Fact or Fiction?

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Treat Health Scares With Caution

Coffee causes cancer! Coffee prevents cancer![1] Drinking gallons of orange juice and popping vitamin pills will make you live longer! Drinking gallons of orange juice and popping vitamin pills will not make you live longer![2]

What study should one believe? Perhaps if you wait long enough, the study you choose to believe will be contradicted by some future research. This is not as far-fetched as it might seem at first blush. A recent study published in the *Journal of the American Medical Association (JAMA)* found that about one-third of studies published in three reputable journals didn't hold up. John Ioannidis looked at 45 studies published between 1990 and 2003 and found that subsequent research contradicted the results of seven of those studies (16%), and another seven were found to have weaker results than originally published. In other words, 32% did not withstand the test of time.[3] This translates into a lot of medical misinformation!

Ioannidis reviewed high-impact journals including *The New England Journal of Medicine, the Journal of the American Medical Association (JAMA)* and *Lancet,* along with a number of others. Each article he reviewed had been cited at least 1,000 times. Think about this number for a minute. How many of us who publish have had one of our papers cited at least 1,000 times? And within a span of only 13 years!

Examples of research subsequently shown to be ineffective or overstated included the idea that hormone pills protected menopausal women from heart disease, that vitamin E pills prevented heart attacks and that flavonoids reduced the risk of heart disease. Later studies showed hormone pills do not protect menopausal women from heart disease, vitamin E pills do not prevent heart attacks and flavonoids only modestly reduce the risk of coronary artery disease. A study involving a drug said to slow HIV disease progressions or treatments to prevent strokes showed positive results initially but subsequent work revealed results to be only modest, or to only have short-term effects.[3]

Here are more of the contradicted studies:

- Contrary to initial findings, human immunodeficiency virus type 1 did not improve survival in gram-negative sepsis.
- Despite initial claims of better oxygenation, nitric oxide does not improve survival in respiratory distress syndrome.
- Superiority of angioplasty over tissue plasminogen activator thrombolysis may be less prominent than originally proposed and pertinent mostly to specialized centers.
- Recombinant tissue-type plasminogen activator may improve outcomes in acute ischemic stroke, but benefit is limited and seen only when treatment is given very early.

In a number of cases, the explanation for the discrepancies may lie in precisely what you'd suspect, sample size. The smaller the group, the shorter the study, the more likely it may be that subsequent, deeper, investigation will contradict or alter the original thesis. Look at Table 1, which clearly verifies that sample size makes a noticeable difference.

And while on the topic of small sample size, here's a fact I've used many times, and perhaps you've done the same. I've heard and repeated the claim that 95% of all dieters never lose weight, and 95% of those who do will not keep it off. Guess where this statement comes from? Science writer Gary Taubes attributes it to University of Pennsylvania psychiatrist Albert Stunkard. The statement is based on 100 patients who passed through Stunkard's obesity clinic during the Eisenhower administration.[4] Talk about a small sample that's gotten a lot of press! As Taubes says, "Folks will cite something as gospel truth because they read it in a magazine."

Ioannidis also suggests that research pointing to possible therapies tends to get more attention than research with "negative findings," *e.g.*, that vitamin A does not protect against the recurrences of breast cancer.

Jonathan Knight discussed a literature review on 166 common genetic variants that had been linked to diseases such as heart disease or acne at least once, and which had been subject to association analysis at least three times. Consistent results were found for only six of the variants. This suggests that false positives and false negatives are all too easy to come by - and because there tends to be a bias towards publishing positive associations, it stands to reason that many genetic links to disease described in the literature are wrong.[5]

Other examples

The *Lancet* recently published a large study that failed to confirm a previous hypothesis that certain versions of the gene for apolipoprotein E make smokers more susceptible to heart disease.[6]

Another example has to do with acrylamide. For nearly three years, we've been warned about potential health risks from acrylamide, a chemical formed when foods containing high levels of carbohydrate are cooked at high temperatures (*e.g.,* frying or baking). Mara Burney reports, "The study made quite a splash; people were advised to avoid popular foods such as potato chips and coffee, and editorialists and activists alike called for a ban."[7] This scare was just another example of the misguided assumption that if a high dose of a chemical causes cancer in animals, exposure to even trace

levels of that chemical will cause cancer in humans. In the case of acrylamide, high doses increased the risk of mammary (breast) tumors in rats.[8] How high a dose in human terms? Someone of average body weight would have to eat 35,000 potato chips (about 62.5 lb.) per day for life to get an equivalent dose of acrylamide as the lab animals.[9] A more recent study, published in March 2005, found no evidence of an association between the amount of acrylamide consumed by over 43,000 Swedish women and risks of breast cancer. This paper also referenced three other case-control studies in humans that did not find an association between dietary acrylamide and cancer risk.[10] Have you heard about any of these four studies from the media? I doubt it. Only the bad news (even if it subsequently isn't shown to be bad) gets the press.

Most alarming with issues like acrylamide is the speed with which a single study can become fact - often with the assistance of a credulous or sensation-seeking media - or acquire a power it doesn't deserve in the hands of tort lawyers and activists whose central motive may be unrelated to improving public health.[11] Then we aren't told the study has proven to be in error.

Summary

Mara Burney sums this up quite well, "All of this does not mean that medical studies are of no value or that health reports are always wrong. It simply serves as a caution that science is fluid, not static or absolute. Study design, sample size and whether a study is prospective or retrospective in nature will all affect the outcome of a trial. Scientists require more than one study, regardless of how large or well designed that one may be, before they accept a result - and so should you. Every time that you see a headline claiming that X causes cancer or that Y prevents it, proceed with caution. A little skepticism may be just what the doctor ordered."[7]

Lastly, even in earlier times folks had problems like these as evidenced from these two quotes:

"If your doctor does not think it is good for you to sleep, to drink wine, or eat of a particular dish, do not worry; I will find you another who will not agree with him."
Michel Eyquem de Montaigne (1533-92)

"Part of the secret of success in life is to eat what you like and let the food fight it out inside."
Mark Twain

Table 1
Sample size versus results for some clinical research studies*

Study	Sample Size	Result
Endotoxin/sepsis	200	50% mortality reduction
	2000	11% mortality reduction
Nitric oxide/respiratory distress	9	Very effective
	535	No benefit
Angioplasty/thrombolysis	395	58% relative risk reduction
	2500	30% relative risk reduction
Stents vs balloon angioplasty	520	42% relative risk reduction
	10,000	10% relative risk reduction
Flavonoids/heart disease	805	68% relative risk reduction
	100,000	20% relative risk reduction

*John P.A. Ioannidis, *JAMA*, **294** (2), 218 (July 13, 2005).

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Test Your Plating I.Q. #422
By Dr. James H. Lindsay

Plating Ingredients

What do the following do in a plating bath?

1. Chelating agent
2. Buffer
3. Wetting agent
4. Leveling agent
5. Carrier brightener / secondary brightener

Answers on page 65.