2026 年度
創価大学 大学院 理工学研究科【環境共生工学専攻】
博士後期課程　一般選抜試験問題

英　　語

開始時刻　午前 10 時 00 分
終了時刻　午前 11 時 00 分

【注意事項】

１．　答案用紙には受験番号、氏名を必ず記入してください。
２．　試験終了後、答案用紙は必ず提出してください（問題用紙は提出しなくてよい）。

1 Answer all questions following a passage on the basis of what is stated or implied in that passage, either in Japanese or English.

In an unexpected finding, a UCLA-led team has discovered that bacteria are present inside the most common type of kidney stone, revealing a previously unrecognized component involved in their formation.

The findings, to be published in the peer-reviewed journal PNAS, point to a possible therapeutic target that could be used for prevention and treatment for the millions of people who are affected by the frequently painful condition.

> "This breakthrough challenges the long-held assumption that these stones develop solely through chemical and physical processes, and instead shows that bacteria can reside inside stones and may actively contribute to their formation. By uncovering this novel mechanism, the study opens the door to new therapeutic strategies that target the microbial environment of kidney stones."
>
> Dr. Kymora Scotland, assistant professor of urology, David Geffen School of Medicine at UCLA and study's co-senior author

Gerard Wong, a professor in the UCLA Departments of Bioengineering, Chemistry and the California NanoSystems Institute at UCLA, served as the study's co-author.

Kidney stones are composed of clumps of small crystals. Their prevalence has risen globally in recent years, so that today about 1 in 11 people will get them in their lifetime. Risk factors include family history, metabolic syndrome, and low fluid intake. The stones start forming when crystals grow in urine and become large enough that they can't be washed out with normal urine flow.

There are several subsets of kidney stones and while one rare stone type is known to contain bacteria, by far the most common stone is calcium oxalate (CaOx), comprising almost 80% of kidney stone cases, which have not have been previously known to contain bacteria. While examining data from electron and florescence microscopy, the researchers unexpectedly detected live bacteria as well as layers, or biofilms, of bacteria integrated into the crystals.

"We found a new mechanism of stone formation that may help to explain why these stones are so common" Scotland said. "These results may also help to explain the connections between recurrent urinary tract infections and recurrent kidney stone formation, and provides insights on potential future treatment for these conditions."

The findings suggest that bacteria could also be involved in other kidney stone types, she added.

The study has focused on calcium-based stones. How other less common stones form is still in question. More studies are needed to fully understand how bacteria and calcium-based kidney stones interact, the

researchers conclude.

"Our multi-institutional team is currently performing studies to determine how bacteria and calcium-based kidney stones interact. We want to understand exactly what makes some patients particularly susceptible to recurrent stone formation, and what it is about these particular species of bacteria that allows them to nucleate these stones," Scotland said.

Modified from source: News-Medical.Net JANUARY 27 2026
www.news-medical.net/news/20260127/Study-reveals-hidden-bacterial-role-in-the-formation-of-most-kidney-stones.aspx

(1) What type of the kidney stone is the main subject in this article?
(2) What was the conventional understanding and the new finding on this type (1) of kedney stone?
(3) What is the next step of their research plan?
(4) What is the expected 'help' of this new research for patients?

2 Answer all questions following a passage on the basis of what is stated or implied in that passage, either in Japanese or English.

The Finnish cleantech startup "TheStorage" officially commissioned its first industrial-scale thermal energy system at a local brewery in January 2026.

This operational pilot represents a massive leap in efficiency, offering a solution that can cut energy costs by up to 70% and reduce carbon emissions by up to 90% for manufacturing facilities.

"The system converts renewable electricity into heat, stores it in sand, and delivers it for on-demand industrial heating," said the company in a press release.

The system addresses a critical global challenge, as industrial heat production currently accounts for one-fifth of the world's total energy consumption, with 80% of that demand still being met by fossil fuels like oil and gas.

"Industrial heat production is one of the largest and hardest-to-solve sources of carbon emissions worldwide," highlighted the press release.

To combat this, the new technology is designed to be highly scalable, offering storage capacities ranging from 20 to 500 MWh and charging power between 1 to 20 MW, allowing it to meet the heavy-duty needs of diverse industrial sectors.

The system uses a "sand-in-motion" principle to store energy where cheap, abundant renewable electricity powers an electric heater to begin the charging process.

"Cool sand moves from a cold silo to an electric heater, reaching temperatures up to 800°C," added the press release.

"The heated sand is then stored in a hot silo, where energy is efficiently retained in stationary sand."

Finally, when the brewery requires steam for its production lines, the hot sand is circulated through an external heat exchanger to discharge the heat on demand, achieving a tenfold higher heat transfer efficiency than conventional static storage models.

By replacing fossil-fuel boilers with a system that utilizes electricity when prices are at their lowest, companies can finally align their ecological goals with economic practicality.

"Companies have wanted to decarbonize for years, but viable solutions simply weren't available," remarked Timo Siukkola, CEO of TheStorage.

"Finally, renewable energy generation can meet industrial heat demand in a way that's both ecologically sound and economically practical."

Vesa Peltola, Production Director of the brewery, noted that producing steam without fossil fuels is a major step toward carbon-neutral production.

This real-world testing proves that even the most heat-intensive industries, from food production to chemical processing, can transition away from gas and oil.

The journey began in 2023 when the concept for the sand-in-motion storage emerged in Finland, which led to detailed engineering and development work throughout 2024.

This process reached its peak in early 2026 when the first industrial-scale pilot was installed and began producing fossil-free steam for the brewery's production lines.

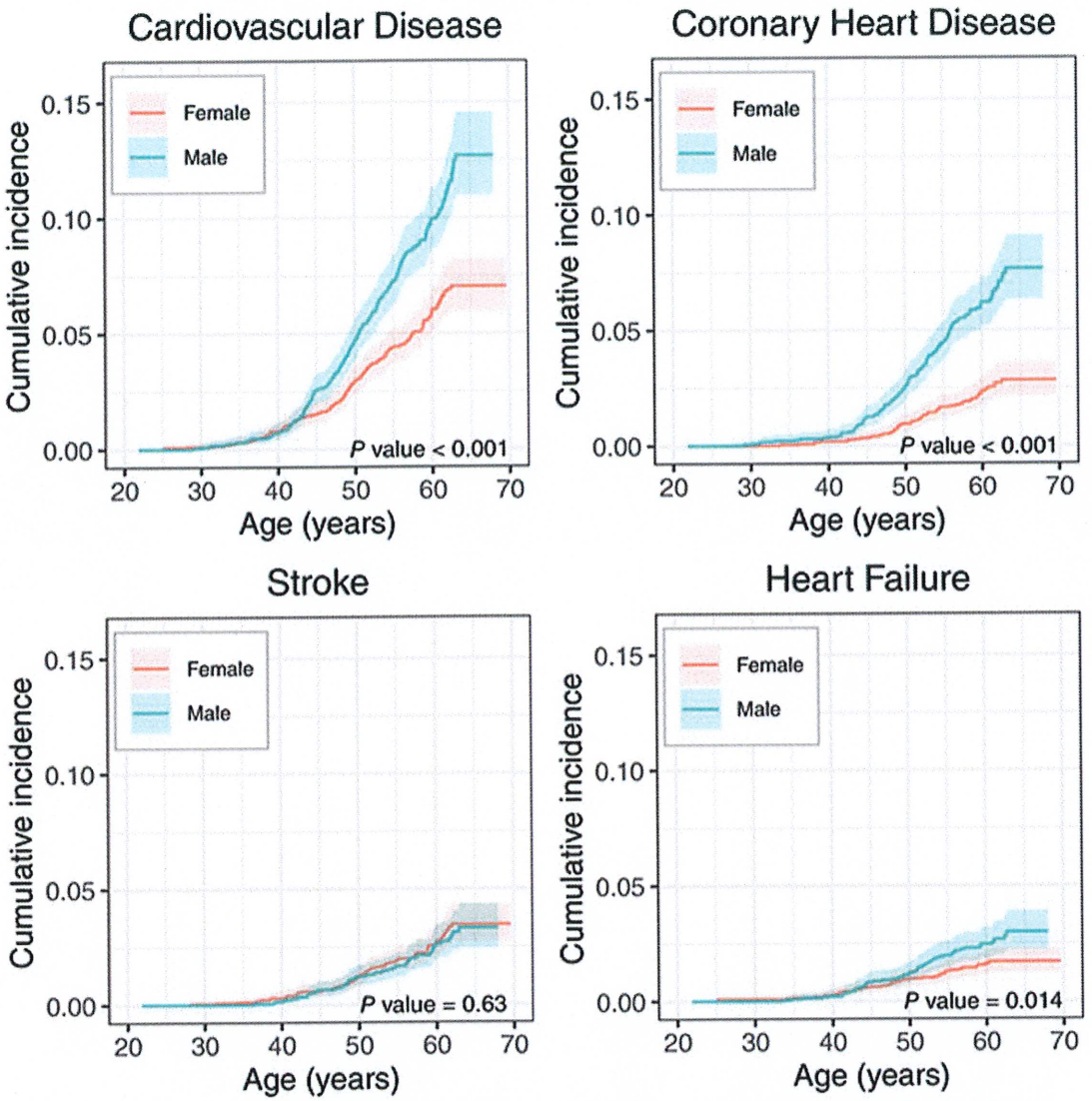
"Heat emissions now appear simultaneously in sustainability reports, energy costs, and customer requirements," concluded Siukkola.

"This forces industrial companies to reconsider how they produce heat to remain competitive in global supply chains."

Modified from source: Aman Tripathi, 01 February 2026, Interesting Engineering
interestingengineering.com/energy/finland-sand-battery-heat-transfer

(1) What is the "sand-in-motion" technique?
(2) What kind of current 'industrial' energy consumption will be 'improved' with this system?
(3) How much 'improvement' is expected?
(4) How does the 'improvement' work?

3 Answer the questions below in English.



Coronary heart disease was where the male and female differences stood out. (Freedman et al., *J. Am. Heart Assoc.*, 2026)

1. Describe in detail, what facts are displayed in the figure.
2. Explore (free) discussion points based on the information in the figure.

Background information:
The US-based researchers followed the health of 5,112 people for an average of around 34 years. As the participants were healthy and aged 18-30 when the study started in the mid-1980s, the researchers could chart cases of cardiovascular disease (including strokes and heart failure) over time.

source: DAVID NIELD, 02 February 2026, Health
www.sciencealert.com/study-reveals-a-turning-point-when-mens-heart-attack-risk-accelerates