

Misconduct in Biomedical Research: Inappropriate Image Duplications

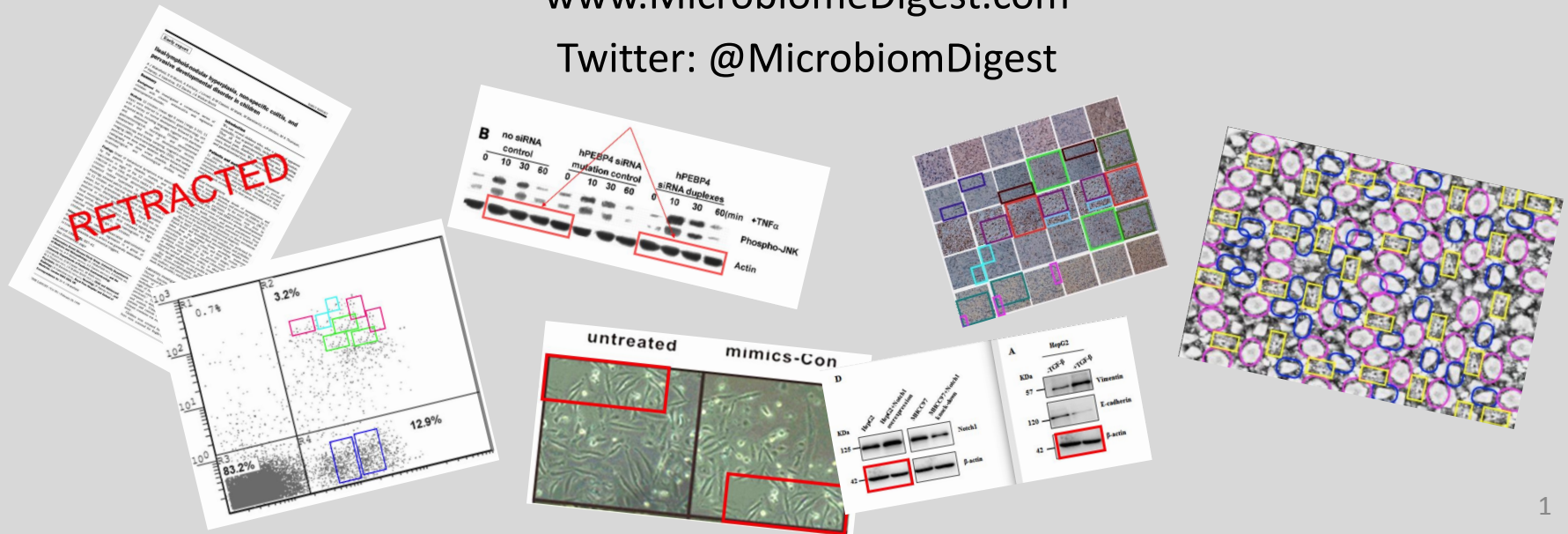
UKRIO Annual Conference, May 26 2022

Elisabeth Bik

www.ScienceIntegrityDigest.com

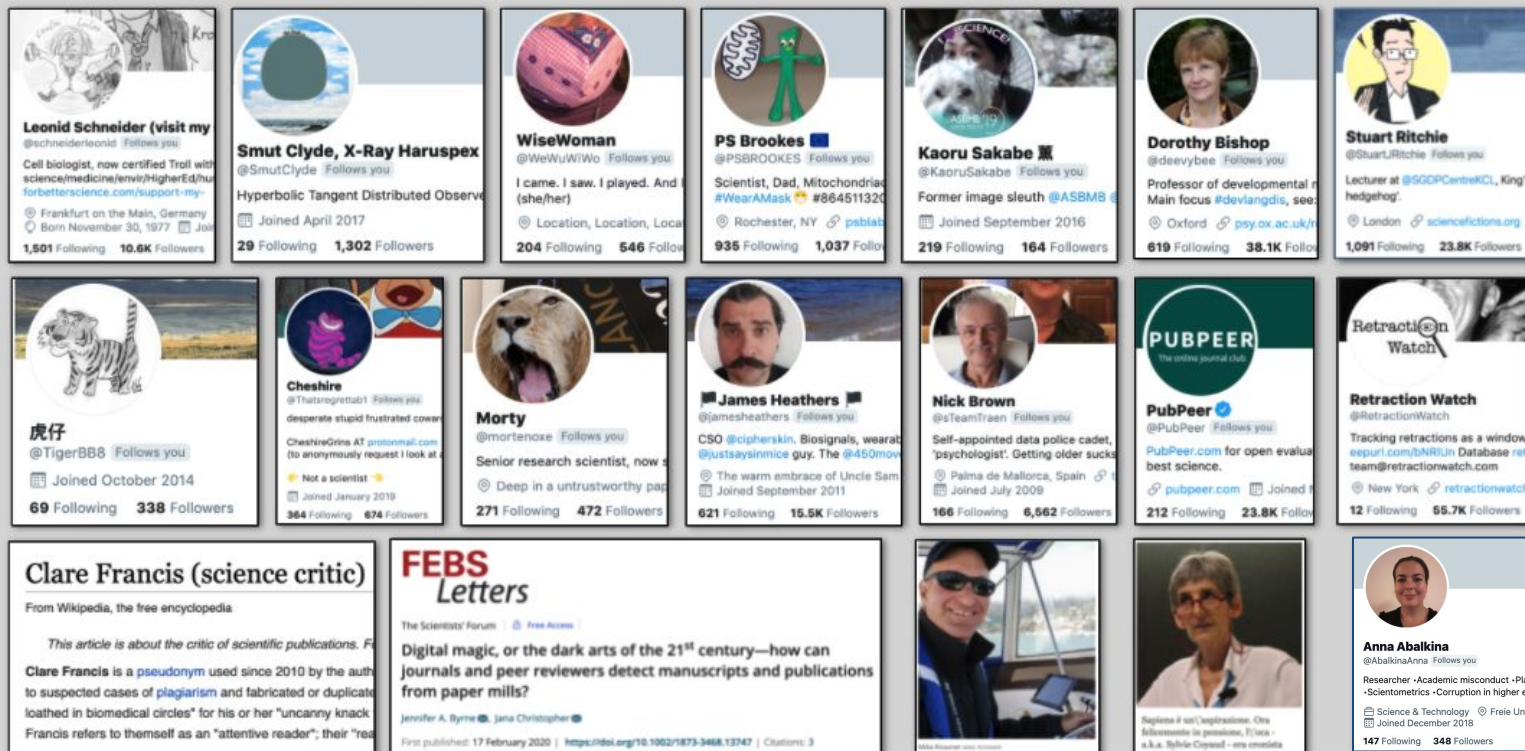
www.MicrobiomeDigest.com

Twitter: @MicrobiomDigest



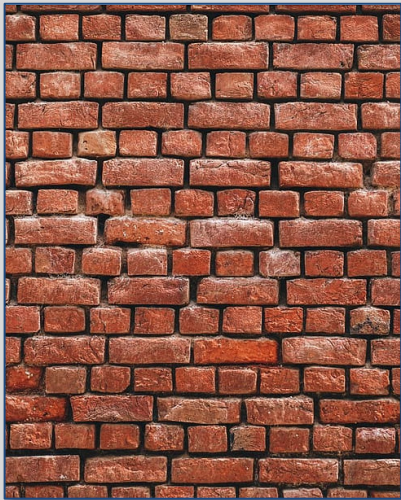
Disclosures and Acknowledgements

- Consulting and speaker's honoraria - *Universities, scientific publishers*
- uBiome (2016-2018)- *four patents, founders charged with insurance fraud*
- Patreon account - <https://www.patreon.com/elisabethbik>

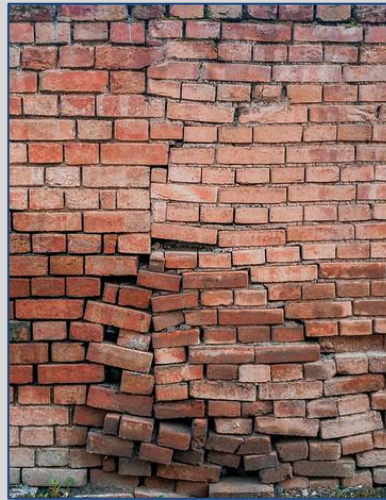


Publications are the foundation of science

- Science is about finding the truth
- Science builds upon science: Publications as building blocks
- Scientists build upon each other's work
- Built on trust: Most scientists are honest
- Science is not immune to fraud
- Science misconduct: Plagiarism, Falsification, Fabrication



www.piqsels.com



Ivan Radic, www.Flickr.com

Why do people cheat in science?

Pressure to publish

Publications as measure of productivity

Easier to publish positive results than negative results

Taste of success

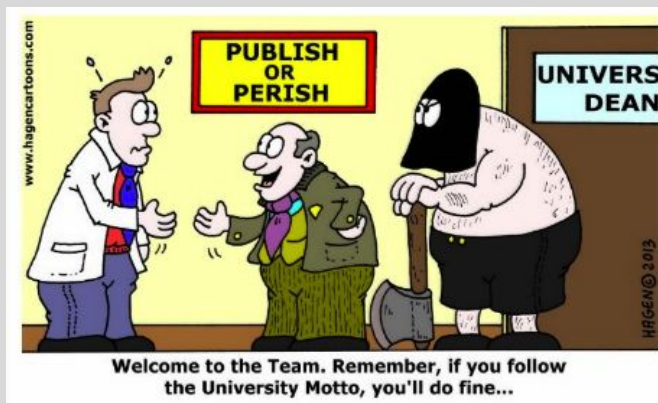
Successful postdoc, Nature or Science publication

Disappointing results after becoming professor

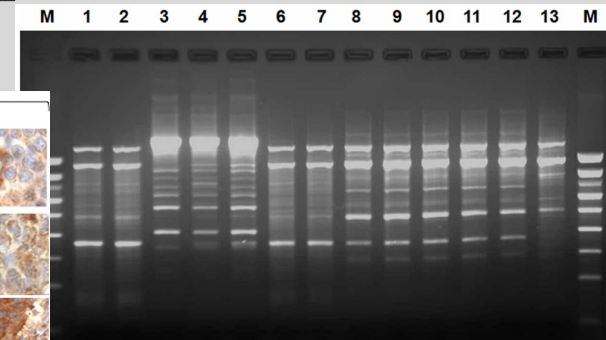
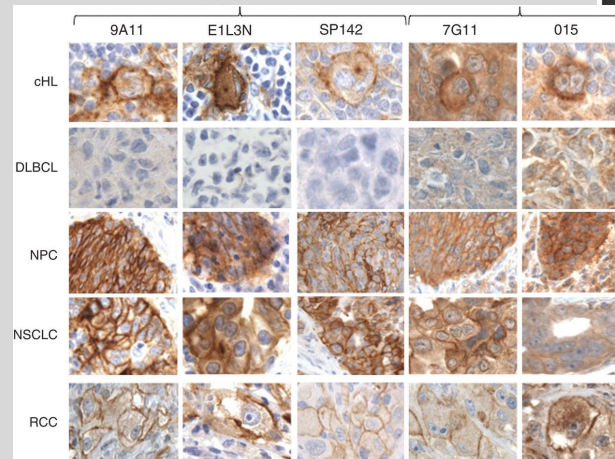
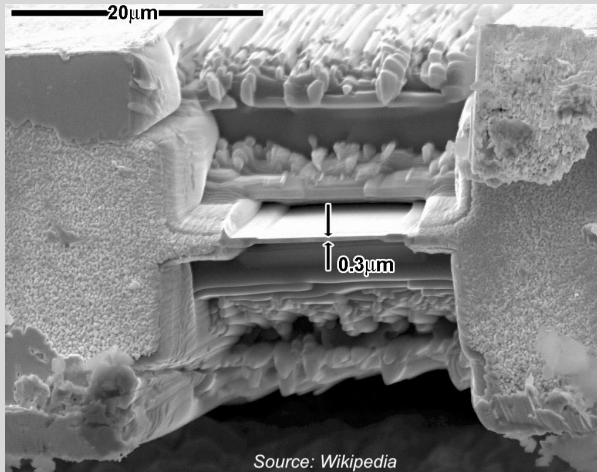
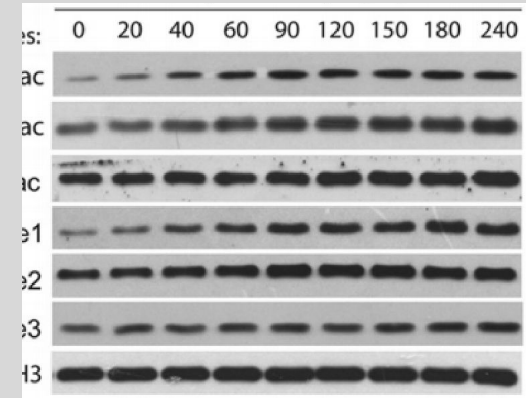
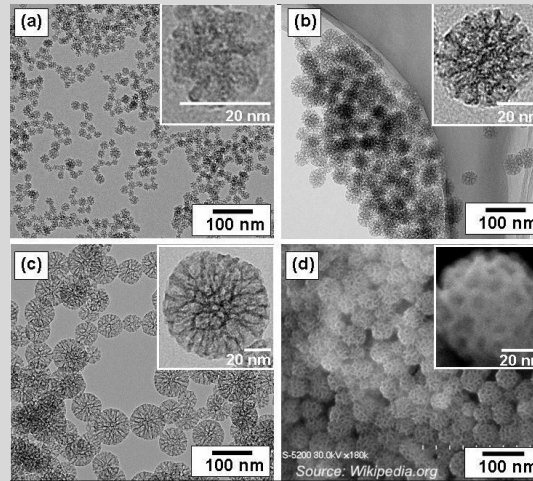
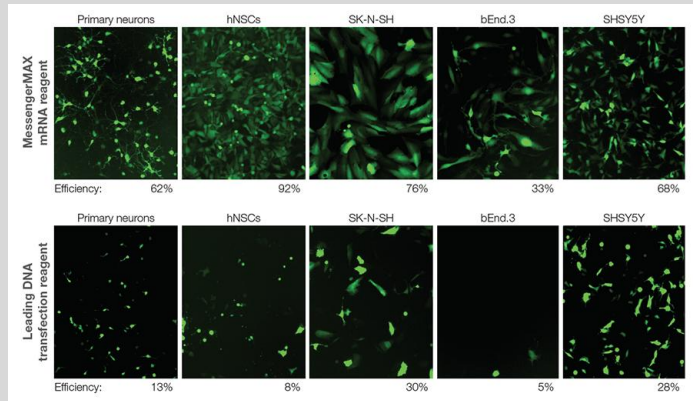
Power play

Professor in power demanding experiments to succeed

Threatens to fire graduate student / postdoc

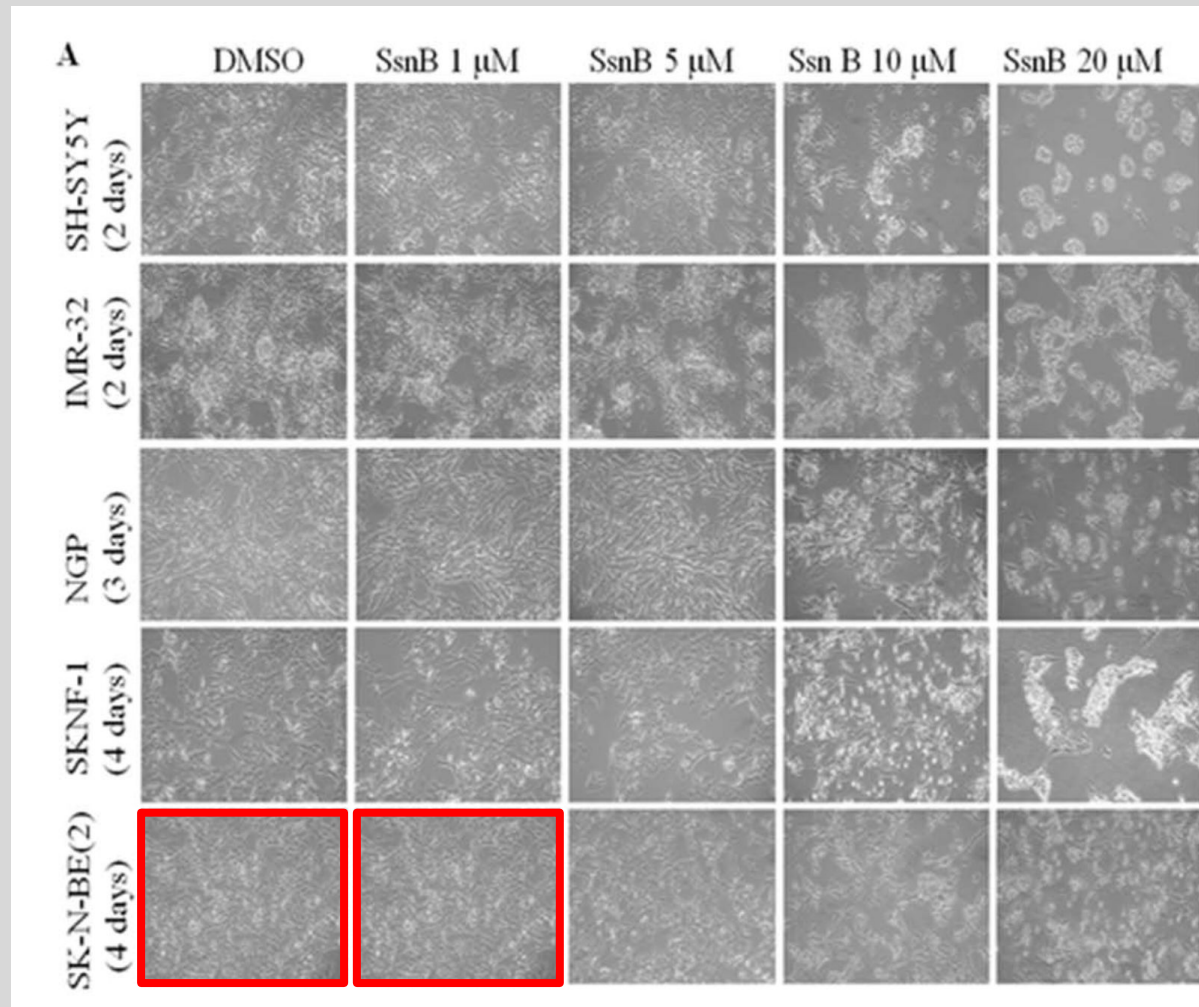


Research images are unique



None of these images are fraudulent!

Type I: Simple Duplication

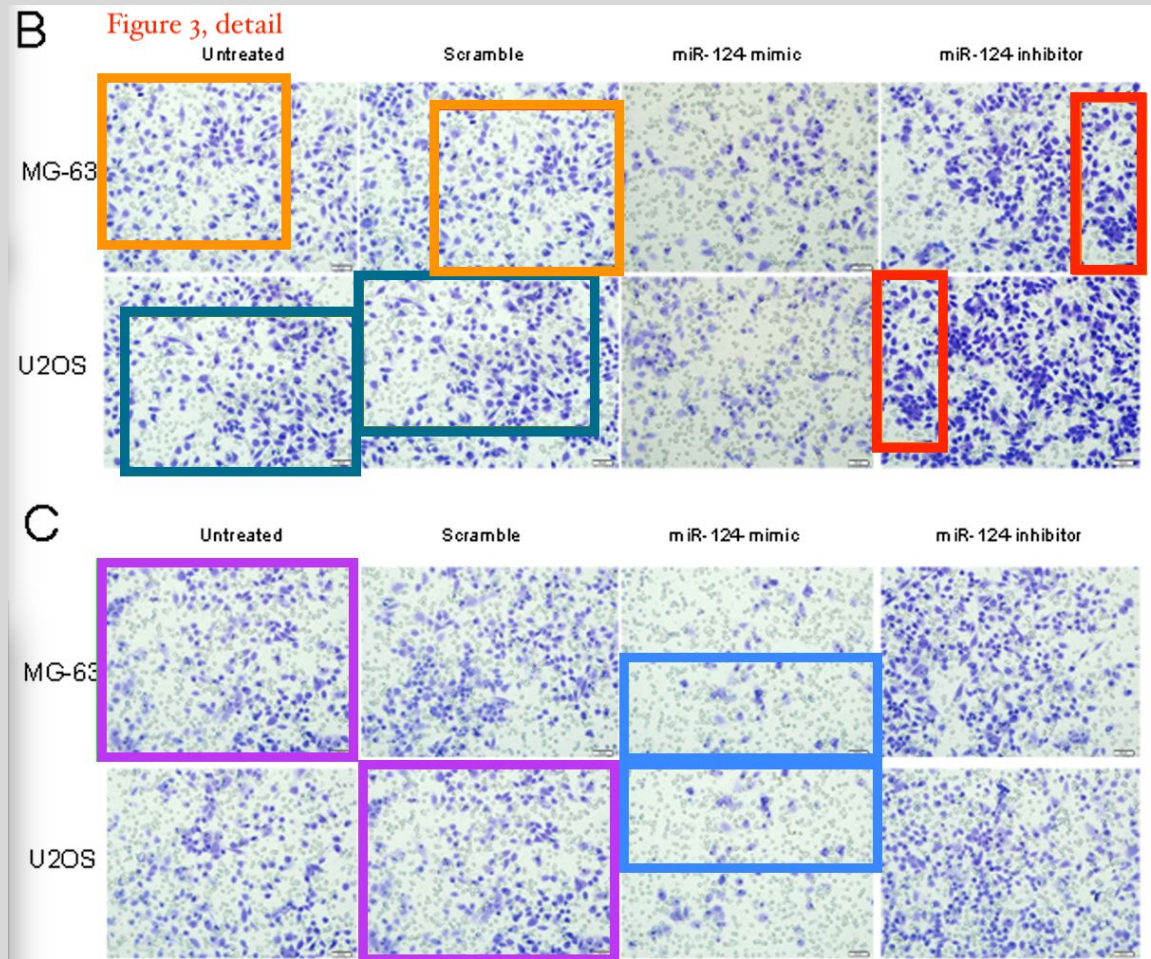


University of South Carolina, USA

PLOS ONE, May 2014, DOI: 10.1371/journal.pone.0096343

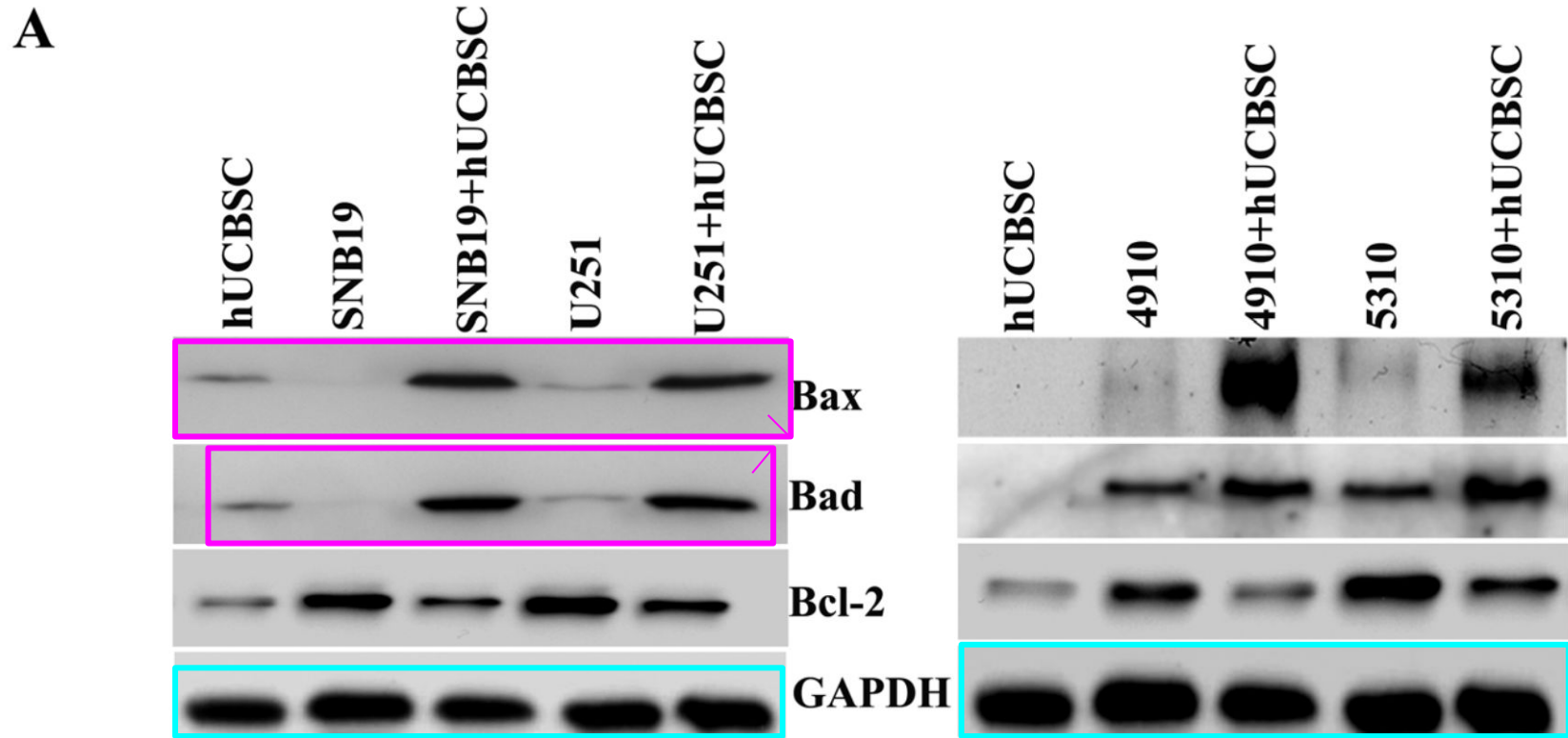
Reported to journal: October 2015. Correction: July 2016.

Type II: Duplication with repositioning



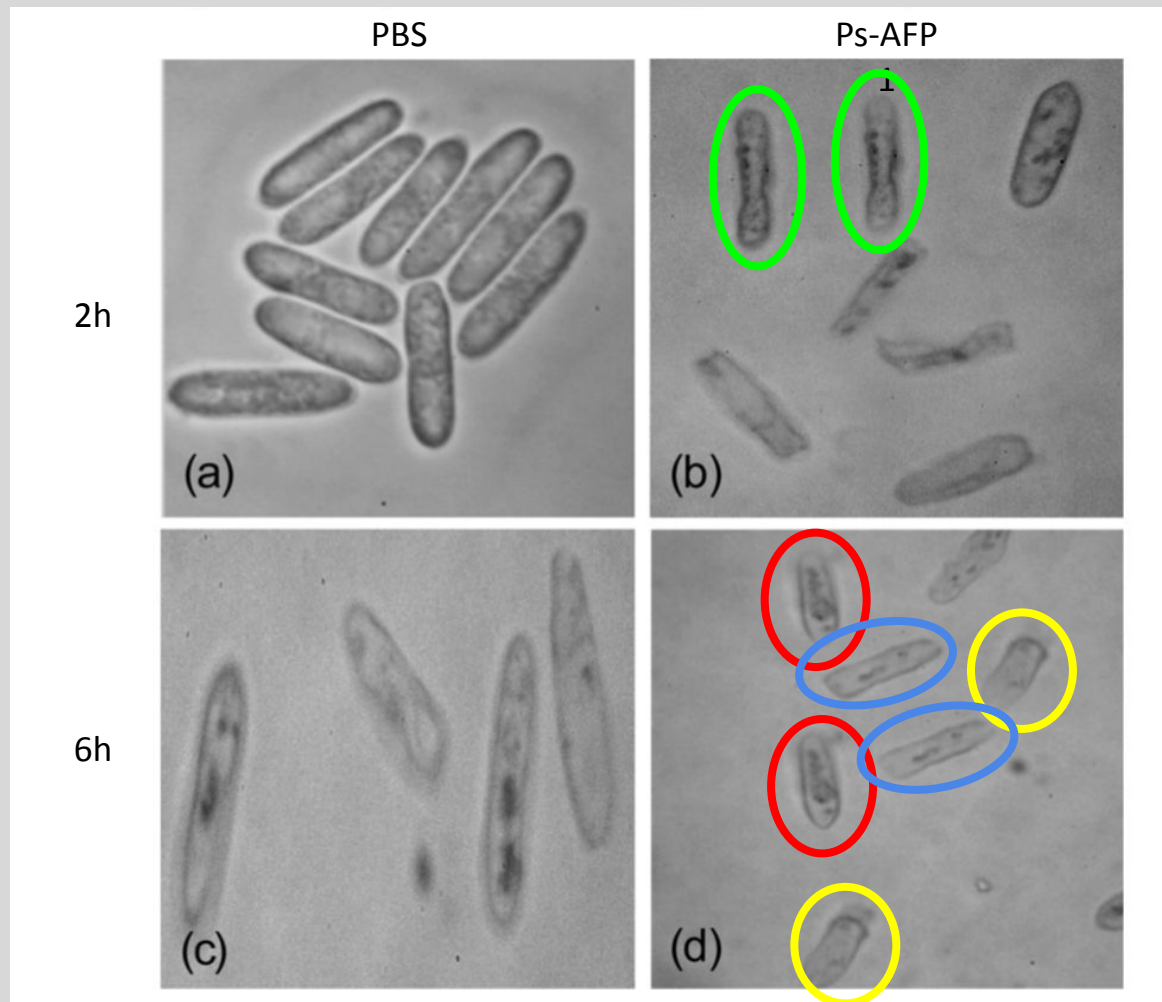
*First Affiliated Hospital of Harbin Medical University, China
PLOS ONE (2014), DOI: 10.1371/journal.pone.0091566
Reported Oct 2015, retracted March 2019, cited by 27*

Type II: Duplication with repositioning



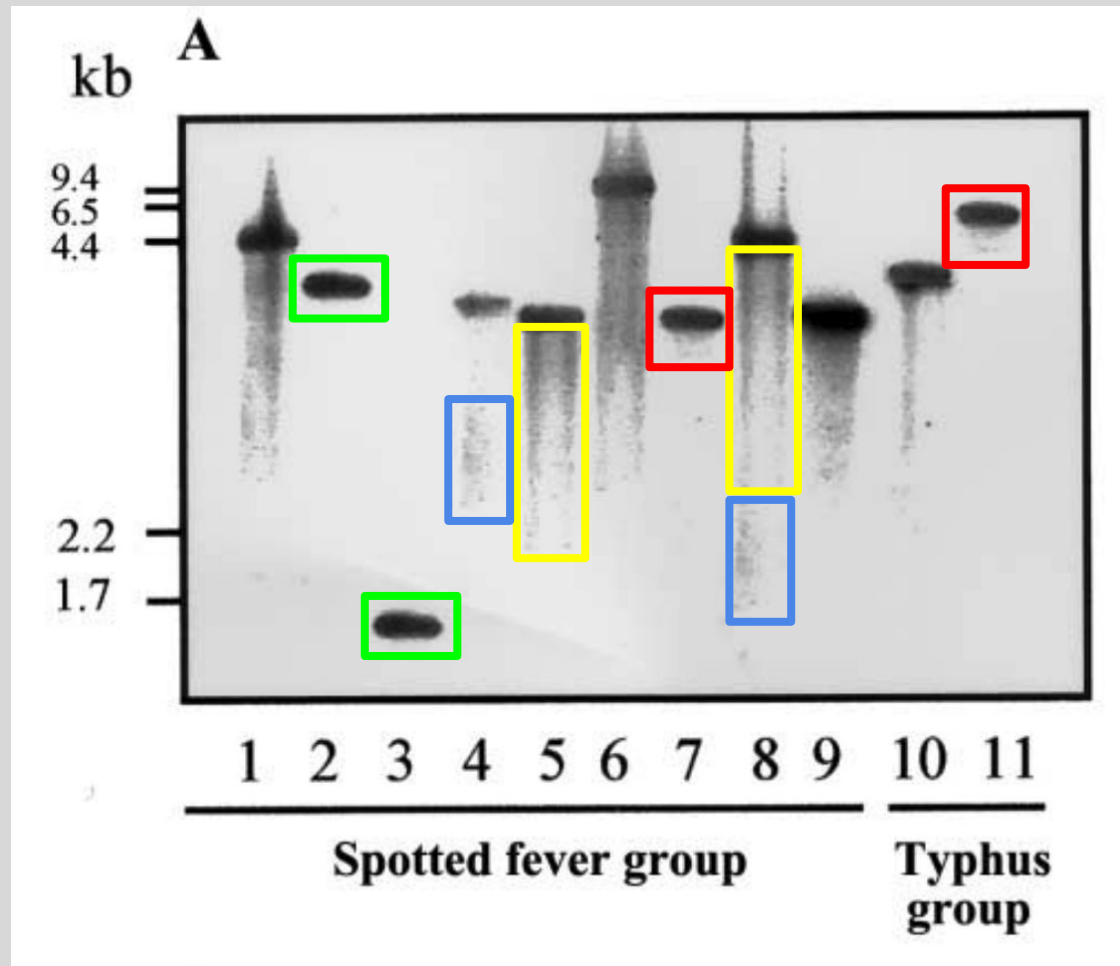
University of Illinois College of Medicine at Peoria, USA
PLOS ONE (2010), DOI: 10.1371/journal.pone.0011813 - Cited 61 times
Reported to institute and journal in October 2019, not yet addressed

Type III: Duplication with alteration



Indian Institute of Technology Kharagpur, India
Biochimie (2013), DOI: 10.1016/j.biochi.2013.06.027, cited by 25
Reported online, March 2016. Corrected July 2016.

Type III: Duplication with alteration

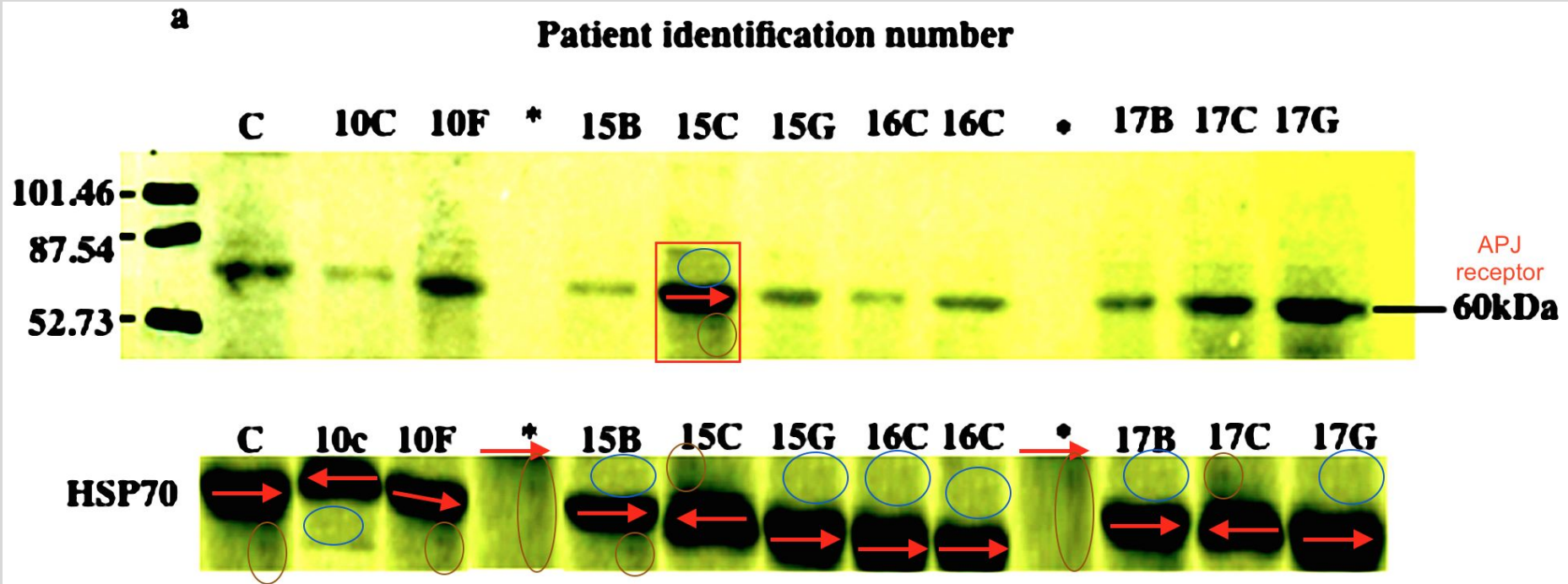


Université de la Méditerranée, Marseille, France

Journal of Infectious Diseases (2003), DOI: 10.1086/379080, cited by 116 papers

Reported online March 2021, not addressed yet.

Type III: Duplication with alteration

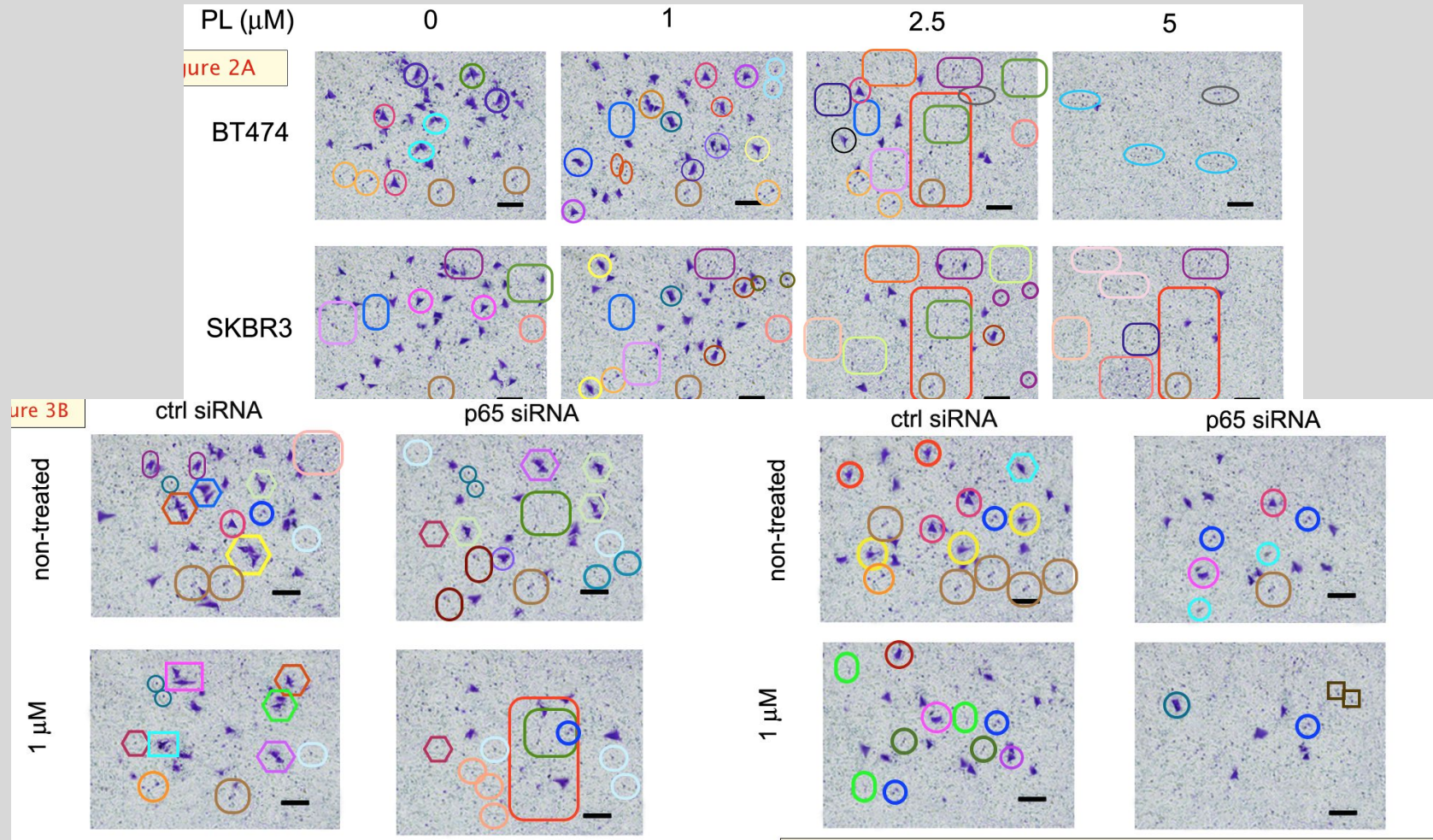


University of Glasgow, UK

PLOS ONE, DOI: 10.1371/journal.pone.0106262, cited by 2

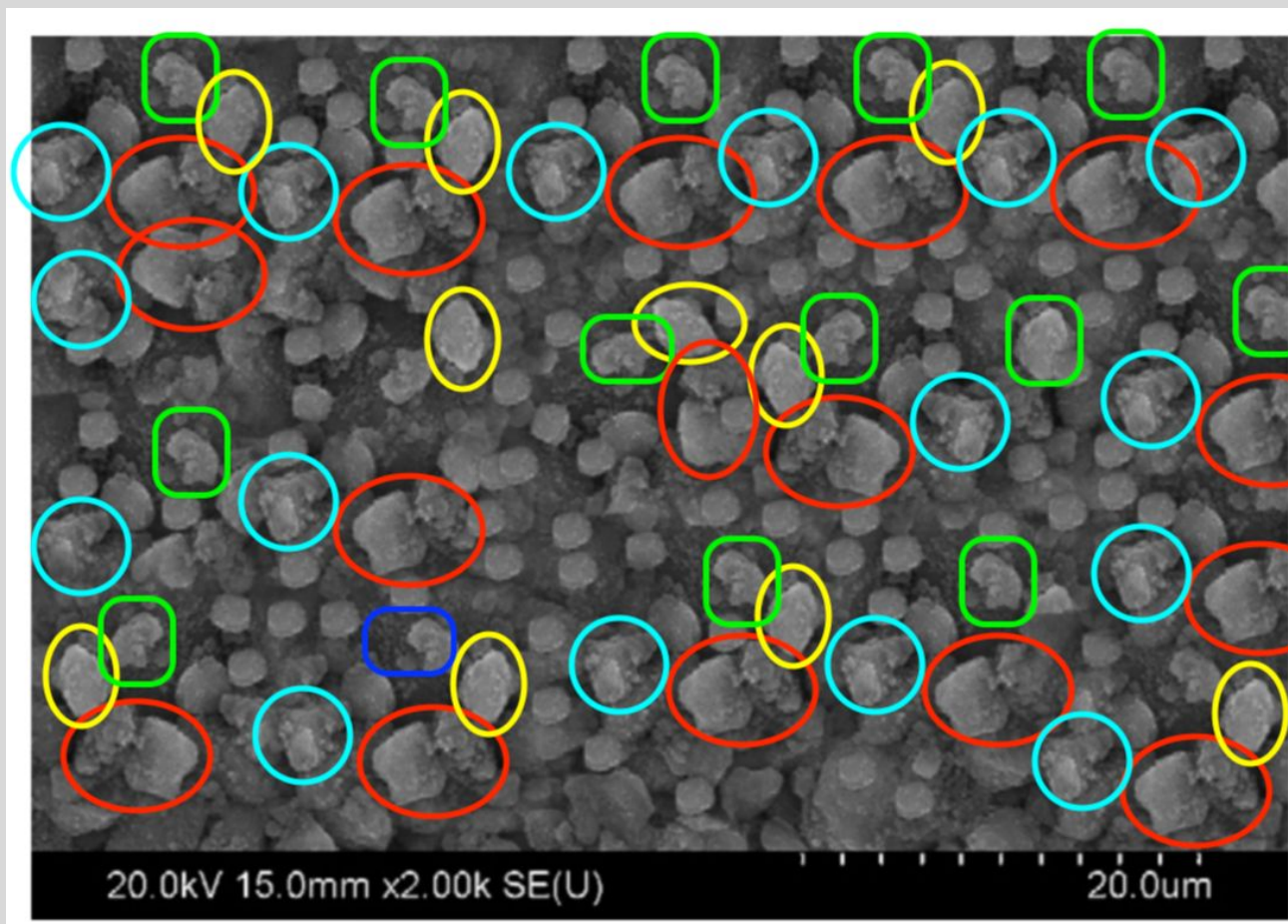
Reported to institution in March 2016, retracted August 2018

Type III: Duplication with alteration



University of Gdansk & Medical University of Gdansk, Poland
 PLoS ONE 11(10): e0164064 (2016), cited by 15.
 Reported to journal in November 2016, retracted January 2019

Type III: Duplication with alteration

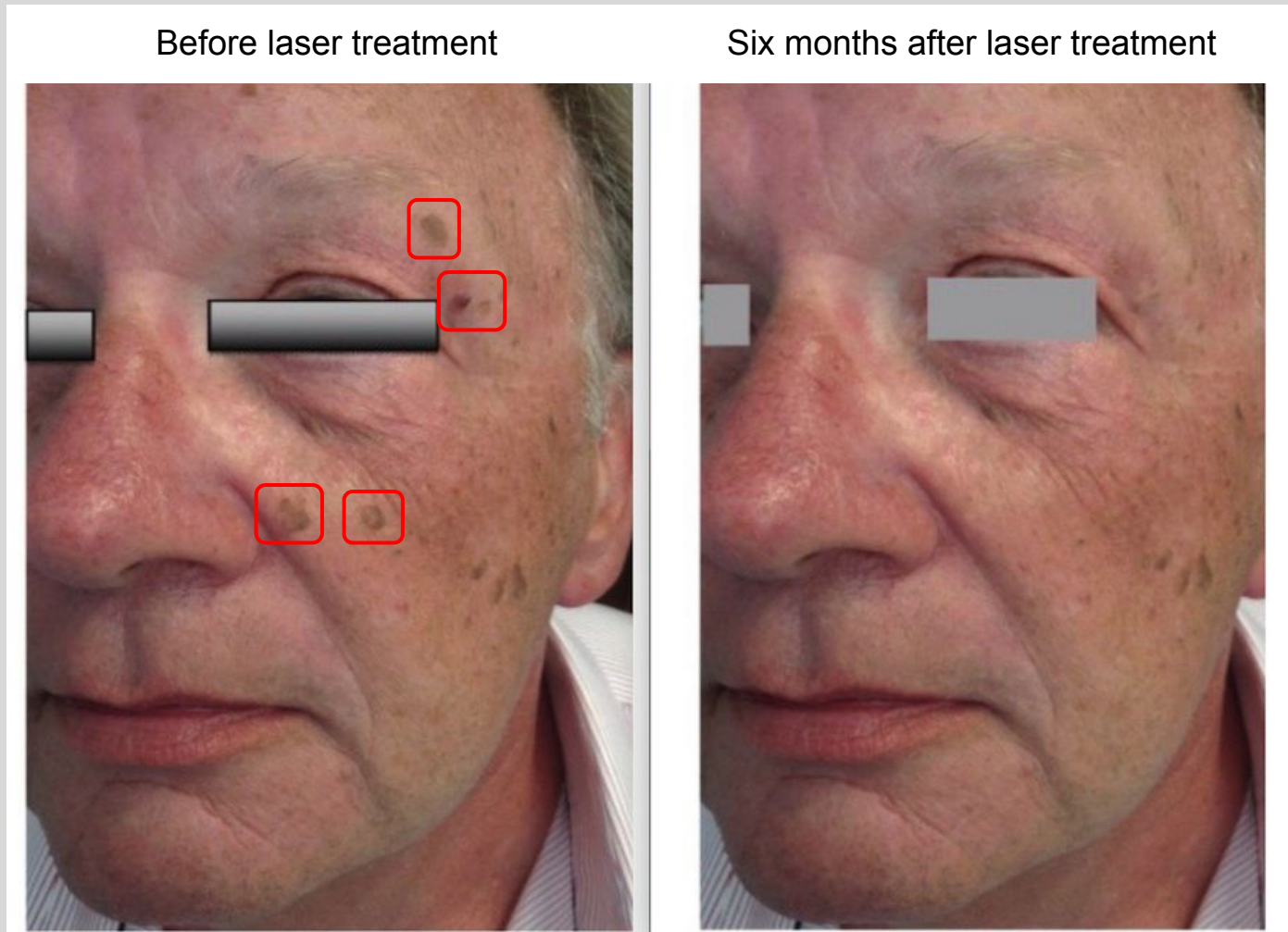


Anna University, India, cited 179 times.

Journal of Molecular Catalysis A (2007), DOI: 10.1016/j.molcata.2006.10.051

Reported to journal editors in September 2019; will be retracted?

Type III: Duplication with alteration

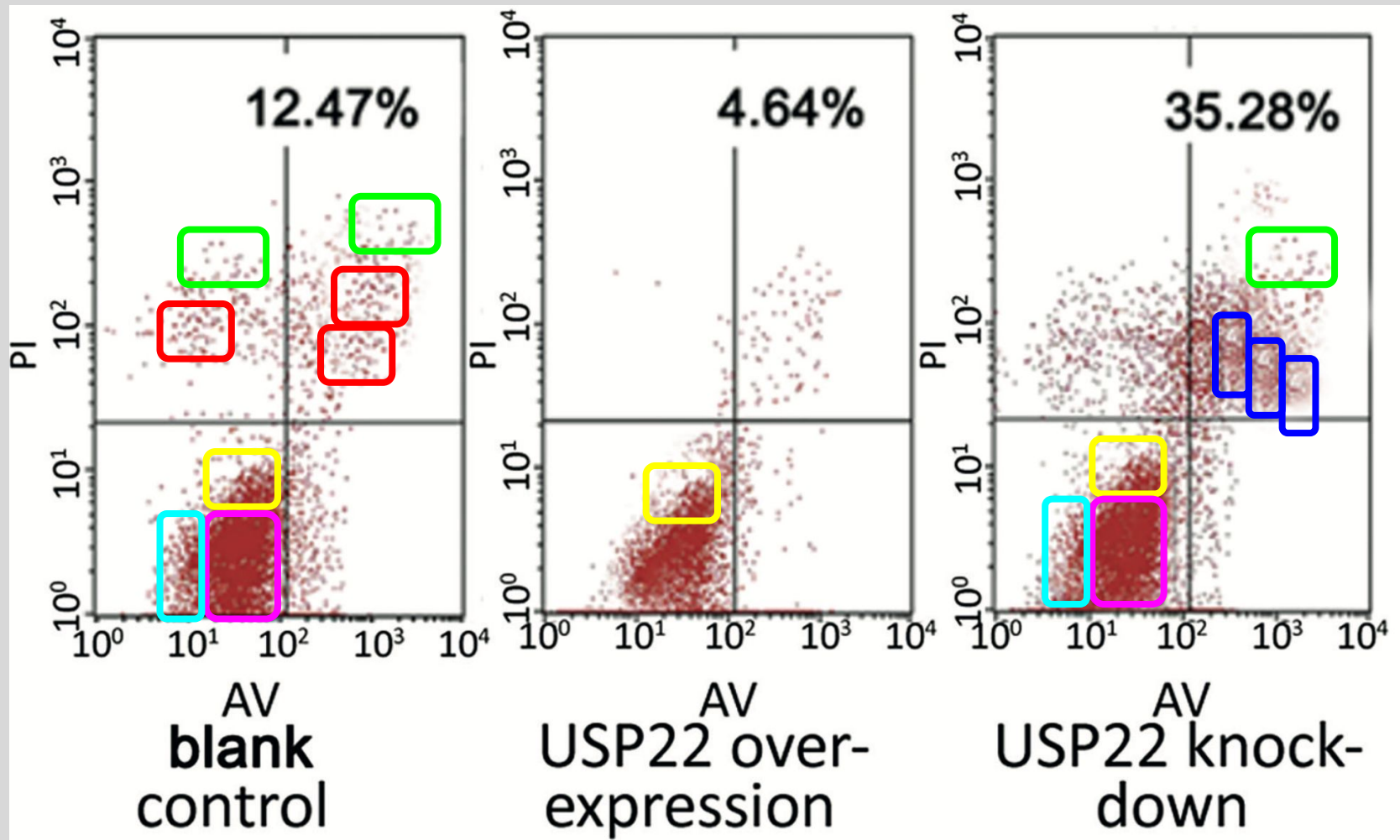


Poole Hospital NHS Foundation Trust, UK

Int. J. Oral Maxillofac. Surg. 2018, DOI: 10.1016/j.ijom.2018.08.008, cited 9 times

Reported to journal November 2019, retracted March 2020

Type III Duplication: Flaw Cytometry

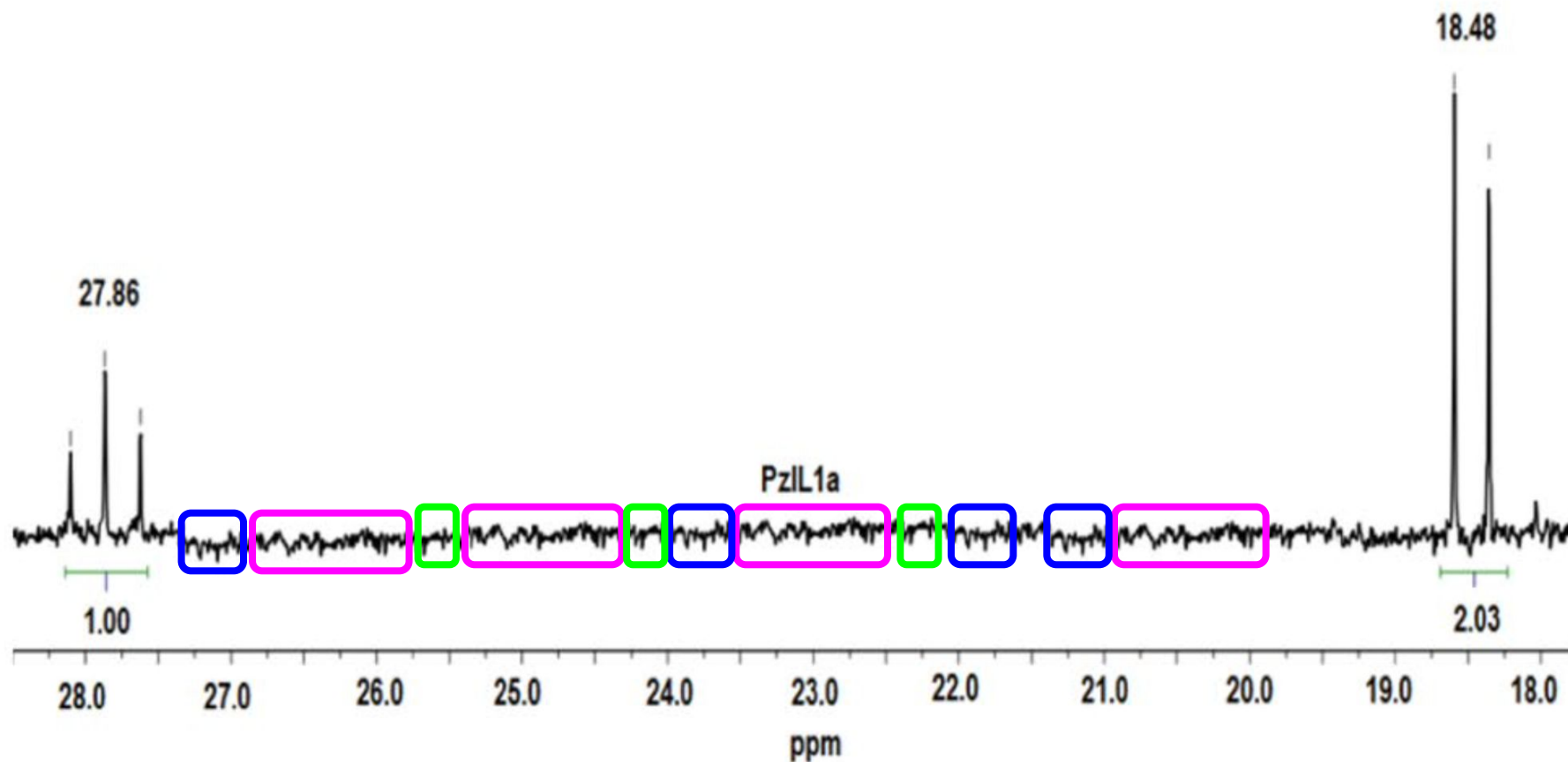


Harbin Medical University, China

Eur Rev Med Pharmacol Sci (2017), PMID: 28682440, cited 15 times

Reported online July 2020, no action

Type III Duplication: NMR spectrum



Dumlupınar University, Turkey

Scientific Reports (2020), DOI: 10.1038/s41598-020-68709-5, cited by 2

Reported August 2020, retracted March 2021

Inappropriate image duplication



AMERICAN
SOCIETY FOR
MICROBIOLOGY



The Prevalence of Inappropriate Image Duplication in Biomedical Research Publications

Elisabeth M. Bik,^a Arturo Casadevall,^{b,c} Ferric C. Fang^d

Department of Medicine, Division of Infectious Diseases, Stanford School of Medicine, Stanford, California, USA^a; Department of Molecular Microbiology and Immunology, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA^b; Department of Medicine, Johns Hopkins School of Medicine, Baltimore, Maryland, USA^c; Departments of Laboratory Medicine and Microbiology, University of Washington School of Medicine, Seattle, Washington, USA^d

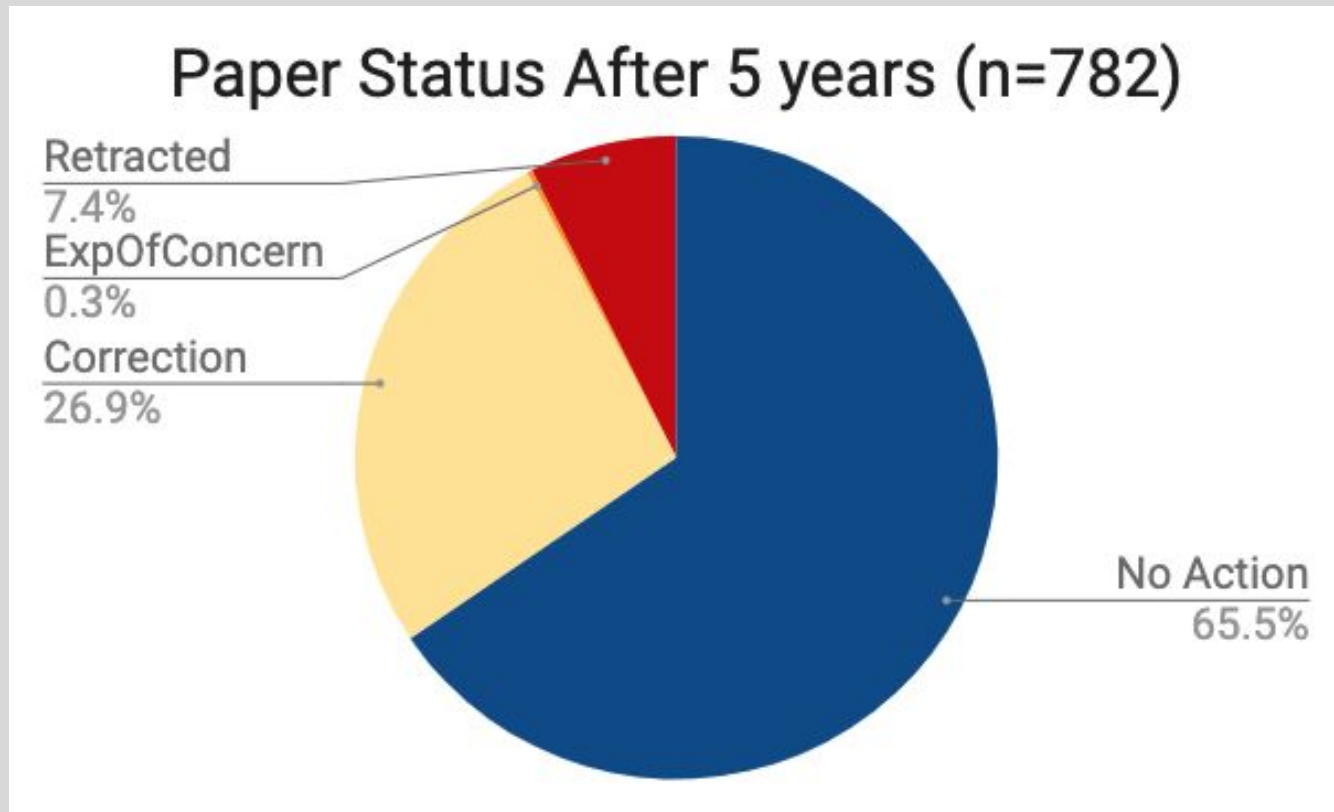
- I scanned 20,621 papers from 1995-2014 - by eye
- 40 journals from 14 publishers
- Found ~ 800 papers with duplicated figures (4%)
- 3 types: **I. Simple** - **II. Repositioned** - **III. Altered**
- Not all are misconduct! About half intentional: 2%
- Alteration in other data types much harder to detect

Journals are very slow to respond

782 papers reported to journals in 2014/2015

65% of papers have not been corrected/retracted five years after reporting

May 2022: 6,136 papers found; 2,647 reported to journals/institutions



Institutions often sweep it under the carpet

The New York Times

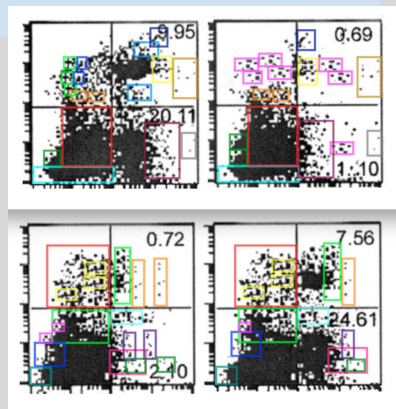
Years of Ethics Charges, but Star Cancer Researcher Gets a Pass

Investigation conclusions and handling opinions on 63 papers by academician X:
"After investigation, no fraud, or plagiarism was found...."

www.most.gov.cn



www.complianceandethics.org



LEIDS UNIVERSITEIT WEEKBLAD
Mare



Opposition to Colzato's anonymous fraud report: 'This seems to be from the secret service'

The Institute of Psychology, the Scientific Integrity Committee and the Faculty Board of Social Sciences oppose the anonymization of publications in which Leiden psychologist Lorenza Colzato committed fraud. "This hinders the entire scientific community."

□ Vincent Bongers and Sebastiaan van Loosbroek

Bij de volgende zeven artikelen zijn de manipulaties dermate ernstig dat geadviseerd wordt de betreffende tijdschriften te verzoeken deze terug te trekken.

1. [Redacted text]

Er zijn 21 proefpersonen verwijderd die als groep geen positieve associatie vertoonden, en er is een grote discrepantie tussen het aantal proefpersonen beschreven in het artikel en het aantal daadwerkelijk geteste individuen (40 vs 61).

2. [Redacted text]

De gerapporteerde onderzoeksopzet is substantieel anders dan die in het protocol, er is een controlegroep toegevoegd, en er zijn belangrijke gegevens en proefpersonen weggelaten.

3. [Redacted text]

De onderzoeksopzet was een cross-over design, terwijl het onderzoek als een parallel-arm onderzoek wordt gerapporteerd. Er zijn bovendien zeven proefpersonen weggelaten.

Reporting concerns about research misconduct

The Official Professional Way:

- Contact Editor-in-Chief of journal
- Contact Research Integrity Officer of university
- Investigation might follow - or not
- Original files might take away concerns

The Experienced, Frustrated, and Proactive Way

- Posting on PubPeer.com (5,543 of 6,163)

The screenshot shows a PubPeer page for a paper titled "Plumbagin Suppresses the Invasion of HER2-Overexpressing Breast Cancer Cells through Inhibition of IKK α -Mediated NF- κ B Activation". A comment by Elisabeth M Birk, dated 3 years ago, expresses concerns about Figures 2A and 3B, stating that some areas appear to be shared between panels. Below the comment, a figure is displayed showing four panels of cell invasion assays at different concentrations of plumbagin (0, 1, 2.5, and 5 μ M). The figure includes a legend for BT474 and C4-2B cells and a scale bar.

The screenshot shows a PubMed search results page for the query "dider rault cong". The results list 22 articles, including "Bacterial Infections in Humans and Nonhuman Primates from Africa: Expanding the Knowledge", "Author Correction: Potential zoonotic pathogens hosted by endangered bonobos", "Stool Serology: Development of a Non-Invasive Immunological Method for the Detection of Enterovirus-Specific Antibodies in Congo Gorilla Faeces", "Occurrence of Ten Protozoan Enteric Pathogens in Three Non-Human Primate Populations", "Potential zoonotic pathogens hosted by endangered bonobos", "Enteroviruses from Humans and Great Apes in the Republic of Congo: Recombination within Enterovirus C Serotypes", "Parasitic Infections in African Humans and Non-Human Primates", "Adenovirus Infections in African Humans and Wild Non-Human Primates: Great Diversity and Cross-Species Transmission", "Genetic diversity of human head lice and molecular detection of associated bacterial pathogens in Democratic Republic of Congo", "Eggerthella thronensis sp. nov., a new species isolated from the stool sample of a pygmy female", and "Colibactin biosynthesis in enterobacteria sp. nov.". Each entry includes the title, authors, journal, and a link to the full text.

Image Duplication Detection Software

NEWS | 21 December 2021

Richard Van Noorden, Nature (2021)

Journals adopt AI to spot duplicated images in manuscripts

A few publishers are using automated software to catch flaws in submitted papers.

Bioscience-scale automated detection of figure element reuse

Daniel E. Acuna, Paul S. Brookes, Konrad P. Kording

doi: <https://doi.org/10.1101/269415>

This article is a preprint and has not been certified by peer review [what does this mean?].

 FigCheck

 Forensically^{Beta}

 ImageTwin

 Proofig



DEFENSE ADVANCED
RESEARCH PROJECTS AGENCY

> Defense Advanced Research Projects Agency > Our Research >

Media Forensics (MediFor)


Artificial Intelligence can create fake photos

GAN = Generative Adversarial Network (Machine Learning)

Random Face Generator (This Person Does Not Exist)

[HOME](#) - [PRIVACY POLICY](#) - [ALGORITHM](#) - [CONTACT US](#)

Generate random human face in 1 click and download it! AI generated fake person photos: man, woman or child.



[Refresh Image](#) [Download](#)

Random Face Generator (This Person Does Not Exist)

[HOME](#) - [PRIVACY POLICY](#) - [ALGORITHM](#) - [CONTACT US](#)

Generate random human face in 1 click and download it! AI generated fake person photos: man, woman or child.

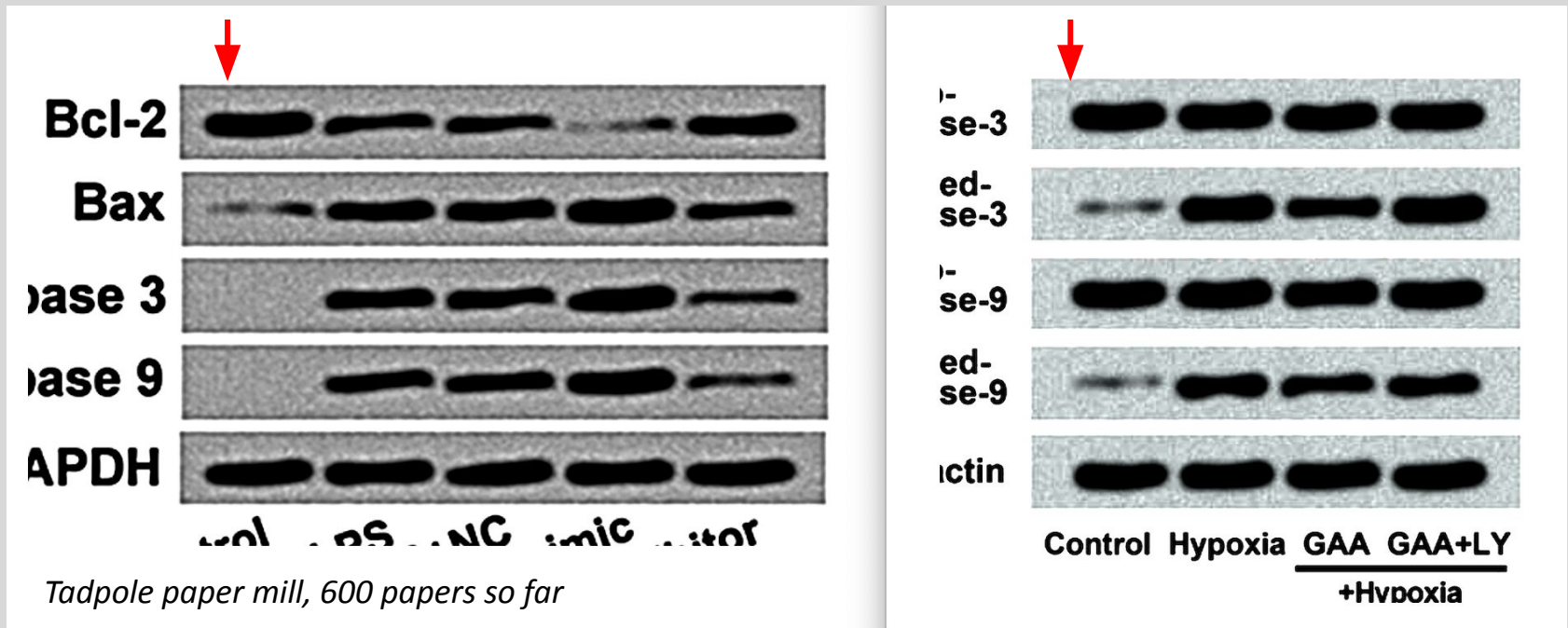


[Refresh Image](#) [Download](#)

GAN technology has troubles with cats



GAN technology used in Paper Mills



- Scientific paper mills - China, Russia, Iran
- Sell authorships on already accepted papers
- Sell fake papers written by ghostwriters with fabricated data
- Credit: Anna Abalkina, Jana Christopher, Jennifer Byrne, Smut Clyde, Morty, Tiger, Cheshire

Science Misconduct: Discussion

- What is percentage of misconduct?
- Why do people commit science misconduct?
- Are we focusing too much on publications/productivity?
- Conflicts of interest (*publishers, institutions*)
- Whose role is it to detect science misconduct?
- Legal protection for whistleblowers
- Tremendous cost of science misconduct (*scientists, science*)

