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Why Flight Attendants Are More Prone to Cancer Than the General Population

Analysis by Dr. Joseph Mercola | November 25, 2023

STORY AT-A-GLANCE

- While previous research has found flight attendants have higher rates of breast cancer and melanoma, research expands that list, finding the same trend for non-melanoma, uterine, cervical, gastrointestinal and thyroid cancers as well
- Compared to the general population, female cabin crew report 1.5 times higher rates of breast cancer, over twice the melanoma and four times the rate of non-melanoma skin cancer
- Breast cancer rates are also higher among flight attendants with multiple children, which is surprising as childbirth and breastfeeding lower a woman's risk of breast cancer
- Explanations for the elevated cancer risk among flight attendants include circadian rhythm disruptions due to irregular work schedules, exposure to carcinogens such as pesticides, fire retardant chemicals and jet fuel, and exposure to high levels of cosmic ionizing radiation
- I describe an inexpensive supplemental strategy to radically lower the damage from exposure to gamma radiation by commercial flying

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While many professions have health risks, some have a particularly high risk for cancer. Female firefighters aged 40 to 50 are six times more likely to develop breast cancer than

the national average, for example, thanks to the high levels of dioxins and furans firefighters are exposed to when flame-retardant chemicals burn.

Shift workers are also at high risk for cancer due to disrupted circadian rhythms and inhibited melatonin production. In fact, the International Agency for Research on Cancer, a research arm of the World Health Organization, classified shift work as a probable human carcinogen in 2007.[1] Another high-risk group is flight attendants, who have higher rates of cancer than the general population, and that includes every cancer examined.

Flight Attendants Have Higher Risk for Cancer

While previous research has found flight attendants have higher rates of breast cancer and melanoma, research[2,3] published in Environmental Health expands that list, noting the same trend for every cancer examined, including non-melanoma, uterine, cervical, gastrointestinal and thyroid cancers.

Compared to the general population, female cabin crew report 1.5 times higher rates of breast cancer, over twice the melanoma and four times the rate of non-melanoma skin cancer. Interestingly, only male crew exposed to secondhand smoke had significantly higher rates of these cancers. According to the authors:

> *"We also found associations between each five-year increase in net job tenure as a flight attendant and non-melanoma skin cancer among females, with borderline associations for melanoma and non-melanoma skin cancers among males. Overall job tenure was not related to breast cancer, thyroid cancer, or melanoma among females …*
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> *Consistent with previous studies reporting on cancer incidence and mortality among flight attendants, we report a higher prevalence of breast, melanoma and non-melanoma skin cancers (comprising basal cell and squamous cell carcinomas) among this occupational group relative to the general population.*

> *This is striking given the low rates of overweight and smoking among flight attendants in our study population, which we take to be indicators of general health and healthy behaviors, as well as being independent risk factors for some cancers."*

Breast cancer rates are also higher among flight attendants with multiple children, a finding that surprised researchers since childbirth and breastfeeding lower a woman's risk of breast cancer. According to the National Cancer Institute, a woman who has given birth to five or more children has half the risk of those who have not given birth.[4]

Risk Factors Associated With Frequent Flying

What's causing this elevated cancer risk in flight crews? Like shift workers, flight attendants often work irregular schedules, and circadian rhythm disruptions have already been identified as a risk factor for cancer.[5] Other possible explanations include exposure to carcinogens such as pesticides, fire retardant chemicals and jet fuel, and exposure to high levels of cosmic ionizing radiation,[6] all of which are known to raise your cancer risk.

As a general rule, European aircrews are better protected from ionizing radiation, as exposure to ionizing radiation is monitored and doses are limited by law in Europe. No such dose limits exist for American flight crews. The goal of the present study was to gather evidence that can be used to, hopefully, create safer work rules for American airline workers.

It's also worth noting that while few studies have assessed the risk faced by frequent fliers, there's reason to suspect their risk for cancer would be similar to that of flight attendants, although matching a flight attendant's frequency of flight would be a challenge for most frequent fliers.

Cosmic Radiation Is a Significant Health Hazard in Large Doses

According to the authors, the results suggest several environmental exposures — including ionizing radiation, circadian rhythm disruption, past exposure to secondhand smoke during flights (for those who worked during years prior to the in-flight smoking ban) and a variety of chemical agents with known carcinogenic potential — contribute to flight crews' elevated cancer risk, although ionizing radiation may be one of the most significant factors. On the issue of cosmic radiation, the researchers note:

> *"Ionizing radiation is a known causal factor for non-melanoma skin cancer and breast cancer, whereas the studies regarding melanoma in relation to ionizing radiation are more conflicted.*
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> *It should be noted that cabin crew have the largest annual ionizing radiation dose of all U.S. workers (e.g. 3.07 mSv vs. 0.59 mSv for U.S. Department of Energy workers). These exposures can easily exceed guidelines released by the NCRP or the International Commission on Radiological Protection.*
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> *Although we evaluated job tenure prior to age 45 or age 40 in relation to cancer prevalence, in part to isolate the potential effects of ionizing radiation exposure at younger ages, these restrictions generally did not meaningfully alter our results.*
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> *This may be because ionizing radiation exposure is also important to cancer risk at older ages, and because it is difficult to disentangle the relevant exposure years in our study population, which has a median tenure of 19 years of employment and for which cancer diagnosis date was not recorded.*
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> *One possible exception is for breast cancer, for which associations were somewhat stronger when evaluating tenure prior age 45 rather than lifetime tenure. These results, while imprecise and requiring replication in a study that estimates cosmic ionizing radiation exposure directly (rather than using tenure as a proxy), may suggest that flight-related exposures are most important to breast cancer risk when occurring at earlier ages."*

My New Research Paper

I am in the process of writing three books, and about three months ago I went on a deep dive tangent seeking to compile a coherent explanation of how EMFs damage your biology. I now believe I have compiled a unified explanation for how nonionizing and ionizing radiation exposure that occurs during commercial air travel causes DNA damage and, more importantly, how it can be effectively biologically remediated.

I have read thousands of pages of detailed scientific studies thus far and have compiled a 50-page document with over 200 references. The paper has been reviewed by Dr. Martin Pall, Thomas Seyfried and an associate of Dr. Richard Veech, along with a few other molecular biologists, and I have gotten much positive feedback. There's still more work to be done, but I hope to publish the paper later this year and make it available to all.

When I saw this study documenting the health effects of commercial air travel, I thought I should share some highlights of my paper. The damage observed in this study is largely a result of subatomic particles from the sun and deep space that bombard the Earth's atmosphere.

When you are flying at 30,000 feet, reactions between those particles and the atmosphere produce secondary particles. Those secondary particles penetrate planes, and your skin, where they can damage your DNA unless you are properly protected.

How Ionizing Radiation Causes Damage

Commercial flight at 35,000 feet will expose you to ionizing radiation, but you are also exposed to them during X-rays. CAT scans are far worse and should be avoided if at all possible. MRIs typically can be substituted and do not damage your DNA like CAT scans do. So, the protocol I describe below not only can be used for air travel, but also for unavoidable X-ray exposures.

There is no question that exposure to the high-energy frequencies of ionizing radiation will cause single and double strand breaks in your DNA. The real question is, how does your body repair the damage? Fortunately, we have built-in repair systems that can accomplish this. There is a family of 18 enzymes called poly ADP ribose polymerases (PARP) that function as DNA damage sensors. PARP binds to both single- and double-stranded DNA breaks.[7]

On binding to damaged DNA, PARP forms long branches of ADP-ribose polymers that may reach up to 200 units on target proteins such as histones and PARP itself.[8] However, this repair process results in cellular energetic NAD+ depletion and, ultimately, when PARP is overactivated, necrosis by bioenergetic collapse. PARP was not known when I was in medical school. It was first described in 1963.[9]

When your DNA is damaged, PARP is activated to repair the damage. This activation, however, is correlated with loss of mitochondrial potential and decreases mitochondrial oxygen consumption along with steady reductions of cellular NAD+.

This slows the rate of glycolysis, electron transport and ATP formation, and eventually leads to functional impairment or death of cells, as well as upregulation of various proinflammatory pathways, and in the worst case scenario, irreversible damage and necrotic cell death.

If you didn't already know, NAD+ is one of the most important metabolic cofactors in all eukaryotic cells, as it plays a critical role in regulating cellular metabolism and energy homeostasis through redox balancing. NAD+ in its reduced form (NADH) serves as the primary electron donor in the mitochondrial transport chain resulting in ATP production.[10]

The key to note here is that the primary fuel for PARP is NAD+. It appears that if you supply your body with NAD+ by supplemental precursors, you can radically limit the damage the ionizing radiation will cause, as PARP will have enough fuel to repair the damage.

How to Remediate Gamma Radiation While Flying

There are actually three strategies that can be taken. The first is to augment NAD+ levels, the second is to increase your ketone levels and the third would be to activate the Nrf2 antioxidant pathway.

- **NAD+ —** There are four dietary NAD precursors: niacin, nicotinamide, nicotinamide riboside (NR) and nicotinamide mononucleotide (NMN). You can also use IV NAD+ but that is obviously not possible while flying, and I'm not sure I would advise it even if it were possible.

  The least expensive way is to purchase niacinamide powder and take 50 mg three times a day, That is difficult to weigh so it is better to get a set of stainless steel teaspoons and use 1/64 of a teaspoon in water.

- **Ketones —** Ketones are another great strategy to lower oxidative damage from ionizing radiation. Unlike antioxidants such as vitamin E, C and glutathione, which are highly charged molecules that cannot easily penetrate cellular membranes if you supplement with them, ketones are readily transported into the cell via a monocarboxylate transporter, and once inside the cell ketones do their magic.

  Part of the magic is that they increase NADPH, which is the primary way that your antioxidants are recharged. NADPH supplies the electrons to recharge C, E and glutathione. But it gets even better, as ketones are potent histone deactylase (HDAC) inhibitors and activate FOXO3a, which causes your body to produce antioxidants inside your cells that can be readily recharged by the increased NADPH.

  There are supplements such as ketone esters and salts that can increase your levels to 0.5 to as high as 8 mmol. The esters are far more effective but also far more expensive. The D isomers likely are far superior to the racemic versions. They are pricey though and cost $1/gram and one typically needs 15 to 25 grams. KetonAid is a good example.

I will discuss these more in future newsletters, as this is a new field and there are new supplements that are coming to the market. You might be interested to know that NASA is currently testing the use of ketones for the space program to decrease oxidative damage in space.

- **Nrf2 Activation —** The Nrf2 is the master antioxidant pathway that regulates the expression of antioxidant proteins that protects you against oxidative damage triggered by injury and inflammation. It is similar in many ways to FOXO3a. You can activate this pathway with healthy cruciferous vegetables like broccoli sprouts that are loaded with sulforaphane.

  Other easy ways to activate it would be through molecular hydrogen. I prefer the high dose (9 mg/liter) nanobubble tablets that you can take several hours before your flight, as it takes a number of hours for them to maximize their antioxidant expression. CBD is also another excellent Nrf2 activator, but it also takes several hours to be maximally effective.

- **Exercise —** We all know exercise is fundamental to good health, but why is it good for DNA damage from ionizing radiation? Very simply, exercise is known to stimulate the transcription factor PGC-1 alpha, which is the most potent stimulus for mitochondrial biogenesis known, and we all appreciate how fundamental mitochondria are to your health.

  But PGC 1-alpha also activates FOXO3s and Nrf2 that cause your body to produce more glutathione, superoxide dismutase and catalase, which will radically lessen the oxidative damage from the ionizing radiation.

Simple Strategies Can Lower Your Cancer Risk

While the recommendations above apply to airline workers and frequent fliers specifically before and during flight, there are also a number of other lifestyle strategies that can help lower your risk of cancer. If you're in the air a lot, you'd be wise to tackle your risk from several angles, including the basics below:

Address your diet and eating schedule — Control your insulin level by limiting your intake of processed foods and sugars, especially fructose, as much as possible. This is one of the most powerful ways to reduce your cancer risk. By avoiding processed foods, you'll also minimize your exposure to pesticides, herbicides, genetically engineered ingredients and factory farmed foods. Ideally, choose organic or biodynamic locally grown whole foods whenever possible.

Once you're used to eating whole foods, seriously consider switching to a cyclical ketogenic diet, and then intermittent feasting and fasting. You'll find the exact steps detailed in my book, "Fat for Fuel." (A cyclical ketogenic diet along with fasting are also important allies in cancer treatment.)

Again this approach will increase ketones which have benefits describe above. Lastly, boil, poach or steam your foods rather than frying or charbroiling them to avoid the creation of acrylamide, a known carcinogen. Avoid all processed meats for the same reason.

Optimize vitamin D and omega-3 — Make sure your vitamin D and omega-3 levels are both optimized. In a study[11] published in 2010, data collected over a decade from more than 67,000 women showed that women with high vitamin D levels were at a significantly reduced risk of breast cancer. For health and disease prevention, aim for a vitamin D level between 60 and 80 ng/mL and an omega-3 index of at least 8%.

Exercise — One of the primary reasons exercise works is that it drives your insulin levels down. Also make sure to get more movement into your waking hours. Simply sitting less can make a profound difference in your health.

Minimize your exposure to electromagnetic fields (EMF) — This includes both wireless technologies and household wiring. To learn more, see "The Harmful Effects of EMFs Explained."

Address emotional factors — Have a tool to permanently erase the neurological short-circuiting that can activate cancer genes. My particular favorite tool for this purpose

is the **Emotional Freedom Techniques**.

Optimize your sleep — Aim for seven to nine hours of **high-quality sleep** each night. The researchers acknowledged that the jet lag could be an issue and I believe they were right on target as NAD+ is under tight chronobiological control and disruption of your circadian rhythm will clearly lower your NAD+ levels.

Detoxify your home and your body — Reduce your exposure to environmental toxins like pesticides, household chemical cleaners, synthetic air fresheners and air pollution, and take steps to detoxify. One of the simplest and perhaps safest ways is to use a low EMF, infrared sauna coupled with a near-infrared light, as your skin is a major organ of elimination.

Breastfeed after giving birth — Breastfeed exclusively for up to six months. Research shows this too will reduce your breast cancer risk.

Blood Tests That Help Reveal Your Cancer Risk

While a healthy diet and lifestyle are recommended for everyone, a number of standard blood tests can help you determine your cancer risk, thereby putting you on notice that more radical lifestyle intervention may be prudent. Dr. Leigh Erin Connealy, whom I've interviewed on this topic, details these tests in her book, "The Cancer Revolution: A Groundbreaking Program to Reverse and Prevent Cancer." Valuable blood tests include:

- High-sensitivity C-reactive protein (CRP) test, which is a nonspecific marker for inflammation. Ideally, you'll want your C-reactive protein to be below 1
- Hemoglobin A1C test, which reflects your blood sugar over the past 90 days. The reason for this test is because high blood sugar is a cancer-friendly environment
- A cancer profile test (fasting blood and urine) from American Metabolic Laboratories, which checks for:

Quantitative human chorionic gonadotropin (hCG)
Phosphohexose isomerase (PHI), the enzyme of hypoxia or low oxygen, which allows cancer to thrive
Dehydroepiandrosterone sulfate (DHEA), a stress hormone
Thyroid hormones, as low thyroid levels may predispose you to cancer
Gamma-glutamyl transferase (GGT), a liver marker and a sensitive screening tool for inflammation
Arachidonyl-2-chloroethylamide (ACEA), a nonspecific marker for many cancers

- ONCOblot, which can identify up to 33 tissue types of cancer and has a 95% accuracy rate. It measures the ENOX2 protein
- Circulating tumor cell test by the Research Genetic Cancer Center. The vast majority of people die not from the tumor itself but from circulating cancer stem cells, which allow the cancer to metastasize and spread throughout the body. This test is used after cancer treatment, to determine whether or not you might need to continue an anticancer program

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