

Source: Okayama University (JAPAN), Public Relations and Information Strategy

For immediate release: 27 February 2018

Okayama University research: Iron removal as a potential cancer therapy

(Okayama, 27 February) **Researchers at Okayama University report in *Oncotarget* a promising method for targeting cancer stem cells that cause tumor growth and cancer relapse. The approach involves administering molecules that capture iron, an overload of which is known to be a potential cause of cancer.**

Cancer stem cells (CSCs) are similar to normal stem cells in that they can differentiate — become cells of a specialized type. CSCs are resistant to radio- and chemotherapy and are believed to play an important role in metastasis and cancer relapse. Since iron overload is known to cause certain types of cancer, Dr. Toshiaki Ohara and Dr. Takayuki Ninomiya from Okayama University and colleagues have now tested whether the suppressing of iron levels can halt proliferation and ‘stemness’ of CSCs. The researchers found that controlled iron depletion indeed has the potential to become a therapy for targeting CSCs.

Dr. Ohara and colleagues first confirmed that in vitro, a supply of iron leads to the proliferation of CSCs, as well as the persistence of their stemness. Then, the researchers studied the effect of administering iron chelators: organic compounds that bond to particular metals, in this case iron. The scientists reckoned that through chelation, iron atoms are isolated and, potentially, ‘neutralized’. Two known iron chelators were tested: deferasirox and deferoxamine. Both compounds suppressed the proliferation of a set of mouse cancer cells. The associated fibroblasts (cells that play a key role in cancer progression and believed to originate from CSCs), however, were not affected.

Regarding the mechanism causing the suppression of CSC proliferation, Dr. Ohara and colleagues found that the iron chelators induced apoptosis (a highly regulated process leading to cell death). The scientists also studied the effect of deferasirox and deferoxamine on the CSCs’ stemness, and observed that the expression of stemness markers was suppressed — indirect evidence for stemness loss. The latter property was not observed in chemotherapy treatment, indicating the unique function of iron chelators as stemness marker suppressors. Finally, the researchers tested the effect of deferasirox and deferoxamine in *vivo*; both iron chelators suppressed CSC tumor growth and stemness marker expression.

The results of Dr. Ohara and colleagues show that the use of iron chelators could develop into an effective cancer treatment, complementary to standard chemotherapy. In the words of the researchers: "Although ... the mechanisms [of stemness marker expression] are currently unknown ... this study may represent an important first step in the development of novel iron chelation based strategies for CSC therapy."

Background

Cancer stem cells

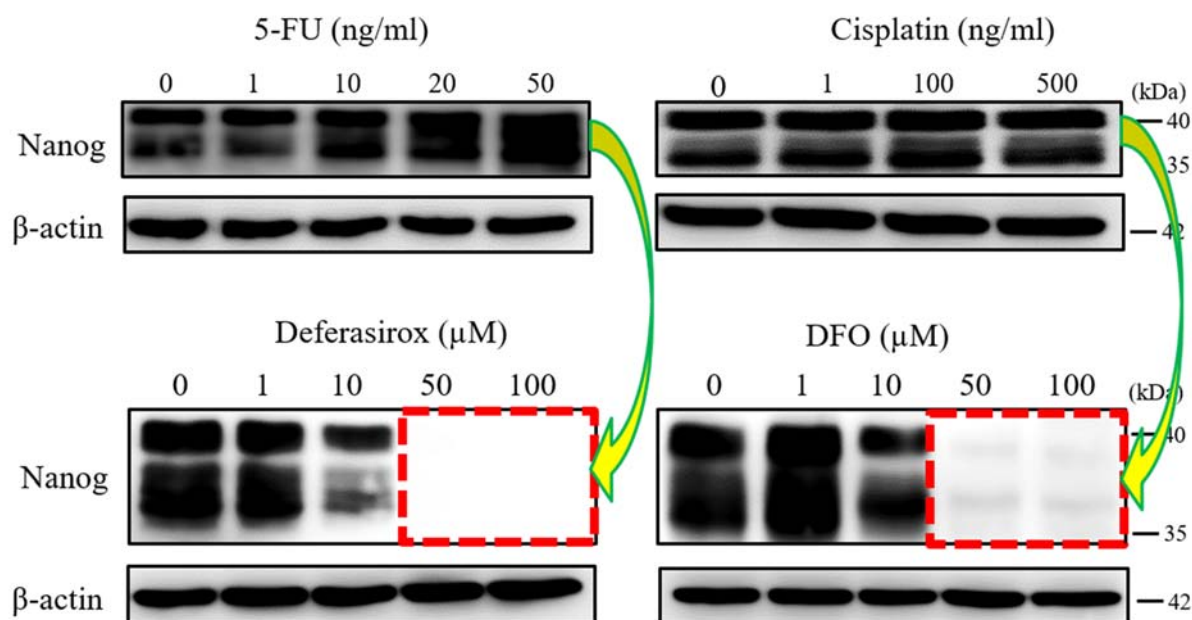
A cancer stem cell (CSC) is a cancerous cell with the property of a normal stem cell that it can differentiate in various cell types found in a particular cancer sample. CSCs are tumor-forming, and cancer therapies targeting them are being developed, as CSCs are involved in cancer metastasis and tumor relapse.

Dr. Ohara from Okayama University and colleagues have now shown that controlled iron depletion in tumors is a promising novel strategy for targeting CSCs.

Chelation

Chelation is a type of bond between metal ions and molecules or molecular ions. It involves a multiple-bonded ligand binding to the metal ion; the ligand is usually an organic compound and called a chelant or chelator.

Since iron overload in the human body can lead to the formation of free radicals, which in turn can cause cancer, Dr. Ohara and colleagues investigated whether iron depletion through chelation, using the iron chelators deferasirox and deferoxamine, can suppress the proliferation and stemness of cancer stem cells.



Caption

Iron chelators Deferasirox and Deferoxamine (DFO) suppress the expression of stemness marker. 5-FU, ordinary anti-cancer drug, did not inhibited.

Reference

Takayuki Ninomiya, Toshiaki Ohara, Kazuhiro Noma, Yuki Katsura, Ryoichi Katsube, Hajime Kashima, Takuya Kato, Yasuko Tomono, Hiroshi Tazawa, Shunsuke Kagawa, Yasuhiro Shirakawa, Fumiaki Kimura, Ling Chen, Tomonari Kasai, Masaharu Seno, Akihiro Matsukawa & Toshiyoshi Fujiwara. Iron depletion is a novel therapeutic strategy to target cancer stem cells. *Oncotarget*, 12 October 2017.

DOI: 10.18632/oncotarget.21846

[http://www.oncotarget.com/index.php?journal=oncotarget&page=article&op=view&path\[\]=21846&path\[\]=69293](http://www.oncotarget.com/index.php?journal=oncotarget&page=article&op=view&path[]=21846&path[]=69293)

Reference (Okayama University e-Bulletin & OU-MRU) : Assistant Professor Ohara's team
OU-MRU Vol.22 : [Medical supportive device for hemodialysis catheter puncture](#)

Correspondence to

Assistant Professor Toshiaki Ohara, M.D., Ph.D.
Department of Pathology & Experimental Medicine,
Graduate School of Medicine, Dentistry and Pharmaceutical
Sciences, Okayama University, Shikata-cho 2-5-1, Okayama
city, Okayama 700-8558, Japan
E-mail: t_ohara@cc.okayama-u.ac.jp
<http://www.okayama-u.ac.jp/user/byouri/pathology-1/TOP.html>



Assistant Professor
Toshiaki Ohara

Further information

Okayama University
1-1-1 Tsushima-naka , Kita-ku , Okayama 700-8530, Japan
Public Relations and Information Strategy
E-mail: www-adm@adm.okayama-u.ac.jp
Website: http://www.okayama-u.ac.jp/index_e.html
Okayama Univ. e-Bulletin: <http://www.okayama-u.ac.jp/user/kouhou/ebulletin/>
About Okayama University (YouTube):
<https://www.youtube.com/watch?v=iDL1coqPRYI>
Okayama University Image Movie (YouTube):
<https://www.youtube.com/watch?v=KU3hOIXS5kk>



Okayama University Medical Research Updates (OU-MRU)

- Vol.1 : [Innovative non-invasive 'liquid biopsy' method to capture circulating tumor cells from blood samples for genetic testing](#)
- Vol.2 : [Ensuring a cool recovery from cardiac arrest](#)
- Vol.3 : [Organ regeneration research leaps forward](#)
- Vol.4 : [Cardiac mechanosensitive integrator](#)
- Vol.5 : [Cell injections get to the heart of congenital defects](#)
- Vol.6 : [Fourth key molecule identified in bone development](#)
- Vol.7 : [Anticancer virus solution provides an alternative to surgery](#)
- Vol.8 : [Light-responsive dye stimulates sight in genetically blind patients](#)
- Vol.9 : [Diabetes drug helps towards immunity against cancer](#)
- Vol.10 : [Enzyme-inhibitors treat drug-resistant epilepsy](#)
- Vol.11 : [Compound-protein combination shows promise for arthritis treatment](#)
- Vol.12 : [Molecular features of the circadian clock system in fruit flies](#)
- Vol.13 : [Peptide directs artificial tissue growth](#)
- Vol.14 : [Simplified boron compound may treat brain tumours](#)
- Vol.15 : [Metamaterial absorbers for infrared inspection technologies](#)
- Vol.16 : [Epigenetics research traces how crickets restore lost limbs](#)
- Vol.17 : [Cell research shows pathway for suppressing hepatitis B virus](#)
- Vol.18 : [Therapeutic protein targets liver disease](#)
- Vol.19 : [Study links signalling protein to osteoarthritis](#)
- Vol.20 : [Lack of enzyme promotes fatty liver disease in thin patients](#)
- Vol.21 : [Combined gene transduction and light therapy targets gastric cancer](#)
- Vol.22 : [Medical supportive device for hemodialysis catheter puncture](#)
- Vol.23 : [Development of low cost oral inactivated vaccines for dysentery](#)
- Vol.24 : [Sticky molecules to tackle obesity and diabetes](#)
- Vol.25 : [Self-administered aroma foot massage may reduce symptoms of anxiety](#)
- Vol.26 : [Protein for preventing heart failure](#)
- Vol.27 : [Keeping cells in shape to fight sepsis](#)
- Vol.28 : [Viral-based therapy for bone cancer](#)
- Vol.29 : [Photoreactive compound allows protein synthesis control with light](#)
- Vol.30 : [Cancer stem cells' role in tumor growth revealed](#)
- Vol.31 : [Prevention of RNA virus replication](#)
- Vol.32 : [Enzyme target for slowing bladder cancer invasion](#)
- Vol.33 : [Attacking tumors from the inside](#)
- Vol.34 : [Novel mouse model for studying pancreatic cancer](#)
- Vol.35 : [Potential cause of Lafora disease revealed](#)
- Vol.36 : [Overloading of protein localization triggers cellular defects](#)
- Vol.37 : [Protein dosage compensation mechanism unravelled](#)
- Vol.38 : [Bioengineered tooth restoration in a large mammal](#)
- Vol.39 : [Successful test of retinal prosthesis implanted in rats](#)
- Vol.40 : [Antibodies prolong seizure latency in epileptic mice](#)
- Vol.41 : [Inorganic biomaterials for soft-tissue adhesion](#)
- Vol.42 : [Potential drug for treating chronic pain with few side effects](#)

- Vol.43 : [Potential origin of cancer-associated cells revealed](#)
- Vol.44 : [Protection from plant extracts](#)
- Vol.45 : [Link between biological-clock disturbance and brain dysfunction uncovered](#)
- Vol.46 : [New method for suppressing lung cancer oncogene](#)
- Vol.47 : [Candidate genes for eye misalignment identified](#)
- Vol.48 : [Nanotechnology-based approach to cancer virotherapy](#)
- Vol.49 : [Cell membrane as material for bone formation](#)



Okayama University (Shikata Campus, Okayama City)

http://www.okayama-u.ac.jp/eng/access_maps/Shikata_Campus.html



Okayama University Hospital (Okayama University, Shikata Campus, Okayama City)

<http://www.hsc.okayama-u.ac.jp/hos/en/index.html>

◆About Okayama University

Okayama University is one of the largest comprehensive universities in Japan with roots going back to the Medical Training Place sponsored by the Lord of Okayama and established in 1870. Now with 1,300 faculty and 13,000 students, the University offers courses in specialties ranging from medicine and pharmacy to humanities and physical sciences.

Okayama University is located in the heart of Japan approximately 3 hours west of Tokyo by Shinkansen.

Website: http://www.okayama-u.ac.jp/index_e.html



Japan (日本)



Hirofumi Makino, M.D., Ph.D.
President, Okayama University



“Okayama University supports the Sustainable Development Goals”



2018 Summer School in Okayama, 01-14 July

SETOUCHI
Its natural environment and society