

# METHICILLIN AND VANCOMYCIN-RESISTANT *STAPHYLOCOCCUS AUREUS*

Drug-resistant *Staphylococcus aureus* threatens primate colonies, staff, and public health.



## *Staphylococcus aureus* and Resistance

*S. aureus* is a common bacterium found on the skin and in the nasal passages of humans and other primates. Usually harmless, it can cause skin infections, pneumonia, and sepsis when immunity is weakened or wounds are present. In primate facilities, close contact enables rapid spread between animals and staff. Treating these outbreaks often requires antibiotics that the World Health Organization considers “critically important” for human medicine.<sup>1</sup> Repeated use in primate facilities fosters resistance, leaving infections harder to treat, endangering staff, and adding to the global public-health crisis of drug-resistant bacteria.

### Methicillin-Resistant *S. aureus* (MRSA)

MRSA is entrenched in primate facilities.<sup>1</sup> At the Washington National Primate Research Center, 17.6% of macaques, 2.5% of staff, and 3.6% of the facility environment tested positive, with genetic analysis confirming that strains originated in monkeys.<sup>2</sup> In a captive chimpanzee colony, 69% carried MRSA, with multiple related strains circulating—evidence that the infection becomes deeply entrenched and is extremely difficult to eradicate once established.<sup>3</sup>

Imported macaques often come from regions where MRSA circulates widely in humans and other primates, heightening the risk of cross-species transmission. For staff, MRSA-positive monkeys present a documented occupational hazard.<sup>2</sup> For monkeys, MRSA carriage doubles the risk of infection, particularly in research models involving immunosuppression, surgery, or implants.<sup>4</sup>

### Vancomycin-Resistant *S. aureus* (VRSA)

VRSA is one of the rarest resistant pathogens in the U.S., with only about 16 human cases ever reported. In 2023, VRSA was detected for the first time in nonhuman primates: long-tailed macaques imported from Mauritius to the Oregon National Primate Research Center.<sup>6</sup>

Among 13 long-tailed macaques, 76.9% carried MRSA. Of these, 70% were VRSA-positive and 30% carried vancomycin-intermediate *S. aureus* (VISA). A rhesus macaque housed in the same room later became VRSA-positive, showing spread inside the facility.

That a pathogen this rare could appear in U.S. primate facilities through legally imported monkeys underscores the risks of continuing to source primates without effective screening and safeguards. Worker safety, animal welfare, and public health are all at risk when resistant bacteria like MRSA and VRSA gain a foothold in primate colonies.

## Endnotes

- <sup>1</sup> Kim J, Habing GG, Salyards GW, Coble DJ. Antimicrobial stewardship in captive monkeys. In: Knauf S, Jones-Engel L, eds. *Neglected Diseases in Monkeys: From the Monkey-Human Interface to One Health*. Springer International Publishing; 2020:141-170. doi:10.1007/978-3-030-52283-4\_7
- <sup>2</sup> Soge OO, No D, Michael KE, et al. Transmission of multidrug-resistant *Staphylococcus aureus* between primates, their environment, and personnel at a United States primate center. *J Antimicrob Chemother*. 2016;71(10):2798-2803. doi:10.1093/jac/dkw236
- <sup>3</sup> Hanley PW, Barnhart KF, Abee CR, et al. Methicillin-resistant *Staphylococcus aureus* prevalence among captive chimpanzees, Texas, USA, 2012. *Emerg Infect Dis*. 2015;21(12):2158-2160. doi:10.3201/eid2112.142004
- <sup>4</sup> Association of Primate Veterinarians. Guidelines for MRSA infections in nonhuman primates in biomedical research. *J Am Assoc Lab Anim Sci*. 2019;58(3):285-288.
- <sup>5</sup> Blechman SE, Wright ES. Vancomycin-resistant *Staphylococcus aureus* (VRSA) can overcome the cost of antibiotic resistance and may threaten vancomycin's clinical durability. *PLoS Pathog*. 2024;20(8):e1012422. doi:10.1371/journal.ppat.1012422
- <sup>6</sup> Bochart R, et al. Identification of vancomycin resistance in methicillin-resistant *Staphylococcus aureus* in two macaque species and decolonization and long-term prevention of recolonization in cynomolgus macaques (*Macaca fascicularis*). *Front Immunol*. 2023;14:1244637. doi:10.3389/fimmu.2023.1244637