A research (later career) and editor perspective

Arturo Casadevall

Johns Hopkins School of Public Health

Three take home messages

- **Figure problems are common in published papers**
- **Most problems are due to error, not misconduct**
- **New procedures are emerging to reduce error**

How good is the literature? The Bik Study

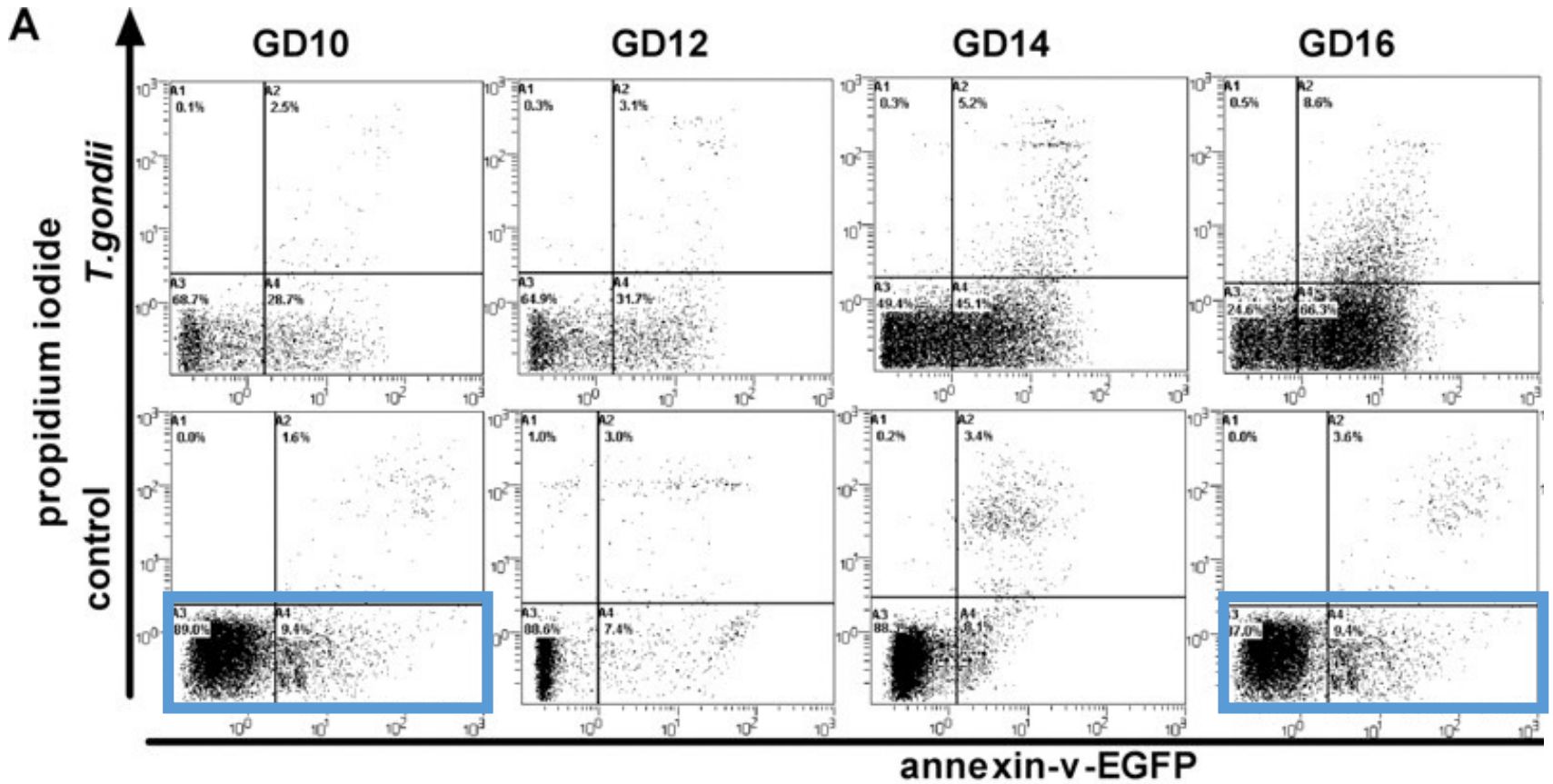
- **ANALYZED 20,443 PAPERS**
- **39 JOURNALS**
- **13 PUBLISHERS**
- **YEARS 1995-2014**
- **VISUAL INSPECTION**
- **FOCUS: PHOTOGRAPHIC IMAGES**
- **FINDINGS THEN VALIDATED BY FERRIC FANG AND I**

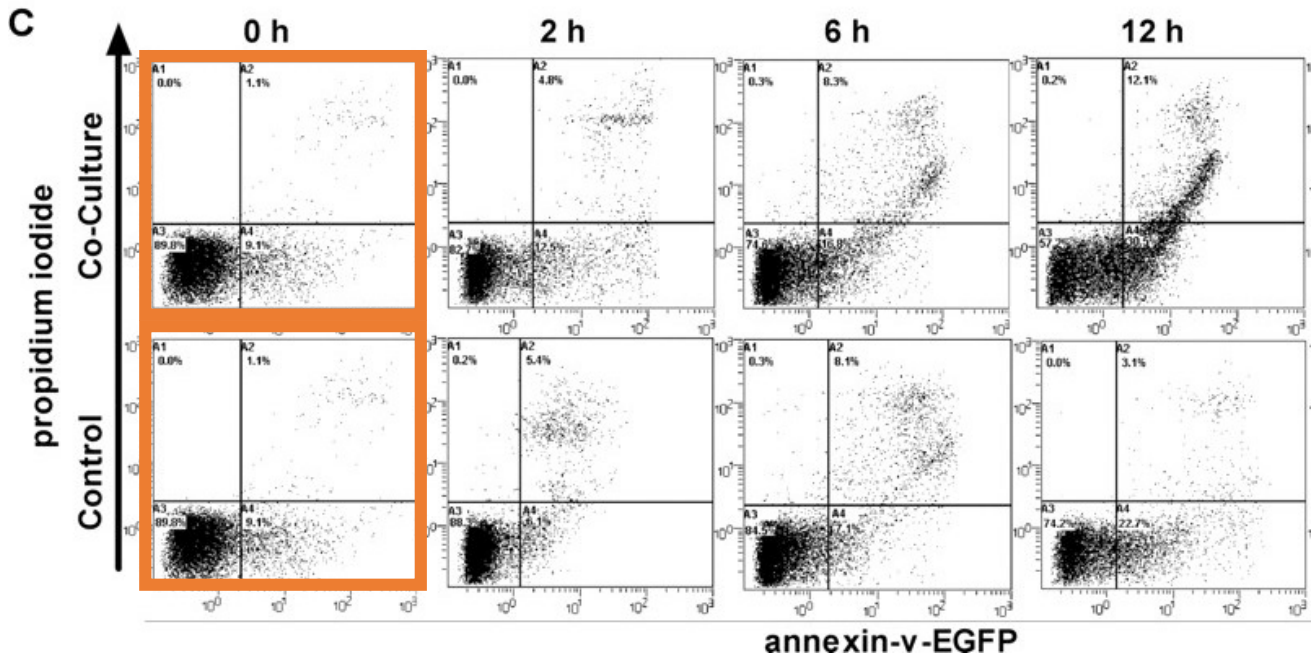
ELISABETH BIK

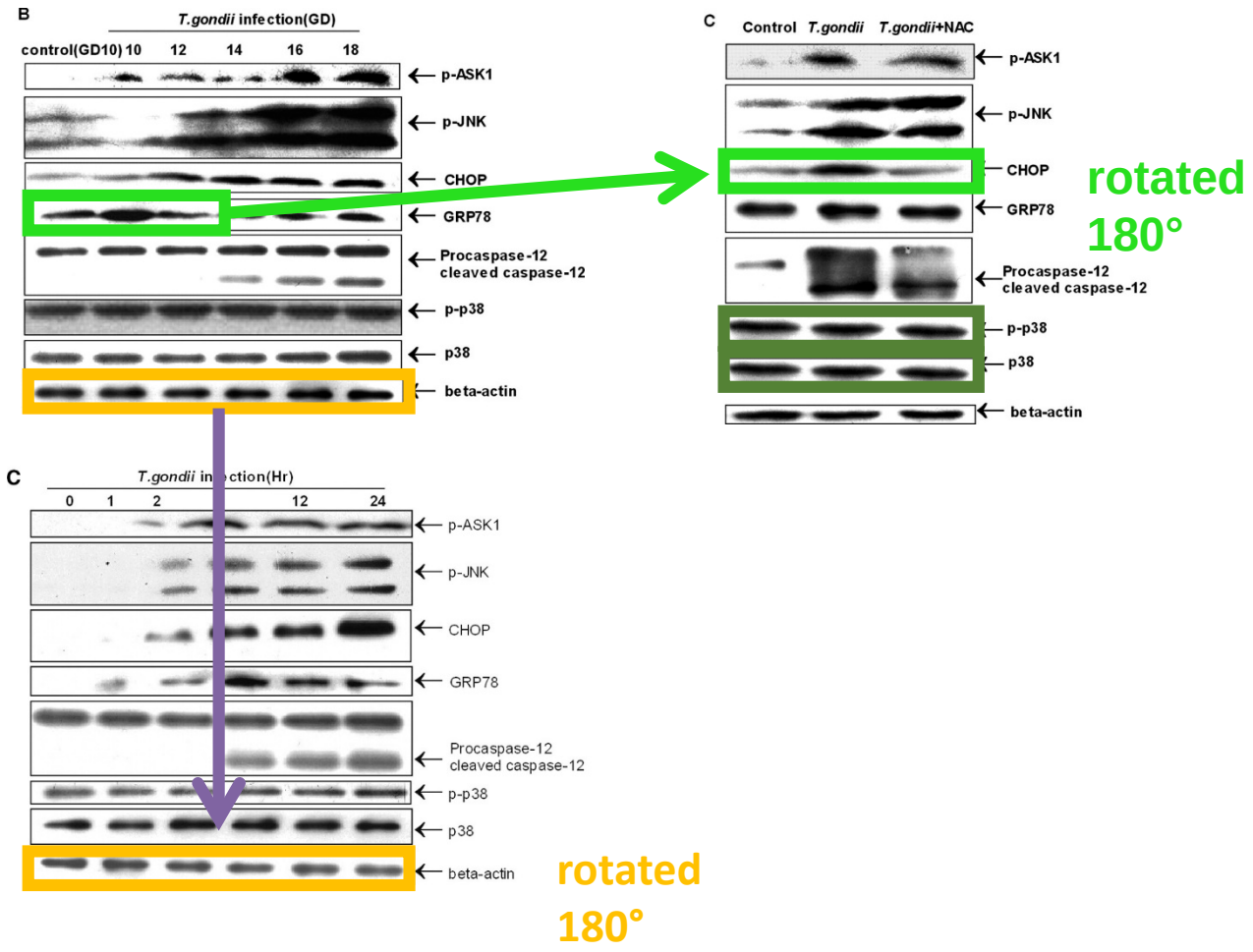
DEPARTMENT OF MEDICINE

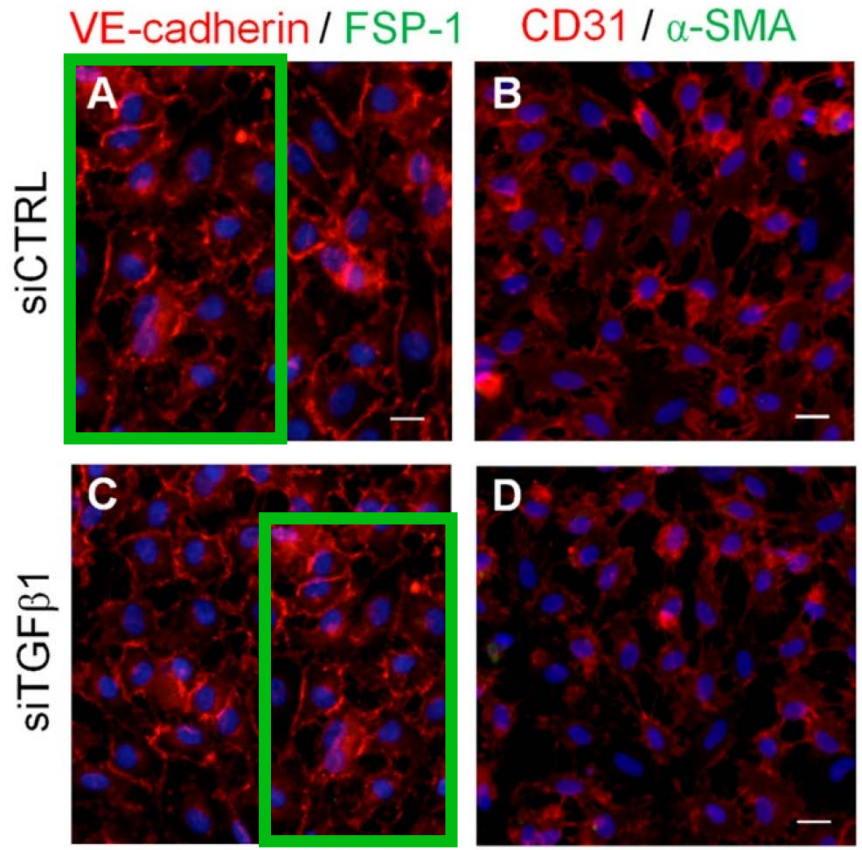
STANFORD UNIVERSITY

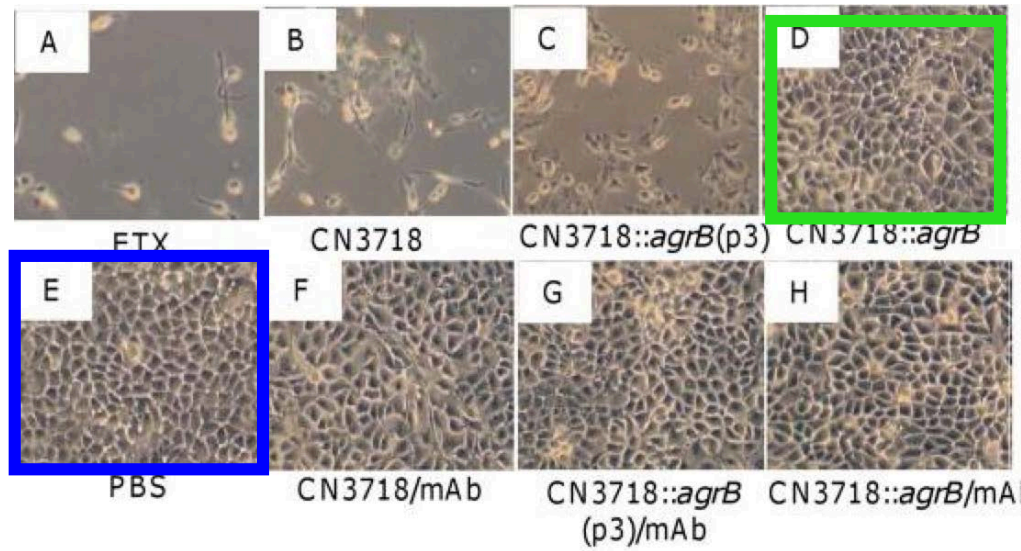
Bik, Casadevall, Fang, mBio (2016)


A
GD10
GD12
GD14
GD16
T.gondii
control
propidium iodide
annexin-v-EGFP
A1 0.1%
A2 2.5%
A3 68.7%
A4 28.7%
A1 0.3%
A2 3.1%
A3 64.9%
A4 31.7%
A1 0.3%
A2 5.2%
A3 49.4%
A4 45.1%
A1 0.5%
A2 8.6%
A3 24.6%
A4 66.3%
A1 0.0%
A2 1.6%
A3 89.0%
A4 9.4%
A1 1.0%
A2 3.0%
A3 88.6%
A4 7.4%
A1 0.2%
A2 3.4%
A1 0.0%
A2 3.6%
A4 9.4%

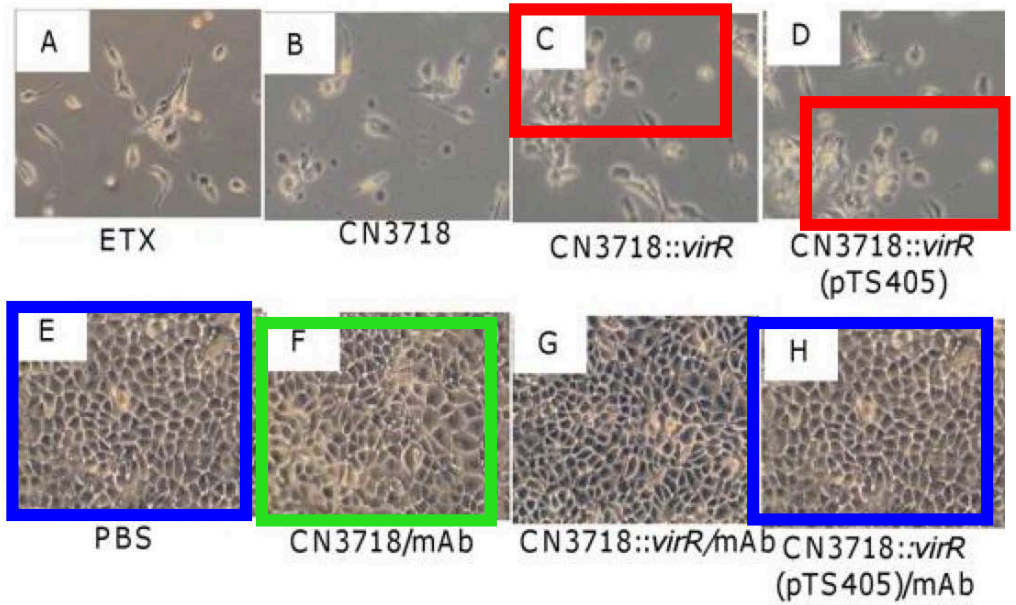

C
0 h
2 h
6 h
12 h
propidium iodide
Co-Culture
Control
annexin-v-EGFP


B
T.gondii infection(GD)
control(GD10) 10 12 14 16 18
p-ASK1
p-JNK
CHOP
GRP78
Procaspase-12
cleaved caspase-12
p-p38
p38
beta-actin
C
Control T.gondii T.gondii+NAC
p-ASK1
p-JNK
CHOP
GRP78
Procaspase-12
cleaved caspase-12
p-p38
p38
beta-actin
rotated
180°
C
T.gondii infection(Hr)
0 1 2 12 24
p-ASK1
p-JNK
CHOP
GRP78
Procaspase-12
cleaved caspase-12
p-p38
p38
beta-actin
rotated
180°


VE-cadherin / FSP-1
CD31 / α-SMA
siCTRL
siTGFβ1
A
B
C
D

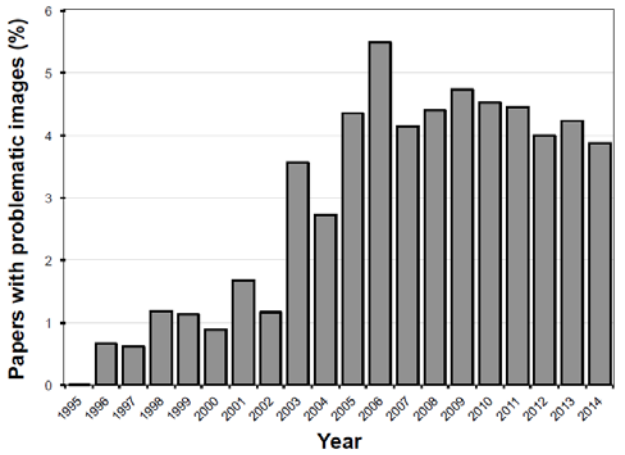

A
B
C
D
ETX
CN3718
CN3718::agrB(p3)
CN3718::agrB
E
F
G
H
PBS
CN3718/mAb
CN3718::agrB (p3)/mAb
CN3718::agrB/mAb

A


A
B
C
D
ETX
CN3718
CN3718::virR
CN3718::virR (pTS405)
E
F
G
H
PBS
CN3718/mAb
CN3718::virR/mAb
CN3718::virR (pTS405)/mAb

The Bik Study Findings

- **PROBLEMATIC IMAGES READILY APPARENT TO CAREFUL INSPECTION**
- **~ 1 OUT OF 25 PAPERS HAS A PROBLEMATIC IMAGE**
- **FINDINGS ARE AN UNDERSTIMATE OF PROBLEMS SINCE ONLY PHOTOGRAPHIC IMAGES ANALYZED**
- **JOURNALS DIFFER IN PREVALENCE OF PROBLEMATIC IMAGES**
- **PROBLEM APPEARS TO BE A 21ST CENTURY PHENOMENON**



Bik, Casadevall, Fang, mBio (2016)

The Molecular and Cellular Biology Study

- **Set out to determine the extent and causes of inappropriate image duplications**
- **analyzed 960 papers from 2009-2016 picked randomly: 6.1 % had problem images**
- **Good news: Most are errors**
- **Bad news: 10% lead to retractions**

Analysis and Correction of Inappropriate Image Duplication: the *Molecular and Cellular Biology* Experience

Elisabeth M. Bik,[a] Ferric C. Fang,[b,f] Amy L. Kullas,[c] Roger J. Davis,[d] Arturo Casadevall[e]

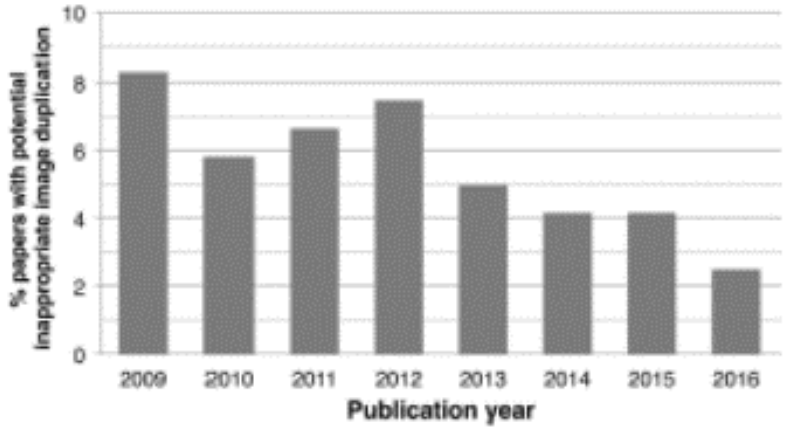
More on the MCB Study

Bad News

- High cost of resources needed to correct problems (~6 h of journal staff time per problem)
- Allowed first estimate of numbers of ‘compromised’ papers in literature: 35,000

Good news

- Increased screening of manuscripts at the journal reduced problems
- Efforts pay of an problematic papers are declining



Analysis and Correction of Inappropriate Image Duplication: the *Molecular and Cellular Biology* Experience

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Similar Experience at JCI

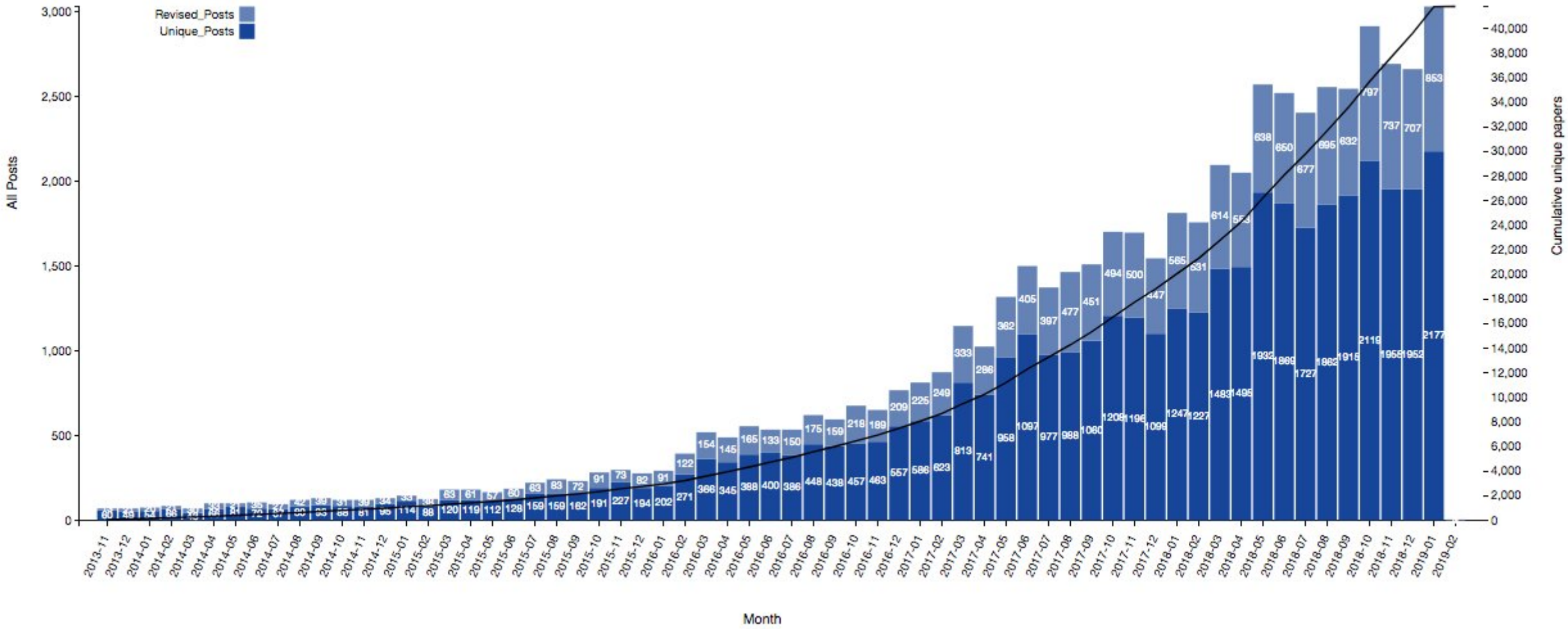
- **28% of papers (57 of 200) flagged for statistical 'issues'**
- **27% of papers (55 of 200) flagged for problems with figures**
  - **89% (49 of 55) minor transgressions)**
  - **7.5% (4 of 55) moderate problems**
  - **1% (2 of 55) major problems – acceptance rescinded**

Figure errors, sloppy science, and fraud: keeping eyes on your data

Corinne L. Williams, … , Arturo Casadevall, Sarah Jackson

J Clin Invest. 2019;129(5):1805-1807. https://doi.org/10.1172/JCI128380.

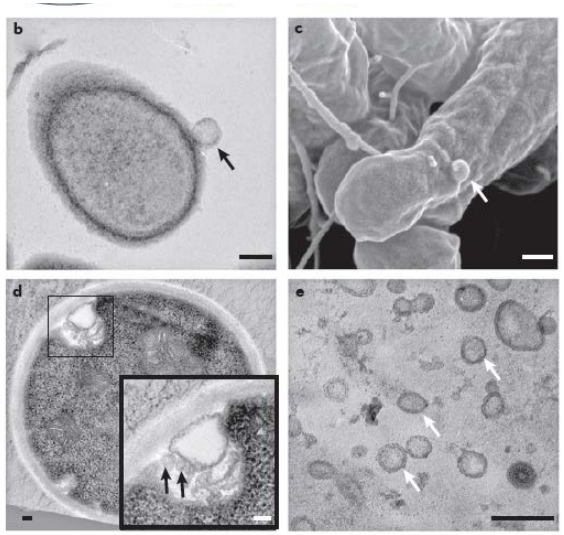
Preprints bring pre-publication review to the Biomedical Sciences



Preprint pre-publication review allowed us to avoid an embarrassing error

Through the wall: extracellular vesicles in Gram-positive bacteria, mycobacteria and fungi

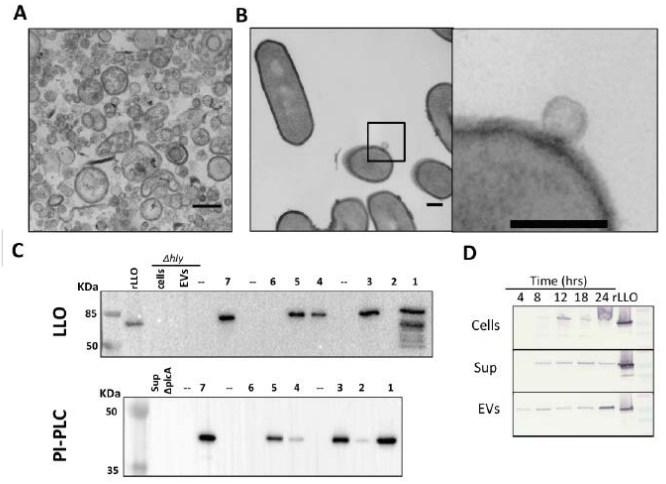
Lisa Brown[1], Julie M. Wolf[2], Rafael Prados-Rosales[1] and Arturo Casadevall[3]



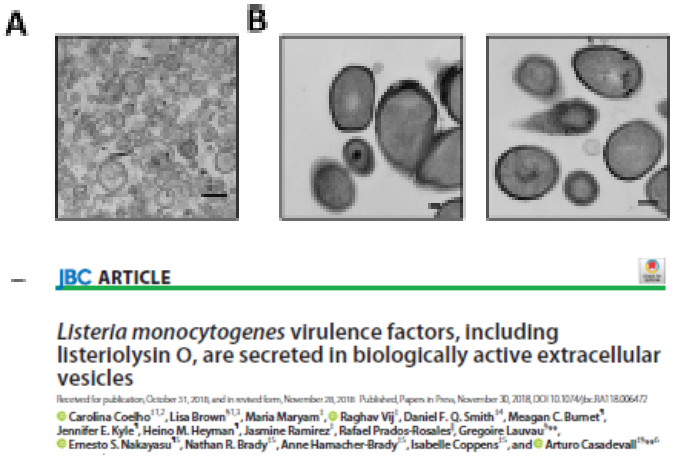
Nature Micro Rev 2014

Listeria monocytogenes virulence factors are secreted in biologically active Extracellular Vesicles

Carolina Coelho[1*], Lisa Brown[2*], Maria Maryam[1], Meagan C. Burnet[4], Jennifer E. Kyle[4], Heino M. Heyman[4], Raghav Vij[1], Jasmine Ramirez[1], Rafael Prados-Rosales[5], Gregoire Lauvau[2,3], Ernesto S. Nakayasu[4#], Nathan Ryan Brady[1#], Anne Hamacher-Brady[1#], Isabelle Coppens[1#] and Arturo Casadevall[1,2,3]



Bioxriv 2017

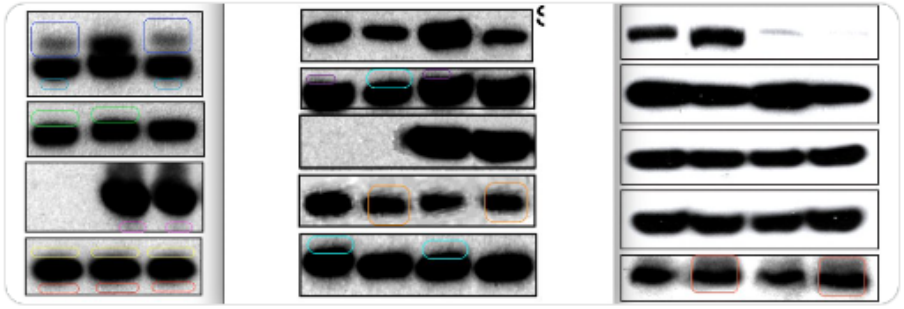


JBC 2019

Social Media Discovery and Shaming

Elisabeth Bik @MicrobiomDigest · Aug 29

From a paper published in @nature yesterday by @HarvardMed scientists.
I just reported it to the EiC, with shaking hands and pounding heart because scary to see that this passed #peerreview and editorial screening in such a high impact journal.



239 1.4K 3.4K

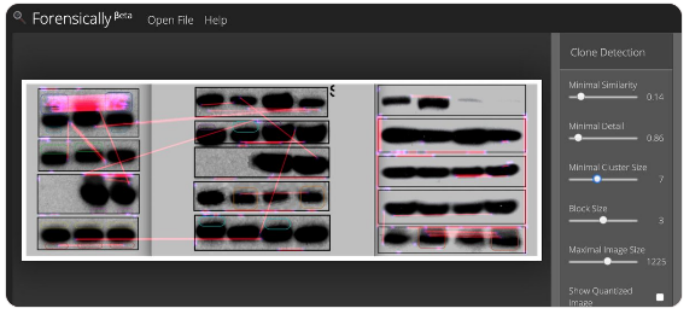
Show this thread

Giuliano Maciocci
@augmentl

Follow

Replying to @mbeisen @MicrobiomDigest @nature

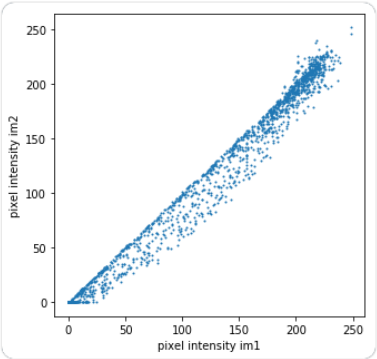
This thread got me intrigued, so I ran the image through Forensically's clone analysis tool (Pro tip). Yup. Lots of cloning going on (The pink lines link cloned pixel clusters). I'd probably get more with the original image, but it's pretty obvious as is.



1:11 AM - 30 Aug 2019

Michael Eisen @mbeisen · Aug 29

Here's why. If you plot the pixel level intensities of band 1 against band 2 you get this. That straight line is really really damning. I can't think of any explanation except that they copied the middle band to the left and added some noise.



10 7 55

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Emerging solutions to safeguard literature

Stage	Safeguard
Pre-publication	**Using Pre-prints**
	Increased education
	Increased vigilance
Review and publication	**Reviewer education**
	Enhanced editorial scrutiny
	Deposition of primary data
Post-publication	**Pub peer**
	Social media shaming…☹
	Journal comments
	Retraction watch
	Retracting paper