







YOUR DAILY DOSE OF SCIENCE

SPECIAL EDITION 9

□ | in | ♥ | f /labmedya bilgi@labmedya.com www.labmedya.com

A WAY TO PRODUCE AN ALTERNATIVE JET FUEL WITH BACTERIA HAS BEEN DISCOVERED!





ARTIFICIAL PHOTOSYNTHESIS CAN PRODUCE FOOD IN COMPLETE DARKNESS



10 BEST PLACES TO VISIT IN TURKEY



STARFISH EMBRYOS SWIM LIKE A "LIVING CRYSTAL" IN ORGANIZED FORMATION

LabMedya

No: 09 August 2022

CHAIRMAN Sülevman GÜLER

EDITOR Berat DURMAZ

GRAPHIC DESIGNER Berat DURMAZ

ADVISORY BOARD

Professor Dr. Kadir HALKMAN Professor Dr. Aziz EKŞİ Melek MALKOÇ Exp. Yelda ZENCİR Özlem Etiz SAĞDAŞ Nevin KOÇAKER

LEGAL ADVISORS Hunting. Ersan BARKIN Hunting. Murat TEZCAN

FINANCIAL CONSULTANT İrfan BOZYİĞİT SMMM

HEAD OFFICE Oğuzlar Mah. 1374 Sok. No:2/4

Balgat – Ankara TURKEY Tel: +90 312 342 22 45 Fax: +90312 342 22 46 bilgi@labmedya.com

PROSIGMA

www.prosigma.net info@prosigma.net

DATE OF ISSUE August 2022 – Ankara

NOTE TO THE READER

Published in the Labmedya Newspaper featured in articles and articles Responsibility of opinions Broadcast LabMedya not to its body and / or Prosigma Company, belongs to the authors. Authors may have consultancy or other business relationships with companies involved in their work. Ads also; is the responsibility of advertisers. The product information published on the product introduction pages are the presentations of the relevant companies and the manufacturer Responsibility

In addition to the Labmedya

WHAT IS LABMEDYA ? www.labmedya.com

A NEW HORRIFYING GENETIC DISEASE

A new genetic disease slows down children's brain development.

A new genetic disease that causes some children's brains to grow abnormally and postpone intellectual development has been discovered by scientists.

The majority of people with the disease, which is still so new that it lacks a name, struggle with significant learning challenges that have a negative impact on their quality of life.

Changes in the protein-coding gene known as Glutamate Ionotropic Receptor AMPA Type Subunit 1 (GRIA1) were the underlying cause of this uncommon genetic disorder, according to an international team of researchers from the universities of Portsmouth, Southampton, and Copenhagen.

The discovery of the variant will help doctors in developing focused treatments to help patients and their families and will pave the way for screening and prenatal diagnosis.

The GRIA1 gene facilitates the movement of electrical impulses inside the brain. The brain's ability to remember information may be hampered if this process is interfered with or if it is rendered less efficient.

To demonstrate that GRIA1 mutations are the fundamental cause of the behavior-altering disease, the study team—which consists of frog geneticists, biochemists, and clinical geneticists—used tadpoles in which the human gene variations were replicated via gene editing. The biochemical analysis of the variants was also carried out in frog oocytes.

Study co-author Professor Matt Guille, who leads a laboratory in the Epigenetics and Developmental Biology research group at the University of Portsmouth, said: "Next generation DNA sequencing is transforming our ability to make new diagnoses and discover new genetic causes of rare disorders.

"The main bottleneck in providing diagnoses for these patients is linking a change discovered in their genome firmly to their disease. Making the suspect genetic change in tadpoles allows us to test whether it causes the same illness in humans.

"The resulting data allow us to support our colleagues in providing the more timely, accurate diagnosis that patients and their families so desperately need."

Co-author Dr. Annie Goodwin, a Research Fellow at the University of Portsmouth who performed much of the study, said: "This was a transformational piece of work for us; the ability to analyze human-like behaviors in tadpoles with sufficient accuracy to detect genetic disease-linked changes opens the opportunity to help identify a huge range of diseases. This is particularly important given that so many neurodevelopmental diseases are currently undiagnosed."

Williams

Co-author Professor Diana Baralle, Professor of Genomic Medicine and Associate Dean (Research) in the Faculty of Medicine at the University of Southampton added: "Discovering these new causes for genetic disorders ends our patients' diagnostic odyssey and this has been made possible by collaborative interdisciplinary working across universities."

One in 17 people will suffer from a rare disease at some time in their lives. Most of these rare diseases have a genetic cause and often affect children, but proving which gene change causes disease is a huge challenge.

Professor Guille said that previously, while studies connecting a gene and a disease were mainly performed in mice; several labs, including his own at the University of Portsmouth, have recently shown that experiments in tadpoles can also provide very strong evidence about the function of variant human genes. The pro-

◎ | in | ¥ | f /labmedya

HEALTH AND LABORATORY MAGAZINE

cess of re-creating some gene variants in tadpoles is straightforward and can be done in as little as three days.

Professor Guille added: "We are currently extending and improving our technology in a program funded by the Medical Research Council; this is making it applicable to the wider range of disease-related DNA changes provided to us by our clinical collaborators.

"If the clinical researchers find the information sufficiently useful, then we will continue to work together to scale up the pipeline of gene function analysis so it can be used to direct effective interventions for a significant number of patients."

The results were published in the American Journal of Human Genetics.

Article: "Identification and functional evaluation of GRIA1 missense and truncation variants in individuals with ID: An emerging neurodevelopmental syndrome" 7 June 2022, American Journal of Human Genetics.

DOI: 10.1016/j. ajhg.2022.05.009



3

YOUR DAILY DOSE OF SCIENCE



A WAY TO PRODUCE AN ALTERNATIVE JET **FUEL WITH BACTERIA HAS BEEN DISCOVERED!**

As these bacteria feed, they produce a strange molecule that can be used to make jet fuel.



AN EXPLOSIVE IDEA

To see if he could synthesize a tricky molecule that has the potential to produce a lot of energy, Jay Keasling, a chemical engineer at the University of California, Berkeley, approached Cruz-Morales, who was a postdoctoral researcher in his lab at the time. "Keasling told me: it's gonna be an explosive idea," says Cruz-Morales.

Keasling wanted to recreate a molecule called Jawsamycin, which is named after the movie "Jaws" because of its bite-like indentations. It is generated by the common bacteria streptomyces, an organism that Cruz-Morales had worked with in the past.

"The recipe already exists in nature," says Cruz-Morales. The jagged molecule is produced by native metabolism of the bacteria as they munch away on glucose. "As they eat sugar or amino acids, they break them down and convert them into building blocks for carbon-to-carbon bonds," he says. "You make fat in your body in the same way, with the same chemistry, but this bacterial process has some very interesting twists."

These twists, which give the molecules their explosive properties, are the incorporation of cyclopropane rings – rings of three carbon atoms arranged in a triangular shape. "If you have bonds that are at a normal angle, an open chain of carbons, the carbons can be flexible and they get comfortable," explains Cruz-Morales. "Let's say you make them into a ring of six carbons – they can still move and dance a little bit. But the triangle shape makes the bonds bend, and that tension requires energy to make."

After careful analysis, the research team determined that the enzymes that were responsible for the construction of these high-energy cyclopropane molecules were polyketide synthases. "Polyketide synthases are the ultimate biological tool to make organic chemistry," says Cruz-Morales.

MAKING FUEL WITH BIOLOGY

Cruz-Morales explains that the fuel produced by the bacteria would work a lot like biodiesel. It would need to be treated so that it could ignite at a lower temperature than the temperature needed to burn a fatty acid. However, when ignited it would be powerful enough to send a rocket into space. "If we can make this fuel with biology there's no excuses to make it with oil," says Cruz-Morales. "It opens the possibility of makina it sustainable."

In the future, Cruz-Morales hopes that he and the team of Department of Energy researchers who worked on the project will be able to scale up this process so that their alternative fuel could actually be used in aircraft. "The problem right now is that fossil fuels are subsidized," says Cruz-Morales. "This is something that is not only related to the technology, but the geopolitical and socio-political constitution of the planet right now. You can see this as a preparation for the moment because we are going to run out of fossil fuels, and there's going to be a point, not far from now, when we will need alternative solutions."

Article: "Biosynthesis of polycyclopropanated high enerav biofuels" by Pablo Cruz-Morales, Kevin Yin, Alexander Landera, John R. Cort, Robert P. Young, Jennifer E. Kyle, Robert Bertrand, Anthony T. lavarone, Suneil Acharya, Aidan Cowan, Yan Chen, Jennifer W. Gin, Corinne D. Scown, Christopher J. Petzold, Carolina Araujo-Barcelos, Eric Sundstrom, Anthe George, Yuzhong Liu, Sarah Klass, Alberto A. Nava and Jay D. Keasling, 30 June 2022, Joule.

DOI: 10.1016/j. joule.2022.05.011

for transporting people, delivering goods, and performing military operations, but the petroleum-based fuels that power them are in short supply. Scientists have now discovered a way to generate an alternative jet fuel by harvesting an unusual carbon molecule produced by the metabolic process of bacteria that are commonly found in soil. The research, by scientists at the Lawrence Berkeley Lab, was published recently in the journal Joule.

Aircraft are indispensa-

ble in the modern age

"In chemistry, everything that requires energy to make will release enerav when it's broken," says lead author Pablo Cruz-Morales, a microbioloaist at DTU Biosustain, part of the Technical University of Denmark. When petroleum jet fuel is ignited, it releases a massive amount of energy. Scientists at the Keasling Lab at the Lawrence Berkeley Laboratory thought there must be some way to replicate this without having to wait millions of years for new fossil

HEALTH AND LABORATORY MAGAZINE

ARTIFICIAL PHOTOSYNTHESIS CAN PRODUCE FOOD IN COMPLETE DARKNESS

Australian researchers have developed a device that can generate power from heat radiation using a mechanism similar to night vision goggles.

For millions of years, photosynthesis has evolved in plants to turn water. carbon dioxide, and the enerav from sunlight into plant biomass and the foods we eat. However, this process is very inefficient, with only around 1% of the energy found in sunlight ending up in the plant. Researchers at the University of California, Riverside and the Universitv of Delaware have found a way to bypass the need for biological photosynthesis altoaether and create food independent of sunlight by using artificial photosynthesis.

The new research, published on June 23, 2022, in the journal Nature Food, uses a two-step electrocatalytic process to convert carbon dioxide, electricity, and water into acetate, the form of the main component of vinegar. Food-producing organisms then consume acetate in the dark to grow. Combined with solar panels to generate electricity to power the electrocatalysis, this hybrid organic-inorganic system could increase the conversion efficiency of sunlight into food, up to 18 times more efficient for some foods.

"With our approach we sought to identify a new way of producing food that could break through the limits normally imposed by biological photosynthesis," said corresponding author Robert Jinkerson, a UC Riverside assistant professor of chemical and environmental engineering.

In order to integrate all the components of the system together, the output of the electrolyzer was optimized to support the growth of food-producing organisms. Electrolyzers are devices that use electricity to convert raw materials like carbon dioxide into useful molecules and products. The amount of acetate produced was increased while the amount of salt used was decreased, resulting in the highest levels of acetate ever produced in an electrolyzer to date.

"Using a state-of-the-art two-step tandem CO2 electrolysis setup developed in our laboratory, we were able to achieve a high selectivity towards acetate that cannot be accessed through conventional CO2 electrolysis routes," said corresponding author Feng Jiao at University of Delaware.

Experiments showed that a wide range of food-producing organisms can be grown in the dark directly on the acetate-rich electrolyzer output, including green algae, yeast, and fungal mycelium that produce mushrooms. Producing algae with this technology is approximately fourfold more energy efficient than growing it photosynthetically. Yeast production is about 18-fold more energy efficient than how it is typically cultivated using sugar extracted from corn.

"We were able to grow food-producing organisms without any contributions from biological photosynthesis. Typically, these organisms are cultivated on sugars derived from plants or inputs derived from petroleum-which is a product of biological photosynthesis that took place millions of years ago. This technology is a more efficient method of turning solar energy into food, as compared to food production that relies on biological photosynthesis," said Elizabeth Hann, a doctoral candidate in the Jinkerson Lab and co-lead author of the study.

The potential for employing this technology to grow crop plants was also investigated. Cowpea, tomato, tobacco, rice, canola, and green pea were all able to utilize carbon from acetate when cultivated in the dark.

"We found that a wide range of crops could take the acetate we provided and build it into the major molecular building blocks an organism needs to grow and thrive. With some breeding and engineering that we are currently working on we might be able to grow crops with acetate as an extra energy source to boost crop yields," said Marcus Harland-Dunaway, a doctoral candidate in the Jinkerson Lab and co-lead author of the study.

By liberating agriculture from complete dependence on the sun, artificial photosynthesis opens the door to countless possibilities for growing food under the increasinaly difficult conditions imposed by anthropogenic climate change. Drought. floods, and reduced land availability would be less of a threat to global food security if crops for humans and animals grew in less resource-intensive, controlled environments. Crops could also be grown in cities and other areas currently unsuitable for aariculture, and even provide food for future space explorers.

"Using artificial photosynthesis approaches to produce food could be a paradigm shift for how we feed people. By increasing the efficiency of food production, less land is needed, lessening the impact agriculture has on the environment. And for agriculture in non-traditional environments, like outer space, the increased energy efficiency could help feed more crew members with less inputs," said Jinkerson.

This approach to food production was submitted to NASA's Deep Space Food Challenge where it was a Phase I winner. The Deep Space Food Challenge is an international competition where prizes are awarded to teams to create novel and game-changing food technologies that require minimal inputs and maximize safe, nutritious, and palatable food outputs for long-duration space missions.

"Imagine someday giant vessels growing tomato plants in the dark and on Mars—how much easier would that be for future Martians?" said co-author Martha Orozco-Cárdenas, director of the UC Riverside Plant Transformation Research Center.

Article: "A hybrid inorganic-biological artificial photosynthesis system for energy-efficient food production" by Elizabeth C. Hann, Sean Overa, Marcus Harland-Dunaway, Andrés F. Narvaez, Dang N. Le, Martha L. Orozco-Cárdenas, Feng Jiao and Robert E. Jinkerson, 23 June 2022, Nature Food.

DOI: 10.1038/s43016-022-00530-x





UNTREATED VISION PROBLEMS CAN INCREASE YOUR RISK OF DEMENTIA BY 44%

According to a recent systematic review and meta-analysis of 16 studies comprising 76,373 individuals, older adults with untreated eyesight problems may have a higher chance of developing dementia.

The study's findings, which were reported in the peer-reviewed journal Aging and Mental Health, demonstrate the need for more research to determine how addressing older persons' vision issues, such as with glasses or cataract surgery, might prevent cognitive issues and dementia.

"This study is among the first to evaluate the association between sight problems and cognitive outcomes in older adults through a comprehensive examination of all available population-based studies in English. Our findings add to the growing evidence that fading evesight is a risk factor for developing dementia," said lead author, Associate Professor Beibei Xu, from the Medical Informatics Center, at Peking University. "Although the reasons behind this remain unclear. it suggests that diagnosing and treating eve conditions may be beneficial – both to improve a person's quality of life and also to potentially slow down or stop memory loss."

People's lives are severely affected by the condition. As the disease develops, individuals will have more memory loss as well as personality and behavioral changes. They will eventually be totally reliant on others to take care of them.

The researchers included 16 studies including 76,373 participants, with five cross-sectional studies and 11 longitudinal studies published before April 2020. From these studies, the authors examined the relationship between visual impairment and cognitive outcomes in older adults. They found that:

> People with a sight problem had an increased risk of cognitive impairment and dementia, regardless of whether their visual impairment was self-reported or diag-

7

nosed using objective measures.

- The likelihood of having a cognitive impairment was 137% higher among people who had a sight problem compared to those who did not.
- People who had a sight problem at baseline had a 41% increased risk of developing cognitive impairment and a 44% increased risk of dementia, compared with those who did not.

"Finding ways to prevent or delay the onset of dementia could help reduce its devastating impact on the lives of affected individuals and their families, espe-

ACHEMP/2022

cially in light of the growing burden of the disease. Identifving modifiable risk factors is the first critical step for developing effective interventions to achieve this goal," says Beibei Xu. "Our new results highlight the importance of regular eve examinations for older adults - enabling any potential problems with their vision to be spotted and treated early. They also suggest that any self-reported changes to a person's eyesight should not be ignored."

The authors recommend future research is now warranted to examine the effectiveness of treating sight problems in older people to prevent cognitive impairment and dementia.



INSPIRING SUSTAINABLE CONNECTIONS

#back2live:

22 – 26 August 2022 Frankfurt, Germany

World Forum and Leading Show for the Process Industries

ACHEMA is the global hotspot for industry experts, decision-makers and solution providers. Experience unseen technology, collaborate cross-industry and connect yourself worldwide to make an impact.

Are you ready? Join now!

www.achema.de

6

HEALTH AND LABORATORY MAGAZINE



ANCIENT MICROBIAL "DARK MATTER"

Thousands of Unknown Bacterial Species Discovered in Hawaiian Lava Caves

Higher bacterial diversity than scientists expected has been uncovered in the lava caves, lava tubes, and geothermal vents on the big island of Hawaii. The findings have been reported in a new study published today (July 21, 2022) in the journal Frontiers in Microbiology.

This research investigates the variety and interactions within these microbial ecosystems, which illustrate how life may have existed on Mars and the early Earth in the past. Surprisingly, the findings showed that a class of bacteria known as Chloroflexi are often "hub" species, meaning that they are connected with many other species and typically play crucial ecological roles in the community. Many Chloroflexi species are little understood, and further research will reveal previously undiscovered species, as well as insights into the role these species play in these extreme environments

"This study points to the possibility that more ancient lineages of bacteria, like the phylum Chloroflexi, may have

important ecological 'jobs,' or roles," said first author Dr. Rebecca D Prescott of NASA Johnson Space Center and University of Hawaii at Manoa, in the US. "The Chloroflexi are an extremely diverse group of bacteria, with lots of different roles found in lots of different environments. but they are not well studied and so we don't know what they do in these communities. Some scientists call such groups 'microbial dark matter' the unseen or un-studied microorganisms in nature."

UNSEEN VOLCANIC LIFE

Prescott and her colleagues gathered 70 samples from a variety of locations, including active aeothermal vents (fumaroles), as well as "younger" and "older" lava tubes and caves, which were under 400 years old and between 500 and 800 years old, respectively, to get a sense of how the bacterial communities might change over time. They were able to determine the diversity and abundance of the bacterial classes in each sample by sequencing the ribosomal RNA

present in the samples. Co-occurring bacterial networks also provided hints regarding possible interactions between these microorganisms.

The harshest conditions the geothermal sites—were expected to have lower diversity than the more established and habitable lava tubes. While the diversity was indeed found to be lower, the team of researchers was surprised to discover that the interactions within these communities were more complex than in locations with higher diversity.

"This leads to the question, do extreme environments help create more interactive microbial communities, with microorganisms more dependent on each other?" said Prescott. "And if so, what is it about extreme environments that helps to create this?"

Since Chloroflexi, and another class called Acidobacteria, were present at nearly all of the locations, they may play essential roles in these communities. However, these were not the most abundant bacteria, and the individual communities from the different sites showed large variations in the diversity and complexity of the microbial interactions. Counterintuitively, the most abundant groups, Oxvphotobacteria and Actinobacteria, were not often 'hub' species, suggesting that their roles may be less important to the overall structure of the community.

MORE QUESTIONS THAN ANSWERS

Since the current study was based on the partial sequencing of one gene, it cannot accurately determine the species of microbes or their 'jobs' in the community. Therefore, further research is needed to help reveal the individual species that are present, as well as to better understand these bacteria's roles in the environment.

"Overall, this study helps to illustrate how important it is to study microbes in co-culture, rather than growing them alone (as isolates)," said Prescott. "In the natural world, microbes do not grow in isolation. Instead, they grow, live, and interact with many other microorganisms in a sea of chemical signals from those other microbes. This then can alter their gene expression, affecting what their jobs are in the community."

Beyond the insights about past, or even future, life on Mars, bacteria from volcanic environments can also be useful in understanding how microbes turn volcanic rock (basalt) into soils, as well as bioremediation, biotechnology, and sustainable resource management.

Article: "Islands Within Islands: Bacterial Phylogenetic Structure and Consortia in Hawaiian Lava Caves and Fumaroles" by Rebecca D. Prescott, Tatyana Zamkovaya, Stuart P. Donachie, Diana E. Northup, Joseph J. Medley, Natalia Monsalve, Jimmy H. Saw, Alan W. Decho, Patrick S. G. Chain and Penelope J. Boston, 21 July 2022, Frontiers in Microbiology.

DOI: 10.3389/ fmicb.2022.934708

Merging quality with experience



Discover the potential

LABORATORY **FURNITURE**

⊔ Cabinets ע צ Service systems ∠

FUME HOODS

- א Standart Model
- Hood
- Lab benches ע

- Fume Hoods ¥ High Performance
- Fumehood Polypropylen Fume
- ע Stainless Steel
- Fume Hood
- **BIO-SAFETY CABINETS** ⊔ Class I Biosafety Cabinet
 - ≥ Class II Biosafety Cabinet
 - ≥ PCR Cabinets א
 - → Accessories And Spare Parts

BALANCE TABLE



CHEMICAL STORAGE CABINETS

- ⊌ Chemichal storage cabinets
- א Asid-base cabinet
- ⊌ Fire resistant cabinets
- ⊌ Gas cylinder storage
- cabinet



Head Office

Merkez Mah. Ayazma Cad. No:37 Papirus Plaza Kat:13 No:196-197 Kağıthane / İstanbul - TURKEY t: +90 212 691 07 77



Factory

Hamidiye Mah. Soğuksu Cad. No:1 Kağıthane / İstanbul - TURKEY www.deltalab.com.tr info@deltalab.com.tr

HEALTH AND LABORATORY MAGAZINE

LabMedya

SPACE SCIENCE PROPOSAL TO YOUNG PEOPLE FROM A TURKISH ASTROPHYSICIST AT NASA

"Space companies have established in many countries around the world, including Turkey, and these companies earn money from space..."

Dr. Umut Yıldız, who has been interested in space since his childhood, graduated from Ankara University, Department of Astronomy and Space Sciences, and completed his master's degree at the University of Groningen in the Netherlands and his doctorate at Leiden University in the Netherlands. After aoina to America, Yıldız started to work at NASA and has been working in NASA's Deep **Space Communications** department for 9 years.

In his speech, Yıldız says, "There is still a lot to be done on this subject. There are things that have been done. For example, there are astrophysics groups under both astronomy departments and physics departments in a few universities in Turkey. This is the science side of the business. However, some people generally want to see something physical. For instance, people want the rocket to be launched from Turkey, and they want space vehicles from Turkey to go to space. Space technologies are actually just developing in Turkey, it first started with the defense industry. Afterward, TÜBİTAK-Space Agency did a lot of work. Besides, In addition, there are now private space companies in Turkey. Now, not only states but also companies with money are involved in this business. For example, companies such as DeltaV, Plan-S, and Hello Space in Turkey are growing over time and expanding the ecosystem as well."

"HAVING YOUR OWN ASTRONAUT IS A GREAT PRESTIGE"

Stating that many

countries are sending their own astronauts to space at the moment. Yıldız says, "Unfortunately, we still have not been able to realize this dream as Turkey. It is a great prestige for a country to have its own astronaut. There are already few countries in the world that can send their own astronauts to space. One of the questions is, what will the astronaut do thereafter he goes to space? The aim of the Turkish Space Agency is to carry out the experiments suggested by the researchers at Turkish universities through our own astronaut on the International Space Station."

Yıldız said that the first

astronaut who will go into space from Turkey will stay there for 10 days, realize the projects presented by Turkish researchers, and then share the results of these experiments with the world, according to the Turkish Space Agency.

Emphasizing that he wanted to experience the pleasure of seeing Turkey succeed rather than being the first scientist from Turkey to go into space. Yıldız, "We have had a dream of space since our childhood, it must be a wonderful thing to look at the world from above and see all the countries in one frame. I'm not trying to be the first, but I want to do it before I die, even if it's the hundredth or the thousandth." says.

"I CONTRIBUTE TO TURKISH STUDENTS EVEN FROM A DISTANCE"

"I don't need to come to Turkey to share my experience. I always give lectures to students in Turkey on topics such as space science, space technologies, astronomy, travel to other planets, the discovery of other galaxies, and the formation of the universe. Even from afar, I give lectures to students. I try to contribute as much as I can. However, these are not the works of one person. We are already in contact with the Space Agency, from now on, I hope that many more young people will cross paths with space."

"I RECOMMEND FAMILIES TO ENCOURAGE THEIR CHILDREN WHO ARE INTERESTED IN SPACE"

Yildiz stated that space sciences and space technologies will be much more popular in the future and that space sciences will be an important alternative for young people who choose a university these days.

Stating that space companies have been established in many countries around the world, including Turkey, and that these companies make money from space. Yıldız said, "As we earn income from space, more companies will be involved in this business in the future, this will increase job opportunities in the sector and more people will be needed. I recommend parents to encourage their children who are interested in space during the preference period."

"SPACE SCIENCE IS ONE OF THE MOST PROMISING SECTORS"

Explaining that he answered the messages of thousands of students who reached him through social media, Yıldız, "I couldn't reach anyone at their age, the technological opportunities today did not exist at that time. I was alone, I know very well what the pain of not being able to ask anyone a question about space science means. I want to help today's students as much as I can. I can say that space is one of the most promising sectors in these days, because access to space is much cheaper. Especially right now, it's a preference period, families and young people should especially take this into account." made its assessment.

Stating that nationality is of no importance at NASA and that people are evaluated only by the work they do, Yıldız says. "US assigns people from many countries. After doing the job well, no one's nationality is looked at."







Viscol 10 Series Automatic Kinematic Viscometer

With different models for oil/fuel, polymer, bitumen, paper/pulp etc. Viscol-10 Series Kinematic Viscometers are developed for the determination of kinematic viscosity of newtonian fluids at wide temperature and viscosity range.

> ASTM D445 ASTM D446 ASTM D789 ASTM D871 ASTM D1243 ASTM D1795 ASTM D2857

ASTM D4243 ASTM D4603 ISO 307 ISO 1628 ISO 3104/3105 IEC 60450 IP 7





Pasol Oxidation Stability Analyzer

ASTM D2272, ASTM D2112 ASTM D4742, ASTM D942, IP 229



CuTie Copper & Silver Corrosion

ASTM D130, ASTM D4048, ASTM D7095 EN ISO 216, IP 154, IP 112, DIN 51811



Odol Ramsbottom Carbon Residue ASTM D524, IP 14

ASTM D524, IP 14 ISO 4262



Vapol Water Content Evaporator

ASTM D1364, ASTM D4377, ASTM D6304 IP 356, IP 471, ISO 6296, DIN 51777

biolab@biolab.com.tr

www.biolab.com.tr

10

HEALTH AND LABORATORY MAGAZINE

10 BEST PLACES TO VISIT IN TURKEY

Steeped in history with a landscape that encompasses beaches and soaring mountains, Turkey has acted as the gateway between Europe and Asia for thousands of years. Being a place of trade and of exchanging cultures has made Turkey a richly diverse country. The point where East meets West, the wealth of culture and breadth of influences has left its mark and is revealed in the country's mouthwatering culinary landscape, as well as in the innumerable religious monuments and archaeological sites.

Istanbul, once the capital of the Byzantine and Ottoman Empires, features prominently in most travel plans but there are many more great destinations. You could enjoy your time here staying in boutique hotels inside caves and floating in hot air balloons above the otherworldly landscape of Cappadocia, wandering in the midst of the Greco-Roman world in Ephesus, or simply soaking up the sun in the luxury beach resorts along the Aegean Sea. Here's a look at the best places to visit in Turkey:

10. PAMUKKALE

The word Pamukkale means "cotton castle" in Turkish. The site gets its name from the numerous cascading white pools with bright turquoise water surfaces. From a distance, the white limestone walls seem to resemble an immense castle of fluffy cotton. These limestone walls were formed by the calcium-rich water from the springs. Eventually, the calcium carbonate in the water slowly deposits itself as a soft jelly and eventually hardens into limestone.

The hot springs aren't Pamukkale's only attraction. Above the cascading pools, you will find the remains of an ancient city. The city of Hierapolis was a Greco-Roman and Byzantine town that stood on top



of the castle. At the end of the 20th century, people started building hotels on top of the ruins. As a result, this heavily damaged the city. The hotels were removed after the Hierapolis became a protected UNESCO World Heritage site in 1988.

The coolest of these facts about Pamukkale might be the underwater section of Hierapolis. Some of the remains of the ancient city became partially submerged after an earthquake. These remains can be found in a pool that was historically considered sacred. This pool is now named the 'Antique Pool'. Unfortunately, the pool has become heavily commercialised and you will need to pay a hefty entrance fee to take a dip.

The hot spring terraces hold gallons of mineral-rich turquoise water. This

natural phenomenon is a breathtaking sight, but also highly sensitive to any disturbances. For this reason, visitors must take of their shoes and walk among the terraces barefoot on a special path. Why? Well, this method prevents erosion of the calcium deposits that form the terraces.

Pamukkale has 17 hot water springs. Interestingly, the temperatures of these pools can range from 35 °C (95 °F) to 100 °C (212 °F). I guess you can't just jump in anywhere! Not to worry, there are several demarcated pools where visitors can safely take a dip in the relaxing water. It's probably not a bad idea, especially considering how the mineral-rich water also has several health benefits. for instance the ability to lower blood pressure and alleviate rheumatism.

YOUR DAILY DOSE OF SCIENCE

9. MARDIN



Perched on a strategic hilltop overlooking the plains of Mesopotamia in southeastern Turkey. Mardin is the one of the oldest settlements in the region, and is best known for its cultural diversity and Old City of sandstone buildings that cascade down the hill.

Mardin's Old City is easily toured by walking. The maze of meandering streets leads visitors alona terraced houses and popular sites like Deyrü'z-Zafaran Monastery, one of the oldest monasteries in the world, and the Sultan Isa Medresesi, a medieval monument that once served as an astronomical observatory. Zinciriye Medresesi, a 14th century Islamic school, features beautiful courtyards and art works.

The Great Mosque, with its soaring minaret, is hard to miss. Although closed to the public, the citadel presents fantastic photo opportunities. Throughout the Old City is a myriad of shops selling the likes of pottery, silverware, leather and traditional headdresses.

8. KONYA

One of the oldest cities in the world and best known for its remarkable Seljuk architecture and Whirling Dervishes, Konya is a large city in Turkey's Central Anatolia Region. In the 12th and 13th centuries, Konya



under the rule of the Seljuk Dynasty. Today, attractive buildings from that era can still be admired such as the Alaeddin Mosque, which houses the tombs of several sultans. Another popular example is the Ince Minare Medrese, now a museum displaying artifacts from the Seljuk and Ottoman eras.

prospered as a capital city

Although in ruins, the Seljuk Palace is also worth a visit. A modern day architectural attraction is the Seljuk Tower, one of the tallest skyscrapers in Turkey, featuring a revolving restaurant at the top two floors.

In the 13th century, Konya was the home of the Persian theologian and Sufi mystic, Rumi. His tomb, the Mausoleum of Rumi with its neighboring Melvana Museum, is a must-see site in Konya. Rumi's followers founded the Mevlevi Order, which are also known as the Whirling Dervishes due to their famous religious ceremonies in which they spin around and around on the left foot while wearing white, billowing gowns. These ceremonies, also known as Sama, can be observed weekly at the Mevlana Cultural Centre.

Konya also offers beautiful green spaces and parks such as Alaeddin Hill, in the city center, and the Japanese Park with its lovely pagodas, waterfalls and ponds.

Because Konya is one of Turkey's more conservative cities, bars and nightclubs are not as plentiful. However, some hotels and cafes do offer alcoholic drinks.

7. ANTALYA

Nestled along the beautiful Turkish Riviera on the Mediterranean coastline, Antalya is a large, vibrant city welcoming tourists with numerous resorts, hotels, bars and restaurants. Spectacular scenery frames the city with gorgeous beaches and lush green mountains dotted with ancient ruins.



From swimming and sailing to mountain climbing, sightseeing and family fun, Antalya offers something for everyone.

A walk around Kaleiçi, the Old Quarter, offers a step back into the city's ancient past with views of the old city walls, Roman gates, maze-like streets and historic structures that include the Clock Tower and beautiful, old churches, mosques and temples. At the heart of the Old Quarter is the Cumhuriyet Square, surrounded by shops, cafes, Turkish baths and street performers.

Antalya's main beaches, Konyaalti and Lara, offer white sands, water sports, resorts, bars and restaurants. Nearby the beaches are water parks, amusement parks and a zoo. Several museums exhibit artifacts and relics from the area, including the award-winning Antalya Museum.

6. MARMARIS



One of Turkey's most popular seaside resorts, Marmaris is a picture– perfect setting of pine–clad mountains, sandy white beaches, turquoise waters and historic architecture. Located along the Turkish Riviera in southwest Turkey, this stunning cruise port is a tourist paradise with exceptional sightseeing opportunities, water sports, fantastic dining and buzzing nightlife.

Marmaris presents so much to see and do that visitors will be spoiled for choice. A walk along the cobblestone streets of the old quarter offers attractive architecture and a visit to the 16th century Castle of Suleyman the Magnificent. Various boating tours take visitors exploring around the picturesque bays and neighboring villages.

Horse safaris canter through lush pine forests, orange groves, traditional villages and around untouched bays and stunning waterfalls, while jeep safaris present off-the-beaten-track adventures.

Marmaris also features water parks for the whole family and Turkish baths for total pampering and relaxation. If that is not enough, there are a number of day trips from Marmaris to outstanding destinations like Dalyan, Ephesus, Pamukkale and Cleopatra Island.

The nightlife scene in Marmaris is one of Turkey's most exciting. There are hundreds of restaurants featuring cuisines from all over the world from fast food to fine dining. Bars and clubs are found throughout the city and along the beaches. Not to be missed are the Turkish Night Show venues, which feature traditional Turkish food, mezes and belly dancing.

5. SIDE

A major port in ancient Pamphylia and occupied by Alexander the Great in 4th century BC, Side today is a picturesque town of classic ruins and modern day resorts overlooking



sandy white beaches. Located on Turkey's Mediterranean Coast in the Antalya Province on a small peninsula, Side offers fantastic sightseeing, nightlife and outdoor adventure.

Side's star attraction is an excavated site of ancient Hellenistic and Roman ruins that include the remnants of a colossal amphitheater, an agora, a Byzantine basilica, public baths, marble columns and various temples. The Roman baths are now restored to house a museum, which displays a number of Roman statues and artifacts. Overlooking the beach, the Temple of Apollo is a spectacular sight, especially at sunset.

Featuring narrow streets and attractive gardens, the charming town of Side offers many restaurants ranging from delis and pizza shops to upscale dining in a variety of cuisines. Just outside of town, the Manavgat River offers boat tours, white water rafting and impressive waterfalls.

4. BODRUM



Located in the Mugla Povince in the southern Aegean region of Turkey, Bodrum is the site of the ancient fortified city, Halicarnassus, which was once home to marble buildings, temples, statutes, paved streets and the Mausoleum, one of the Seven Wonders of the Ancient World.

After falling into ruins, the city remained a quiet fishing village until the 20th century when Turkish intellectuals brought popularity to it through their writings. Today,



12

HEALTH AND LABORATORY MAGAZINE

Bodrum's intriguing ruins, stunning beaches and clifftop resorts attract people from all over the world.

On Bodrum's eastern side, tourists will find a beautiful beach overlooking brilliant blue water. Near the beach are plenty of cafes, bars and nightclubs. On the western side of town is the marina, shopping centers and restaurants.

No visit to Bodrum would be complete without seeing the Castle of St. Peter, also known as Bodrum Castle. Built from 1402 by the Knights Hospitaller it now operates as a museum. Other sights include the last remains of the Mausoleum, and ancient amphitheater and the Myndos Gate, which was once the scene of a bloody battle during a siege by Alexander the Great.

Besides sightseeing, other things to see and do in Bodrum include the award-winning Bodrum Museum of Underwater Archaeology which is housed inside Bodrum Castle, historic windmills, Turkish saunas and mud baths, windsurfing, scuba diving and boat tours that feature nightclubs and glass-bottomed dance floors.

3. EPHESUS

Europe's most complete classical metropolis, Ephesus is an ancient site located in Aegean Turkey. By the 1st century BC, Ephesus was one of the largest cities in all of the Roman Empire, boasting one of the Seven Wonders of the Ancient World, the Temple of Artemis. The ruins of Ephesus are well preserved and contained within a large archaeological site, making it one of Turkey's most popular tourist attractions.

Ephesus was declared a Roman settlement in 133 BC, although it did not reach its peak until some 200 years later. At one point, when the city was the capital of Roman Asia Minor, Ephesus housed more than 250.000 permanent residents. St.Paul lived in Ephesus, fostering Christianity among many other religions. With the decline of the harbor of Ephesus. and the sacking of the city by Germanic Goths in the third century, Ephesus began its decline.

For roughly 1,500 years, Ephesus was all but forgotten. The remnants of this incredible classical city were hidden from the world until the 1860s, when an international team of archeologists began unearthing the ruins. Today, less than 20 percent of Ephesus has been excavated, but it is still one of the largest accessible archeological sites in the world.

Without question, the most famous structure in Ephesus is the Temple of Artemis. The temple was once the largest on the planet, showcasing just how important the city of Ephesus was. Unfortunately, the temple itself was largely destroyed around the fifth century, but it is still possible to tour the ruins.

Some of the most recently excavated attractions in Ephesus, and certainly some of the most popular, are the Terraced Houses. These were the homes of the richest residents of Ephesus in approximately the first century, and they were built in a modern Roman style.

Remarkably, some of the homes had hot and cold baths, marble floors and even heating systems. On the walls, you can spot unusual artwork, mosaics and even love poems scrawled by hand.

No trip to Ephesus would be complete without seeing the famed Library of Celsus. Built in 123 AD, the library was once of the largest libraries in the ancient world, coming in third after the libraries of Alexandria and Pergamum. The library has been restored, making it easier to see its two-story design, its columns and its capitals.

Be sure to admire the four statues that represent the four virtues. While these are now replica statues, and not the originals, you can still see Sophia, representing wisdom, Episteme, representing knowledge, Ennoia, representing thought, and Arete, representing goodness.

Just two miles from Ephesus is the town of Selcuk, where many visitors choose to spend time before or after exploring the ruins of Ephesus. In the center of Selçuk, you might want to stop and admire the Roman aqueduct that once supplied water to the city, or you could learn a little more about the archeology of the region by exploring the collections at the Museum of Ephesus. You can also browse at the market or pick up double knot carpets, the most popular souvenir from the area.

2. CAPPADOCIA

Situated in Central Anatolia of Turkey, Cappadocia is best known for its fairytale landscape of unusual formations resembling chimneys, cones, mushrooms and pinnacles. Natural processes such as ancient



volcanic eruptions and erosion have all sculpted these odd formations over the ages, with some of them rising as much as 130 feet (40 meters) high. However, thousands of years ago, mankind added remarkable touches to the landscape by carving out houses, churches and underground cities from the soft rock.

Inhabited as early as 1800 BC. Hittites and other residents chiseled out underground tunnel complexes, seeking safety from invading Persians and Greeks. Much later in the 4th century AD. Christians, fleeing out of religious persecution from Rome, sought refuge in Cappadocia's tunnels and caves. Today, the region's natural wonders and historic sites all make it a popular destination.

While much of Cappadocia is located in the province of Nevsehir, some of the main towns in the region are Üraüp, Göreme, Avanos, Ortahisar and Mustafapasa. Many of these towns offer hotels, restaurants, nightlife options and attractions such as museums, rock castles, fairy chimneys, underground tunnels, old Greek villages, monasteries and handicraft markets. Some of the caves in the region are actually hotels and cater to tourists.

1. ISTANBUL

Once serving as the capital of the Ottoman and Byzantine Empires, Istanbul today is the largest city in Turkey and one of the largest in the world. Istanbul stretches across both sides of the Bosphorus, a narrow strait that connects Asia and Europe, making it the only city in the world spanning two continents. Impressive architecture, historic sites, dining, shopping, nightlife and exotic atmosphere all make Istanbul one of the world's top tourist destinations.

The Old City is where most of the city's impressive historic sites are found. which include the Hagia Sophia, Blue Mosque and Topkapi Palace, Another important district is New City, known for its modern day attractions, skyscrapers and shopping malls. Beyoglu and Galata are popular zones for nightlife and entertainment, while the Bosphorus area is home to beautiful palaces. waterfront mansions and urban parks.

There is no shortage of exciting things to see and do in Istanbul. A shopping affair not to be missed is the Grand Bazaar, one of the world's oldest and largest covered markets. Visiting a Turkish bath is also a great way to experience the local culture. The nightlife scene in Istanbul abounds in numerous restaurants, pubs and nightclubs to suit every budget and preference.





www.labmarket.com.tr | 🖸 in 🎔 f



13

POTENTIAL CURE FOR BALDNESS

Scientists have discovered that a single chemical is key to controlling when hair follicle cells divide, and when they die. This breakthrough could not only lead to effective treatment of baldness, but ultimately speed up wound healing because follicles are a source of stem cells.

In the human body, most cells have a specific form and function determined during embryonic development that does not change. A blood cell, for example, cannot turn into a nerve cell, or vice versa. However, stem cells are like the blank tiles in a game of Scrabble; they can turn into other types of cells.

Stem cells' adaptability makes them valuable for repairing damaged tissue or organs.

"In science fiction when characters heal quickly from injuries, the idea is that stem cells allowed it. In real life, our new research gets us closer to understanding stem cell behavior, so that we can control it and promote wound healing," said University of California, Riverside mathematical biologist and study co-author Qixuan Wang.

In response to wounds, the liver and stomach regenerate themselves. However, Wang's team of researchers studied hair follicles because they're the only organ in humans that regenerates automatically and periodically, even without injury.

The scientists discovered how TGF-beta, a type of protein, controls the process by which cells in hair follicles, including stem cells, divide and form new cells, or orchestrate their own death — eventually leading to the death of the whole hair follicle.

"TGF-beta has two opposite roles. It helps activate some hair follicle cells to produce new life, and later, it helps orchestrate apoptosis, the process of cell death," Wang said.

As with many chemicals, it is the amount that makes the difference in the outcome. If the cell produces a certain quantity of TGF-beta, it activates cell division. However, too much of it causes apoptosis.

If researchers can determine more precisely the way TGF-beta activates cell division, and how the chemical communicates with other important genes, it might be possible to activate follicle stem cells and stimulate hair growth.

Because many animals, including humans, possess skin covered with hair, perfect wound healing would require the regeneration of hair follicles. Being able to more precisely control levels of TGF-beta could also one-day cure baldness, which bothers millions of people all over the world.

WE'D LIKE TO BE YOUR SOLUTION PARTNER FOR THE HEATING PROCESSES IN YOUR LABORATORY.

Protherm is with you to offer solutions for your special heat treatment requirements and analyses.



14

HEALTH AND LABORATORY MAGAZINE

STARFISH EMBRYOS SWIM LIKE A "LIVING CRYSTAL" IN ORGANIZED FORMATION

Their swirling, clustering behavior may someday inform the design of self-assembling robotic swarms.

A starfish embryo, in its earliest stages, before it sprouts its distinctive tentacles, looks like a small bead and spins in the water like a miniature ball bearing. Now, MIT researchers have discovered that when multiple starfish embryos spin up to the water's surface, they naturally gravitate together and spontaneously assemble into a surprisingly organized, crystal-like structure.

Even more curious still, this collective "living crystal" can exhibit odd elasticity, an exotic property whereby the spinning of individual units — in this case, embryos — triggers significantly larger ripples across the entire structure.

This rippling crystal configuration can persist over relatively long periods of time before dissolving away as individual embryos mature, according to the scientists.

"It's absolutely remarkable - these embryos look like beautiful alass beads, and they come to the surface to form this perfect crystal structure." savs Nikta Fakhri, the Thomas D. and Virginia W. Cabot Career **Development Associate** Professor of Physics at MIT. "Like a flock of birds that can avoid predators, or fly more smoothly because they can organize in these large structures, perhaps this crystal structure could have some advantages we're not aware of yet."

Beyond starfish, she says, this self-assembling, rip-

pling crystal assemblage could be applied as a design principle, for example in building robot swarms that move and function collectively.

"Imagine building a swarm of soft, spinning robots that can interact with each other like these embryos," Fakhri says. "They could be designed to self-organize to ripple and crawl through the sea to do useful work. These interactions open up a new range of interesting physics to explore."

Fakhri and her colleagues published their results on July 13, 2022, in a study in the journal Nature. Co-authors include Tzer Han Tan, Alexander Mietke, Junang Li, Yuchao Chen, Hugh Higinbotham, Peter Foster, Shreyas Gokhale, and Jörn Dunkel.

SPINNING TOGETHER

Fakhri says the group's observations of starfish crystals was a "serendipitous discovery." Her team has been studying how starfish embryos develop, and specifically how embryonic cells divide in the very earliest stages.

"Starfish are one of the oldest model systems for studying developmental biology because they have large cells and are optically transparent," Fakhri says.

The scientists were observing how embryos swim as they mature. Once fertilized, the embryos

grow and divide, forming a

shell that then sprouts tiny hairs, or cilia, that propel an embryo through the water. At a certain point, the cilia coordinate to spin an embryo in a particular rotational direction, or "chirality." Tzer Han Tan, one of the group members, noticed that as embryos swam to the surface, they continued spinning, toward each other.

"Once in a while, a small group would come together and sort of dance around," Fakhri says. "And it turns out there are other marine organisms that do the same thing, like some algae. So, we thought, this is intriguing. What happens if you put a lot of them together?"

In their new study, she and her colleagues fertilized thousands of starfish embryos, then watched as they swam to the surface of shallow dishes.

"There are thousands of embryos in a dish, and they start forming this crystal structure that can grow very large," Fakhri says. "We call it a crystal because each embryo is surrounded by six neighboring embryos in a hexagon that is repeated across the entire structure, very similar to the crystal structure in graphene."

JIGGLING CRYSTALS

To understand what might be triggering embryos to assemble like crystals, the researchers first studied a single embryo's flow field, or the way in which water flows around the embryo. To do this, they placed a single starfish embryo in water, then added much smaller beads to the mix, and took images of the beads as they flowed around the embryo at the water's surface.

Based on the direction and flow of the beads, the researchers were able to map the flow field around the embryo. They found that the cilia on the embryo's surface beat in such a way that they spun the embryo in a particular direction and created whirlpools on either side of the embryo that then drew in the smaller beads.

Mietke, a postdoctoral researcher in Dunkel's applied mathematics group at MIT worked this flow field from a single embryo into a simulation of many embryos, and ran the simulation forward to see how they would behave. The model produced the same crystal structures that the team observed in its experiments, confirming that the embryos' crystallizing behavior was most likely a result of their hydrodynamic interactions and chirality.

In their experiments, the scientists also observed that once a crystal structure had formed, it persisted for days, and during this time spontaneous ripples began to propagate across the crystal.

"We could see this crystal rotating and jiggling over

a very long time, which was absolutely unexpected," she says. "You would expect these ripples to die out quickly, because water is viscous and would dampen these oscillations. This told us the system has some sort of odd elastic behavior."

The spontaneous, long-lasting ripples may be the result of interactions between the individual embryos, which spin against each other like interlocking gears. With thousands of gears spinning in crystal formation, the many individual spins could set off a larger, collective motion across the entire structure.

The team is now investigating whether other organisms such as sea urchins exhibit similar crystalline behavior. They are also exploring how this self-assembling structure could be replicated in robotic systems.

"You can play with this design principle of interactions and build something like a robotic swarm that can actually do work on the environment," she says.

Article: "Odd dynamics of living chiral crystals" by Tzer Han Tan, Alexander Mietke, Junang Li, Yuchao Chen, Hugh Higinbotham, Peter J. Foster, Shreyas Gokhale, Jörn Dunkel and Nikta Fakhri, 13 July 2022, Nature.

DOI: 10.1038/s41586-022-04889-6



NGK SERIES **CLASS II BIO SAFETY CABINETS**

"Ensuring first class protection for operatör, environment and product, the NGK Series Class II Microbiological Safety Cabinets are the insrument of choice when handling hazardous microorganisms or those whose hazard level is unknown"

The control panel have display of digital and LCD. In the control panel;

- Air Flow Speed,
- Total of working time,
- Time counter,
- Front glass.
- UV lamp,

Nükleon

- HEPA filters working life,
- Total working time/life of UV lamp,
- UV lamp countdown counter,
- Giving into working area non-partide of air flow speed.. (etc.)



Œ

NPC SERIES

Ťurkcy

Discover the potential

Nükleon

BIO SAFETY CABINET

- ..- III

Class II

PCR CABINETS

Transparent side glass windows maximize light and visibility inside the cabin, providing a bright and open working environment.

- The control panel have display of digital and LCD. In the control panel;
- UV sterilization system.
- HEPA filter efficiency 99.999%, 0.3µm. Locking function: UV lamp can only be turned on
- when the windshield is closed, ensuring operator safety.
- UV timer (1-99 minutes): When the set time has expired, the UV lamp will automatically turn off for the next experiment.

+90 530 918 47 18

Address: İvedik Organize Sanayi Bölgesi Öz Ankara San. Sit. 1464 (675). sokak No 37 İvedik/Ankara - TURKEY Phone: +90 312 395 66 13 · Fax : +90 312 395 66 93

www.nukleonlab.com.tr

info@nukleonlab.com.tr





HEALTH AND LABORATORY MAGAZINE

LabMedya

EMBRYOS WERE PRODUCED WITHOUT USING SPERM AND EGGS!

The embryos lasted longer than anticipated.

An ega meets a sperm - that's a necessary first step in life's beginnings. In embryonic development research, it's also a common first step. However, in a new study, researchers from the Weizmann Institute of Science have arown synthetic embryo models of mice outside the womb by starting solely with stem cells cultured in a petri dish. That means they are grown without the use of fertilized eggs. This method opens new horizons for studving how stem cells form various organs in the developing embryo. It may also one day make it possible to grow tissues and organs for transplantation using synthetic embryo models.

"The embryo is the best organ-making machine and the best 3D bioprinter – we tried to emulate what it does," says Prof. Jacob Hanna of Weizmann's Molecular Genetics Department, who headed the research team.

Hanna explains that scientists already know how to restore mature cells to "stemness." In fact, pioneers of this cellular reprogramming won a Nobel Prize in 2012. However, going in the opposite direction, that is, causing stem cells to differentiate into specialized body cells, not to mention form entire organs, has proved far more difficult.

"Until now, in most studies, the specialized cells were often either hard to produce or aberrant, and they tended to form a mishmash instead of well-structured tissue suitable for transplantation. We managed to overcome these hurdles by unleashing the self-organization potential encoded in the stem cells."

Hanna's team built on two previous advances in his lab. One was an efficient method for reprogramming stem cells back to a naïve state – that is, to their earliest stage - when they have the greatest potential to specialize into different cell types. The other, described in a scientific paper in Nature in March 2021, was the electronically controlled device the team had developed over seven vears of trial and error for growing natural mouse embryos outside the womb. The device keeps the embryos bathed in a nutrient solution inside of beakers that move continuously, simulating the way nutrients are supplied by material blood flow to the placenta, and closely controls oxygen exchange and atmospheric pressure. In the earlier research, the team had successfully used this device to grow natural

mouse embryos from day 5 to day 11.

In the new study, the team set out to grow a synthetic embryo model solely from naïve mouse stem cells that had been cultured for years in a petri dish, dispensing with the need for starting with a fertilized egg. This approach is extremely valuable because it could, to a large extent, bypass the technical and ethical issues involved in the use of natural embryos in research and biotechnology. Even in the case of mice, certain experiments are currently unfeasible because they would require thousands of embryos. whereas access to models derived from mouse embryonic cells, which grow in lab incubators by the millions, is virtually unlimited.

Before placing the stem cells into the device, the researchers separated them into three groups. In one, which contained cells intended to develop into embryonic organs themselves. the cells were left as they were. Cells in the other two aroups were pretreated for only 48 hours to overexpress one of two types of genes: master regulators of either the placenta or the yolk sac. "We gave these two groups of cells a transient push to give rise to extraembryonic tissues

that sustain the developing embryo," Hanna says.

Soon after being mixed together inside the device, the three groups of cells convened into aggregates, the vast majority of which failed to develop properly. But about 0.5 percent - 50 of around 10.000 – went on to form spheres, each of which later became an elongated. embrvo-like structure. Since the researchers had labeled each aroup of cells with a different color, they were able to observe the placenta and yolk sacs forming outside the embryos and the model's development proceeding as in a natural embryo. These synthetic models developed normally until day 8.5 – nearly half of the mouse 20-day gestation - at which stage all the early organ progenitors had formed, including a beating heart, blood stem cell circulation, a brain with well-shaped folds, a neural tube and an intestinal tract. When compared to natural mouse embryos, the synthetic models displayed a 95 percent similarity in both the shape of internal structures and the gene expression patterns of different cell types. The organs seen in the models gave every indication of being function

For Hanna and other stem cell and embryonic development researchers, the study presents a new arena: "Our next challenge is to understand how stem cells know what to do how they self-assemble into organs and find their way to their assigned spots inside an embrvo. And because our system, unlike a womb, is transparent, it may prove useful for modeling birth and implantation defects of human embryos.'

In addition to helping reduce the use of animals in research, synthetic embryo models might in the future become a reliable source of cells, tissues, and organs for transplantation. "Instead of developing a different protocol for arowing each cell type for example, those of the kidney or liver - we may one day be able to create a synthetic embryo-like model and then isolate the cells we need. We won't need to dictate to the emerging organs how they must develop. The embryo itself does this best."

Reference: "Post-Gastrulation Synthetic Embryos Generated Ex Utero from Mouse Naïve ESCs", 1 August 2022, Cell.

DOI: 10.1016/j. cell.2022.07.028

YOUR DAILY DOSE OF SCIENCE





SCIENTISTS HAVE IDENTIFIED A NEW COMMON SUBTYPE OF PROSTATE CANCER

A recent study by a aroup of researchers at Memorial Sloan Kettering Cancer Center (MSK) and Weill Cornell Medicine finds that a previously unidentified subtype of hormone-resistant prostate cancer makes up roughly 30% of all cases. The study was recently published in the journal Science. The discovery could make it possible for patients with this subtype of prostate cancer to get targeted therapies.

Only two prostate cancer subtypes had previously been identified: androgen-dependent and neuroendocrine before this recent research, which was led by Yu Chen. Dr. Chen is an MSK physician-scientist, a member of the Human Oncology and Pathogenesis Program, and an associate professor at Cornell. Because some of the genes that are switched on in the cells are similar to those in stem cells, Dr. Chen's team has termed the newly identified third subtype of prostate cancer stem cell-like (SCL).

Dr. Chen and his colleagues looked at 40 distinct patient-derived models of prostate cancer that were gathered from patients who had cancer treatment at MSK and Weill Cornell to make their discovery.

"We didn't know whether we were going to find additional subtypes," Dr. Chen says. "This is a field that's been studied for many years, by many investigators. So we were happy and surprised to find that there's this fairly large group of patients with tumors that haven't been characterized."

The lack of sufficient high-quality laboratory models for researching this form of cancer may be one reason why the subtype eluded researchers.

"Prostate cancer is uniquely difficult to propagate in the lab," Dr. Chen explains. "Whereas there are hundreds of cell lines of melanoma and lung cancer, there's only three or four prostate cancer cell lines that are useful."

To circumvent this problem, the team turned to a new technology called organoids. The organ-like structures are grown in the lab from pieces of a patient's tumor. They are a kind of "avatar" of a patient's tumor and can be used to study its genetics and biochemistry.

In addition, the team made use of patient-derived xenografts — tumors removed from a patient and grown in a mouse — for a total of 40 different patient-derived models of prostate cancer.

They could then determine whether genes are activated or inactive in the cells using these patient-derived organoids as a starting point. The scientists utilized this data to establish the existence of a new subtype of prostate cancer.

Next, they looked to see if the SCL subtype was apparent in a biobank of 366 prostate cancer tumors. It was. In fact, it was the second most prevalent group, after the androgen-sensitive type.

Knowing the molecular drivers of this common subtype of prostate cancer opens the door to approaches that could target these drivers with drugs.

The scientists found that there are experimental drugs currently being tested in humans that can block the growth of the SCL subtype in laboratory and animal models. They are currently working with several companies to establish a clinical trial of their drugs for people with this subtype of prostate cancer.



HEALTH AND LABORATORY MAGAZINE



MIT ENGINEERS DEVELOP STICKERS THAT CAN SEE INSIDE THE BODY

New stamp-sized ultrasound adhesives produce clear images of heart, lungs, and other internal organs.

Ultrasound imaging is a safe and noninvasive window into the body's workings, providing clinicians with live images of a patient's internal organs. To capture these images. trained technicians manipulate ultrasound wands and probes to direct sound waves into the body. These waves reflect back out to produce high-resolution images of a patient's heart, lungs, and other deep oraans.

Currently, ultrasound imaging requires bulky and specialized equipment available only in hospitals and doctor's offices. But a new design by MIT engineers might make the technology as wearable and accessible as buying Band-Aids at the pharmacy.

In a paper appearing today in Science, the engineers present the design for a new ultrasound sticker — a stamp-sized device that sticks to skin and can provide continuous ultrasound imaging of internal organs for 48 hours.

The researchers applied the stickers to volunteers and showed the devices produced live, high-resolution images of major blood vessels and deeper organs such as the heart, lungs, and stomach. The stickers maintained a strong adhesion and captured changes in underlying organs as volunteers performed various activities, including sitting, standing, jogging, and biking.

The current design requires connecting the stickers to instruments that translate the reflected sound waves into images. The researchers point out that even in their current form, the stickers could have immediate applications: For instance, the devices could be applied to patients in the hospital. similar to heart-monitoring EKG stickers, and could continuously image internal organs without requiring a technician to hold a probe in place for long periods of time

If the devices can be made to operate wirelessly – a goal the team is currently working toward – the ultrasound stickers could be made into wearable imaging products that patients could take home from a doctor's office or even buy at a pharmacy.

"We envision a few patches adhered to different locations on the body, and the patches would communicate with your cellphone, where Al algorithms would analyze the images on demand," says the study's senior author, Xuanhe Zhao, professor of mechanical engineering and civil and environmental engineering at MIT. "We believe we've opened a new era of wearable imaging: With a few patches on your body, you could see your internal organs."

A STICKY ISSUE

To image with ultrasound, a technician first applies a liquid gel to a patient's skin, which acts to transmit ultrasound waves. A probe, or transducer, is then pressed against the gel, sending sound waves into the body that echo off internal structures and back to the probe, where the echoed signals are translated into visual images.

For patients who require long periods of imaging, some hospitals offer probes affixed to robotic arms that can hold a transducer in place without tiring, but the liquid ultrasound gel flows away and dries out over time, interrupting long-term imaging.

In recent years, researchers have explored designs for stretchable ultrasound probes that would provide portable, low-profile imaging of internal organs. These designs gave a flexible array of tiny ultrasound transducers, the idea being that such a device would stretch and conform with a patient's body.

But these experimental designs have produced low-resolution images, in part due to their stretch: In moving with the body, transducers shift location relative to each other, distorting the resulting image.

"Wearable ultrasound imaging tool would have huge potential in the future of clinical diagnosis. However, the resolution and imaging duration of existing ultrasound patches is relatively low, and they cannot image deep organs," says Chonghe Wang, who is an MIT graduate student.

AN INSIDE LOOK

The MIT team's new ultrasound sticker produces higher resolution images over a longer duration by pairing a stretchy adhesive layer with a rigid array of transducers. "This combination enables the device to conform to the skin while maintaining the relative location of transducers to generate clearer and more precise images." Wang says.

The device's adhesive layer is made from two thin

layers of elastomer that encapsulate a middle layer of solid hydrogel, a mostly water-based material that easily transmits sound waves. Unlike traditional ultrasound gels, the MIT team's hydrogel is elastic and stretchy.

"The elastomer prevents dehydration of hydrogel," says Chen, an MIT postdoc. "Only when hydrogel is highly hydrated can acoustic waves penetrate effectively and give high-resolution imaging of internal organs."

The bottom elastomer layer is designed to stick to skin, while the top layer adheres to a rigid array of transducers that the team also designed and fabricated. The entire ultrasound sticker measures about 2 square centimeters across, and 3 millimeters thick – about the area of a postage stamp.

The researchers ran the ultrasound sticker through a battery of tests with healthy volunteers, who wore the stickers on various parts of their bodies, including the neck, chest, abdomen, and arms. The stickers stayed attached to their skin, and produced clear images of underlying structures for up to 48 hours. During this time,



YOUR DAILY DOSE OF SCIENCE

volunteers performed a variety of activities in the lab, from sitting and standing, to jogging, biking, and lifting weights.

From the stickers' images, the team was able to observe the changing diameter of major blood vessels when seated versus standing. The stickers also captured details of deeper organs, such as how the heart changes shape as it exerts during exercise. The researchers were also able to watch the stomach distend, then shrink back as volunteers drank then later passed juice out of their system. And as some volunteers lifted weights, the team could detect bright patterns in underlying muscles, signaling temporary microdamage.

"With imaging, we might be able to capture the moment in a workout before overuse, and stop before muscles become sore," says Chen. "We do not know when that moment might be yet, but now we can provide imaging data that experts can interpret."

The team is working to make the stickers function wirelessly. They are also developing software algorithms based on artificial intelligence that can better interpret and diagnose the stickers' images. Then, Zhao envisions ultrasound stickers could be packaged and purchased by patients and consumers, and used not only to monitor various internal organs, but also the progression of tumors, as well as the development of fetuses in the womb.

"We imagine we could have a box of stickers, each designed to image a different location of the body," Zhao says. "We believe this represents a breakthrough in wearable devices and medical imaging."

Bioadhesive ultrasound for long-term continuous imaging of diverse organs

https://www.science. org/doi/10.1126/science. abo2542 IN BIOEXPO Powerful events Cutting-edge technologies Inovative developments

bioexpo

19-21 October 2022

İstanbul Lütfi Kırdar www.bioexpo.com.tr







WATER DISTILLER



MILK CENTRIFUGE



FAT ANALYZER

∣ in ♥ f /clssci

If you choose us for your laboratories All you have to do is enjoy the fast and smooth operation.

When you purchase any of the CLS Scientific products, you become a part of the intense communication that strengthens the relationship between us and our customers. Our technical team, who is well-versed in the subject, will solve possible problems as soon as possible. In the regions we cannot reach, we produce solutions focused on customer satisfaction by using all current communication options in the most effective way.



P. +90 312 278 40 47 **F.** +90 312 278 37 23 Dökmeci Sanayi Sitesi 10. Cadde No:3/1 Ankara - TURKEY info@clslabor.de www.clslabor.de