

Failure is the mother of discovery

Marija Šakić

Student Wageningen University and Research

14 April 2021

Last year the corona crisis reached the Netherlands. Amidst all chaos, I – a Food Technology student - was especially astounded that the young were less affected by corona; only 8.5% of the reported corona cases were of children younger than 18 (WHO, 2020), which goes against the idea of YOPI. YOPI refers to a risk group with lower resistance against disease and that are therefore more susceptible to disease. YOPI includes the Young, Old, Pregnant, and Immunosuppressed (RIVM, n.d.). This question raised the basis of my theory that children have received a vaccination that contained antigens similar to that of corona virus, preparing their immune system against the virus causing them to quickly fight the virus and display little to no symptoms (Appendix 1). I could not find any sources supporting my theory and therefore e-mailed one of my professors, who thought it was unlikely that I was right. Out of fear of being wrong, I did not share my theory anywhere else. However, two months passed and researchers from Cambridge University found that the MMR-vaccination could be the reason children were less susceptible to corona and had milder symptoms (Brink, 2020). The necessity of finding the right answers and being in line with current theories poses barriers on the practicality and versatility that comes with taking the risk of being ‘wrong’. Being wrong plays an important role in the world of scientific research, as it affects the way scientists approach research, broadens and challenges perspectives and is driving force of evolution in research.

Firstly, the possibility of being wrong challenges scientists to improve and perfect their research as well as influences how they conduct their research. The chance of conducting research that results in faulty conclusions will trigger researchers to work precise and with careful thought, as the outcome can have a great influence on society. This especially holds true in the field of food science because statements can have great consequences to the public health. An example of such a case is when in the 1980s studies showed that the intake of vegetables rich in beta carotene was associated with a lower risk of lung cancer (ATBC Cancer Prevention Study Group, 1994). Consequently, many smokers started consuming a great deal of supplements containing beta carotene. A study by the ATBC Cancer Prevention Study Group investigated the influence of different doses of beta carotene on the development of lung cancer in smokers. In 1994 they published the shocking result that while certain amounts of beta carotene may prevent lung cancer, consuming large amounts significantly increases the risk of lung cancer in smokers. Had the original studies included different doses of beta carotene, this blunder could have been prevented. Errors like these can thus have a great impact and can also damage the public’s trust in scientific information. If there was no such risk in science, scientists could approach their research very indifferently and irreverently, rather focusing on bringing out a lot of publications than accuracy. This would severely impact the quality of scientific publications.

Moreover, wrongs are of value because they can lead to better rights as they provoke cognitive creativeness and force new perspectives upon the matter. A rejected hypothesis will induce creativeness under scientists by forcing them to think outside the box to explore and find new perspectives for the improvement of their theories. If everything in science came easy, there would be no such cognitive challenges and hence no second train of thought that forces the scientist to dive deeper within the subject, which could lead to a better understanding of the topic and even a better theory. Stuart Firestein, author of ‘Failure: Why Science is So Successful’, refers to this failure induced phenomena as “the portal of the unknown”. This is where *the deepest and most worthwhile questions come from* (Kehoe, 2020). In 2011, Jason Moser, a psychologist at Michigan State University, observed the brain’s reaction upon failure. When the participant’s made a mistake the brain was challenged between a correct answer and an error, causing a rise in the brain activity

(Kehoe, 2020). A difference between a hypothesis and the obtained results indicates that there is something that is not known and thus something that could be learned. For years, scientists have tried to formulate food supplements for malnourished young children in developing countries, but to no avail; even when consuming sufficient nutrients, their organ development and overall growth did not improve. After three decades of trying to improve the recovery of malnourished children, Tahmeed Ahmed took the gained knowledge of this lack of success and teamed up with Jeffrey Gordon, who had been studying the gut microbiome in relation to obesity, to study the role of microbiome in malnutrition. This led to the discovery that the gut microbiome does not mature in starving children, which was theorized to be the reason they did not develop even when fed (Pennisi, 2021). Further investigation of this theory showed which strains of microbes in the gut are linked to maturation, and supplements improving these bacteria were created. The testing of these supplements showed consumption increased signaling molecules indicating recovery from malnutrition present in the child's blood; a great example of how failure led to the discovery of a new concept and improved results (Chen et al., 2021). Also, just because the outcome of a study proved to be wrong, does not mean the results are of no value. Some decades ago, astronomers developed a signal processing technique to detect exploding micro black holes. Although they did not achieve the desired results, that very technique is currently used for Wi-Fi communication (Bryce, 2020). Each result, whether right or wrong, should be valued because each is a product of rational and creative thinking.

Last but not least, failure is the driving force of the world of science: every hypothesis includes a sense of faultiness as any observation has several angles of approach leading to different concepts and explanations for the same observation, which is the basis of evolution within research. One proven theory does not exclude that other (sometimes contradictive) theories can be correct, meaning every hypothesis is somewhat 'wrong'. If in contrary one proven hypothesis would mean the whole truth about a certain matter was unfolded, research and invention would come to a halt. One wrong does not cancel out all rights, and one right does not cancel out all wrongs. In Food Chemistry, there can be endless combinations and possibilities regarding macromolecules and their structures in food products. One theory about their structure can lead to for example plant-based food with certain properties, while another assumption about their chemical makeup can lead to the formation of completely different vegan alternatives to animal products. Hence it can be argued that the imperfection and wrongness of scientific theories has led to a great variety of innovative plant-based food products and more generally the diversity and evolution of the scientific interpretation of our planet, which is ever-growing. After all, research is not about being right, but about uncovering and understanding the several truths of this world and implementing these to improve our society.

To review, being incorrect in science can have great value. The probability of rejecting a hypothesis is quite large in research, and this requires scientists to be deliberate and meticulous. As Firestein stated, being wrong opens the portal of the unknown where creativity and cognitive challenges lie, as well as new and expanded theories. Failure is the contingent outcome of that each observation can be approached from different outlooks, which is what drives the progression and expansion of scientific research. The current stigma around failure masks the true reality that being wrong is a key element of research in science, especially in food science. Coming back to my theory, the uneasiness experienced when being incorrect kept me from sharing my – proven - thoughts. Think of the much more important research that gets disregarded this way because of initially being 'wrong'. And that while being wrong has brought us further than being right.

1343 words

References

- Alpha-Tocopherol, Beta Carotene Cancer Prevention Study Group (1994, April 14). *The Effect of Vitamin E and Beta Carotene on the Incidence of Lung Cancer and Other Cancers in Male Smokers*. The New England Journal of Medicine, 330(15):1029-35.
- Brink, van den R. (2020, May 2). *Bmr-vaccinatie geeft mogelijk milder verloop van covid-19-infectie*. NOS Gezondheidszorg. <https://nos.nl/artikel/2332479-bmr-vaccinatie-geeft-mogelijk-milder-verloop-van-covid-19-infectie.html>
- Bryce Benda (2020, October 8). *How the scientific community can learn from failures*. Universiteit Leiden. <https://www.universiteitleiden.nl/en/news/2020/10/how-the-scientific-community-can-learn-from-failures>
- Chen, R. Y., Mostafa, I., Hibberd, M. C., Das, S., Mahfuz, M., Naila, N. N., Islam, M. M., Huq, S., Alam, M. A., Zaman, M. U., Raman, A. S., Webber, D., Zhou, C., Sundaresan, V., Ahsan, K., Meier, M. F., Barratt, M. J., Ahmed, T., & Gordon, J. I. (2021). *A Microbiota-Directed Food Intervention for Undernourished Children*. New England Journal of Medicine, NEJMoa2023294.
- Cooke, R. M. (1991). *Experts in uncertainty: opinion and subjective probability in science*. Oxford University Press.
- Kehoe, Rachel (2020, September 10). *A secret of science: Mistakes boost understanding*. Science News for Students. <https://www.sciencenewsforstudents.org/article/secret-science-mistakes-boost-understanding>
- Parkers Eileen (2019, January 10). *Scientific progress is built on failure*. Nature ISSN 1476-4687 <https://www-nature-com.ezproxy.library.wur.nl/articles/d41586-019-00107-y>
- Pennisi, E. (2021). *Food supplements that alter gut bacteria could 'cure' malnutrition*. Science.
- Pollack, H. N. (2003). *Uncertain science ...: uncertain world*. Cambridge University Press.
- RIVM (n.d.). *Risicogroepen*. Ministerie van Volksgezondheid, Welzijn en Sport. <https://www.rivm.nl/ziek-door-dier/risicogroepen>
- WHO (2020, September 18). *Coronavirus disease (COVID-19): Schools*. World Health Organization. <https://www.who.int/news-room/q-a-detail/coronavirus-disease-covid-19-schools#:~:text=So%20far%2C%20data%20suggests,in%20this%20age%20group.>

Appendices

Appendix 1 E-mail (Dutch) sent to a professor at my university during beginning of the Corona pandemic in the Netherlands explaining my theory.

 Reply  Reply All  Forward  IM



Thu 12-Mar-20 18:36

Sakic, Marija

Coronavirus klachten jong/oud

To

Mijn naam is Marija Šakić en ik ben een tweedejaars Food Technology studente.

Het coronavirus heeft onlangs Nederland bereikt en is vooral een bedreiging voor mensen boven de 70 jaar. Weinig gevallen van jonge mensen met het virus zijn bevestigd, vooral jonge kinderen (van alle gevallen in China was maar 0.9% jonger dan 9 jaar). Daarbij vertonen jonge mensen weinig ziekteverschijnselen en worden ze snel beter/ heeft hun lichaam de ziekte snel bestreden. Dit is opmerkelijk omdat jonge kinderen vaak, samen met ouderen, worden gezien als kwetsbaar voor ziektes (YOPI).

Experts zijn ook niet zeker waarom jonge kinderen minder vatbaar voor het virus zijn en relatief milde klachten ervaren als ze wel besmet raken. Ik heb hierachter een "reden" bedacht en kon er verder niks over vinden in de bronnen die ik heb bestudeerd; ik denk dat jongeren gevaccineerd zijn tegen een ander virus en dat deze vaccinatie wellicht ook nu hun immuunsysteem enigszins heeft "voorbereid" op het coronavirus waardoor zij snel genezen en weinig klachten tonen. Oudere generaties hebben deze vaccinatie misschien niet gehad.

Ik stuur u een bericht omdat ik niet weet hoe ik in contact kan komen met iemand die hier professioneel naar kan kijken en wellicht onderzoek naar kan doen. In het geval dat dit klopt, kunnen misschien (als dit veilig is) oudere generaties de vaccinatie alsnog toegediend krijgen om ze te beschermen tegen het coronavirus en het sterftecijfer van het virus omlaag te brengen.

Ik ben natuurlijk geen expert en ik weet niet of hier iets van klopt, maar het leek mij het toch waard om dit te delen als ik hiermee mensen kan helpen.

Ik hoop dat u mij kan helpen om contact te zoeken met de juiste persoon.

Met vriendelijke groet,

Marija Šakić

Sent: 13 March 2020 08:35:38

To: Sakic, Marija

Subject: RE: Coronavirus klachten jong/oud

Beste Marija,

Als microbioloog denk ik niet dat dit zo is, omdat juist ouderen meer grieprikken etc krijgen, dwz vaccinaties tegen virussen. Weliswaar geen coronavirus, maar toch.

Maar ja, ik ben geen medicus, noch viroloog. En die hebben we hier ook niet aan de uni (alleen planten virologen). Ik ken ook geen medisch virologen helaas. Ik kijk eens even rond of ik iemand in mijn LinkedIn heb die iets meer zou weten (als ik die heb laat ik het je weten), maar anders zou ik toch moeten verwijzen naar het RIVM...