

Ferritin

- A globular nanoprotein -

NAGASE & CO. developed a technology to mass-produce ferritin with proprietary recombinant DNA techniques.

What is Ferritin?

Ferritin is a globular, cage-shaped protein complex synthesized by almost all organisms. Ferritin helps the regulation of iron ion concentration in the body. Animal ferritin, shown in Figure 1, consists of 24 subunits. Ferritin has an outer diameter of 12 nm and an internal cavity measuring 8 nm across where iron is stored. Recent research has shown that ferritin can hold a range of metal ions and organic molecules in addition to iron¹.

NAGASE's Proprietary Ferritin-Producing Technology

Ferritin consists of L- and H- chain subunits. Changing the proportion of these two subunits alters the amount of metal ion that can be stored in the inner cavity. The NAGASE R&D CENTER **developed and patented a technology for mass-producing ferritin** with different subunit compositions using *E. coli* recombinant DNA techniques developed by the company over the years².

Several Applications of Ferritin

Companies and organizations worldwide are conducting research on the properties of ferritin. One such property, self-organization, allows ferritin to form regular arrangements on a surface. Applications under development include quantum dots etched with iron-containing ferritin arranged on a surface as an etching mask³, nano-filters made with cross-linked ferritin⁴, and drug delivery systems that use ferritin to hold an active pharmaceutical ingredient⁵. In fact, research is proceeding in diverse fields, including electronics, medicine, and environmental technologies.

NAGASE & CO. is committed to continuing to commercialize our ferritin technology to meet the needs of our customers in the near term.

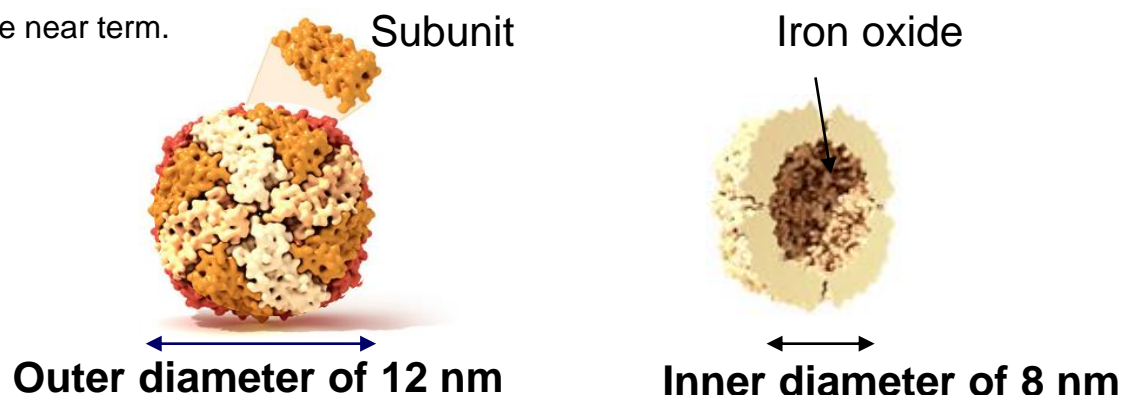


Figure 1 Schematic diagram showing animal ferritin from the outside (left) and in cross-section (right)⁶

References

1. Yamashita I. et al. Ferritin in the field of nanodevices. *Biochim Biophys Acta*. (2010) 1800(8):846-857
2. Method for producing ferritin. Japanese Patent, No. 5957443 (2016)
3. Wang XY. et al. Damage-free top-down processes for fabricating two-dimensional arrays of 7 nm GaAs nanodiscs using bio-templates and neutral beam etching. *Nanotechnology* (2011) 22(36):365301
4. Peng X. et al. Ultrafast permeation of water through protein-based membranes. *Nat Nanotechnol*. (2009) 4(6): 353-357
5. Truffi M. et al. Ferritin nanocages: A biological platform for drug delivery, imaging and theranostics in cancer. *Pharmacol Res*. (2016) 107: 57-65
6. Sited from U.S. National Library of Medicine, URL : <https://ghr.nlm.nih.gov/condition/neuroferritinopathy#images>

The NAGASE R&D CENTER is committed to developing processes for efficiently producing a wide range of compounds with proprietary fermentation technologies.