Beauty & Personal Care Ingredient Intelligence Report

A ROADMAP TO ACCELERATE SAFER CHEMISTRY FOR ALL

OCTOBER 2024



SAFER CHEMISTRY IMPACT FUND

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Contributors

Alex Lanphier, Senior Manager, Sustainability Strategy, Ulta Beauty Alissa Sasso, Environmental Defense Fund (2023) Ame Igharo, Senior Director Sustainability Strategy, Ulta Beauty Boma Brown-West, Strategic Advisor Carley Klekas, Global Director of Product Sustainability, Sephora Cassie Huang, Environmental Defense Fund (2023) **Catherine (Katie) Sminkey**, Director of Product Stewardship, Inolex Christina Ross, MPH, Director of Science and Policy, Credo Beauty Gabrielle Rigutto, MS, Research & Data Quality Specialist, ChemFORWARD Gail Meerdter, Manager, Corporate Communications and Branding, Inolex Heather McKenney, MPH, Science and Safer Chemistry Lead, ChemFORWARD Jennifer Marques, Global Strategic Marketing Director, Personal Care, Dow Jennifer McPartland, Ph.D., Vice President, Mission, Beautycounter Junyeol Kim, Ph.D., Research Toxicologist, The Honest Company Lisa Gandolfi, Ph.D., Vice President, Product and Marketing, Inolex Noah Maddock, Data Analyst and Platform Specialist, ChemFORWARD Mary Ruhter, Senior Scientist and Safety Director, Beautycounter Olasunkanmi Abass, Sr. Toxicology & Product Safety Coordinator, The Honest Company Paige Engerer, Technical Service and Development Chemist, Dow Sara Farahmand, DABT, Director, Toxicology, Product Safety and Regulatory,

The Honest Company

Foreword

The Safer Chemistry Impact Fund is proud to support the groundbreaking work of the Know Better, Do Better (KBDB) Collaborative. This report, and this collaboration, underscore the transformative power of shared data in advancing the use of chemicals and chemistry in harmony with planetary boundaries and healthy life on earth.

The story of this report starts with a leap of faith. A few brands sought to better understand their customers' interest in the health and safety of product ingredients. They commissioned Ingredient Intelligence Reports from Chem*FORWARD*. Then, finding that chemical hazards are **KNOWABLE**, they began to explore the potential to address chemical safety as an industry-wide value, because while the number of chemicals to be assessed might be daunting for a single company, the task was in fact **MANAGEABLE** if it was shared.

Many hands make light work. Shared data became the **ENABLER** of a precompetitive collaboration that allows brands to honor the concerns of customers and elevate both their reputation and that of the beauty and personal care industry as a whole, by committing to unprecedented standards transparency and product integrity.

Collaboration proved to be an **ACCELERATOR** of progress. It catalyzed meaningful engagement with ingredient designers and commitments to continuously improving products. In this virtuous cycle, safer choices cascade through the supply chain to inform sustainable and health-protective decisions for humans and the environment.

This collaboration believes, and proves, that the challenge of toxic chemical exposure is **SOLVABLE**. It models the potential to change the nature of the dialogue between customers, brands, suppliers, and regulators across industries. Rather than reacting to the latest chemical of concern, it is now possible to work together systematically to identify, prioritize and make markets for smart and safer chemistry. This is the **beauty** that we all seek as leaders in this generation, and caretakers for the next.

If this project inspires you as much as it does me, we invite you to join us in developing the virtuous cycle of safer chemistry for the beauty and personal care sector and beyond.



Executive Summary

The beauty and personal care industry is undergoing a significant transformation, driven by consumer demand for safer and more sustainable products.

The "Establishing Beauty & Personal Care Ingredient Intelligence Report" report highlights the progress made in 2023 through the Know Better, Do Better (KBDB) Collaborative, a group of industry leaders committed to increasing ingredient hazard transparency, shared data, and the use of safer chemistry.

The report reveals that 70% of all ingredients in the analyzed dataset are wellcharacterized, meaning their potential hazards are understood and that 66% of those characterized are verified as safer chemistry. However, there's still work to be done, as high hazard ingredients are still used in high frequency across product types and should be prioritized for elimination.

The report also signals the importance of assessing uncharacterized ingredients. 30% of all ingredients reported account for data gaps in the assortment and thus occur in a significant number of products. Over the past year, KBDB Collaborative members have sponsored chemical hazard assessments to characterize unknown ingredients that have already made a substantial impact, filling thousands of data gaps in the assortment and paving the way for informed decision-making across the industry. With more work to be done on characterization, the Collaborative invites others to join this effort for even greater collective impact.

The five key insights from the report are:

- **1. Chemical Hazards are Knowable:** The report establishes that 70% of the ingredients in the analyzed dataset are well-characterized, meaning their potential hazards are understood. This serves as a baseline or "Metric Zero" for the industry.
- 2. The Number of Ingredients is Manageable: Despite analyzing over 8,500 products with nearly 318,000 ingredients, the report found only 2,279 unique ingredients. This insight allows for a more focused approach to understanding and managing product compositions.

- **3. High-Hazards Persist Despite Safer Alternatives:** The report identifies 45 chemicals with known high hazards that should be prioritized for elimination. It also highlights that safer functional alternatives exist for these chemicals, encouraging a shift towards safer options.
- **4. Full Characterization of Ingredients Is an Urgent Imperative:** The report stresses the need for complete characterization of all ingredients through chemical hazard assessments to fully understand their human and environmental impacts. It suggests strategies such as prioritizing high-frequency data gaps and engaging suppliers in trade name-specific assessments.
- **5. Collaboration is an Accelerator:** The report demonstrates the power of collaboration in driving the transition to safer chemistry. Shared data and resources have enabled the filling of critical data gaps and reduced costs, showcasing the tangible benefits of collective action.

The report concludes with a call to action, urging the industry to continue investing in chemical hazard assessments, eliminate high-hazard chemicals, and embrace the transition to safer chemistry. By prioritizing hazard transparency and collaboration, the beauty and personal care industry can create a future where products are verified to be inherently safe for both human health and the environment.

"Transparency is crucial in the cosmetics industry, yet data gaps undermine this principle. Consumers increasingly demand safer products—and high quality, comprehensive chemical hazard assessments provide key data to meet these expectations. By closing data gaps and utilizing only safer ingredients, we can meet consumer demand while safeguarding consumer, environmental, and occupational health."

Heather McKenney, MPH Science & Safer Chemistry Lead ChemFORWARD "Using safer ingredients isn't just about doing the right thing—it's a must for the cosmetics industry. Real change starts with getting the science right—and rigorous hazard assessments and ingredient transparency are essential baseline scientific practices to drive our industry forward. By prioritizing safer ingredients and committing to higher standards, we can collectively drive innovation, build trust, and set a new norm."

Christina Ross Director of Science and Policy Credo Beauty

THE REPORT

Introduction

The <u>Safer Chemistry Impact (SCI) Fund</u> provided a grant to Chem*FORWARD*'s <u>Know Better, Do Better Collaborative</u> to establish baseline metrics for the Beauty and Personal Care Sector that will measure the transition to safer chemistry in alignment with their metrics framework published in August 2024 titled, <u>"Accelerating the</u> <u>Transition to Safer Chemistry: Establishing A Collective Vision & Impact Metrics</u>".

This report is the first in a series to establish "Metric Zero" in at least four consumerfacing supply chains to better measure and manage the transition to safer chemistry.

<u>ChemFORWARD</u> is a science-based, data-driven, non-profit organization, dedicated to creating broad access to chemical hazard information that improves decision making toward safer and more sustainable consumer products. ChemFORWARD unites businesses, governments, and NGOs in precompetitive collaborations utilizing an innovative data-sharing model, and empowering collaborators with resources and tools to help the supply chain assess chemicals for hazards, identify safer alternatives, and make informed decisions about chemical use.

The methodology for this report included the following steps:

- O Define scope of the analysis and data source(s);
- Analyze the data set and summarize insights including:

METRIC 0.0: Percent of characterization (termed "Metric Zero")

- **METRIC 0.1:** Identify priorities for elimination (high hazard/regulatory risk chemicals: D and F Hazard Bands)
- **METRIC 0.2:** Quantify safer chemistry (Hazard Bands A,B,C)
- METRIC 0.3: Prioritize functional data gaps for investment
- Summarize key insights and calls for action to eliminate chemicals of concern and accelerate safer chemistry; and
- Establish an approach that could be repeated and tracked year over year.

Prioritizing the Beauty and Personal Care Sector for Safer Chemistry Acceleration

The beauty and personal care sector is "ripe" for safer chemistry acceleration based on a high level of ingredient transparency in this consumer-facing supply chain, the opportunity to identify disproportionate impacts, and a coalition of willing industry leaders that have organized under Chem*FORWARD*'s <u>Know Better, Do Better</u> <u>Collaborative</u>.

The market size and growth rate indicate a strong potential for impact. According to Euromonitor International, **the global cosmetics industry was valued at over \$617.2 billion in 2023 with a projected annual growth rate of 9%**. This sector leads other industries relative to ingredient transparency while having the distinction as "one of the least regulated industries in the U.S.," according to the <u>Campaign for Safe Cosmetics</u>.



Although ingredient lists are readily available, information about the potential hazards associated with these ingredients has historically been lacking. The common assumption that unregulated ingredients must be low hazard has notable exceptions. In particular, the belief that natural or naturally derived ingredients are inherently safe is often unfounded. This initiative seeks to address this problem by promoting radical transparency regarding ingredient hazards, thus enhancing safety, reducing brand risk, and strengthening consumer trust.

Many of today's efforts focus on reducing and eliminating specific chemicals of potential concern. These are typically identified by individual brands and retailers, and thus are not always consistent. In these cases, chemicals of potential concern are communicated to suppliers through a Restricted Substances List (RSL). However, because the RSLs do not identify acceptable, safer alternatives, they can lead to the unintended consequence of a "regrettable substitution," in which a chemical of similar or even higher hazard replaces the restricted chemical. This often happens due to data gaps, situations where a chemical has not yet been evaluated against environmental or health-based criteria. Lacking any identified hazards, it is not on an RSL and therefore is considered a suitable replacement. Regrettable substitution. In order to ensure responsible substitution, we must characterize ingredients through full chemical hazard assessments and only use characterized ingredients that are verified as safer to replace chemicals of concern.

"We are at a pivotal moment to impact the beauty and personal care value chain from farm to consumer shelf by insisting on verified safer chemistry. ChemForward has created a platform for collaborative change, rooted in science-based decision-making, and the results show that it's working."

Lisa Gandolfi, Ph.D. Vice President Product & Marketing Inolex

"Do the best you can until you know better. Then, when you know better, do better."

Inspired by these words of wisdom from poet Maya Angelou's, this collaboration seeks to continuously improve the industry by sharing trusted, science-backed information that ensures sustainable, health-protective decisions for humans and the environment.

Groundbreaking Supply Chain Collaboration

Established in 2023 and managed by Chem*FORWARD*, the <u>Know Better</u>, <u>Do Better</u> (<u>KBDB</u>) <u>Collaborative</u> (Collaborative) is a group of beauty industry leaders across the supply chain including the retailers Sephora, Ulta Beauty, and Credo Beauty, companies Beautycounter and The Honest Company, ingredient suppliers Inolex and Dow, and the non-profit Environmental Defense Fund. Members represent ingredients, products, and sales channels which are widely accessible to BPC users across various U.S. and some international locations, socioeconomic statuses, ages, races, ethnicities, and other key demographics.











Inolex

SEPHORA



The Collaborative is fueled by a belief that with access to trusted, cost-effective knowledge about chemical hazards and safer alternatives, the supply chain will make safer choices—resulting in better human and environmental outcomes for all.

KBDB is a science-based, data-driven initiative to boost confidence in the use of safer chemistry in BPC products. Collaborative members have committed to a charter that includes:

- Agreeing that uncharacterized ingredients¹ are unacceptable and that the task of filling data gaps in BPC assortments is larger than any one company;
- Engaging in a joint effort to fill data gaps by commissioning chemical hazard assessments and creating a minimum dataset for botanicals;
- Utilizing a shared data repository of chemical hazard assessments that is accessible to all collaborative members and beyond; and
- O Encouraging suppliers to get their trade name ingredients assessed.

"The Honest Company is dedicated to creating clean- and sustainable-designed products and ChemFORWARD's Know Better, Do Better Collaborative is instrumental in helping us make thoughtful formulation choices while also helping the entire industry make more informed decisions. The KBDB progress report embodies the power of collaboration in the beauty and personal care sector. By prioritizing hazard assessments and fostering transparency, we are paving the way for science-backed product development decisions."

Sara Farahmand Director, Toxicology, Product Safety and Regulatory *The Honest Company*

Ingredient Intelligence Reports (IIR)

To help inform the Collaborative's work, Chem*FORWARD* piloted a process that is now known as an Ingredient Intelligence Report (IIR). Utilizing the chemical hazard repository managed by Chem*FORWARD*, IIRs help brands, retailers, and investors gain new insights, build stronger brands, and increase consumer trust with science-based, data-driven reporting.

Each year, Chem*FORWARD* analyzes ingredient data from dozens of suppliers, brands and retailers to produce custom IIRs and annual aggregated insights. IIRs are used to provide clear, comparable data for chemical management planning and reporting.

Reports are designed to offer insights that:

- Overify the elimination of chemicals of high concern and audit company RSLs;
- Quantify the use of safer chemistry;
- O Identify high-impact investment to fill data gaps; and
- O Measure progress year over year against established chemical management goals.

The ChemFORWARD repository contains chemical hazard assessments (CHAs) populated and maintained by qualified toxicology firms and peer-reviewed by toxicology experts using comprehensive, globally accepted methodologies. All CHAs are available to all subscribers, allowing users to benefit from a cost-sharing model which reduces cost barriers to accessing hundreds of high quality CHAs.



A comprehensive CHA in Chem*FORWARD* covers more than 21 human and environmental endpoints, applicable routes of exposure, and includes classification rationales for each endpoint; see example Hazard Table in **Figure 1**. Additional information such as physical hazards, identifiers, and physical/chemical properties are also included in a comprehensive CHA.

The chemical is then assigned a roll-up hazard score based on endpoint classifications. Chem*FORWARD* uses harmonized Hazard Bands based on leading chemical hazard assessment methods to provide actionable decision support (**Table 1**)². To generate the IIR, the ingredient list provided by the client is screened using the Chem*FORWARD* dataset. Hazard Bands are assigned to each ingredient. The results are reviewed by a toxicologist and a summary narrative is developed. The Chem*FORWARD* repository, in addition to using CHAs, categorizes chemicals aligned with regulatory and chemical-class (i.e. list-based) methods to identify high-hazard substances (e.g., ECHA Substances of Very High Concern and per- and polyfluoroalkyl substances (PFAS)). It also uses "proxy" scores from other reputable CHA programs like U.S. EPA Safer Chemical Ingredients List (SCIL) and publicly available GreenScreen[®] assessments to assign chemical hazards. For more details, see **Table 1**. All Hazard Bands in the repository are gathered and tabulated to produce a report³.

The Hazard Band "?" denotes uncharacterized chemicals. Such chemicals cannot be assigned a Hazard Band based on a CHA, a proxy score, or a list-based approach. The frequency at which a "?" appears in a given dataset is reported as the number of data gaps in that dataset, which provides a key indicator where further analysis and investment in CHAs are likely to be beneficial.

IMPLICATIONS	CHEMICAL RATING	US EPA SCIL	GREEN SCREEN BENCHMARK	
ow hazard and low risk	a	-	4	
ome moderate hazards but low risk	b or c/b	green full circle	3 (3tp, 3dg)	
Aoderate hazard, moderate risk or uncertainty hat could result in moderate risk	x/c, x/c-CMR(2), grey/c, c/b-CRE	green half circle, yellow triangle	2 (2411 2412)	
Aoderate to high hazard; emerging regulatory isk (classification may be based on a chemical class/grouping approach)	x*, x-PB, x-PMT, x-vPvM, x/c-CM(2)-E	-	2 (2tp, 2dg)	
ligh hazards and high risk in most scenarios	x-Reg, x/c-CMR(1), x/c-E, x-PBT, x-vPvB, x-vPT	grey square	1 (1tp), LT-1	
CHA completed with excessive data gaps, ating is not possible	grey	-	BM U	
Request a CHA to inform decision	no CHA	no CHA	No GS, LT-UNK, LT-P1	
	ow hazard and low risk ome moderate hazards but low risk doderate hazard, moderate risk or uncertainty hat could result in moderate risk doderate to high hazard; emerging regulatory isk (classification may be based on a chemical class/grouping approach) ligh hazards and high risk in most scenarios HA completed with excessive data gaps, ating is not possible	IMPLICATIONSRATINGow hazard and low riskaome moderate hazards but low riskb or c/bInderate hazard, moderate risk or uncertainty hat could result in moderate riskx/c, x/c-CMR(2), grey/c, c/b-CREInderate to high hazard; emerging regulatory isk (classification may be based on a chemical class/grouping approach)x*, x-PB, x-PMT, x-VPVM, x/c-CM(2)-EHA completed with excessive data gaps, ating is not possiblegrey	IMPLICATIONSRATINGOSEPASCILow hazard and low riska-ome moderate hazards but low riskb or c/bgreen full circleboderate hazard, moderate risk or uncertainty hat could result in moderate riskx/c, x/c-CMR(2), grey/c, c/b-CREgreen half circle, yellow triangleboderate to high hazard; emerging regulatory isk (classification may be based on a chemical class/grouping approach)x*, x-PB, x-PMT, x-VPVM, x/c-CMR(1), x/c-E, x-VPT-had completed with excessive data gaps, ating is not possiblegrey-	

PROGRAM EQUIVALENCY

TABLE 1

HARMONIZED HAZARD BAND

ChemFORWARD Hazard Bands and Program Equivalency

Scope of the 2023 Aggregated Dataset

For this report, Collaborative members were invited to submit product and ingredient information to contribute to this Aggregated IIR. All BPC datasets submitted for IIRs in 2023 were included. The aggregated dataset used for this report includes information submitted by participating ingredient manufacturers, brands, and retailers as well as product and ingredient information gathered from market research. The dataset includes:

- Product information submitted by a KBDB Collaborative Member which is representative of the Collaborative Member's entire assortment of their top selling/performing SKUs across all product categories sold;
- Product types defined as BPC products, such as haircare, skincare, body care, color cosmetics/makeup, etc. Beauty tools, product kits, sample sizes, and most over-the-counter drug products (OTCs) were excluded from the analysis);
- Full fragrance disclosure when available.

The data from all individual organizations were anonymized and aggregated. The dataset spanned more than 8,500 products (SKUs) from hundreds of brands and included 317,945 individual ingredients. Chem*FORWARD*'s data analyst checked these ingredients, predominantly presented as INCI names, against the latest internal CAS number (CASN) mapping and reported Hazard Bands for each ingredient (refer to Insight 1, below). Due to the dynamic nature of the Chem*FORWARD* database and contributors' product offerings, this analysis is time stamped as of April 21, 2024.

Data Confidence

Confidence in the dataset is high with room for improved accuracy. As mentioned previously, in most cases, datasets provided only include INCI names as the primary identifier. ChemFORWARD's internal mapping program matches INCI names to CASNs which is then checked manually. Using multiple sources, we were able to find a match for nearly all (99.9%) of the ~318,000 ingredients which were therefore included in data insights. All non-identifiable substances were excluded from further review⁴.

"At Ulta Beauty we believe collaboration and partnership are critical for the entire beauty industry to create a meaningful, positive legacy for our world. With this dataset, we are helping fill critical data gaps. This work showcases the importance of transparency and continued collaboration to create safer products and consistency for the entire beauty industry."

Kristin Wolf SVP of Enterprise Strategy and Digital Innovation *Ulta Beauty*

KEY INSIGHTS

CHEMICAL HAZARDS ARE KNOWABLE

Utilizing the shared chemical hazard repository, Chem*FORWARD* could assign a confident Hazard Band to approximately 70% of the ~318,000 total identified ingredients reported in the dataset before de-duplication; this is the baseline or "Metric Zero" for the Beauty and Personal Care aggregated dataset. This is a well characterized dataset compared to other sectors that ChemFORWARD has preliminary analyzed.

In summary:

- METRIC 0.0: 70% characterized
- METRIC 0.1: 3% priorities for elimination (D/Fs) see page 20 for top 10 priorities for elimination
- METRIC 0.2: 66% safer chemistry (A/B/Cs)
- **METRIC 0.3: 30% data gaps (?s)** see page 24 for the top 10 high-impact priorities to fill data gaps



METRIC ZERO: Total Hazard Band Distribution for 2023 Aggregated Dataset

This represents the distribution of ingredients across all products. For further analysis, we sought to explore the unique ingredients in the dataset. Unique ingredients were reviewed for the remainder of data analysis.

INSIGHT 2 THE NUMBER OF INGREDIENTS IS MANAGEABLE

Analyzing the data from over 8,500 products, with nearly 318,000 ingredients listed, we uncover a striking insight: there were only 2,279 unique ingredients across all products. For example, "glycerin" is listed in 6,300 products but is counted as one unique ingredient. In contrast, 926 ingredients (40%) are present in less than 10 products.

By focusing on core high-frequency ingredients, we can streamline our approach to understanding and managing common product compositions. This consolidation from a vast array of products to a manageable set of substances demonstrates the power of data analysis in transforming what appears overwhelmingly intricate into something distinctly navigable.

Priority actions from these unique ingredients are detailed below and include:

- O Priorities for characterization—turning ?'s into characterized hazard bands (A, B, C, D, F, U);
- Analysis of high hazard ingredients to identify priorities for elimination and/or opportunities for innovation; and
- Roadmap to increase the % of verified safer ingredients being used.



unique ingredients across all products.

INSIGHT 3 HIGH-HAZARDS PERSIST DESPITE SAFER ALTERNATIVE OPTIONS

After deduplication, 45 chemicals have known high hazards or are considered emerging chemical classes of concern (Ds and Fs) and thus should be prioritized for elimination. The top 10 by frequency are presented in **Table 2**.

% OF PRODUCTS	INCI NAME	POSSIBLE FUNCTIONS*		
18%	Cyclopentasiloxane	Emollient, Solvent	F	
14%	BHT (Butylated Hydroxytoluene)	Antioxidant/ Preservative	D	
10%	Chromium oxide greens (Cl 77288)	Colorant	F	
9%	Methylparaben	Preservative	F	Ŧ
9%	Carbomer (chlorinated)	Emulsion Stabilizer, Viscosity Increasing	D	HAZARD
7%	Red 30 (CI 73360)	Colorant	D	D BAND
7%	Red 27 (CI 45410)	Colorant	D	Ð
5%	Butylphenyl Methylpropional (Lilial)	Fragrance	F	
5%	Ethylhexyl Methoxycinnamate (Octinoxate)	UV Protection	F	
3%	Aluminum Powder (Cl 77000)	Colorant	F	

TABLE 2

Aggregated Report: Top 10 High Frequency/High Hazard Chemicals

Further consideration of functionality for high hazard incumbent chemicals provides granularity which reveals that safer functional alternatives exist for all 10 high hazard/ high frequency chemicals. However, formulating efficacious and stable cosmetics is complex. Therefore, product type is another key variable which provides a feasibility gauge as to whether safer alternative ingredients can be substituted in the place of high hazard ingredients across various product types and chemistries. For example, cyclopentasiloxane is often cited as an emollient which improves the dry time of cosmetics; reviewing other ingredients tagged as emollients on Chem*FORWARD* provides insight into safer, potential functional alternatives which also impart quick-drying benefits such as Isododecane and Heptyl Undecylenate (hazard band C).

To better visualize the availability of safer alternatives, **Figure 3** shows the distribution of all ingredients in the shared repository which have been tagged with a function of Emollient, Antioxidant, or Preservative. In all cases, safer alternatives (greens and yellow) are abundant.



Further analysis of functions did not identify any functions for which a clear call for innovation is currently supported (i.e. where no or few safer alternatives exist) by this research. Areas for innovation certainly do exist and will be pursued in future research projects. At this time, we suggest innovation efforts align to those identified in the 2023 publication from Safer Made highlights **The Need for Safer Chemistry in Beauty: Opportunities for Innovation**.

As an immediate step, brands and retailers should add chemicals in Table 2, which are considered high hazard or of regulatory concern, to their RSLs if they haven't already. RSLs may prohibit chemicals from use in products altogether or provide guidance on a safe use limit, impurity profile, form-specific requirements, and the like. As a strategic consideration, given the availability of data and likely safer alternatives, leading brands and retailers may consider prohibiting all high-hazards (D's and F's) and/or require additional documentation to justify safe use.

As an example, Google shared in a recent blog post titled, <u>Making proactive safer</u> <u>chemistry a standard operating procedure</u>, that they have implemented a more proactive Restricted Substances Specification (RSS) as of November 2023. This program requires any solvent, flame retardant, or PFAS used in their products to have a hazard rating, regardless of whether the chemical appears on the restricted list or if it is regulated or not. Chemicals with an F hazard band (or equivalent) are not permitted without pre-approval.

Overall, brands and retailers should take care to restrict substances as appropriate for the product types they make or sell and the consumers that they serve.

FULL CHARACTERIZATION OF INGREDIENTS IS AN URGENT IMPERATIVE

Chemical Pollution rivals Carbon as an existential threat. A recent study published in the journal Environmental Science & Technology concludes that chemical pollution has crossed a "planetary boundary", defined as the point at which human-made changes to the Earth push it outside the stable environment of the last 10,000 years . The data indicates that humanity has already crossed the 'novel entities' (chemical pollution) and 'biogeochemical flows' boundaries by larger margins than climate/energy, rivaling the urgency of climate change due to its potential for irreversible impacts on Earth's ecological and human health.

The 'novel entities' or chemical pollution boundary encompasses man-made materials and chemicals, such as plastics and pollutants, whose unchecked production and release touches virtually every corner of the earth.

Importantly, the authors assert that the planetary boundary for novel entities is exceeded as annual production and release outpace global capacity for safety assessment and monitoring, and immediate actions must follow to return us to the safe operating space. To return to the safe operating space and prevent future damage, a hazard-based approach prioritizing chemical classes of concern may support the rapid identification and elimination of the most deleterious substances from manufacturing



and distribution. Stated plainly, proactively conducting chemical hazard assessments before substances enter circulation, and avoiding those with high hazards, is needed to bring this system back into balance for humans and the environment.

To fully understand the human and environmental impacts of the ingredients used in BPC products, complete characterization of ingredients through chemical hazard assessments is needed. At this early phase of characterization, several strategies can be employed to make progress such as prioritizing high frequency data gaps for impact, deprioritizing likely low-hazard ingredients, and engaging suppliers in trade name specific assessments.

CHARACTERIZATION STRATEGIES

1. HIGH FREQUENCY DATA GAPS, BROAD IMPACT

High frequency data gaps (**Table 3**) can be prioritized for investment in CHAs to benefit thousands of products (SKUs) and hundreds of suppliers, while lower frequency ingredients might be deprioritized at this early stage of characterization.

Prioritization for CHA investment may alvso focus on various factors such as: frequency of use, availability of safer alternatives within that function, chemicals with new or expanding applications, disparate exposures (considering chemicalproduct combinations predominantly used by or for which increased exposure levels in marginalized subpopulations is known), or those raising potential health or environmental concerns. Whenever possible, identifying specific safer functional alternatives to high hazard chemicals is a high priority.

% OF PRODUCTS	INCI NAME		
63%	Міса	?	
21%	Trimethylsiloxysilicate	?	
20%	Nylon-12	?	
20%	Red 6 (Cl 15850)	?	Ĥ
18%	Manganese Violet (Cl 77742)	?	HAZARD BAND
15%	Carmine (CI 75470)	?	D BAN
14%	Octyldodecyl Stearoyl Stearate	?	Đ
14%	Octyldodecanol	?	
13%	Bismuth Oxychloride (Cl 77163)	?	
12%	Phenyl Trimethicone	?	

TABLE 3

Aggregated Report: Top 10 High Frequency Data Gaps

CHARACTERIZATION STRATEGIES

2. WHEN TO CONSIDER DEPRIORITIZING DATA GAPS

While the ultimate goal is complete characterization of all chemicals used in BPC products, organizations may choose to deprioritize investment in high frequency data gaps to achieve other goals at this early phase. For example, chemicals may be deprioritized for CHAs if the chemical is known to be inert or endogenous (i.e. produced in the human body), is of low intrinsic exposure potential, necessitates risk-benefit analysis (i.e. OTC drugs), or if meaningful assessment cannot be made at the CAS-level (i.e. where trade-name level is more appropriate).

It may also be helpful to identify chemicals for which practical limitations of disclosure, characterization, or hazard assessment by INCI or a single CASN exist. These may include UVCB substances which have unknown or variable composition (e.g. C10-11 Isoalkane), complex reaction products (Polyethylene glycols (PEGs)), and biological materials (essential oils). Other examples include geological materials (mica) and polymers (Glycol/Sebacic Acid Copolymer). In these cases, a trade name assessment (e.g. CleanGredients and ChemFORWARD SAFER™) may provide more actionable information to the value chain.

3. TRADE NAME ASSESSMENTS

CASN-level assessments are a critical starting point. These assessments are designed for pure substances which are predominantly not considered proprietary. Trade name materials are often complex mixtures and can include non-intentionally added substances (NIASs) such as impurities or residuals. Further, these complex mixtures are often considered proprietary to protect a company's innovative formulation. Ensuring the safety of all chemical constituents, including NIASs of off-the-shelf products, requires a process for assessing trade name materials that protects a supplier's confidential business information. This is an essential next step in accelerating supply chain adoption of safer alternatives.



To address this need, ChemFORWARD created the

SAFER[™] trade name designation. SAFER[™] utilizes third-party assessors who can enter into NDAs with suppliers to ensure comprehensive disclosure while protecting CBI. The SAFER[™] program leverages existing CHAs in the shared repository to reduce the cost and increase consistency of a material

review. This process also builds customer confidence with rigorous third-party assurances while providing a portable claim to distinguish trade name material as a safer alternative. Trade name listings from Dow, Inolex, and more are listed in the free **SAFER[™] product registry**.

Other certifications and designations (e.g. CleanGredients) may also serve this purpose. Quality trade name assessment programs will utilize third-party assessors, have comprehensive disclosure requirements for intentionally added and non-intentionally added substances, and require comprehensive CHAs.

INSIGHT 5 COLLABORATION IS AN ACCELERATOR

CHAs have traditionally cost individual companies thousands of dollars per chemical. As individual companies seek hazard insights, the same chemical is assessed over and over by different assessors using slightly different methods. Further, toxicology reports were not shared with others, including supply chain partners, limiting the usefulness of each report. Chem*FORWARD*s CHA repository has changed this model and created broad access to chemical hazard data through a digital platform utilizing a cost-sharing, data-sharing model that has reduced costs and increased consistency of the data.

Shared data is an enabler for supply chain transformation and the return on investment is tangible.

Consider impact in terms of investment per data gap. For example, conducting 10 new CHAs on the high frequency data gaps in **Table 3** will cost less than \$50,000 and will fill 17,935 data gaps across the 2023 aggregated data set. At \$2.79 per data gap, characterization is improved for thousands of products and knowledge is enhanced for hundreds of suppliers.

In 2023, members of the KBDB Collaborative sponsored the creation of **25 CHAs**, successfully **filling 20,314 data gaps**, thereby enriching the 2023 aggregated data set significantly⁶. This substantial achievement was realized with an investment of only **\$125,000**, which translates to an economical **\$6 per data gap** yet offers immeasurable value in informed decision making for the entire industry (and beyond).



Looking ahead, assessing the top 25 uncharacterized ingredients from the 2023 aggregated dataset is projected to improve characterization of the total hazard band distribution by an additional 10% for a total of 80% characterized—a very impressive achievement compared to other preliminary industry datasets (e.g. electronics, built environment) that Chem*FORWARD* has analyzed.



It is now possible to envision a future where hazards are known, and hazard data is an expectation in B2B communications.

An Invitation

This dataset represents a subset of the BPC industry; however, it includes value chain members of various sizes, budgets and markets which serve a variety of consumers. Therefore, we expect that the overall market trend will be directionally aligned with these findings. Additional research is necessary to understand to what extent these results are representative of the entire BPC sector. Chem*FORWARD* welcomes additional datasets to further this research.

While understanding the overall market trend is a key baseline metric, it does obscure potentially important insights for certain subpopulations that may be disproportionately exposed to high hazard chemicals. Additional IIRs should be generated for ingredients in BPC products used by disparately exposed or particularly susceptible or vulnerable subpopulations, such as BIPOC, low socioeconomic status (SES), and pregnant consumers.

Chem*FORWARD* welcomes additional datasets for our follow-up aggregated analysis, particularly for products which are known to be used by populations with disparate exposures to chemicals of potential concern or who experience a disproportionate burden of disease.

"As one of the largest beauty care ingredient suppliers the world, we are delighted to see ChemFORWARD advancing this database. Leveraging the data of complex science, the ease and transparency of the program make it particularly appealing. This initiative offers a consistent method for assessing material safety, making it easier for brands and formulators to obtain key information."

Jennifer Marques Global Strategic Marketing Director, Personal Care *Dow Consumer Solutions*

Conclusion

The BPC industry stands at the cusp of a transformative era, where data-driven insights are poised to redefine safety and sustainability. The journey towards 'Metric Zero' for the entire industry—a comprehensive understanding of ingredient hazards—is well underway and within our grasp, and the progress made in 2023 through the Know Better, Do Better Collaborative serves as a beacon of collective achievement. The collaborative efforts have not only filled critical data gaps but have also illuminated a path towards informed decision-making, fostering an environment where innovation and consumer trust can flourish. These efforts have yielded insights that the Safer Chemistry Impact Fund believes will translate across business sectors:

Chemical hazards are Knowable.

The number of chemicals is Manageable.

Shared data is an **Enabler**.

Collaboration is an Accelerator.

Toxic chemical exposure is Solvable.

The call to action is clear: the industry must continue to invest in shared, highquality CHAs, prioritize the elimination of high-hazard chemicals, and champion the transition to verified safer chemistry. By embracing chemical hazard transparency and collaboration, we can create a future where beauty products are inherently safe for both human health and the environment. The momentum is building, and the time to act is now. Let us collectively strive for a beauty industry that embodies the principles of 'Know Better, Do Better,' ensuring a legacy of responsible and sustainable practices for generations to come.

Endnotes

- ¹ Sufficient data to identify and characterize high hazard chemicals may be available via regulatory determinations or chemical class groupings; determinations may not be based on full comprehensive assessments, rather one or more documented high hazards. Thus, Chem*FORWARD* conservatively assigns D and F hazard bands aligned to certain regulations and authoritative listings to characterize chemicals known to be high hazard. Chemical classes of high concern (e.g. PFAS) may also be characterized using this approach. Details are available in "Chemical Hazard Rating Guidance" on the <u>Chem*FORWARD* website</u>.
- ⁱⁱ For detailed information on Chem*FORWARD*'s Chemical Rating methodology, review "Chemical Rating Guidance v2.0" under "Our Approach" on the Chem*FORWARD* website <u>HERE</u>. Note that this Rating Guidance may be replaced as new version updates are available. Archived Rating Guidelines are available <u>HERE</u>.
- ^{III} Note that for this assessment, CHAs which are in progress ("IP" Hazard Band) were considered to be characterized as the CHA results will soon be available.
- ^{iv} Limitations exist with the naming conventions used in BPC ingredients, and the CASN match is not always exact. We are continually improving our processes. To increase data accuracy in the future, we aim to coordinate across platforms (e.g. wINCI, PubChem, Pharos, etc.) for consistent identifiers.
- ^v The 2023 update to the Planetary Boundaries Licensed under CC BY-NC-ND 3.0. CREDIT: Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023.
- ^{vi} CHAs sponsored by KBDB members in 2023 listed by INCI (total count in 2023 dataset): Tetrasodium EDTA (658), Tin Oxide (CI 77861) (1984), Paraffin (708), Polyethylene (964), Isododecane (2057), Nitrocellulose (24), Disteardimonium Hectorite (1551), Mannitol (67), Disodium Stearoyl Glutamate (258), Synthetic Fluorphlogopite (2043), Chamomilla Recutita (Matricaria) Flower Extract (385), Calendula Officinalis Flower Extract (381), Pogostemon Cablin Leaf Oil (117), BHT (Butylated hydroxytoluene) (1200), Ascorbyl Palmitate (1089), Ethylhexyl Palmitate (1179), Boron Nitride (1304), Behentrimonium Methosulfate (207), Methylparaben (804), Methylisothiazolinone (MIT) (281), Triethoxycaprylylsilane (1127), Magnesium Myristate (788), Citrus Grandis (Grapefruit) Seed Extract (203), Salvia Officinalis (Sage) Extract (141), Euphorbia Cerifera (Candelilla) Wax (794); 2023 Total Collective Impact: 20,314



KNOW BETTER, DO BETTER

Together, we are accelerating safer chemistry for all.

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