**Reviewing Light to Moderate alcohol consumption as a cause for cancer**

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**This microreview takes a look at three articles based on cohort studies to review the science of alcohol as a cause for cancer from the past half-decade and determine the risk associated with drinking alcohol as a cause of cancer. Previous literature thought that there was no risk for the light to moderate drinker. Further analysis done by three different studies comprised of hundreds of more articles has since linked alcohol to cancer for the light drinker and quantified the risk associated with consumption. The results of the articles found that there is a 1.02-fold risk for those who have between 5-10 grams a day and a 1.2-fold risk for those who have 25 grams a day. This analysis enhances the idea that increased consumption of alcohol leads to increased risk of cancer induced by alcohol but their mechanisms remain unclear.**

**Introduction**

 Alcohol has been regarded as a cause for cancer in the field of science for a couple of decades. It wasn’t until the late 20th century that heavy use of alcohol was even shown in studies to have an increased risk for cancer outside of those who also smoked. Till this day exact mechanisms as well as overwhelming evidence to the extent of alcohol causing cancer still evades scientists. Although knowledge is always progressing in this field, the vast array of complexities that cancer envelop could cause many more decades of research until fully understood. The search for a link between alcohol and cancer has been a popular topic in science for the past two to three decades, and many still argue whether light to moderate drinking even increases a person’s risk for cancer. Studying the effects that any chemical has in our bodies is undoubtedly important, but with the consumption of alcohol being an across-the-board activity in almost every part of the world it makes for a compelling argument that it’s one of the most important consumables to study. The studies; *Light to moderate intake of alcohol, drinking patterns, and risk of cancer: results from two prospective US cohort studies*, *Alcohol consumption as a cause of cancer, and Alcohol consumption and liver cancer risk: a meta-analysis,* all bring new information or expand on pre conceived notions that had no evidence to support. Taking a look at the three studies talked about in this review, will not only provide evidence but deliver statistics with great precision for the topic.

**Recent Progress**

 Progress on the topic of alcohol and cancer has really taken off since around 1988 when alcohol was deemed a carcinogen by the International Agency for Research (Chuang, 2015). Since then, studies like the ones being reviewed in this paper have looked at specific cohorts to try and link alcohol consumption to cancer. However, because this process of cancer and mutations is so complicated and such a long-term process, well controlled studies and their analysis have mostly progressed in the 21st century. In just the past half-decade scientist have associated alcohol to almost all primary digestive organs and the liver. Recent progress has suggested that increased consumption as expected leads to increased risk and this risk does not deteriorate fully for at least 30 years after the stopped consumption of alcohol (Connor,2016). The current status on the extent of alcohol as a cancer-causing agent has mixed reviews in the scientific community. Many believe that just a small amount of consumption leads to no noticeable difference in risk while other studies claim that the risk is proportional to the amount consumed.

**Discussion**

 The article, *Alcohol consumption and liver cancer risk: a meta-analysis* really emphasizes on the most implicit cancer caused by alcohol in the liver. This article’s goal was to take a look into liver cancer caused by alcohol and compare the dose associated for risk of cancer. Because alcohol was already a confirmed risk this study wanted to crack down on the exact parameters that cause liver cancer by use of alcohol. They mention previous studies results that they did not find compelling, as the studies they stated found that only large amounts (40-60 grams of alcohol) on a regular basis was a cause for cancer. Their study was done by a literature search on pub Med with strict parameters on liver and alcohol consumption. Their statistical analysis used Meta-RR or, MRR which assessed all of the 300 studies that they pulled from PubMed and was used to investigate the combination or interaction of a group of independent studies. Their analysis found that consumption does have an effect on cancer risk to further support what has already been stated in the scientific community. More specifically their meta-analysis showed that for those who average 2 drinks or 25g per day could see a risk increase of 1.2x vs that of a nondrinker. This further supports the side of moderate intake = moderate risk vs no risk. While they found that the risk was small for those who drank moderately with no underlying conditions, cancer in those who drank with other health issues increased even more but usually not by enormous quantities.

 This study is very important to the field of medicine and even anyone who is a light casual drinker. It is amazing how these small unexplored concepts and comments made by scientist find their way into the general public. For those who might have heard the previous concept that light moderate drinking has no effect for the chance of liver cancer it has now been shown that it does seem to have a small proportional effect for risk. Many might already infer this themselves, but for anyone needing statistical and scientific evidence about liver cancer risk now is able to make a more informed decision for themselves. It is also important for anyone in the health field to have this knowledge and be able to reference this study for those that do not believe that drinking could increase their risk of health concerns. The importance of being able to further the knowledge and continue building the profile of risk association for such a commonly used substance could even help deter those from coming to abuse the substance if they have a genuine concern for their health.

 Expanding past the liver being a risk site the article, *Alcohol consumption as a cause of cancer* looks at all the sites that are believed to be a risk associated site for alcohol causing cancer. The basis of this review article was to take a deeper look into studies conducted for cancer in the sites that are in contact with the alcohol in the body. This included 7 sites that they claimed had been shown in other studies to have increased risk at the oropharynx, larynx, esophagus, liver, colon, rectum and female breast. While this study did not give their method of obtaining the articles, they reviewed to summarize their alcohol cancer assessment, they did a great job of providing straightforward information on the topic. Like the previous article this one found that increased consumption was cause for more risk of cancer. While their consumption parameters had slightly more range as far as consumption goes, they even went a step further to add in which cancer areas and types seemed to be more influenced as well as some preventative measures alcohol has in specific cancer types. As a whole however, they stated that more than 50g a day was shown to be somewhere between 4-7% increase in cancer. 50g is double the previously discussed 25g that the last article stated caused a 1.2% increase so they seem to complement one another as one would expect.

 This study is important because it re-emphasizes the previous discussion of increased consumption = increased risk. Their analysis of studies conducted on this topic adds to a quantifiable number for risk that expands on what people can take into consideration based on their knowledge. This study might be most important however, because of the areas it highlights can be at risk. All seven of the sites they described can be affected and this further demonstrates that it is not just the liver that is at risk but anything that alcohol comes into contact with, and with more studies it is likely that there are more sites than that. Another interesting topic that this article brought to light was the risk associated with drinkers that became sober from alcohol. They were able to access from a 2007 study as well as a more recent systematic review that the effects of risk for those who use to drink deteriorated 15% of the excess risk every 5 years. This was a great assessment to those who might worry of their risk after the fact because the articles that have quantified the drinkers risk based on the amount of their consumption can calculate where they are in their risk in the present and future. However, using this metric it takes slightly over 30 years of sobriety just to negate the cancer risks at these sites and with further studies on this subject could show prolonged reversal for those who drank more before quitting. And this was only an assessment for the risk of cancer so other health related issues tied to alcohol may not be reversible. Either way this is good news regardless for anyone assessing their risk of past alcoholic choices.

 The last study of this review titled: *Light to moderate intake of alcohol, drinking patterns, and risk of cancer: results from two prospective US cohort studies* takes a very specific cohort and information to expand on the effects of light to moderate alcohol consumption. Their consumption was calculated on the same grams per day basis as the other articles mentioned but added another dynamic to it by taking into consideration the type of alcohol consumed. This category seemed like an important aspect that the other articles neglected to take into consideration the separation of beer, wine, and liquor. They also used 121,700 female nurses aged 30-55 years and g 51,529 male health professionals aged 40-75 years for their statistical analysis which gave a much more similar constructed background of those being used in the study. They also made adjustments for a large parameter of cancer factors such as; race, height, body mass index, family cancer history, and much more which likely gave them much more accurate real world results compared to the other two studies in this review. On top of this their study took into consideration physical activity associated with how much people drank and reiterated that heavy drinkers on average were more likely to smoke, all of these parameters taken into consideration have shown that they play a large role in cancer risk even outside of alcohol consumption.

 Their results were almost identical to the other studies with their risk assessment. In those that only drank between one to five grams a day showed an increase of only 1.02% and those who drank 15g per day saw a risk increase of 1.13. This is very complimentary to the numbers seen by the other two studies even with its strict criterion. This study was important regardless because it emphasized throughout that there were many other factors that have to be taken into consideration for cancer risk. Height, weight, body mass index, race, as well as physical activity are very important players to the overall health and risk association of an individual.

 Each article gives its own criteria and analysis on the association of cancer and alcohol. Each in common having its own large cohorts and literature searches to encompass many of the studies conducted so far in order to analyze the risk between alcohol and cancer. It has been well documented that there is a risk, but these articles were able to put into a percentage that can be understood by the general public. Not only did they each achieve this but their findings all complimented or even matched one another even with a different method used across all 3 articles. This further reinstates their findings to be more believable and more reliable to take and use for the general scientific knowledge on the subject.

 Further research that could be beneficial to the subject would be proof in the mechanisms of how alcohol causes cancer. It is surprising that this has not been proven yet given that alcohol has been known to modify DNA for many decades now. Further research showing how exactly the cancer is caused by this could prove useful in the field of cancer and even hopefully lead to a cure in optimistic future generations.

Cancer is such a complex science but with each and every detail that scientist find to add to our understanding the closer we are to understanding how it works and hopefully how we can stop it. While it is rather unlikely alcohol studies will provide an appropriate answer to how and why cancer operates, any additional information could be used to determine how to eventually end cancer and or cancer death. Another area of research that would be beneficial to the topic would be further elaborating and studying the reversal effects of not drinking over time and looking at how many years of alcohol consumption it takes for risk to be relevant.

 *Alcohol consumption as a cause of cancer* anticipates that much like with smoking companies the alcohol companies will take opportunistic shots to discredit the science at hand which could be an uphill battle that was observed with Tabaco for so many years.

 Limitations of this study likely include the frequency of doses. As observed from each article each drink had to be not only estimated in alcohol percentage of the drink but how many times a day. There is no real way to quantify the amount as each day is different and for light to moderate drinkers many might have went periods of time with no drink. While the articles estimates were good based on the information at hand, it is a limitation that there is no practical way to have an exact time and amount of each person’s drink throughout their lifetime. Another limitation could be geographical region of those in the study analysis because location is a crucial part of all cancers. Most importantly though our diet and digestive organs are affected by location when in regard to cancer. These studies used cases from all over the world which might’ve heavily averaged out the outliers of this study if there were any based on their geographical location. In addition to these, the time of alcohol consumption was lacking in these studies. There seemed to be no consensus on the number of years the individual had been drinking alcohol and when they were analyzed by the studies.

 Like with all scientific research there is much to learn still on the subject of alcohol and cancer in general and as synergist together. More studies seemingly can continue to quantify risk of cancers of all types and locations in the body. With so many risks associated with carcinogens that cause cancer adding to that list is not good in the sense of causing cancer, but good as in it can help the general public be more informed in the decisions they make. A risk for the responsible drinker being only 1.2% respectively will likely not have an effect on those who take much higher risks in other daily activities but at this point in the science we cannot negate that it is a risk and the preconceived notion that there is not a risk associated with light alcohol consumption seems to be dated by the science of the last couple years.

**References**

Connor, J. (2016). Alcohol consumption as a cause of cancer. *Addiction*, *112*(2), 222–228. https://doi.org/10.1111/add.13477

Chuang, S.-C., Lee, Y.-C. A., Wu, G.-J., Straif, K., & Hashibe, M. (2015). Alcohol consumption and liver cancer risk: a meta-analysis. *Cancer Causes & Control*, *26*(9), 1205–1231. https://doi.org/10.1007/s10552-015-0615-3

Cao, Y., Willett, W. C., Rimm, E. B., Stampfer, M. J., & Giovannucci, E. L. (2015). Light to moderate intake of alcohol, drinking patterns, and risk of cancer: results from two prospective US cohort studies. *BMJ*. https://doi.org/10.1136/bmj.h4238