



**PUBLICATION
INTEGRITY WEEK**
2-6 OCTOBER 2023

Image Integrity screening in biomedical research publication

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Image Integrity screening in biomedical research publication

Section 1

Image integrity screening at journal level,
Key screening techniques

Section 2

Rise of paper mills
Emergence of AI-generated images

Section 3

Raw data



Section 1

Image integrity screening at journal level Key screening techniques

At least 4-6% of Biomedical Research papers have inappropriately duplicated images

(Bik et al, doi: 10.1128/MCB.00309-18, doi: 10.1128/mBio.00809-16)

Plus other problems

- inappropriate processing
- manipulations
- wrong images shown
- undetectable errors

Image problems are a ***potential indicator*** of illegitimate scientific conduct so conscientious journals check for this



Image duplication

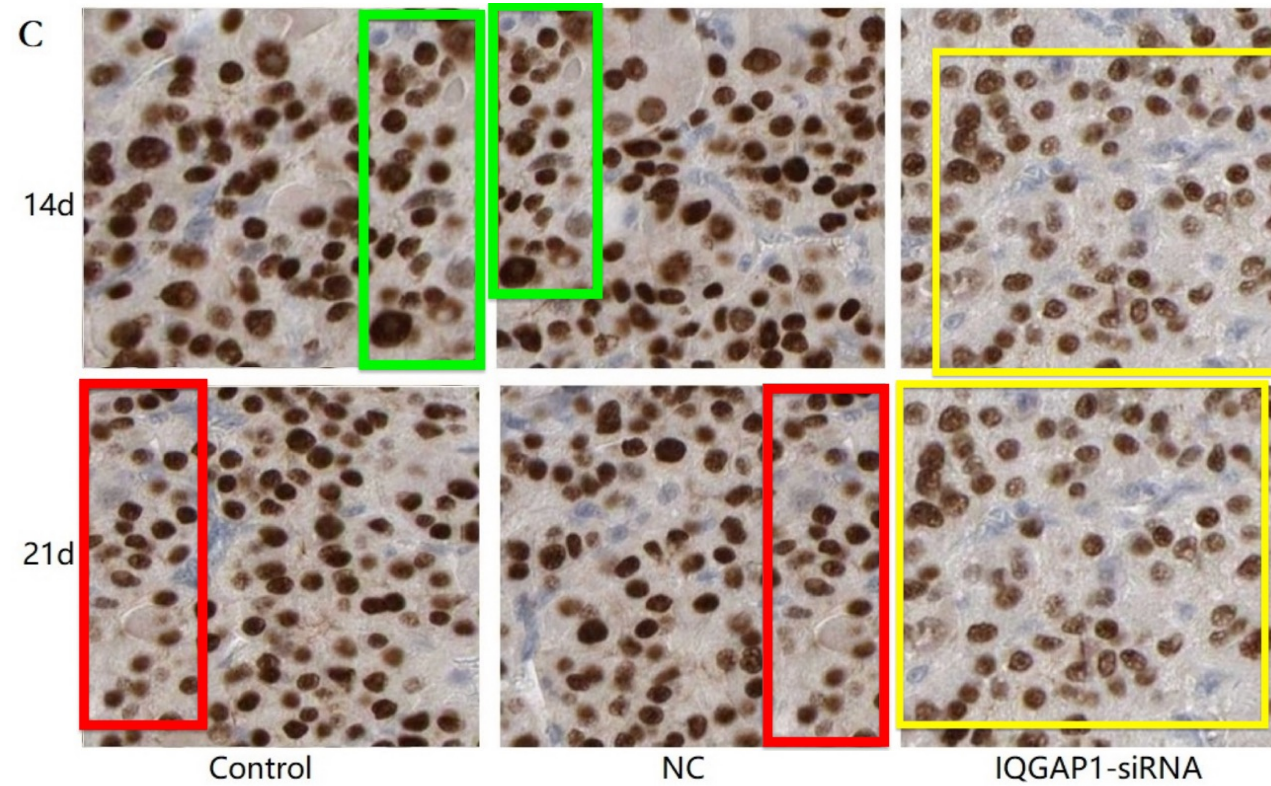


Image duplication

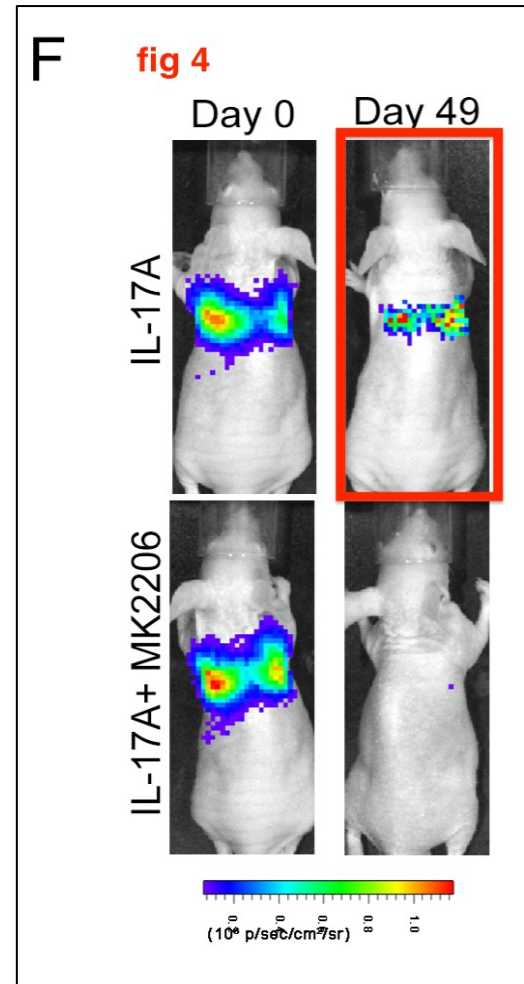
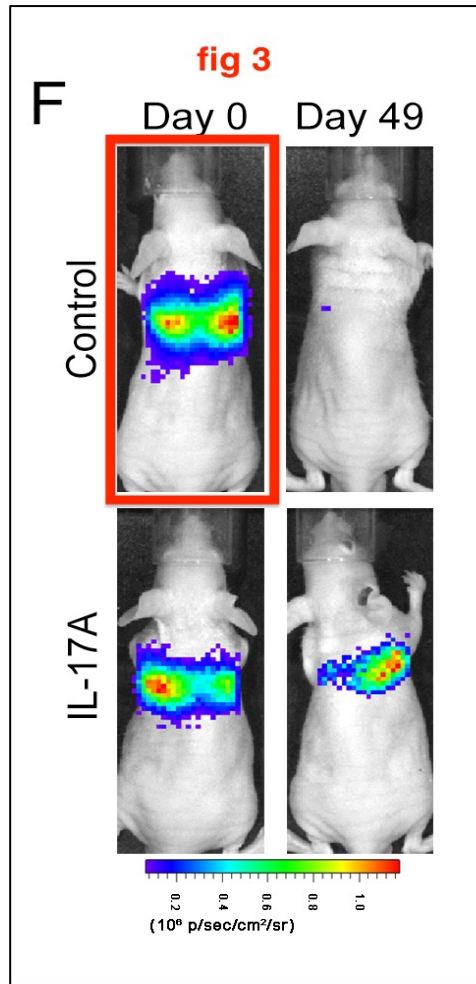
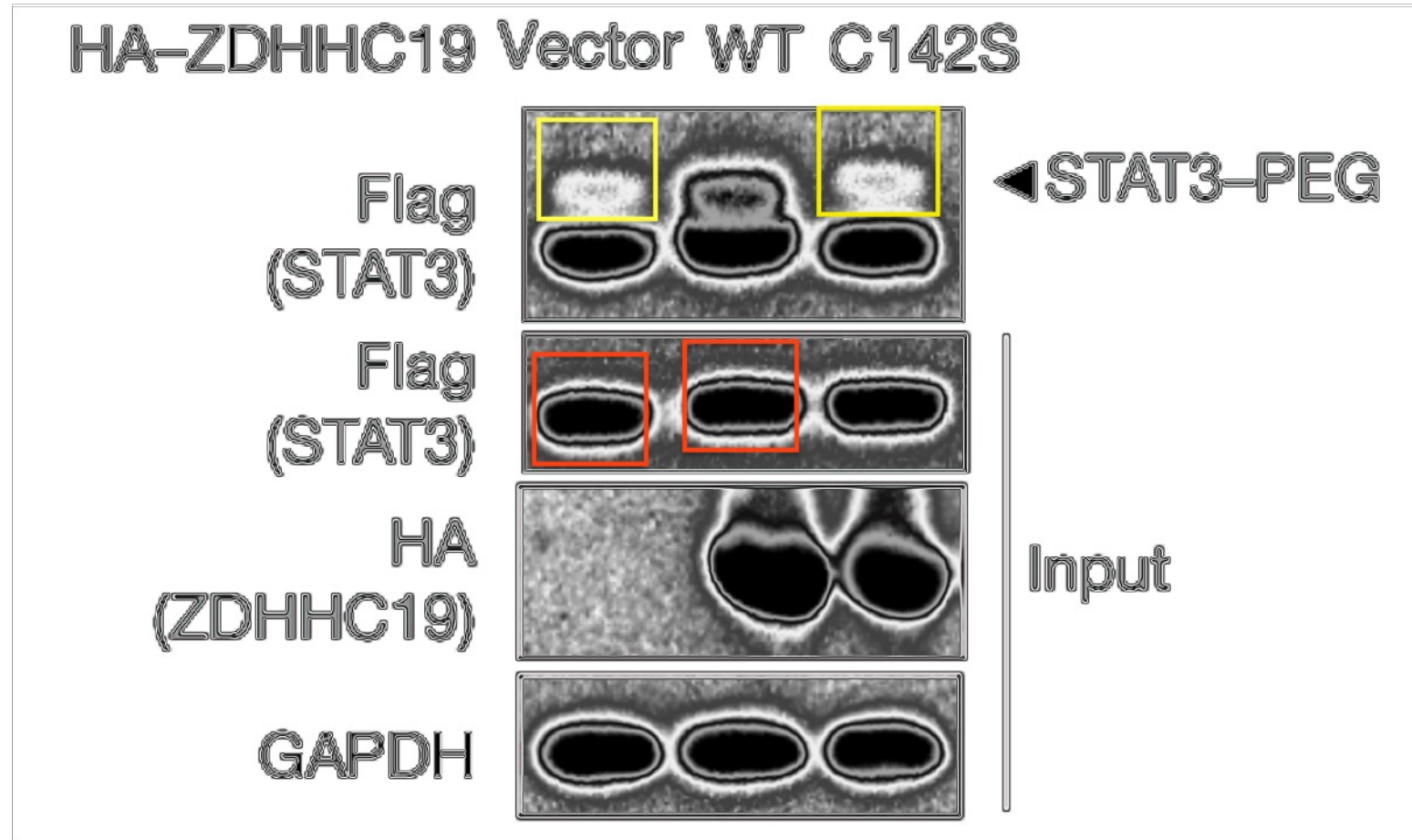
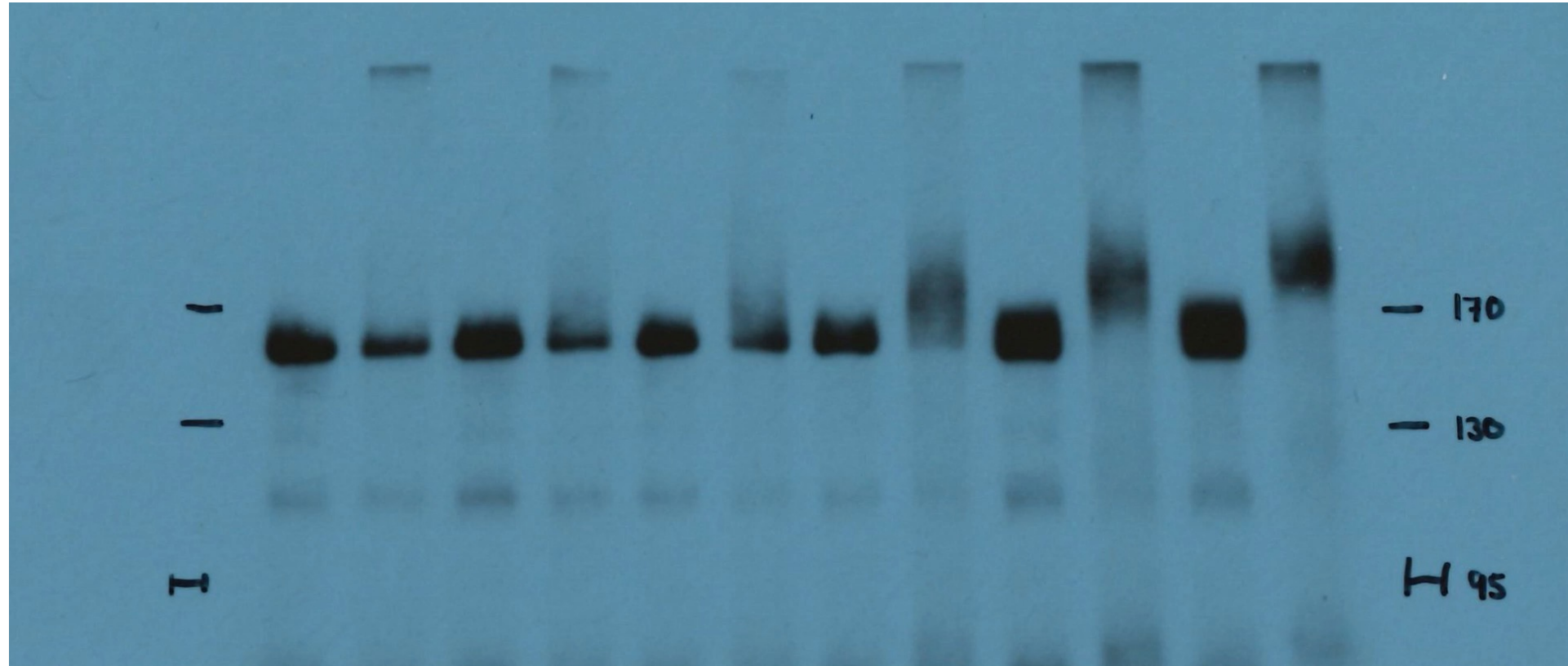


Image manipulation



<https://doi.org/10.1038/s41586-019-1511-x>
Nature volume 573, pages 139–143 (2019)

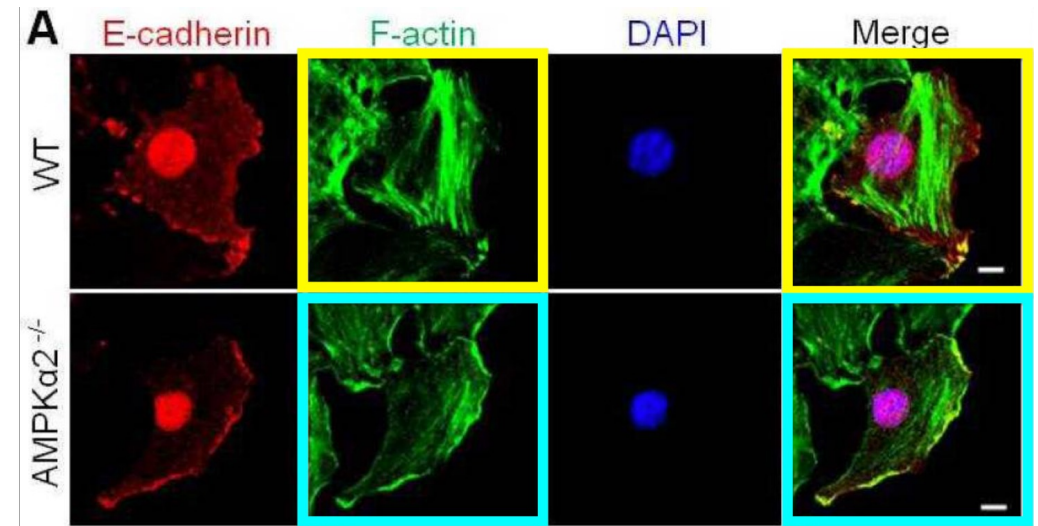
Cloning



Automated Screening tools

General points

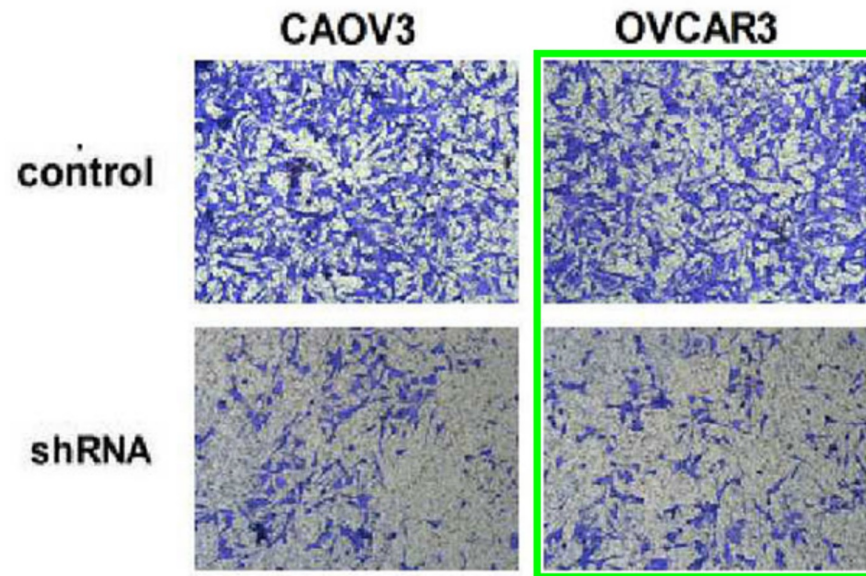
- Exclusively look for duplications
- False positives and false negatives
- Results require **verification** by an expert
human involvement indispensable
- **Financial** considerations



Song et al (2014)
doi: [10.1161/ATVBAHA.113.301869](https://doi.org/10.1161/ATVBAHA.113.301869)
retracted

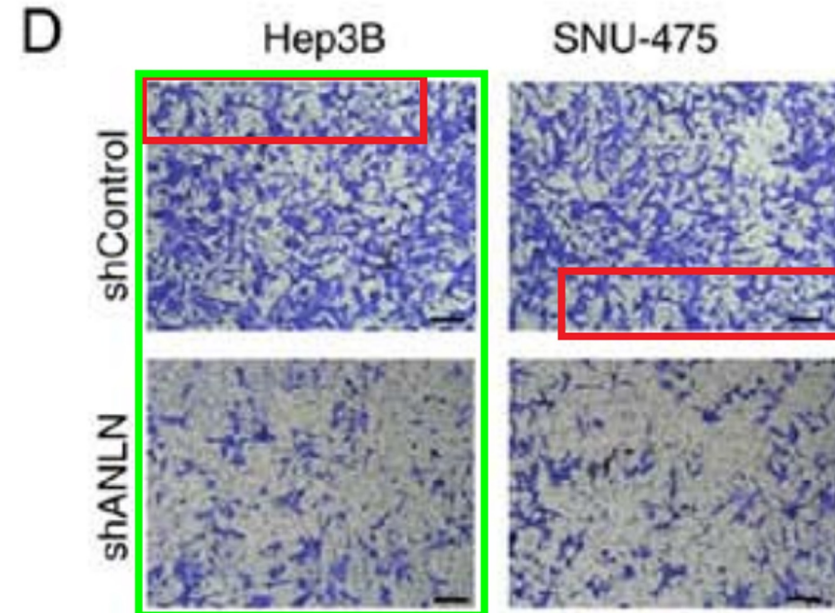
Duplication detection - ImageTwin

CYPA promotes the progression and metastasis of serous ovarian cancer (SOC) in vitro and in vivo (Zhi-Ying Qi 2019) Fig 3B.



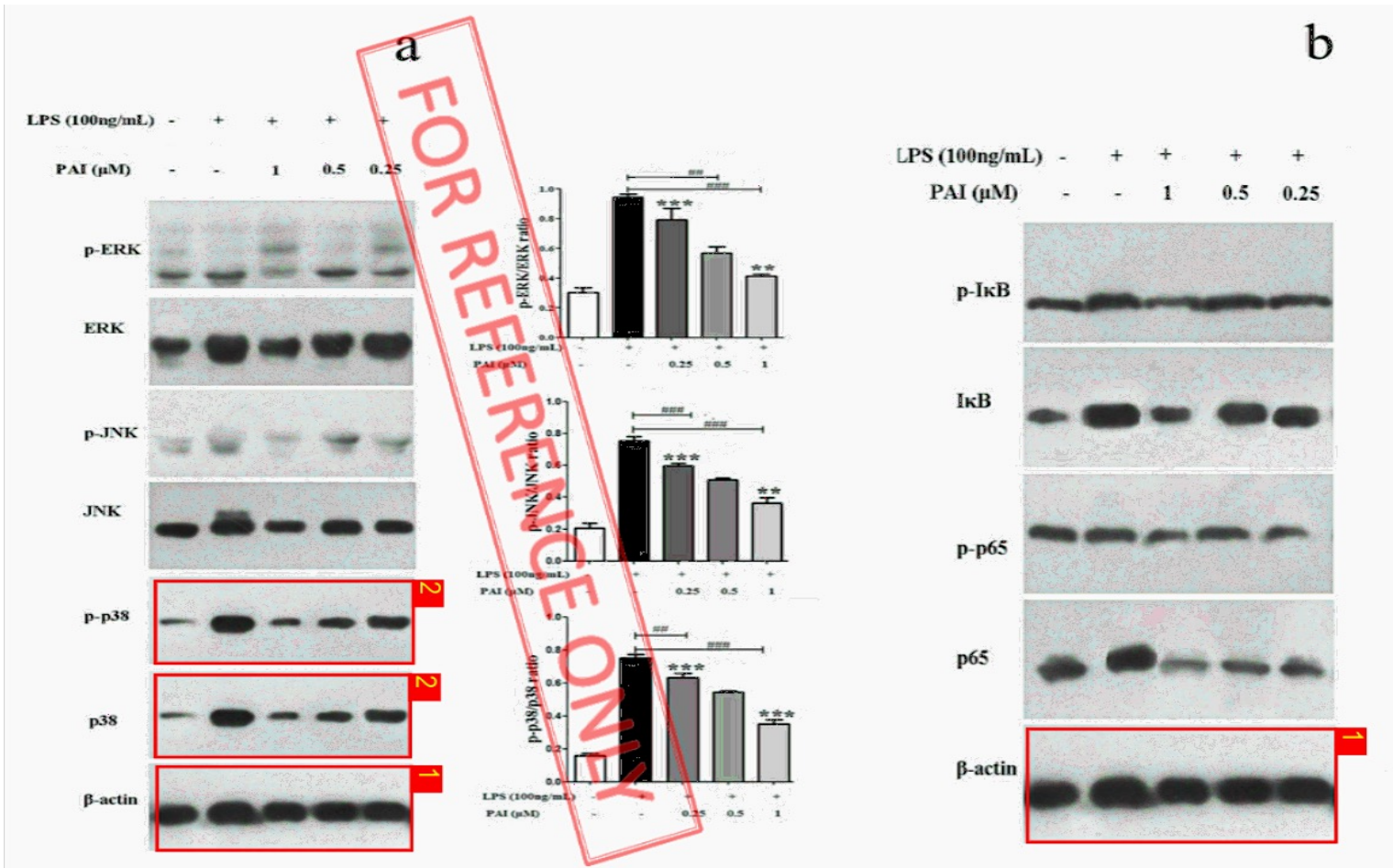
J Ovarian Res . 2019 doi: 10.1186/s13048-019-0593-2.
Retracted 25 August 2023.

Actin-binding protein anillin promotes the progression of hepatocellular carcinoma in vitro and in mice (Jia et al 2021) Fig 4D



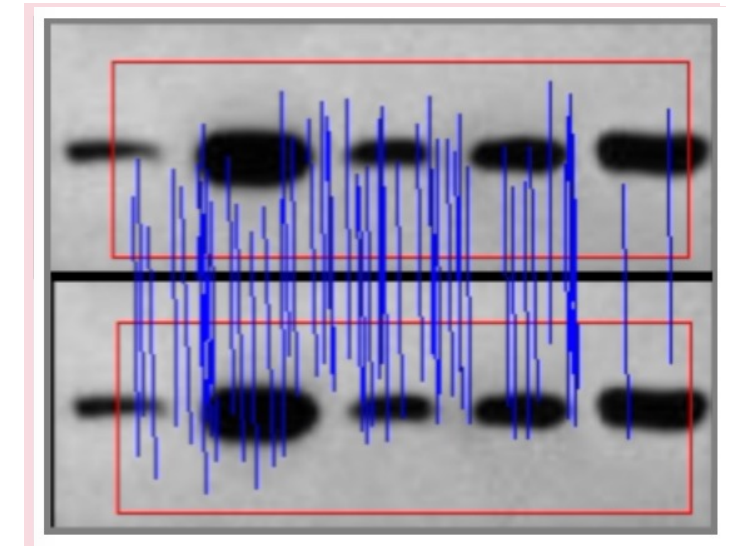
Exp Ther Med. 2021 doi: 10.3892/etm.2023.12120
Retracted 17 July 2023.

Duplications - Proofing

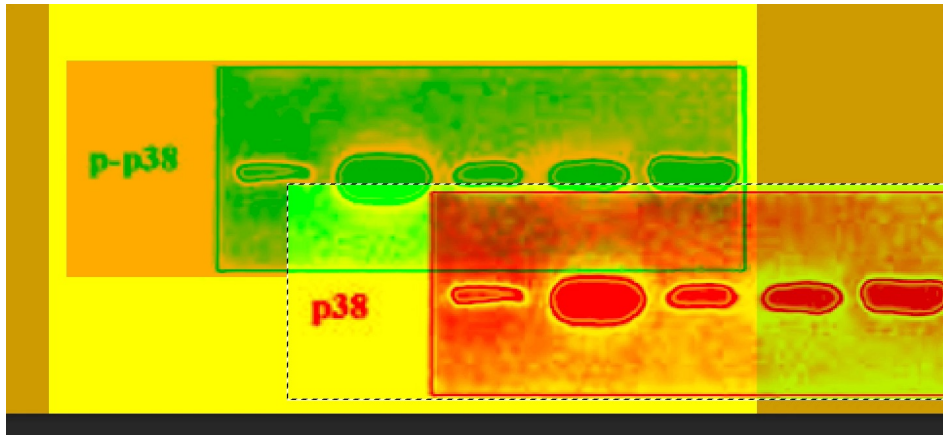


BMC Complement Med Ther. 2020 ;20(1):347.
doi: 10.1186/s12906-020-03090-4.

Retracted 5 May 2023.



Forensics - Photoshop



BMC Complement Med Ther. 2020 ;20(1):347.
doi: 10.1186/s12906-020-03090-4.
Retracted 5 May 2023.

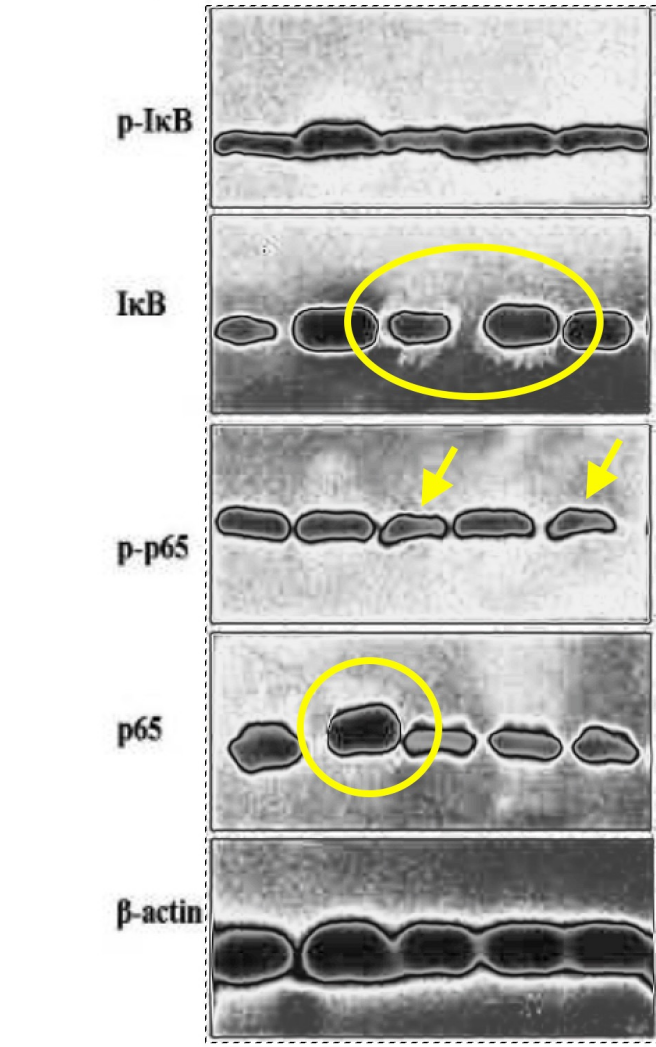
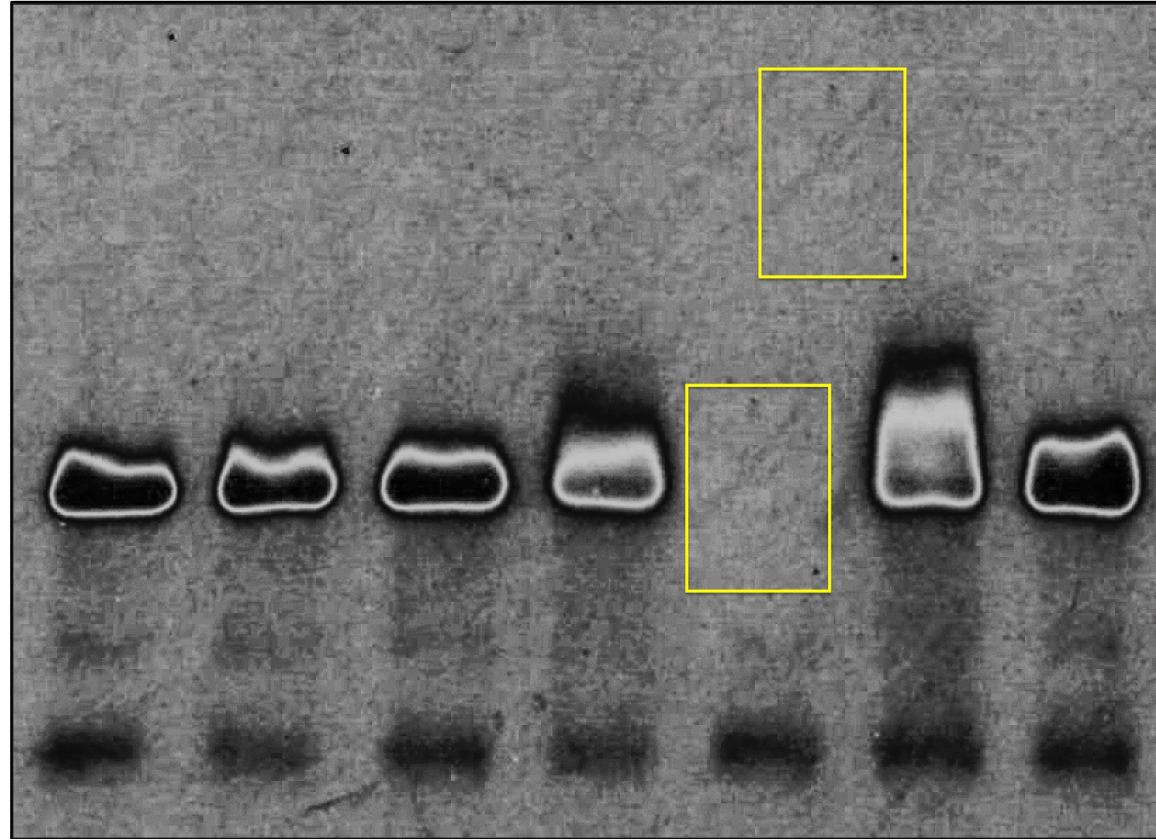
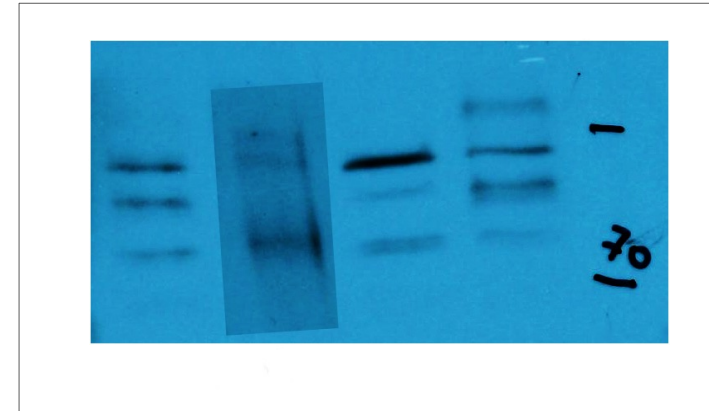
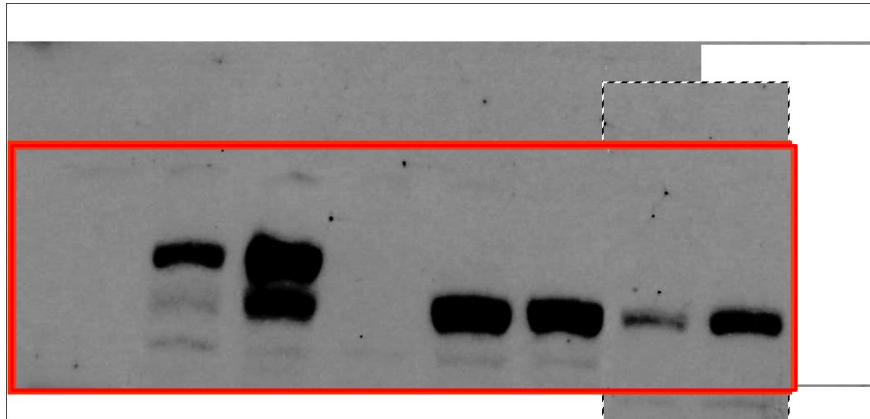


Image manipulation in Photoshop – Solarizing images



Beautification and processing mistakes Inaccurate reporting of experimental data

- Splicing Western blots
- Over-contrasting



Beautification and processing mistakes

Inaccurate reporting of experimental data

- Consistency of processing
- Cleaning up background with the eraser tool
- Moving elements to optimize an image within a frame

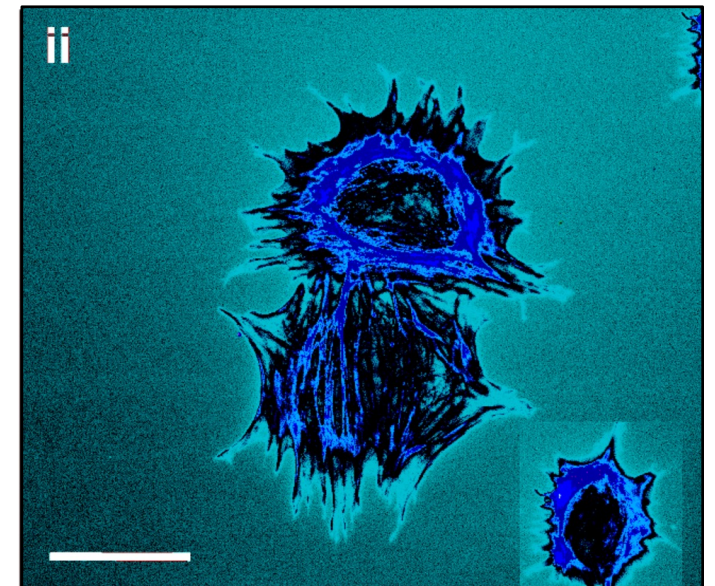
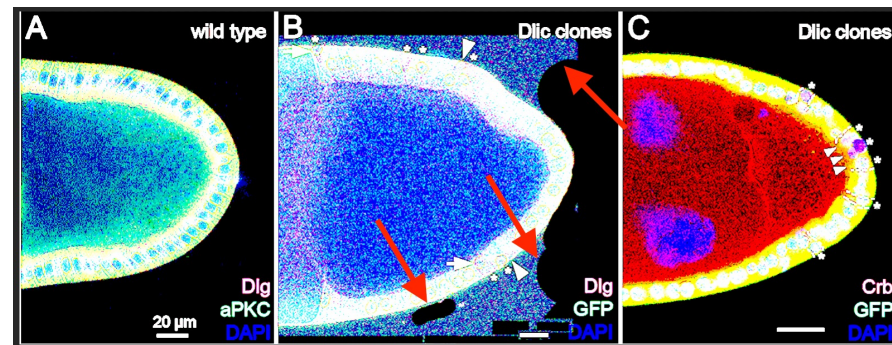
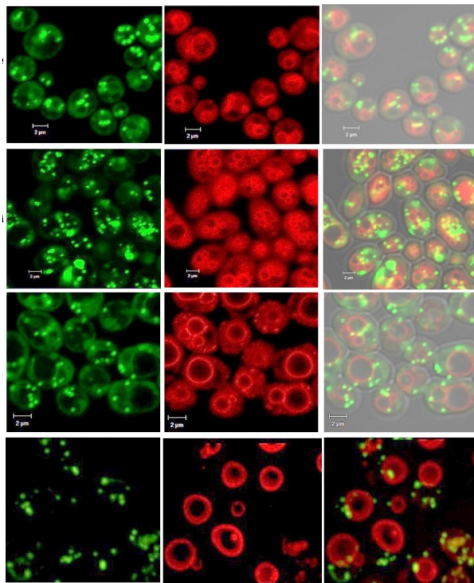


Image screening in Photoshop – STM Video Series <https://www.stm-assoc.org/standards-technology/working-group-on-image-alterations-and-duplications/>

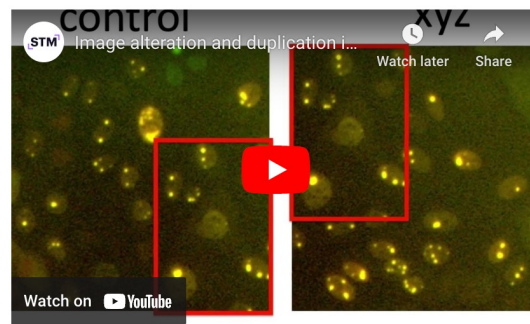


Welcome to the Resource Center for the [STM Image Alterations & Duplications Working Group](#).
This is an evolving hub of videos, tools and guidelines for publishers working to detect automatic image alteration and/or duplications.

Instructional Videos

Image Integrity in Scientific Publication | Video Series

A series of instructional video modules intended to serve as a tool for scholarly journal editors screening for manipulated images in submitted manuscripts.



MODULE 1. This first module provides an overview of the most commonly found image aberrations in scientific publications and



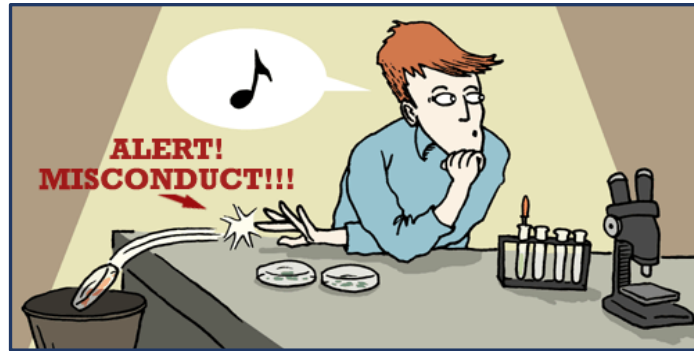
MODULE 2. The second module offers an overview of commonly found **image aberrations in blot images** — and provides techniques

Section 2

Rise of **paper mills**

Emergence of **AI-generated images**

Individual misconduct



http://undsci.berkeley.edu/images/us101/misconduct_cartoon.gif

- Individual researcher/author falsifying results
- Many possible motives
- QRPs
- Negligence

Paper mills



<https://science.sciencemag.org/content/342/6162/1035>

- Companies that produce and sell scientific papers at demand
- Data included in these papers are often falsified or fabricated.

Paper mills

COPE describes paper mills as “**profit oriented, unofficial and potentially illegal organizations that produce and sell fraudulent manuscripts that seem to resemble genuine research.**”

Paper mills circumvent journal security by doing two things: ***manipulating identities*** of the participants in the publishing process, and ***fabricating content*** that gets published.

Journal security is thus critical for trustworthy research communication. Without it, paper mills and other schemes will continue to fill journals with fabricated content, and damage society’s trust in peer review and journal publications.

As technology, like generative AI, becomes more widely adopted, the scale of the problem will only increase

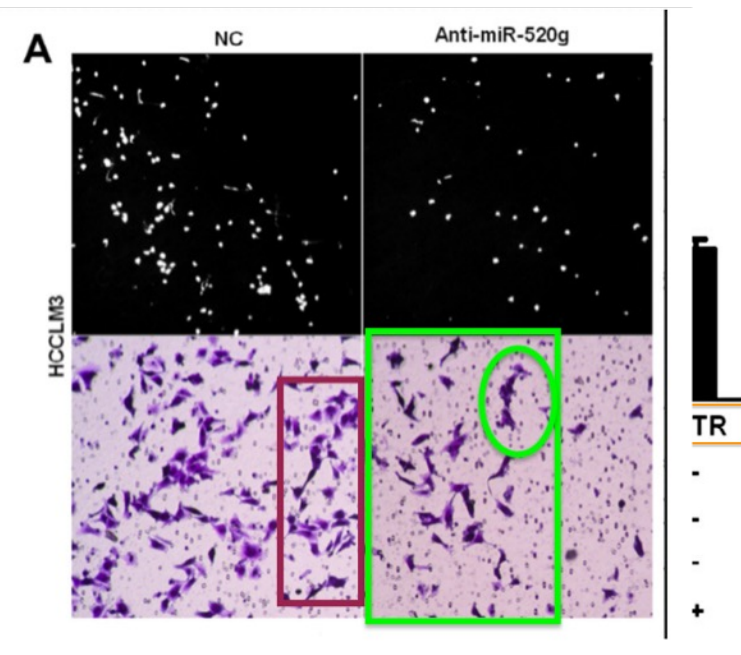
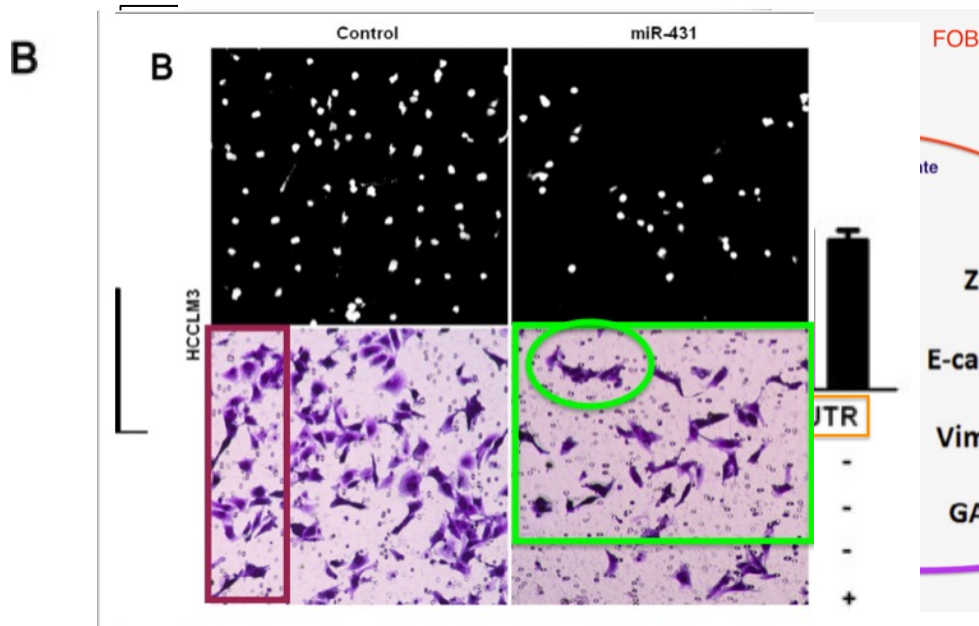
<https://scholarlykitchen.sspnet.org/2023/04/04/guest-post-addressing-paper-mills-and-a-way-forward-for-journal-security/>

Stock images



MicroRNA-431 inhibits migration and invasion of hepatocellular carcinoma cells by targeting the ZEB1-mediated epithelial–mesenchymal transition
 Sun et al (2015) **retracted**

MicroRNA-520g induces epithelial–mesenchymal transition and promotes metastasis of hepatocellular carcinoma by targeting SMAD7
 Kan et al (2014) **retracted**



MicroRNA-454 functions as an oncogene by regulating PTEN in uveal melanoma

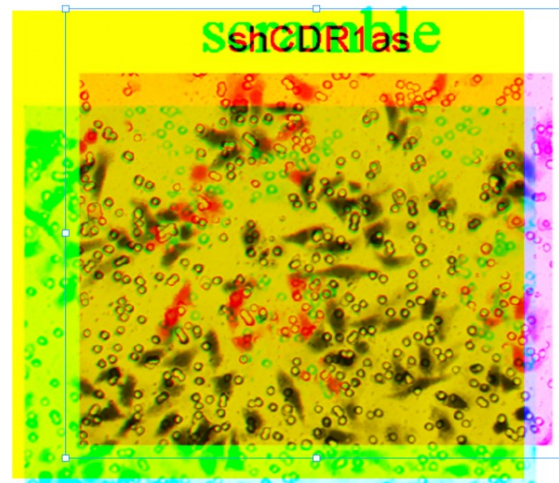
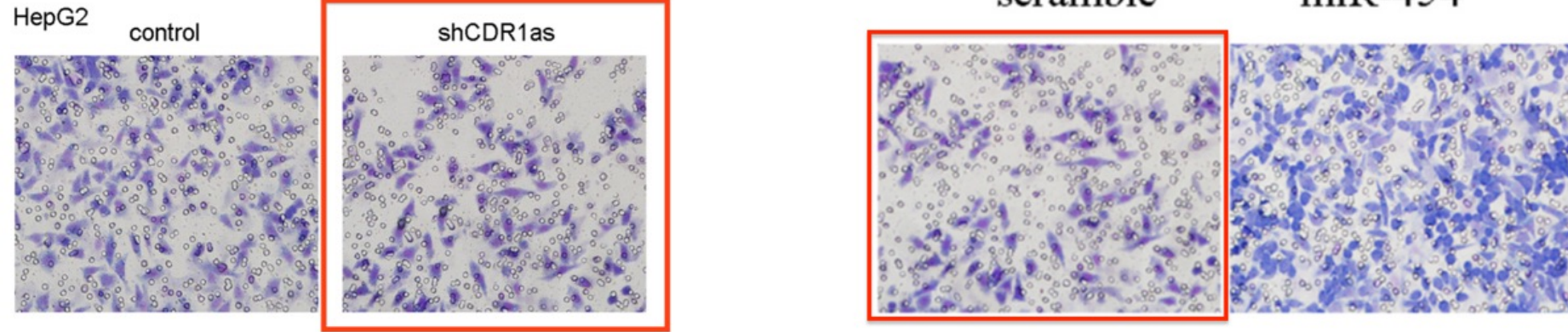
Sun et al. FEBS Letters (2015)

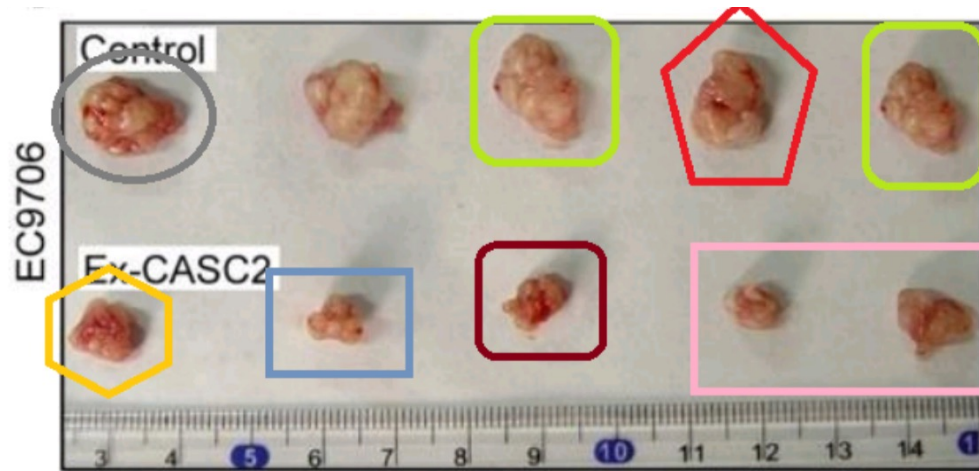
retracted

"The Circular RNA Cdr1as Act as an Oncogene in Hepatocellular Carcinoma through Targeting miR-7 Expression"

Yu et al, PLoS ONE (2016)

retracted





Myricetin exerts anti-proliferative, anti-invasive, and pro-apoptotic effects on esophageal carcinoma EC9706 and KYSE30 cells via RSK2

Tumour Biol, 2014
DOI: [10.1007/s13277-014-2579-4](https://doi.org/10.1007/s13277-014-2579-4)

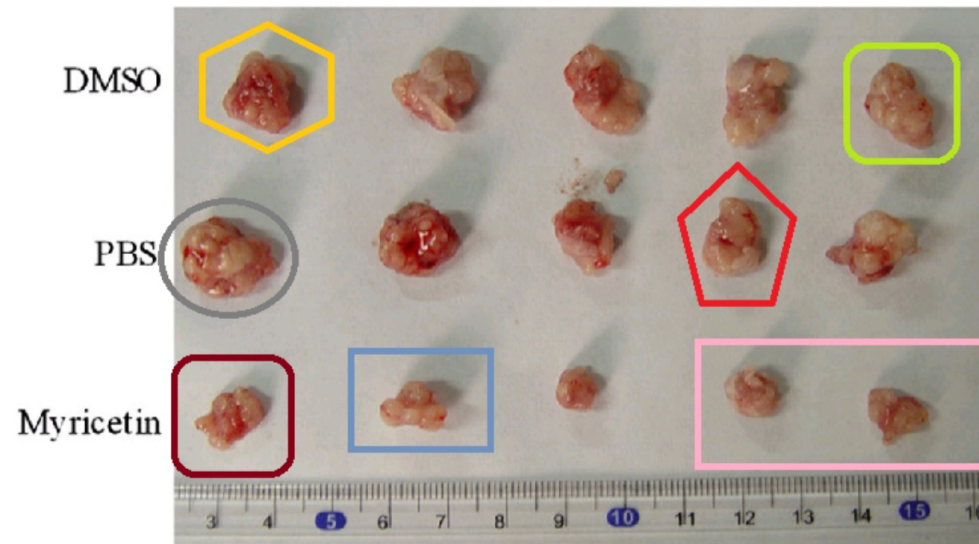
Retracted in 2019

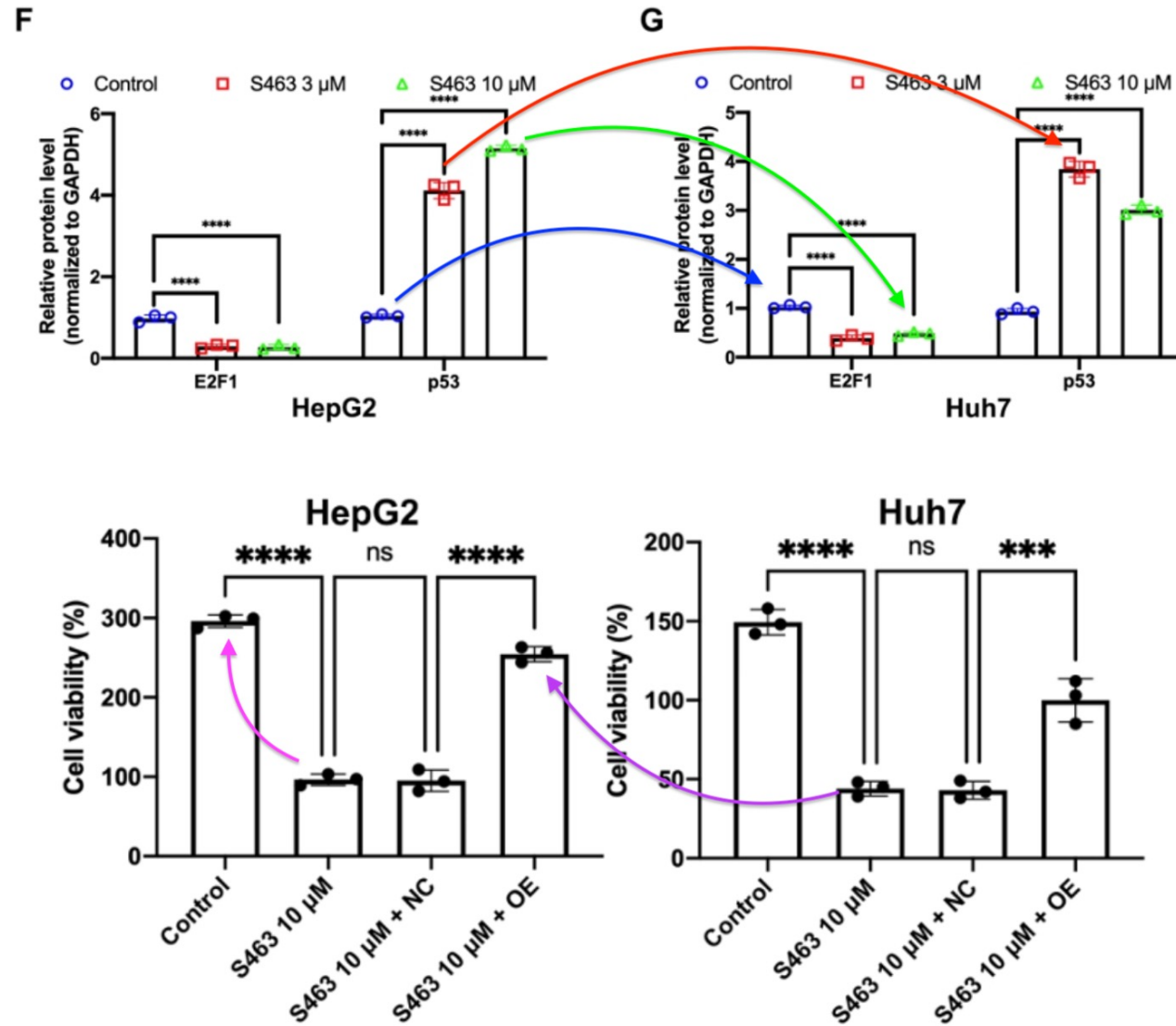
The long noncoding RNA CASC2 inhibits tumorigenesis through modulating the expression of PTEN by targeting miR-18a-5p in esophageal carcinoma

Experimental Cell Research (2017)
doi: [10.1016/j.yexcr.2017.09.037](https://doi.org/10.1016/j.yexcr.2017.09.037)

Retracted in 2018

Credit: *Hoya camphorifolia*





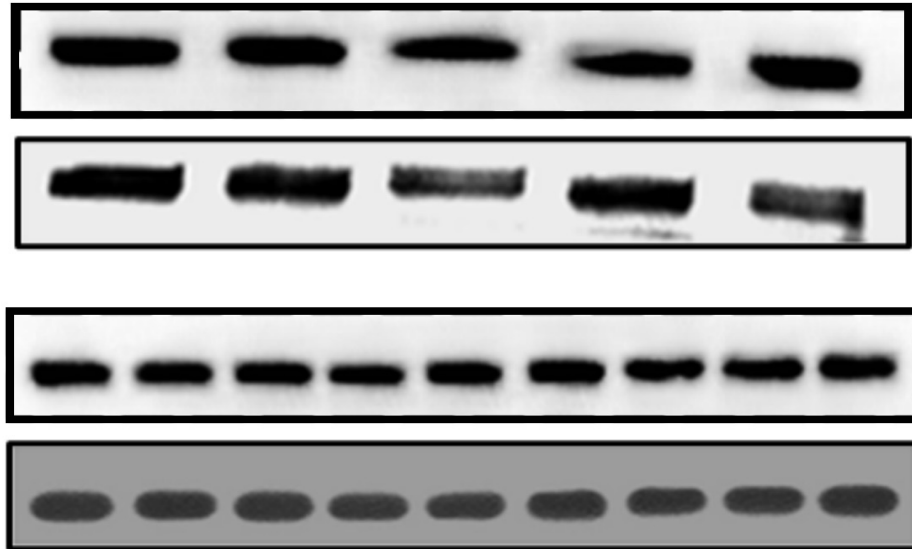
Deep fakes

Use of AI technology (GANs) to generate fake images which are next to impossible to detect by eye alone

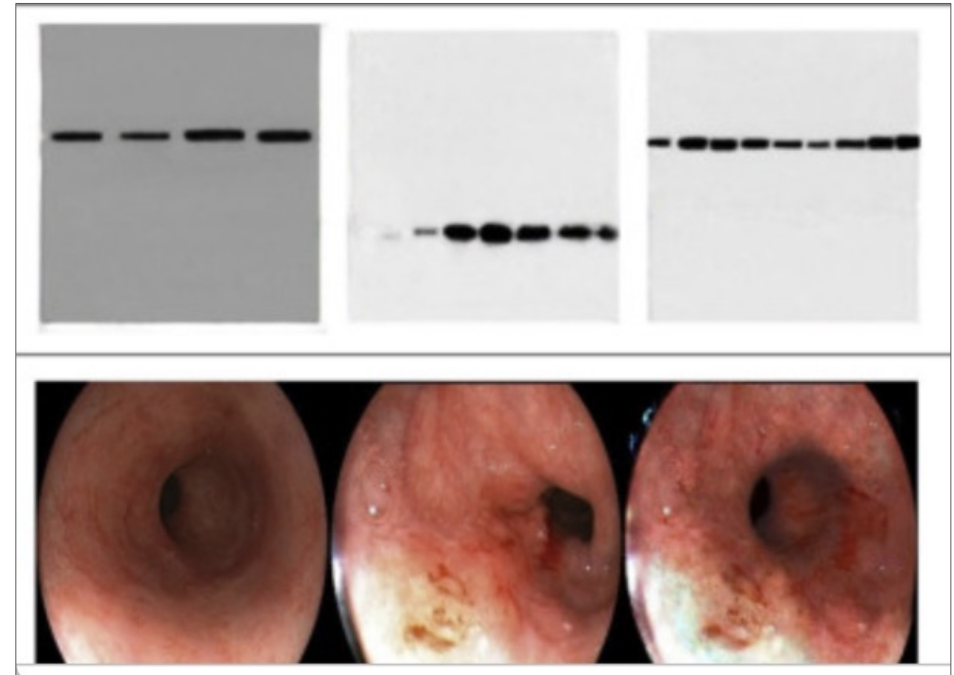


<https://this-person-does-not-exist.com/en>

Deep fakes

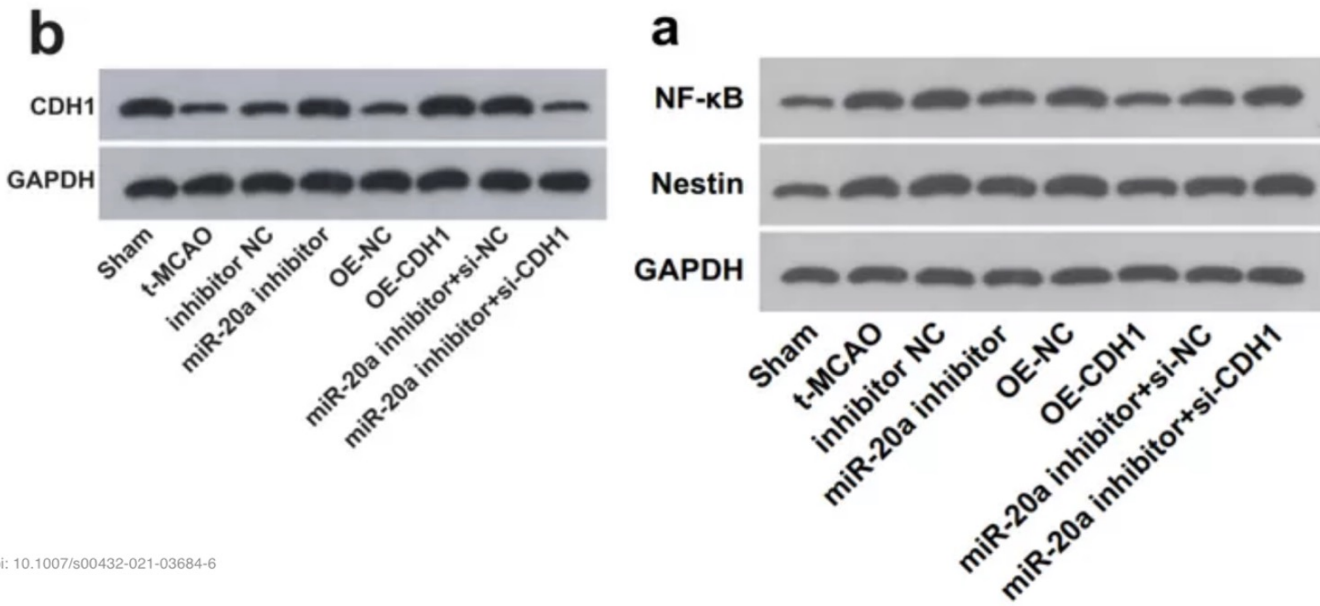


<https://www.advancedsciencenews.com/image-fraud-gets-a-boost-from-ai/>
<https://www.biorxiv.org/content/10.1101/2020.11.24.395319v2.full>
Forensic Analysis of Synthetically Generated Western Blot Images



Deepfakes: A new threat to image fabrication in scientific publications?
Liansheng Wang et al, 2022, doi.org/10.1016/j.patter.2022.100509

Same-style images across multiple manuscripts



doi: 10.1007/s00432-021-03684-6

Credit: Smut Clyde (*Hoya camphorifolia*)



Section 3

Raw data

Many journals now request raw data for blots and micrographs at submission stage.

Need to specify clearly what will be accepted

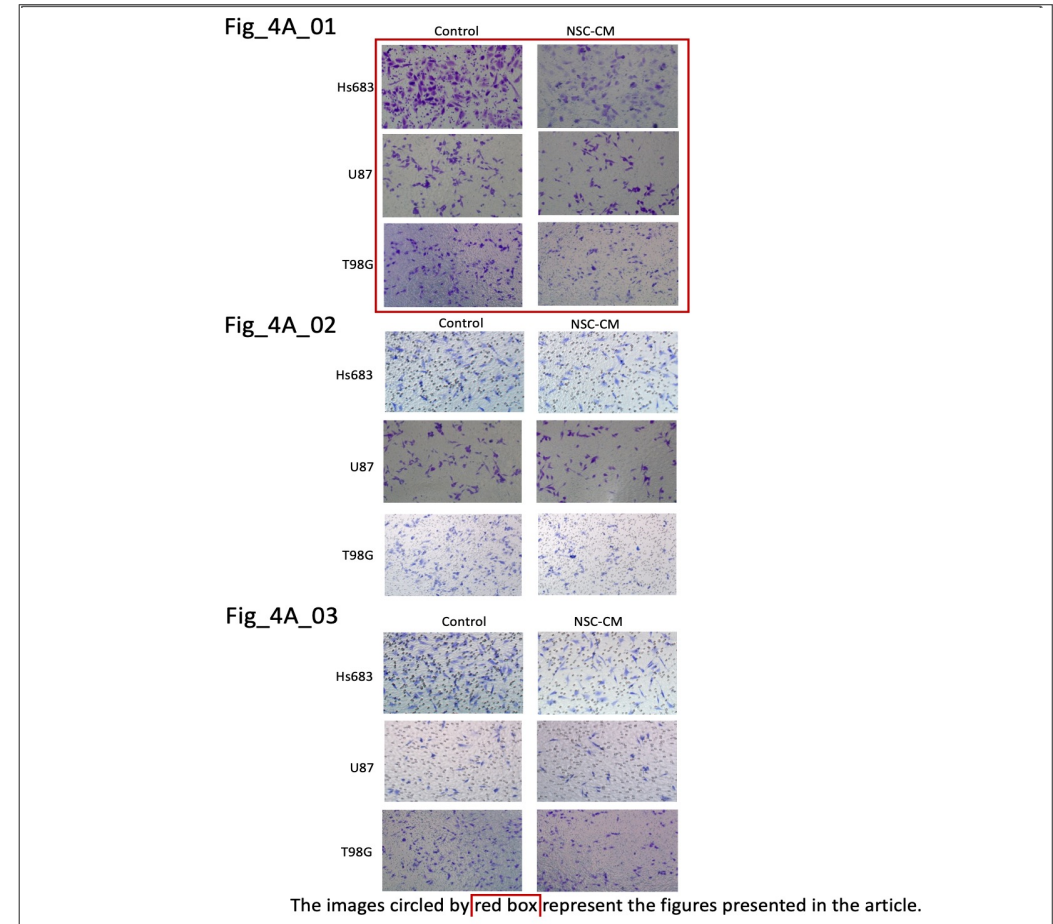
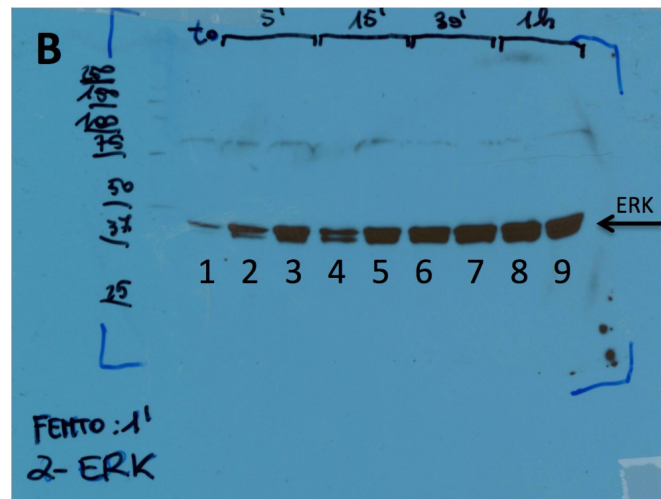
Blots, and gels: Uncropped, unprocessed images incl. weight markers and sample loading. Repeats.

Microscopy:

Uncropped originals

High res

Dated correctly



**Alternative/replacement images
are not a substitute for missing raw data**

| C | O | P | E |

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THANK YOU

publicationethics.org