Hochschule Albstadt-Sigmaringen
Albstadt-Sigmaringen University

Skin Ageing & Challenges November 17-18, 2022

Influence of water-filtered infrared (wIRA) hyperthermia on autophagy of human skin fibroblasts

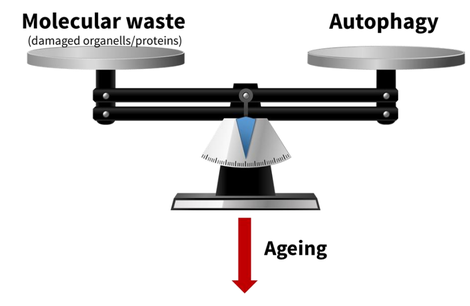
Hochecker Barbara[1], von Ardenne Alexander[2], Molinski Noah[2], Schniertshauer Daniel[1], Bergemann Jörg[1]

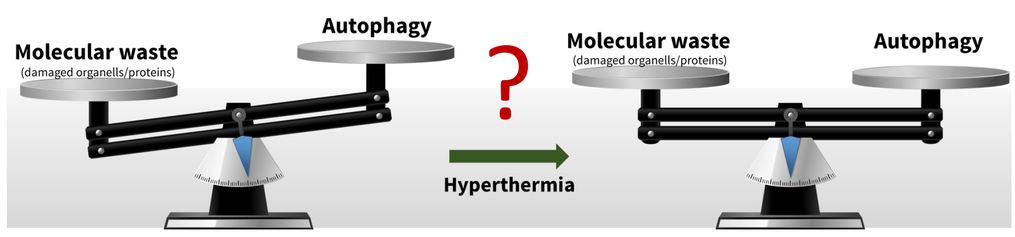
Albstadt-Sigmaringen University, Germany[1]; Von Ardenne Institute of Applied Medical Research GmbH, Germany[2]

1 Introduction

Autophagy is an intracellular degradative mechanism that removes damaged cell organelles and is critical for maintaining cellular homeostasis under stress conditions, such as age-related cellular dysfunctions [1]. It is well known that damaged proteins and organelles accumulate in aged cells due to these dysfunctions [2]. To counteract this large amount of molecular waste, an increase in the autophagic process is required. A promising option to activate autophagy is hyperthermia with water-filtered infrared A (wIRA) radiation. [3-4]

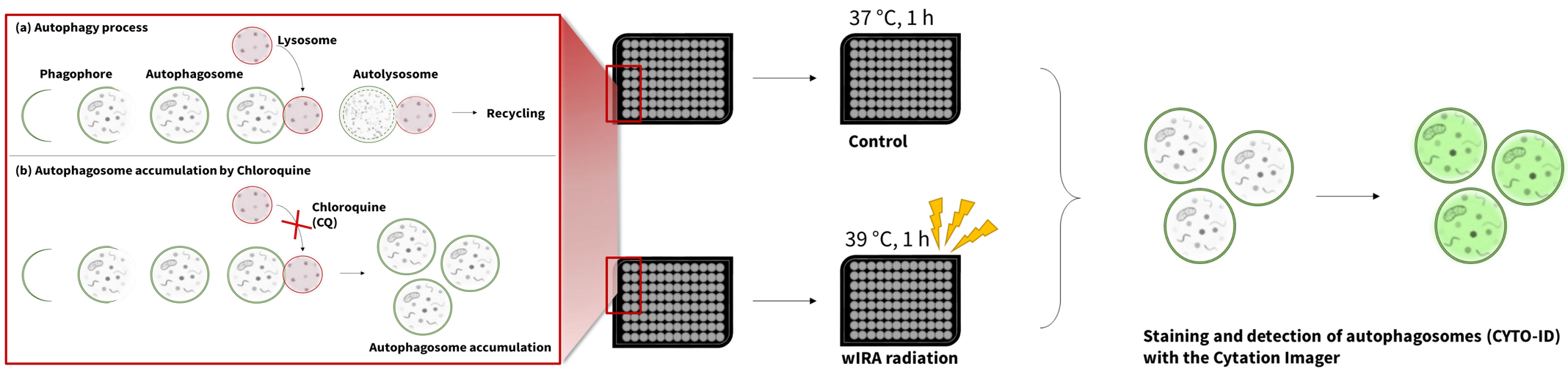
→ Does hyperthermia have a positive effect on autophagy in human skin fibroblasts?





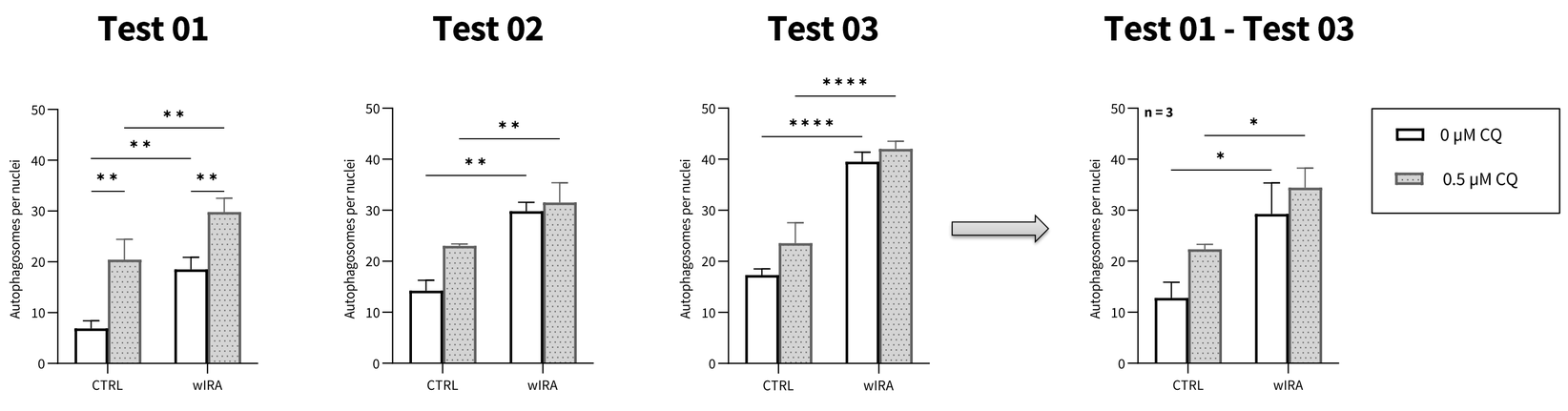
2 Method

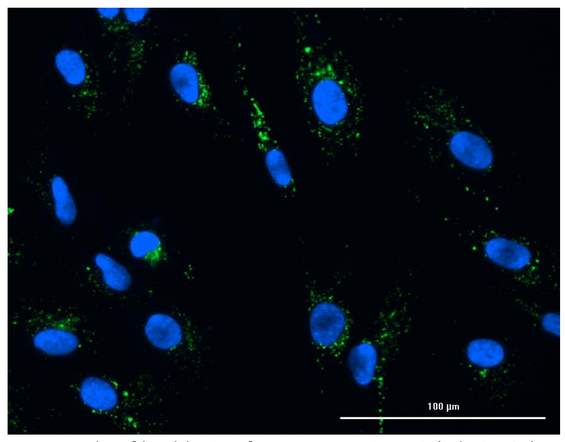
We investigated the effect of one-hour hyperthermia treatment with wIRA radiation at 39 °C on autophagy in human skin fibroblasts. For this purpose, some cells of both groups (control/wIRA) were inhibited with chloroquine (CQ) prior to wIRA treatment. CQ acts as a test control by inhibiting the fusion of lysosomes with autophagosomes, resulting in the accumulation of autophagosomes. The cells were treated with wIRA at 39 °C for 1 h or incubated for 1 h at 37 °C (control). After treatment, plates were subjected to the CYTO-ID® Autophagy Detection Kit 2.0 and read with the Cytation Imager.



3 Results

Hyperthermia leads to a stronger induction of autophagosome formation per nuclei compared to the control group. All three performed experiments as well as the grouped data show significantly increased induction of autophagosomes per nuclei. Statistical analysis was conducted as two-way ANOVA with subsequent Tukey's multiple comparisons test. (ns $P \geq 0.5$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$ and **** $P < 0.0001$)

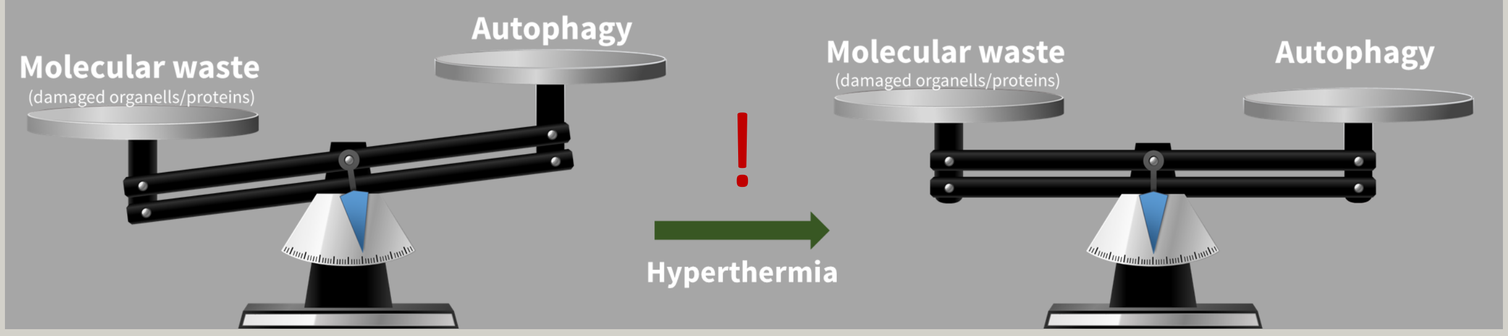




Human skin fibroblasts after wIRA treatment (1 h, 39 °C) and 0,5 µM CQ (Test 03)

4 Conclusion

Our data suggest that hyperthermia has a positive effect on autophagy in human skin fibroblasts and may be a potential way to interfere with skin aging. However, further experiments are needed to confirm these results.



Quellenangaben

1 Kim, H. et al. "Autophagy in Human Skin Fibroblasts: Impact of Age." International journal of molecular sciences vol. 19,8 2254. (2018), doi:10.3390/ijms19082254

2 López-Otín, C. et al. "The hallmarks of aging." Cell vol. 153,6 (2013): 1194-217. doi:10.1016/j.cell.2013.05.039

3 McCormick, J. J. et al. "Autophagy and heat: a potential role for heat therapy to improve autophagic function in health and disease." Journal of applied physiology vol. 130,1 (2021): 1-9. doi:10.1152/japplphysiol.00542.2020

4 Piazena, H. "Physical and Photobiological Basics of wIRA-Hyperthermia." Vaupel, P. (eds) (2022) Water-filtered Infrared A (wIRA) Irradiation. Springer, Cham. https://doi.org/10.1007/978-3-030-92880-3_3

Funding
Professor Manfred von Ardenne
Forschungsförderungsgesellschaft e.V

Cooperations partner
Von Ardenne Institute
of Applied Medical Research GmbH,
Germany

VON ARDENNE
APPLIED BIOMEDICAL TECHNOLOGIES
Science in Alliance with Nature

Albstadt-Sigmaringen University, Germany
Anton-Günther-Str. 51 | 72488 Sigmaringen
www.hs-albsig.de/forschung

Area
Faculty Life Science
Biomedical Sciences

Web
www.hs-albsig.de/ls
www.hs-albsig.de/bms

Contact
Barbara Hochecker
hochecker@hs-albsig.de