June 2025

## GEORGPATHVAYS M A G A

### STEMming The Reading Gap

Where Does My Drinking Water Come From?

Repairing Damaged DNA

Leadership In Education

The Technology Association of Georgia Education Collaborative (TAG-Ed) strengthens the future workforce by providing students with relevant, hands-on STEM learning opportunities and connecting them to Technology Association of Georgia (TAG) resources.

Formerly the TAG Foundation, TAG-Ed is a 501(C)(3) non-profit organization formed by TAG in 2002. Later, the organization's name was re-branded to TAG Education Collaborative to facilitate our role as the leaders for K-12 STEM education in Georgia.

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This magazine services the STEM education industry needs of the state of Georgia. This magazine is viewed by the consumer with the understanding that the information presented is from various sources from which there can be no warranty or responsibility by the Technology Association of Georgia, the Technology Association of Georgia Education Collaborative and/or their affiliates as to legality, completeness or accuracy. Leadership In Education WAYNE CARLEY

STEMming the Reading Gap Shelly A. MUNOZ

Repairing Damaged DNA JEREMY RUMSEY / ORNL

Where Does My Drinking Water Come From? JEAN M. WALLACE

Sun-care: Safe or Scam? Monica Ramos / Anastasiya Shor Welcome to the June 2025 edition of Georgia Pathways Magazine, a platform dedicated to exploring the forces shaping our state's innovation economy. For today's employers—large and small success increasingly hinges on a workforce that is not only technically skilled but adaptable, visionary, and well-prepared for the fast-evolving demands of science and technology. This issue highlights how Georgia is advancing that future through strategic investments in STEM education and real-world application.

In this edition, we spotlight areas that directly influence workforce readiness and business growth. In "Leadership in Education," we examine how cultivating confident, future-ready STEM educators is essential to building strong talent pipelines. "STEMming the Reading Gap" reveals how integrating literacy and scientific thinking lays a foundation for critical problem-solving—an asset for any career path, especially in data-rich and tech-driven fields.

"Repairing Damaged DNA" showcases advancements in biotech that are not only transforming healthcare, but also opening new job markets in life sciences. Our feature on "Where Does Drinking Water Come From" underscores the growing need for environmental engineers and technicians, whose work ensures resilience in core infrastructure. And "Safe Suncare Chemistry" highlights how ethical innovation in product development intersects with consumer demand and sustainability—priorities for today's mission-driven employers.





Whether you're a business leader looking to connect with future talent, a policymaker shaping legislation, or a student preparing to enter a STEM-based career, this issue offers actionable insight into the future of Georgia's workforce. These stories reflect a statewide commitment to cultivating creativity, critical thinking, and collaborative problem-solving—the essential skills that modern industries value most.

We invite you to continue this conversation in person at the TAG Tech Workforce & Legislative Summit, happening July 24, 2025, at Troutman Strategies in Atlanta. This gathering is a critical forum for aligning educational initiatives with the real needs of Georgia's employers. Learn more or register at https://tagedonline. org/tag-tech-workforce-legislative-summit/.

Let's build a workforce—and a future—that works for everyone.

Larry K. Williams President TAG / TAG-Ed

Larry K. Williams serves as the President and CEO of the TAG and the TAG Education Collaborative. TAG-Ed's mission is to strengthen Georgia's future workforce by providing students with relevant, hands-on STEM learning opportunities by connecting Technology Association of Georgia (TAG) resources with leading STEM education initiatives.



### **Educational Leadership**

By Wayne Carley

The effectiveness of every organization known depends on leadership, and the quality of that leadership will make or break that effort. From national government, to your local school systems, there are a wide variety of leaders within, appointed and not, that influence, inspire, encourage and can unfortunately crush the spirit of those involved. It been said that behind every failed company was a poor leader(s).

History has proven this correct as confidence in an organization usually rests on the vision, decisions and inspiration of the leadership. Educational leadership refers to the practice of guiding and influencing others within an educational setting to achieve common goals and improve the quality of education. It encompasses various roles and responsibilities, including setting and communicating a vision, fostering a positive learning environment, and promoting effective teaching practices. Educational leadership is not limited to formal administrative positions, but can be practiced at all levels, from students, teachers, administrators, and even parents and community members.



At the root of leadership within the classroom are those influential students who shine as an example to their peers, often followed and emulated as a role model. It's hoped that those role models are a "positive" one. The inverse is also often true, and can inflict a damaging blow to all leading efforts moving up the ladder. A strong and positive student leader is a treasured ally for the teacher, the class and the school.



Classroom educators may have one of the most vital responsibilities in the chain of leadership, as they spend the most time with students and can exude tremendous influence daily in students lives on every topic including their self-esteem, scholastic success, expectations, collaboration and socialization within the school and community.

The pressure to perform as an effective leader on a daily bases weighs heavily, with standardized testing expectations, curriculum pace, often volatile adolescent behaviors and of course the vast complexities of being a human daily with it's ebbs and flows.

As the national teacher shortage continues to ramp up to becoming an emergency, young educators within the first 5 years of their career share that the leading cause of their decision to quit teaching is the lack of administrative support, in addition to poor pay, harsh working conditions and stress. This brings us back to leadership at the principal and district superintendent levels.

The average national tenure of school principals is less than 4 years - hardly enough time to make the leadership impact schools need. The primary reason principals are not more successful is a lack of interpersonal skills, specifically the inability to build and maintain positive relationships with their staff, students, and parents. This often appears as poor communication, a lack of empathy, and an inability to foster a positive school culture. They too are human, and the responsibility and stress of having to be effective daily weighs heavy. It's exhausting.

If the principal lacks of vision, strategic planning, and an inability to effectively manage resources, everyone within their scope of care suffers. It's common for many principals to lack the necessary training and experience in educational administration, leading to difficulties in areas like budgeting, curriculum development, and conflict resolution. There may be ineffectiveness in communications with stakeholders, including teachers, parents, and students, leading to misunderstandings, decreased morale, and a lack of trust.

Effective leadership is a daunting task, and the stakes are high as we attempt to retain teacher talent while trying to inspire our future workforce to excellence. Although many principals have previous teaching experience, which is valuable, it does not automatically translate to effective leadership across the school environment. It is wise for those making the transition from classroom to administration to pursue additional personal resources and skills necessary to this broader responsibility.

#### **Renewed Inspiration and Passion**

To rekindle their educational inspiration, principals should leverage resources like professional associations, mentors, and peer networks. They can also find inspiration in educational publications, books, and by observing student and teacher interactions. Staying curious, seeking diverse perspectives, and reflecting on their "**why**" can further fuel their passion for education.

The professional "self-care" necessary for principals to succeed is hard work and it's always a good time to remind them, encourage them and support their self-care efforts. Any good leader knows that frequent introspection of their efforts is healthy and necessary. "What can I do better? Am I currently effective? How can I support our teachers better so they can be more effective? How can I listen and communicate



#### more effectively?"

For the classroom educator, peer support, remembering past successes, valuable interactions with colleagues and students, and professional development opportunities are medicine for the soul. Exploring new ideas, seeking feedback, and reflecting on what brings joy in teaching can also reignite passion for the profession. That passion that first launched the teacher into this career field must be rekindled to be the most effective classroom leader possible. Why did I want to be a teacher? What was my passion? How can I get it back?

Let us be clear; the teacher is a human being, and self-care mentally, emotionally, physically and spiritually are fundamental. Overall health and balance are the foundation of any successful leader, and teachers struggle daily with this complicated formula that may include a family at home.



Good educational leader qualities:

**Integrity** - honest, ethical, and trustworthy, setting a strong moral foundation for their team and organization.

**Strong communications** - clear, concise, and open, ensuring that everyone understands the goals, expectations, and progress. Never underestimate the need to be an excellent "listener". Your staff needs to be heard.

**Inspiration** - the ability to inspire and motivate are non-negotiable, as well as a commitment to continuous personal learning and development. Adaptability, empathy, and strong decision-making abilities are critical.

There is no substitute for passion in your work. This kind of exhilaration becomes contagious, rubbing off on the people you lead. Without passion, you cannot provide the direction and guidance your job requires and those you serve will not be as effective leading in this most important career field. If you lack passion and enjoyment, people will see right through you. You'll never be able to inspire them to greatness or higher effectiveness, so *rediscover* your passion. While you needn't possess every skill that characterizes great leadership, you must be able to explain why you're passionate about your work. Once again, become passionate and lead your staff and students to greater successes and fulfillment.

### **STEM**ming the Reading Gap:

Boosting Literacy, Fluency, and Comprehension in STEM Classrooms

#### By Shelly A. Munoz



Reading literacy is no longer just the domain of English Language Arts (ELA) teachers. With the passage of initiatives like the Read Act in Minnesota and other states, educators across all disciplines are called upon to integrate literacy instruction into their teaching practices.

For Science, Technology, Engineering, and Math (STEM) teachers, this is both a challenge and an opportunity. Literacy is foundational for students to access and excel in STEM fields, and STEM teachers are uniquely positioned to enhance reading fluency, comprehension, and critical thinking through engaging, discipline-specific strategies.

Integrating Oral Language and Literacy Acquisition (OLLA) training into STEM classrooms offers additional tools to boost student engagement and understanding. OLLA emphasizes the importance of spoken language as a pathway to strong reading skills, making it an ideal complement to STEM education's focus on inquiry, collaboration, and problem-solving.

## **Enhancing STEM Instruction with OLLA Strategies**

**1** Oral Discussions to Build Comprehension

STEM topics often involve complex concepts that benefit from verbal processing. Teachers can:

• Begin lessons with "turn and talk" activities where students discuss key questions or vocabulary before reading.

• Use structured academic conversations, such as sentence stems like, "I think this data shows \_\_\_\_\_ because \_\_\_\_."

• Host Socratic seminars where students verbally analyze and critique scientific articles, fostering deeper comprehension.

**2**. Storytelling and STEM Connections Storytelling is a powerful tool for oral language development. In STEM, teachers can:

• Encourage students to narrate the process of an experiment, explaining each step and its purpose.

• Integrate STEM stories, such as the biographies of scientists or the history of technological breakthroughs, to humanize STEM concepts while building narrative skills. • Use oral summaries to assess understanding, asking students to explain concepts like photosynthesis or the Pythagorean theorem in their own words.

## **3** Explicit Oral Vocabulary Instruction

Developing strong oral language skills is foundational for reading comprehension in STEM. Teachers can:

• Use OLLA techniques to introduce and practice STEM-specific vocabulary through repetition, questioning, and interactive dialogue.

• Incorporate tools like think-pairshare or small-group discussions to help students verbalize their understanding of terms before seeing them in print.

• Encourage students to create and explain analogies for new vocabulary, such as, "A nucleus is like a brain because it controls the cell."

**4** Multimodal Reading and Speaking OLLA training highlights the benefits of pairing oral and written language for literacy development. In STEM classrooms:

• Use read-alouds of STEM texts followed by group discussions to reinforce comprehension.

• Have students verbally interpret data from charts and graphs, such as explaining what trends a graph shows and why they matter.

• Pair digital tools like Flipgrid with reading assignments to allow students to record and share oral summaries or analyses.

**5** Oral-to-Written Pathways for Literacy

OLLA training emphasizes transitioning from oral to written communication. STEM teachers can:

• Begin assignments with verbal brainstorming sessions, then guide students to translate their ideas into writing.

• Use oral group discussions to refine hypotheses or analyze data before students write lab reports.

• Encourage students to orally present their findings from STEM projects, reinforcing their understanding through both speech and writing.

**6** Leveraging Peer Collaboration Oral language flourishes in collaborative settings. STEM educators can:

• Organize peer teaching opportunities where students verbally explain concepts to their classmates. • Use group activities that require students to solve problems collabora-tively and articulate their reasoning.

• Incorporate STEM debates where students discuss the merits of different solutions to real-world problems, building argumentation skills while reinforcing content knowledge.

#### Conclusion

By integrating OLLA training into STEM classrooms, teachers can strengthen the oral language skills that underpin reading fluency and comprehension. These strategies not only enhance literacy but also deepen students' ability to communicate, analyze, and solve problems—skills that are critical for success in STEM fields.

The synergy between OLLA techniques and STEM education ensures that students are not just learning science, technology, engineering, and math; they are also developing the language tools necessary to articulate their ideas and connect with the broader world.

With this comprehensive approach, STEM teachers can bridge the gap between literacy and technical learning, preparing students to thrive in both academic and professional settings.



*"Encourage students to orally present their findings from STEM projects, reinforcing their understanding through both speech and writing."* 

- Shelly Munoz





# Summit supercomputer draws molecular blueprint for repairing damaged DNA

By Jeremy Rumsey / ORNL

Sunburns and aging skin are obvious effects of exposure to harmful UV rays, tobacco smoke and other carcinogens. But the effects aren't just skin deep. Inside the body, DNA is literally being torn apart.



The Summit supercomputer revealed how damaged strands of DNA are surgically repaired by a molecular pathway called nucleotide excision repair, or NER. NER's protein components can change shape to perform different functions of repair on broken strands of DNA (blue and red helix). Credit: Tanmoy Paul, Georgia State University Understanding how the body heals and protects itself from DNA damage is vital for treating genetic disorders and life-threatening diseases such as cancer. But despite numerous studies and medical advances, much about the molecular mechanisms of DNA repair remains a mystery.

For the past several years, researchers at Georgia State University tapped into the Summit supercomputer at the Department of Energy's Oak Ridge National Laboratory to study an elaborate molecular pathway called nucleotide excision repair, or NER. NER relies on an array of highly dynamic protein complexes to cut out, or excise, damaged DNA with surgical precision.

In their latest study, published in Nature Communications, the team built a computer model of a critical NER component called the pre-incision complex, or PInC. PInC plays a key role in regulating DNA repair processes in the latter stages of the NER pathway.



L/U.S. Dept. of Energy

Decoding NER's sophisticated sequence of events and the role of PInC in the pathway could provide key insights into developing novel treatments and preventing conditions that lead to premature aging and certain types of cancer.

"We're interested in the way cells repair their genetic material," said lead investigator Ivaylo Ivanov, a chemistry professor at Georgia State University. "NER is a versatile pathway that repairs all kinds of different DNA damage using a three-stage process that relies on delicately balanced molecular machinery. Unfortunately, harmful mutations can develop that interfere with this machinery and cause severe human diseases." "Yet, the effects of genetic mutations can be strikingly different depending on their positions within the repair complexes. In some cases, mutations result in patients having UV light sensitivity and an extreme cancer predisposition. In other cases, they cause abnormal development and premature aging," he said. "Why that happens is not completely understood at the molecular level. That's the mystery our computer modeling efforts aim to unravel."

#### The three acts of repair

NER unfolds in three distinct stages: recognition, verification and repair. Each stage requires different groups of proteins to perform specific functions, much like a trauma team has different specialists needed to treat injured patients in the emergency room. In that way, the NER machinery can adapt and change its shape depending on the task at hand.

In the first stage, the NER protein XPC (xeroderma pigmentosum group C) acts like a first responder that locates the site of the damaged DNA, or lesion, and then twists the DNA helix to make the damage accessible. XPC then calls in other repair proteins to help initiate the second stage, called damage verification, or lesion scanning.

Here, the NER protein machinery shifts into its next shape. As XPC steps back, the protein complex called transcription factor IIH, or TFIIH (pronounced T-F-2-H), moves into position. TFIIH further unwinds the section of DNA and scans the newly exposed strand for lesions.

After that, it's in the hands of the surgeon — the PInC — in the third and final stage of repair.

With the "patient" stabilized and prepped for surgery, the operation to remove the damaged DNA strand can begin. Two enzymes, XPF and XPG (xeroderma pigmentosum groups F and G), position themselves precisely on each side of the lesion and act as molecular scissors to cut out the damaged segment of DNA. Once the lesion is removed, new DNA is synthesized to fill in the gap left behind. Finally, the DNA backbone is sealed, and the damaged DNA is restored back to health.

"What we want to know is how the PInC forms after the lesion scanning phase," Ivanov said. "How does it control the positioning of the two enzyme subunits that perform the dual incision of the damaged DNA strand? And importantly, is there any cross talk between the two enzymes? Do they sense each other?"

"That matters because once the damaged DNA strand is cleaved, it's vital that the repair process is completed by filling in that gap," he added. "Otherwise, it will lead to cell death or to the introduction of double-stranded breaks, which are extremely harmful to the cell."

Answering those questions required the researchers to solve the structure of the PInC. In biology, understanding protein structure is essential for understanding the behavior or function of protein assemblies. The shapes, sizes and interactions of proteins determine how they fit together to form large biomolecular assemblies.

"We integrated the structural model of PInC using data from a variety of biophysical techniques, notably cryo-electron microscopy," Ivanov said. "But in the end, the computation is what puts everything together."

Much like the pieces of a jigsaw puzzle, the PInC model had to be assembled from known structures of constituent proteins, and all the individual pieces had to be put together in 3D. However, many of the PInC components had no known experimental structures.

To overcome this challenge, the researchers used a neural networkbased model called AlphaFold2 to predict the unknown structures and the interfaces between the proteins that hold PInC together.

#### Summit's final simulations

"Computationally, once you assemble the PInC, molecular dynamics simulations of the complex become relatively straightforward, especially on large supercomputers like Summit," Ivanov said.

Nanoscale Molecular Dynamics, or NAMD, is a molecular dynamics code specifically designed for supercomputers and is used to simulate the movements and interactions of large biomolecular systems that contain millions of atoms. Using NAMD, the research team ran extensive simulations. The number-crunching power of the 200-petaflop Summit supercomputer — capable of performing 200,000 trillion calculations per second — was essential in unraveling the functional dynamics of the PInC complex on a timescale of microseconds.

"The simulations showed us a lot about the complex nature of the PInC machinery. It showed us how these different components move together as modules and the subdivision of this complex into dynamic communities, which form the moving parts of this machine," Ivanov said.

The findings are significant in that mutations in XPF and XPG can lead to severe human genetic disorders. They include xeroderma pigmentosum, which is a condition that makes people more susceptible to skin cancer, and Cockayne syndrome, which can affect human growth and development, lead to impaired hearing and vision, and speed up the aging process.

"Simulations allow us to zero in on these important regions because mutations that interfere with the function of the NER complex often occur at community interfaces, which are the most dynamic regions of the machine," Ivanov said. "Now we have a much better understanding of how and from where these disorders manifest."

Most of the molecular dynamics simulations were performed on Summit. However, after 6 years of production, Summit was retired at the end of 2024. Looking ahead, Ivanov and his team plan to use Summit's successor, Frontier, the exascale-class supercomputer that debuted as the world's most powerful supercomputer when it came online in 2022.

Their work on Frontier will involve examining transcription-coupled NER, which is a DNA repair process that fixes damage in actively transcribed genes to ensure that essential proteins can continue being made.

In addition to Ivanov, the research team includes Jina Yu, Chunli Yan, Tanmoy Paul and Lucas Brewer at Georgia State University; Susan E. Tsutakawa and John A. Tainer at Lawrence Berkeley National Laboratory; Chi-Lin Tsai at the University of Texas MD Anderson Cancer Center; and Samir M. Hamdan at King Abdullah University of Science and Technology.

Frontier is managed and operated by ORNL's Oak Ridge Leadership Computing Facility, a DOE Office of Science user facility. The OLCF also managed and operated Summit until its decommissioning in November 2024. Read more about New Insights Into a <u>Shapeshifting Protein Complex here.</u>

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Where Does My *Drinking Water* Come From?

A corporate/community partnership supporting teachers and educating students.



By Jean M. Wallace

#### Defining the Purpose

Do you know where your drinking water comes from? A question that many adults have difficulty answering. While most of the Earth's surface is water, the amount of potable water is limited. According to drinking water provider, AQUA, a subsidiary of Essential Utilities, drinking water often travels quite a distance from its original source and must then go through an essential treatment process before reaching our homes and schools. Krista Seng, AQUA's Community Affairs Lead, reminds us why protecting water quality is critical. "It is always easier to prevent pollution than to treat it."

Thanks to funding from AQUA's Essential Foundation, (essential.co) and expertise from AQUA's team members (aquawater.com), a partnership in education was formed to support student learning about water quality. Located just outside of Philadelphia, Pennsylvania, all fifth-grade students in the Upper Darby School District are now discovering the importance of this finite resource and learning how to protect the source of their own drinking water, Crum Creek.

### Where is the earth's water found?



## Developing and Delivering the Program

Riverbend Environmental Education Center (riverbendeec.org) and AQUA came together with great synergy to create a partnership that directly supports teachers and students. It was the perfect storm of content, process, expertise and schools wanting to engage students in real-world, meaningful learning.

During one in-class lesson, delivered by Riverbend, students traced how water travels from Crum Creek to their school. Through a network of underground pipes, the students learned how water flowed from the creek to the treatment plant where it is filtered and cleaned. Once treated, the water is sent to a water tower where it is stored. When needed, the clean water travels through more pipes to reach the school. Students were also given a hands-on experience of the water treatment process. While a fun activity, the students were clearly learning important concepts outlined in required academic standards.

The new STEELS (Science, Technology and Engineering, and Environmental Literacy) Standards are a requirement as of next school year. All traditional public schools and charter schools in

### From Source to Tap: Surface Water Treatment



Pennsylvania must teach these standards. These new requirements offer Riverbend and AQUA the opportunity for additional community outreach to design and deliver standards-aligned training for teachers.

#### **Ongoing Support is Key**

The AQUA/Riverbend/Upper Darby partnership is an exciting community collaboration establishing an educational network to support local teachers and students while also creating the next generation of environmental stewards. As experts in water quality, AQUA created and provided the necessary resources to classroom teachers. Utilizing these resources, classroom teachers and Riverbend educators designed the framework for learning and the methods that would best engage students in the process of learning.

When asked where Riverbend sees teachers needing the most support, Riverbend's Education Director, Suzanne Safran sees the new standards as more process driven while still recognizing the importance of science content. "As experts in both content and process," she said, "Riverbend will be there to help. We already focus on the STEELS framework, and our staff is very STEELS literate. Both our on-site field trips and teacher trainings are designed to fully incorporate these new standards."

#### **Assessing Success**

As for the learning outcomes that AQUA would like to see? To date,

most of the assessments have been through observations and discussions with both classroom teachers and Riverbend staff. Beginning next year, Riverbend will be doing a more "deep dive" evaluation by creating pre-program and post-program assessments. These assessments will not only measure the growth in learning but will also help Riverbend identify those aspects of the program that most contributed to this growth.

Upper Darby Curriculum Supervisor, Elisabeth Riches, has been instrumental in this partnership and has experienced the benefits of the AQUA program firsthand. "I was visiting a class after their AQUA lesson" she said, "and the teacher asked a question relating to science content. A student easily answered it using strong vocabulary from what they learned in the AQUA/ Riverbend lesson. When we can make learning about an abstract concept like 'watersheds' and make it concrete and personal to the students' lived experience, it strengthens their understanding and their ability to remember the lessons."

#### A Wish List for the Future

Suzanne Safran expressed how Riverbend is always looking to improve its outreach and share its expertise. "Going forward," she said, "at the top of Riverbend's wish list would be to expand



the Upper Darby program to include hands-on field studies for students at a location along Crum Creek." This would require additional funds and an approval of instructional time for on-site, place-based learning. Riverbend would also like to implement the AQUA program in other schools and districts.

Finally, meeting directly with AQUA employees would allow students to gain insight into a career in water quality, hear how technology and automation might influence future careers, and come away with an understanding of the knowledge and skills they may need to acquire to compete. For Elisabeth Riches, her wish is a simple one. She would love to have more copies of the student books used in the program. Krista Seng shared why AQUA remains enthusiastic in its support for this learning experience. "These students learn that each of us has the power to



protect water quality with the small actions we take every day. We all want safe drinking water and the best thing we can do is educate as many people as possible about where their drinking water comes from and how to protect it.

When students connect what they are learning to their local community, they not only gain important knowledge and skills, but an understanding of and appreciation for what the environment provides for us all."





## **GEORGIA PATHWAYS MAGAZINE**

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### Social Media Suncare: Safe or Scam?

by **Monica Ramos**, PharmD Candidate 2025, Touro College of Pharmacy-NY Edited by **Anastasiya Shor**, PharmD, BCPS

In the growing era of TikTok, skin and suncare products from outside the U.S. often claim they are superior to products approved for sale in the U.S. Sunscreen made in countries like Japan, South Korea and France include newer chemical filters, some of which have been shown to have broader coverage against UV rays than those used in the U.S.<sup>1</sup> In the U.S., sunscreens are regulated as drugs, but in other parts of the world, they are considered cosmetic products.

Aside from the classification, one big difference is how sunscreen ingredients are approved for use in the U.S., which is also why such ingredients never seem to reach the American market.

Basal cell and squamous cell carcinomas remain a major health concern in the U.S., as they are the most common types of skin cancer.<sup>2</sup> As of July 1, 2024, the Centers for Disease Control and Prevention reports that about 6.1 million adults are treated for basal cell and squamous cell carcinomas annually at a cost to the health care system of about \$8.9 billion a year.

Nevertheless, consumers trust electronic content like TikTok videos produced by beauty influencers. However, it can be challenging to identify the best product to use due to widespread misinformation.<sup>3,4</sup>

A lot of the social media skincare advertising claims promotes products which "melt into the skin" and feature a "lightweight texture" to result in more radiant-looking skin.<sup>5</sup> However, promoters fail to point out that the ingredients in these products are not FDA approved and therefore have not been proven safe and effective for use in the U.S. Here is some important information to consider before selecting a sun or skin care product.

Overview of Sunscreens and Sunblock Utilizing sunscreen effectively is key to preventing sunburn, minimizing exposure to harmful UV rays, and reducing the risk of skin cancer.<sup>6</sup> UV-A and UV-B rays from the sun reach the Earth and can penetrate the layers of both the epidermis and dermis. UV-A rays have longer wavelengths and can damage DNA by modifying collagen and elastin proteins in the skin, causing aging and wrinkles. UV-B rays have shorter wavelengths that primarily affect the superficial layers of the skin and are commonly associated with skin cancer, sunburns, and tanning.

There are two main categories of sunscreen: chemical and physical/mineral screens. Physical or mineral sunscreens, often called "sunblock" act like a shield by forming a barrier on the skin's surface that helps block and scatter harmful rays.<sup>7</sup> Currently, there are only two FDA-approved mineral sunscreen ingredients: zinc oxide and titanium dioxide.



Chemical sunscreens function by absorbing the UV rays from the sun like a sponge, converting them into non-damaging heat, which is then released into the skin.<sup>6,7</sup> Chemical sunscreen ingredients include: oxybenzone, avobenzone, octisalate, octocrylene, homosalate and octinoxate.<sup>7</sup>

Chemical sunscreens are easier to rub into the skin and may not leave a white cast, while mineral sunscreens are gentler on the skin and can be used for those with sensitive skin, but have an undesirable white cast effect.

#### **Sun Protection Factor**

Sun Protection Factor (SPF) measures how well sunscreen can protect against UV-B rays, not UV-A.7 While SPF is one of the most commonly used measures for sunscreen effectiveness, consumers often mistakenly believe that SPF relates to solar exposure time, which is not the case, because SPF is not directly related to time but to the amount of solar exposure.<sup>8,9</sup>

According to the FDA, SPF is a measure of how much UV radiation is needed to produce a sunburn on protected skin (i.e., in the presence of sunscreen) relative to the amount of UV radiation needed to produce a sunburn on unprotected skin.<sup>8</sup> For example, the amount of solar exposure may be affected by time of day and duration of exposure. An individual who is exposed to 1 hour of sun at 9 a.m. may receive the same amount of exposure as someone exposed to 15 minutes of sun at 1 p.m.<sup>9</sup>



#### **Interpreting SPF**

To get an idea, an SPF of 30 blocks approximately 97% of UV-B rays.<sup>7,10</sup> Higher SPF values (up to 50) provide greater sunburn protection, but the difference in protection beyond an SPF of 50 is actually very small.<sup>9</sup> For instance, an SPF of 100 blocks approximately 99% of UV-B rays.<sup>10</sup>

To obtain the most benefit from sunscreens, choose those that have an SPF of at least 30 and use products labeled as "*broad spectrum*" and "water resistant" to most effectively protect the skin from both UV-A and UV-B rays.<sup>7</sup> Sunscreen should be re-applied after about two hours, or more frequently if sweating or swimming. Use two milligrams of sunscreen per square centimeter of skin, which in simpler terms is equal to a shot glass of sunscreen to cover the face and exposed areas of the body.

## What Makes Foreign Suncare Different?

The influencer promotion of foreign suncare products on social media raises consumers' curiosity about these products. The videos often discuss aesthetics that are important to consumers, like the texture of the product, ease of use, and additional skin care benefits. However, the more important distinction lies in the active ingredients. In the European Union, Australia, and most countries in Asia, companies gain approval for sunscreen ingredients much faster than in the U.S. and are therefore able to offer a broader range of active ingredients.<sup>11</sup> These sunscreens incorporate some of the same ingredients as U.S. sunscreens, like titanium dioxide, but also use other patented ingredients like bemotrizinol (Tinosorb<sup>®</sup> S), bisoctrizole (Tinosorb<sup>®</sup> M), ecamsule (Mexoryl<sup>®</sup> SX) and drometrizole trisiloxane (Mexoryl<sup>®</sup> XL).<sup>12</sup> Bemotrizinol, bisoctrizole and drometrizole trisiloxane are UV-A/UV-B filters while ecamsule is a UV-A filter.<sup>13</sup>

These products are titled broad-spectrum but utilize a different rating called the PA system. This system, which stands for "protection grade of UV-A," is a Japanese scale used to measure a sunscreen's effectiveness in protecting the skin from UV-A rays.<sup>14</sup> The rating is indicated by plus signs (e.g., PA+, PA++, PA+++), and the more plus signs the greater protection (Table 1).

#### Warnings and Precautions

The U.S. drug review and approval processes requires extensive testing to deem the products safe and effective.15 Despite discussions with the FDA about allowing these newer chemicals into the American market, the FDA continues to defend its review process and calls for testing of all sunscreens sold in the U.S.

PA+	Provides some UVA protection, suitable for minimal or short-term sun exposure.
PA++	Offers moderate UVA protection, ideal for everyday use in environments with regular sun exposure.
PA+++	Provides high protection from UVA rays, recommended for long periods of sun exposure or for people with sensitive skin prone to photoaging.
PA++++	The highest level of UVA protection, often found in sunscreens used in regions with intense sun or for those with a high risk of skin damage. <sup>14</sup>

Tahle	1 1 1//4	Protection	Grade	Nomenclature
lable	1. UVF	FIOLECTION	Glaue	Nomenciature

Another significant drawback of using foreign products is the risk of buying counterfeit products, especially on social media websites. Due to high product demand, many may seek to profit by releasing low-quality products. Counterfeit skincare raises much more concern for the ingredients and the dangers they can pose. These products can be made with substandard or hazardous materials or components that can pose a risk of irritation, burns, and no sun protection.<sup>16</sup>

You will notice these products are not for sale at responsible beauty retailers because it is illegal to sell these products in the U.S. without FDA approval. Whether purchasing the true product or a counterfeit one, this is something to be very mindful about and consumers should think twice before buying anything from social media sites.

#### Pharmacists' Role

As pharmacists, it is our duty to become well informed about consumer trends to be able to make high quality recommendations for our patients. Feeling comfortable offering advice on suitable products is essential to ensure the safe use of suncare products on the market.

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## Al Skills: The New Currency in Today's Job Market

The AI revolution is here. Ever since ChatGPT arrived on the scene in late 2022, artificial intelligence has been reshaping the way we live and work. What does that mean for tech professionals looking to compete in a changing labor market?

TV pundits and talking heads love to get riled up about whether robots are coming for our jobs — but the truth is that AI will probably create more jobs than it eliminates. And one thing's for sure: understanding how AI works, and mastering AI skills, will be the key to success in tomorrow's ever-changing world of work.

New research shows that a growing number of companies are asking for AI skills in job descriptions — including non-tech roles. And a survey of HR professionals released last month shows that job candidates with AI skills ask for more money during the interview process — and tend to get it once they're hired. Simply put, AI is going to be underpinning nearly every job out there. That's why staying ahead of the latest in AI development is so important.

Building AI skills doesn't just mean learning how to engineer prompts for ChatGPT. It's everything from programming to data modeling and analysis to mastering concepts like machine learning and natural language processing. And if there's anything certain in our fast-paced economy, it's that building AI fundamentals today will translate to career opportunities tomorrow and beyond. That's where SkillStorm comes in. In partnership with TAG, we offer Microsoft Azure AI courses that are instructor-led, career-aligned tech certification courses and will help you build the AI skills that employers need. From the basics of AI and machine learning to a comprehensive understanding of how to design, deploy, and maintain AI solutions, you'll learn everything you need to accelerate a career in the economy's hottest fields.

It won't be long before all kinds of jobs, all across the economy, require AI skills. And starting now is the best way to accelerate your ascent up the career ladder. Build those skills today and you'll lay the foundation for opportunity for years to come — and set yourself up for success in an AI-driven future of work. <u>Register today</u> to get started with a career in tech.



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