

Antibiotic alternative opens up sustainable direction for global dairy industry

Antibacterial compounds are a potential alternative to the use of antibiotics, which has raised concerns about increasing antibiotic resistance and the risk of milk being contaminated with antibiotic residues.

According to a VNA reporter in Singapore, a research team in this country has developed new antibacterial compounds that can help treat mastitis in cows - a bacterial disease that reduces milk production and causes billions of dollars in losses each year to the global livestock industry.

These compounds are seen as a potential alternative to the use of antibiotics, which has raised concerns about growing antibiotic resistance and the risk of milk being contaminated with antibiotic residues.

According to The Straits Times, this is the result of an interdisciplinary research group on antimicrobial resistance (AMR) including scientists from Nanyang Technological University (NTU) and the Singapore-MIT Alliance for Research and Technology (Smart), a research enterprise of the Massachusetts Institute of Technology (MIT) in Singapore.

Bovine mastitis is an inflammation of the mammary glands caused by microorganisms entering through the milk ducts, usually occurring 30-45 minutes after milking, when the teats are still open and susceptible to infection.

According to Dr. Zhang Kaixi, a scientist in Smart's AMR group, farms now often dip cows' teats in antiseptic solutions containing iodine or chlorhexidine (disinfectant) to prevent disease.

However, long-term use of these solutions can cause irritation and cracking of the nipple skin, making it easier for bacteria to penetrate. When cows have mastitis, they will be treated with antibiotics, but this will produce milk containing high levels of antibiotics and must be discarded within 10-11 days, not consumed or traded.

In addition, some bacteria have begun to become resistant to commonly used antibiotics. There are also concerns that iodine or chlorhexidine may be released into the environment through wastewater, causing harm to aquatic life.

In a study published in the journal Nature Communications (July 2025), scientists said they discovered a new compound called oligoimidazolium carbon acid (OIM) that can solve the above limitations.



Dairy cows are raised on a farm in Plymouth, Indiana, USA. (Photo: AFP/VNA)

According to Professor Mary Chan, co-leader of the research team at NTU's School of Chemistry, Chemical Engineering and Biotechnology, the OIM is designed to develop a new generation of antibacterial polymers for agricultural and biomedical applications to combat drug-resistant bacteria.

Part of the OIM can be converted into highly active molecules called carbenes, which help them penetrate the bacteria's protective membrane, destroy DNA, and effectively kill bacteria. Because this mechanism is more powerful than traditional antibacterial compounds, OIM requires lower doses, reducing the risk of side effects.

Dr. Zhang said the experiment showed that cows whose teats were dipped in OIM solution did not develop infections despite exposure to bacteria, while the compound is non-irritating, easy to wash off, and has no negative impact on the environment.

“OIM is a biodegradable compound that, after use, breaks down into natural molecules, is non-toxic and non-polluting, much more environmentally friendly than iodine or chlorhexidine,” he said.

Professor Chan added that OIM does not alter the composition or safety of milk and is a “very promising” compound. The team is now conducting long-term trials on a herd of about 30-40 cows at a farm in Malacca, Malaysia, to assess its effectiveness and safety, after having had positive results in the lab and at a farm in China.

Professor Paula Hammond - Executive Vice Provost of MIT and co-author from the Smart AMR group said that after achieving positive results in both research and field, the group is cooperating with businesses to scale up and proceed to commercialize this new antibacterial compound.

Several agricultural companies in Australia, Belgium and Malaysia have expressed interest in using OIM. In the future, the research team plans to establish a subsidiary to bring this technology to market./.

(TTXVN/Vietnam+)

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