in partnership with the Indian Pharmaceutical Alliance, held a virtual workshop titled “Excipient Composition and Organic Impurities” on September 15–16, 2021. An estimated 140 individuals attended, including government regulators, international academics, and industry experts. The event featured presentations on nitrosamines in excipients, discussions on potential collaborative opportunities, and attendee input on setting compendial specifications for excipient composition and organic impurities. These activities address Resolution VII, on education and training for industry and healthcare professionals; Resolution XIII, on coalition building to advance public health and patient safety; and Resolution XV, on expanding USP’s public health impact by reaching more people in more geographies with USP standards, capability building, and advocacy.

**Published Papers:** These activities align with Resolution II, on the efficient sharing of information that is critical to standards development:

- Excipient Nomenclature Guidelines have been completed and are anticipated to be posted on USP.org.
- USP staff and the LG Polymer JS published a *Stimuli* article titled “A Practical Approach to Compendial Nomenclature and Testing for Lactide and Glycolide Polymers and Related Polymeric Excipients” in *PF* 48(2). The article reviews the synthesis, structure/function relationship, formulation application, and analytical testing of pharmaceutical LG polymers and related excipients. It also proposes nomenclature that facilitates individual and umbrella monographs for these pharmaceutical excipients.

“We have continued to focus on developing and updating standards to help ensure the quality of excipients throughout the supply chain and that they are fit for purpose to safeguard consumers and address stakeholder needs. We’ve continued to identify opportunities to collaborate with stakeholders on utilizing the Science Quality Framework’s iterative and emerging approaches for introducing advanced testing methods and novel excipients.”

—Catherine M. Sheehan, M.S., M.S., DRSc., Senior Director, Growth Programs—Foods and Excipients

**FY22 Highlights: Excipients**

- 7 New Monographs Published in *PF*
- 5 Revised Monographs Published in *PF*
- 14 Modernized Monographs Published in *PF*
- 4 New General Chapters Published in *PF*
- 37 F Lot, R Lot, and C Lot Releases
- 7 Modernized Monographs Published in *USP-NF 2022, Issue 1*
- 1 Revised Monograph Published in *USP-NF 2022, Issue 1*
- 1 Minor General Chapter Revision Published in *USP-NF 2022, Issue 1*
- 1 New Monograph Published in *USP-NF 2022, Issue 2*
- 3 Modernized Monographs Published in *USP-NF 2022, Issue 2*
- 3 Modernized Monographs Published in *USP-NF 2022, Issue 3*





Expert Volunteers who serve on the Food Ingredients (FI) EC focus on developing standards for FIs to ensure the identity, quality, and purity of food additives, processing aids, flavors, colors, and other substances used to manufacture food products. These standards are published in the FCC, which is used by product developers, ingredient suppliers, food manufacturers, testing laboratories, and regulators in the U.S. and internationally. The FI EC works closely with the BDSHM and NBDS ECs to coordinate the development of standards for substances that are used as both FIs and dietary ingredients.



“FY22 was a year of significant gains for the FI EC and the FCC. We have adopted standards and guidance to combat food fraud in dietary proteins and honey... We also adopted standards for Hemp Protein and Hemp Oil and held a successful FCC roundtable involving the collaborators to support the specifications that had been set.”  
—Jonathan DeVries, Ph.D., Chair, FI EC

## Key Activities in Food Ingredients

### FCC, Thirteenth Edition (FCC 13),

**Released:** [FCC 13](#), the first online-only edition of FCC, along with associated commentary, was released on March 1, 2022. FCC 13 includes the following:

- First-ever monographs for Hemp Seed Oil and Hemp Seed Protein FIs that include analytical methods and specifications on purity attributes relevant to hemp seed products, including limits on cannabinoids
- A new Identity Standard for Avocado Oil, an emerging high-value food oil

These efforts align with Resolution II, on the efficient sharing of information that is critical to standards development; Resolution III, on quality standards that help to safeguard consumers and meet stakeholders’ needs; and Resolution X, related to scientific research on cannabis, cannabis-derived products, and cannabis-related compounds.

### FCC High-Impact Standards:

The FCC Identity Standard for Honey was published in FCC 12, *Third Supplement*. This standard provides practical information on multiple characteristics and analytical tests that can be used to assist analysts in determining the authenticity of honey. The Foods team has also continued its work on standards for high-value food oils and plant-based proteins that have been rapidly gaining consumer interest. These activities align with Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution III, on quality standards that help to safeguard consumers and meet stakeholders’ needs.

### Amino Acid Fingerprinting for Protein

**Ingredients:** This new analytical method was proposed for addition to Appendix XVI: Protein-Based Ingredients in the FCC Forum in December 2021. This method

was developed by the Dietary Proteins EP of the FI EC as part of a larger body of work to provide stakeholders with modern analytical techniques for the identification and characterization of protein-based ingredients. Additionally, a new monograph for Mycoprotein, an innovative fungal protein ingredient, was proposed in the December 2021 FCC Forum. These activities are in accordance with Resolution I, on collaboration with stakeholders on health priorities; and Resolution III, on identifying emerging trends and developing innovative and agile approaches in evolving global regulatory environments.

### FCC Analytical Materials Program:

The Foods team continued its work on the new FCC Analytical Materials (FAMs) program’s initial offerings, which include validated methods and physical analytical materials to verify the gluten-free status of oat products. FAMs are

validated, commercially representative samples of FIs that are fit for purpose for the food industry and food testing laboratories in areas that complement FCC standards. Additional FAMs for whey protein method development are expected to be released in FY23 Q1. This work aligns with Resolution V, on the development of innovative, fit-for-purpose solutions.

### Isopropyl Alcohol Monograph

**Modernization Proposal:** A proposal for Isopropyl Alcohol monograph modernization was published in the December 2021 FCC Forum. This work addresses Resolution II, on the efficient sharing of information that is critical to standards development and revision.

### Prebiotic Ingredients Proposals:

Foods staff continued their work to develop and submit FCC proposals for Potato Protein, Galacto-Oligosaccharides (GOS), and Isomaltooligosaccharides (IMO) to the June 2022 FCC Forum. Both GOS and IMO are considered prebiotic ingredients; GOS is an ingredient used in infant formula products. These efforts help to fulfill Resolution III, on developing innovative and agile approaches to address current and future needs of

industry, regulators, practitioners, consumers, and patients.

### Hemp Seed-Derived FI:

The Foods team hosted a virtual roundtable on hemp seed-derived FIs on May 24–25, 2022, attended by 21 invited individuals from industry; trade associations; and regulatory agencies, including the FDA, USDA, and Health Canada. The purpose of the roundtable was to discuss current manufacturing practices for hemp seed-derived FIs, including mitigation measures utilized to reduce cannabinoid contamination from other plant parts. The discussion was robust, with information sharing from all invited sectors. The outcome of this event may lead to the development of additional FCC monographs for any legally marketed hemp-based FIs as they become commercially available for use in foods. This roundtable aligns with Resolution II, on the efficient sharing of information that is critical to standards development.

## FY22 Highlights: Foods

- 1 New Appendix Published in FCC Forum
- 6 New Monographs Published in FCC Forum
- 25 Monograph Revisions Published in FCC Forum
- 5 Monograph Modernizations Published in FCC Forum
- 7 Errata Published in the Compendium
- 3 Monograph Modernizations Published in the Compendium
- 18 Monograph Revisions Published in the Compendium
- 4 New Appendix General Tests Published in the Compendium
- 10 New Monographs Published in the Compendium



“We have continued to collaborate with key stakeholders throughout the globe on high-priority food ingredients to address food fraud.”

—Catherine M. Sheehan, M.S., M.S., DRSc., Senior Director, Growth Programs—Foods and Excipients

USP General Chapters provide specifications for tests, procedures, and other standards as well as general guidance for USP–NF monographs. Expert Volunteers serve on the following General Chapters Collaborative Group Expert Bodies: General Chapters–Chemical Analysis (GCCA), General Chapters–Dosage Forms (GCDF), General Chapters–Measurement & Data Quality (GCMDQ), General Chapters–Microbiology, General Chapters–Packaging and Distribution (GCPD), General Chapters–Physical Analysis (GCPA), and General Chapters–Statistics (GCSTAT) ECs and their affiliated EPs and subcommittees. Their work impacts the quality control, packaging, and supply integrity of drugs and drug products as well as standards governing analytical procedure validation and verification.

### Key Activities in General Chapters

#### USP General Chapter <1220>

**Analytical Procedure Life Cycle:** USP General Chapter <1220> became official on May 1, 2022. This chapter presents a new vision for analytical procedure validation, verification, and transfer and is being viewed favorably by industry. It is anticipated that the <1220> concepts will be reflected in the ICH guideline Analytical Procedure Development (Q14) draft, which was undergoing public comment. This work helped to fulfill Resolution III, on being a scientific leader in quality standards; and Resolution XV, on expanding USP’s public health impact by reaching more people in more geographies with USP standards, capability building, and advocacy.

#### Harmonizing USP General Chapter <621> Chromatography:

The PDG reached consensus for the harmonization of the Chromatography chapter across the *JP*, *Ph.Eur.*, and *USP*. The harmonized chapter was posted at USP.org in November 2021. This activity aligns with Resolution XI, on pharmacopeial cooperation and convergence.

**qNMR Measurements:** The qNMR EP of the GCCA EC concluded its work, drafting revisions to USP General Chapters <761> *Nuclear Magnetic Resonance Spectroscopy* and <1761> *Applications of Nuclear Magnetic Resonance Spectroscopy*. These revisions were posted in *PF* 48(4) [Jul.–Aug. 2022]. A *Stimuli* article titled “Consistent Terminology for Advancement of NMR Spectroscopy” was also posted in *PF* 48(4). These activities support Resolution II, on developing and updating standards to maintain and continuously optimize their impact and sharing information that is critical to standards development.

#### Reporting Thresholds in USP–NF Monographs:

Based on input received from two roundtables and from cross-functional groups within USP, several possible approaches were considered for introducing “reporting threshold” into the compendium. A Prospectus was posted for the proposed new USP General Chapter <477> *User-Determined Reporting Thresholds*. This chapter would

provide an approach for determining an appropriate numeric value for the reporting threshold in chromatographic test procedures and would be applicable if the chapter is referenced in an individual monograph employing a user-determined reporting threshold. These efforts align with Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution III, on developing quality standards that address stakeholders’ current and future needs.

**Dissolution:** A second-generation RS is under development that would provide significant improvements for customers conducting performance verification testing when using USP Apparatus 1 or 2. A revision to USP General Chapter <711> *Dissolution*, published in *PF* 48(2), adds the option of a stationary basket as an alternative to sinkers when using the Apparatus 2 dissolution vessel. A major proposed revision to USP General Chapter <1724> *Semisolid Drug Products—Performance Tests* was published in *PF* 48(3). The proposal would expand the chapter’s

“The new USP General Chapter <1220> Analytical Procedure Life Cycle became official on May 1, 2022, and arrived with fanfare and jubilation.... This work was fueled by intense passion and commitment to bringing the new concepts to the pharmaceutical industry, and now the work providing education on <1220> begins.”

—Jane Weitzel, B.Sc., Chair, GCMDQ EC



scope to include in vitro permeation tests and in vitro release tests. This major revision will support the recent FDA guidances on performance tests for products applied to the skin, including sunscreens. In addition, the proposed new USP General Chapter <1002> *Filters and Membranes* is under development and includes recommendations on how to select and qualify filters and membranes for dissolution testing and other analytical techniques. This work aligns with Resolution I, on collaboration with stakeholders on health priorities; Resolution II, on efficiency in standards development and revision; and Resolution III, on developing innovative and agile approaches to address current and future needs of industry, regulators, practitioners, consumers, and patients.

**PCM:** Three proposed new standards for the following physical properties of material used in PCM have been identified for development: electrostatics characterization, fitting compaction model characterization, and wetting characterization. USP also plans to develop a technical guide on

PCM control strategy. These and future guides could be developed into DSs as they mature in industry, potentially positioning USP as the industry leader in control strategy development. USP is committed to reducing industry barriers to, and cost of, widespread PCM adoption. These activities support Resolution III, on developing innovative and agile approaches to address current and future needs of industry, regulators, practitioners, consumers, and patients.

#### Revision to USP General Chapter <660> Containers—Glass:

The <660> EP of the GCPD EC continued to work toward the modernization of the chapter. Over the past six months, the EP has worked on delineating the tests, procedures, technology requirements, and specifications for the different glass quality attributes. This effort has included stakeholder outreach to better understand revision impact prior to publication in *PF*. These activities are in accordance with Resolution I, on collaboration with stakeholders on health priorities; and Resolution II, on the efficient development, revision, and

sharing of information that is critical to standards development.

#### New Chapters on Microbial Methods:

Two proposed new general chapters on microbial methods are anticipated to be published in *PF* 48(5) [Sep.–Oct. 2022]. USP General Chapter <74> *Solid Phase Cytometry-based Rapid Microbial Methods for the Detection of Contamination in Short Shelf-life Products* would enable users to process large volumes of filterable products and capture or scan an image of the entire membrane to detect microorganisms. USP General Chapter <77> *Mycoplasma Nucleic Acid Amplification Tests* describes criteria for selecting a validated nucleic acid amplification test comparable to compendial methods for detecting mycoplasma. These efforts align with Resolution II, on the efficient development, revision, and sharing of information that is critical to standards development; and Resolution III, on quality standards that help to safeguard consumers and meet stakeholders’ needs.

“With a forward-looking vision, we have explored the latest technologies in manufacturing and analysis of medicines and updated our standards accordingly. In this way, we have provided the necessary tools to determine the quality of medicines for years to come.”

—Horacio Pappa, Ph.D., Director, General Chapters

#### **New Liposome Drug Products Chapter:**

Liposome drug products are commonly used nanotechnology-based formulations. The new proposed USP General Chapter <1154> *Liposome Drug Products* focuses on specific requirements for liposomes and the product quality tests that are generally necessary for liposomal preparations. A draft is anticipated to be published in *PF* 48(6). This work supports Resolution III, on quality standards that provide innovative and agile approaches to address stakeholders' current and future needs; and Resolution V, on the development of innovative standards and solutions.

#### **Revision to USP General Chapter <541>**

**Titrimetry:** The GCCA EC has proposed revising USP General Chapter <541> with updated information on modern titrimetry testing and structural changes for improved clarity. These modernization efforts include updating information on automated titration and standardization of titrants/reagents, restructuring the chapter sections, and revising certain tabular information. This work aligns with Resolution II, on developing and updating standards to maintain and continuously optimize their impact.

#### **Linearity and Accuracy in Method Validation:**

The GCSTAT EC has developed a *Stimuli* article that provides a generic definition of linearity that is useful for supporting method calibration and accuracy studies. This enables discussion of linearity for quantal bioassays and supports the life cycle of the methods. The paper will address issues related to terminology, provide information and guidance on evaluating the types of linearity violations, and include examples of linearity for three different measurement methods. This *Stimuli* article is anticipated to be published in *PF* 48(5). This work addresses Resolution II, on the efficient sharing of information that is critical to standards development and revision.

#### **Mutagenic and Potential**

**Mutagenic Impurities:** Recent concerns about the presence of mutagenic impurities in the commercial drug supply have focused USP's attention on the need to address this important category of impurities in general chapters and monographs. The GCCA EC has developed a *Stimuli* article titled "Mutagenic Impurities and Potential Mutagenic Impurities in the USP-NF" to briefly describe some of the unique challenges posed by mutagenic and potentially mutagenic impurities and to solicit early input on how USP could best support manufacturers to ensure product quality. This article is anticipated to be published in *PF* 48(5). This work addresses Resolution II, on the efficient sharing of information that is critical to standards development and revision.

#### **The General Chapters Group Supported Virtual Open Forums:**

The following stakeholder outreach activities align with Resolution II, on the efficient sharing of information that is critical to standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion:

- Introduction to USP General Chapter <1220> and Case Study, held on December 2, 2021
- USP Cases of Modernization—General Chapters, held on April 12, 2022
- Packaging Standards Update to Extractables and Leachables

Safety Information Exchange, held on May 25, 2022

#### **The General Chapters Group**

**Supported USP Webinars:** The following stakeholder outreach activities align with Resolution II, on the efficient sharing of information that is critical to standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion:

- Introduction to Subvisible Compensial Particulate Standards—Series
- USP Packaging Update: Plastic, Glass, Elastomers, Metal, and Biological Reactivity
- PQM+ Myanmar—An Overview of General Chapters and the Compensial Process

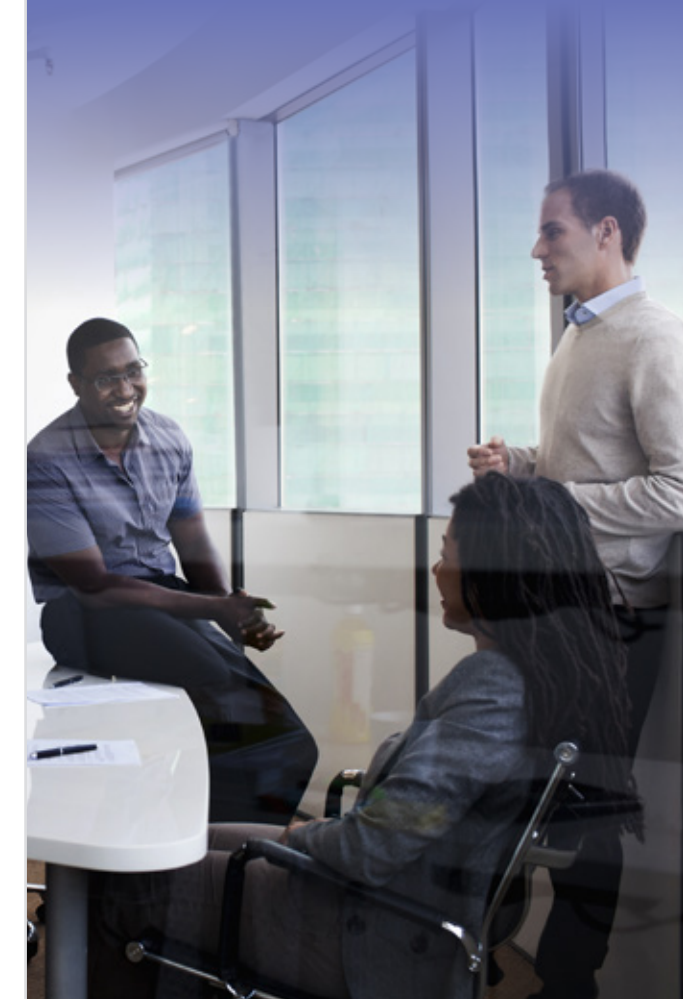
#### **The General Chapters Group Supported Virtual USP Workshops:**

The following stakeholder outreach activities align with Resolution II, on the efficient sharing of information that is critical to standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion:

- Development and Validation of Bioassays for Advanced Therapies, January 19–20, 2022
- USP Residual Solvents, Elemental and Organic Impurities, held May 11–13, 2022
- Highlights and Key Points of USP General Chapter <1469>, held November 15, 2021

“We have more diverse membership compared with previous cycles in terms of ethnicity, gender, and expertise. This diversity has led to stimulating discussions and many good ideas.... We are about to assemble our first cohort of Expert Advisors to work on continuous manufacturing, a key area in USP's Science Quality Framework.”

—Xiaorong He, Ph.D., Chair, GCPA EC



## FY22 Highlights: General Chapters

- 4 New General Chapters Published in *PF*
- 7 New General Chapters Official in the Compendium
- 12 Major General Chapter Revisions Published in *PF*
- 13 Major General Chapter Revisions Official in the Compendium
- 7 Minor General Chapter Revisions Published in *PF*
- 14 Minor General Chapter Revisions Official in the Compendium
- 2 Omissions
- 11 *Stimuli* Articles



- ICH Q3C Guideline, *USP* <467> *Residual Solvents*, and <1467> *Residual Solvents—Verification of Compendial Procedures and Validation of Alternative Procedures* (provided to the Korean National Institute of Food and Drug Safety Evaluation and the Ministry of Food and Drug Safety), held November 16–19, 2021
- USP Workshop in China—Testing Method for Nitrosamines Analysis—Analytical Challenges, held May 27, 2022

### The General Chapters Group

**Supported Presentations:** The following stakeholder outreach activities align with Resolution II, on the efficient sharing of information that is critical to standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion:

- Analytical procedure life cycle and analytical quality by design (AQbD) principles applied to the development of procedures for

Biologics, presented to the Korea Biomedicine Industry Association on March 7–10, 2022

- Untargeted metabolomics studies of dietary supplements rich in polycyclic aromatic compounds by liquid chromatography coupled to high-resolution mass spectrometry (LC-HRMS) poster presentation at the American Society for Mass Spectrometry Congress 2022 on June 5, 2022
- Quality Risk Management and AQbD applied to Procedure Development: Venlafaxine Extended-Release Tablets Case Study oral presentation at the HPLC Congress on June 18, 2022
- USP Elemental Impurities Chapters and ICHQ3D, presented at the International GMP Conference on March 7, 2022

### New Advancements in Product Performance Testing (NAPPT):

The NAPPT EP of the GCDF EC worked toward publishing the following *Stimuli* articles, as per Resolution II, on information sharing for standards development:

- “Testing the In Vitro Product Performance of Nanomaterial-Based Drug Products—View of The USP Expert Panel” in *PF* 47(6) [Nov.–Dec. 2021]
- “In-Vitro Performance Tests for Continuous Manufacturing: The Impact on the Current Compendial Framework from the Viewpoint of the USP New Advancements in Product Performance Testing Expert Panel” in *PF* 48(4)
- “In-Vitro Product Performance of Parenteral Drug Products: View of the USP Expert Panel” in *PF* 48(4)
- “Product Performance of Oral Drug Products—View of the USP Expert Panel” in *PF* 49(1) [Jan.–Feb. 2023]
- “Testing the In-Vitro Product Performance of Inhalation and Nasal Drug Products: Views of the USP Expert Panel” in *PF* 48(5)
- “Overview of the Activities of the USP Expert Panel on New Advancements in Product Performance Testing” in *PF* 48(3)

“I am proud of the way our Expert

Committee has continued to work and engage with energy and enthusiasm through a continuation of COVID-related remote working and interaction.... Despite multiple time zones, the diversity and inclusivity within our EC makes it a great environment to work together.”

—Eloise Welfare, Ph.D., Vice Chair, GCPA EC



The Healthcare Quality and Safety (HQS) group is a designated Center of Excellence that enables USP to deliver quality standards and solutions that meet the needs of healthcare professionals to help improve medicine quality, patient safety, and access. HQS provides approaches to 1) enhanced quality, accessibility, and equity of medication practices; 2) data and digital tools designed to improve the use of standards in knowledge sharing, decision making, and reporting; and 3) quality medication and treatment tailored to the individual characteristics of each patient.

HQS is focused on addressing the needs of patients, healthcare professionals, and overall public health, including standards and solutions for safe medication use, drug formulary classification, sterile and nonsterile compounded preparations, the handling of hazardous drugs, and the naming and labeling of drug products and ingredients.

Expert Volunteers serve on the Compounding (CMP), Healthcare Information and Technology (HIT), Healthcare Safety and Quality (HSQ), and Nomenclature and Labeling (NL) ECs and related EPs and subcommittees. Together, these volunteers deliver quality standards and solutions that are beneficial to healthcare professionals, healthcare systems, and other stakeholders working to address patient care needs.



*“I am proud of the role the HSQ EC played in the development of the USP ‘COVID-19 Vaccine Handling Toolkit’ due to its public health impact. There were many unanswered questions as massive COVID-19 vaccination rollouts began. The Toolkit and corollary ‘International COVID-19 Vaccine Handling Guide’ and translation into six languages answered these questions to minimize waste, maximize shots in arms, and increase confidence in consistent procedures across vaccination sites.”*

—Melody Ryan, Pharm.D., MPH, Chair, HSQ EC

### Key Activities in Healthcare Quality and Safety

#### International COVID-19 Vaccine

**Handling Guide Update:** Revisions to the “International COVID-19 Vaccine Handling Guide” in March 2022 included updates on storage, preparation, transportation, and handling requirements for several international vaccines as well as strategies to prevent vaccine mix-ups that have been reported globally. USP’s vaccine guides and resources are now available in Spanish, Portuguese, French, Arabic, and Indonesian. The guide was assembled by the HSQ EC in collaboration with members of the CMP EC, GCPD EC, BIO3 EC, HIT EC, and NL EC. This activity supports Resolution V, on exploring the development of solutions that address patient and public health needs; and Resolution XV, on expanding USP’s public health impact by reaching more people in

more geographies with USP standards, capability building, and advocacy.

#### U.S. COVID-19 Vaccine Handling

**Toolkit:** The “COVID-19 Vaccine Handling Toolkit,” first published in January 2021, was updated in November 2021. The toolkit, along with the ancillary fact sheets addressing beyond-use dating and vaccine transport, were updated to include information regarding booster doses, pediatric Pfizer-BioNTech vaccine preparation, beyond-use dating in pre-drawn syringes, and strategies to avoid mix-ups with other vaccines. This work aligns with Resolution V, on exploring the development of solutions that address patient and public health needs.

**Hand Sanitizer Toolkit:** In November 2021, the CMP EC updated its

“Compounding Alcohol-Based Hand Sanitizer During COVID-19 Pandemic” document to reflect FDA’s announcement of the withdrawal of its temporary guidances for alcohol-based hand sanitizers (AbHS) on December 31, 2021. The FDA noted that the supply of AbHS from traditional suppliers had increased and that most consumers and healthcare personnel were no longer having difficulty obtaining these products. The CMP EC also received comments from FDA requesting the withdrawal of USP’s hand sanitizer document to avoid confusion regarding the regulatory requirements for producers of AbHS in the U.S. The CMP EC reviewed the comments and decided to maintain the document for use internationally in case of shortages but amended the document to address FDA’s concerns with respect to the U.S. These efforts help to fulfill

Resolution I, on collaboration with the FDA, industry, and other stakeholders on health priorities; and Resolution IX, on compounding.

#### Revisions to Compounding General

**Chapters:** The CMP EC continued its review of proposed revisions to USP General Chapters <795> *Pharmaceutical Compounding—Nonsterile Preparations* and <797> *Pharmaceutical Compounding—Sterile Preparations*. These two chapters were remanded following the conclusion of an appeals process in March 2020. Proposed revisions were published on November 1, 2021, in *PF 47(6)* and were pre-posted at USP.org on September 1, 2021. Following requests from stakeholders, the deadline for public comments was extended from January 31, 2022, to March 17, 2022. The CMP EC continued to offer stakeholder

engagement events, including virtual Open Forums and a roundtable for state boards of pharmacy held on February 15, 2022. After numerous EC meetings, the CMP EC concluded its review of the 1,400 public comments received for <797> and <795> on April 19, 2022, and agreed to advance the chapters to ballot. For the latest updates, visit <https://www.usp.org/compounding/updates>. This work aligns with Resolution IX, on compounded drug preparations.

#### USP General Chapter <17> Prescription

**Container Labeling:** The HSQ EC announced two revisions to <17>. These include a framework for developing an opioid warning label to mitigate misuse of opioids and a revision to promote accurate dosing of pediatric liquid medications to help reduce unintentional underdosing or overdosing

of children. The official date for these revisions was December 1, 2021. USP presented these updates at the annual Centers for Disease Control and Prevention’s Prevention of Overdoses and Treatment Errors in Children Taskforce (PROTECT) meeting in November 2021. These efforts align with Resolution II, on the efficient sharing of information that is critical to standards development; and Resolution III, on quality standards that help to safeguard consumers and meet stakeholders’ needs.

#### Digital Therapeutic Labeling:

The HQS Center of Excellence partnered with the Digital & Innovation Division to host a roundtable on the topic of digital therapeutic labeling on October 21, 2021, in an effort to understand the evolution of digital labeling. Stakeholders included

digital therapeutic developers, digital medicine organizations, consultants, and regulatory agencies. The discussion included dialogue on potential digital label formats geared toward patients to support health literacy in the digital space. This roundtable aligns with Resolution II, on the efficient sharing of information that is critical to standards development; Resolution XII, on evidence generation to inform policy; and Resolution VI, on the digital transformation of standards.

**USP Drug Classification (USP DC) for 2022:** The HSQ EC published the [USP DC 2022](#) on December 17, 2021. The USP DC is an independent drug classification system, which was developed in response to stakeholder input regarding the utility of a classification system beyond the Medicare Model Guidelines to assist with formulary support outside of Medicare Part D. This annual revision includes

classification of new FDA-approved drugs and a mapping of USP’s classification with RxNorm’s interoperable drug data set. This work supports Resolution I, on collaboration on health priorities; Resolution XII, on evidence generation to inform policy; and Resolution XIV, on culture of excellence.

**The HQS Group Supported Virtual Stakeholder Events:** The following stakeholder events align with Resolution II, on the efficient sharing of information that is critical to standards development; Resolution XII, on evidence generation to inform policy; and Resolution IX, on compounding:

- USP Roundtable on Standardizing Compounded Preparation Information in Electronic Health Systems, held on December 14, 2021. The HIT EC is currently developing standards for the exchange of compounded

preparation prescriptions in electronic health systems. The virtual roundtable provided an opportunity to obtain feedback from industry and association representatives, government, and Expert Volunteers on the impact of encoding compounded preparations on workflow processes to help improve medication safety, interoperability, and reimbursement.

- USP Roundtable on Labeling of Multi-Entity Anesthetic Drug Products, held on October 21, 2021. The NL EC is evaluating labeling for multi-entity injectable anesthetic products that contain epinephrine in combination with other active ingredients such as lidocaine. The virtual roundtable provided an opportunity to obtain feedback from healthcare professionals who work directly with these products.

“The Healthcare Information and Technology EC proudly incorporated the principles of DEIB into our vision statement and relevant discussions. FY22 has been a busy year for us, focused on the digital exchange of compounded prescriptions.... In FY23, we look forward to starting work on the standardization and digital exchange of allergy information.”

—Jeanne Tuttle, B.S.Pharm., HIT EC



### FY22 Highlights: Healthcare Quality and Safety

- 4 New Monographs Published in *PF*
- 2 Monograph Revisions Published in *PF*
- 2 Minor General Chapter Revisions Published in the Compendium
- 6 New Monographs Published in the Compendium
- 43 Nomenclature Monograph Titles Approved

# Our Expert Volunteers and Government Liaisons

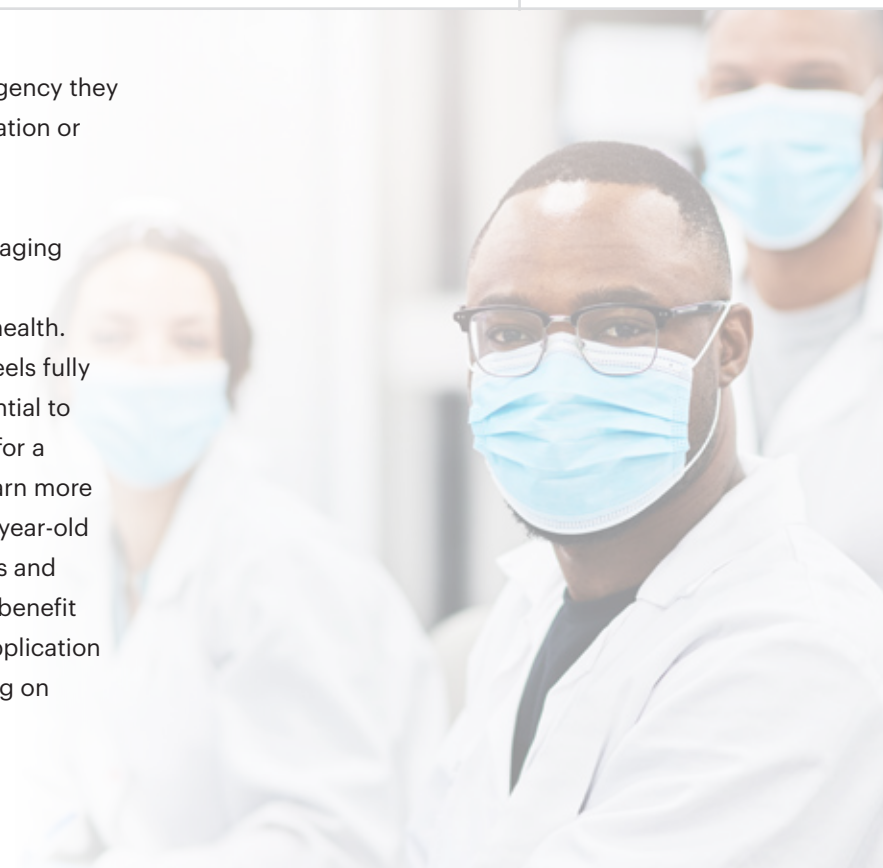
Among USP's greatest assets are the transparency and scientific rigor that 790 Expert Volunteers and 264 Government Liaisons helped bring to USP's standards-setting process in FY22. Through the contribution of their individual expertise, they have helped to ensure the identity, strength, quality, and purity of chemical and biological medicines, excipients, dietary supplements, and food ingredients and benefited consumers, patients, and other stakeholders in the U.S. and around the world.

The CoE—consisting of the 29 EC Chairs listed in the table below, plus Jaap Venema, Ph.D., USP's Chief Science Officer & CoE Chair—oversees the activities of numerous global scientific experts who serve on ECs, EPs, and JS3s. These Expert Volunteers play a vital role in providing expertise and in the development of standards by participating in Expert Body discussions and reviewing documents/information. EC members approve DSs for publication and RSs for release. They ballot on all regular DS revisions, new RSs, and a sampling of R and C Lots.

Government Liaisons—representatives from the FDA, other federal or state government agencies in the U.S., and government agencies in other countries—contribute to discussions at Expert Body meetings to which they are assigned. Government Liaisons do not vote on standards that are up for ballot. They offer opinions on all facets of standards development

from the perspective, and on behalf of, the government agency they represent, and may be tasked with seeking further information or soliciting opinions from the agency they represent.

USP aspires to be a diverse, inclusive, innovative, and engaging organization that empowers and engages staff and Expert Volunteers to contribute to its mission to improve global health. We are committed to creating a culture where everyone feels fully empowered and valued and can contribute their full potential to accomplish our mission to help build quality foundations for a healthier world. Visit [usp.org/get-involved/volunteer](https://usp.org/get-involved/volunteer) to learn more about how volunteers contribute to USP's more than 200-year-old mission to improve global health through public standards and related programs that help ensure the quality, safety, and benefit of medicines and foods. Find out how you can start the application process to become a member of our ECs or EPs by clicking on [callforcandidates.usp.org](https://callforcandidates.usp.org).



## COLLABORATIVE GROUPS



### Biologics

#### Biologics Monographs 1–Peptides & Oligonucleotides EC

Michael De Felippis, Ph.D., Chair

#### Biologics Monographs 2–Proteins EC

Wendy Saffell-Clemmer, M.S., Chair

#### Biologics Monographs 3–Complex Biologics & Vaccines EC

Earl Zablackis, Ph.D., Chair

#### Biologics Monographs 4–Antibiotics EC

Matthew Borer, Ph.D., Chair

#### Biologics Monographs 5–Advanced Therapies EC

Mehrshid Alai, Ph.D., Chair



### Small Molecules

#### Small Molecules 1 EC

Mary Seibel, B.Sc., Chair

#### Small Molecules 2 EC

Justin Pennington, Ph.D., Chair

#### Small Molecules 3 EC

Eric Kesslen, Ph.D., Chair

#### Small Molecules 4 EC

Kim Huynh-Ba, M.S., Chair

#### Small Molecules 5 EC

Amy Karren, B.Sc., Chair

#### Over-the-Counter Methods & Approaches EC

Raphael Ornaf, Ph.D., Chair



### Excipients

#### Simple Excipients EC

Eric Munson, Ph.D., Chair

#### Complex Excipients EC

Otilia Koo, Ph.D., Chair

#### Excipients Test Methods EC

Chris Moreton, Ph.D., Chair



### General Chapters

#### General Chapters–Dosage Forms EC

Martin Coffey, Ph.D., Chair

#### General Chapters–Chemical Analysis EC

Nancy Lewen, B.Sc., Chair

#### General Chapters–Microbiology EC

Donald Singer, M.S., Chair

#### General Chapters–Packaging & Distribution EC

Renaud Janssen, Ph.D., Chair

#### General Chapters–Measurement & Data Quality EC

Jane Weitzel, B.Sc., Chair

#### General Chapters–Statistics EC

Charles Tan, Ph.D., Chair

#### General Chapters–Physical Analysis EC

Xiaorong He, Ph.D., Chair



### Healthcare Quality & Safety

#### Nomenclature & Labeling EC

Stephanie Crawford, Ph.D., Chair

#### Healthcare Safety & Quality EC

Melody Ryan, M.P.H., Chair

#### Compounding EC

Brenda Jensen, M.A., Chair

#### Healthcare Information & Technology EC

Jeanne Tuttle, B.S.Pharm., Chair



### Dietary Supplements & Herbal Medicines, Food Ingredients

#### Botanical Dietary Supplements & Herbal Medicines EC

Robin Marles, Ph.D., Chair

#### Non-Botanical Dietary Supplements EC

Guido F. Pauli, Ph.D., Chair

#### Dietary Supplements Admission Evaluation & Labeling EC

Tieraona Low Dog, M.D., Chair

#### Food Ingredients EC

Jonathan DeVries, Ph.D., Chair



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