

Welcome to the forensic toxicology podcast. This podcast is on the topic of volatile organic compounds, also known as VOCs. Let's consider our first case, rehab, rivers versus Air Canada 2010. OHSTC 11 CanLii. On March 14th, 2005. Ms. Rivers occupied the position of in-charge flight attendant. She was scheduled for work on a flight number 101 on an aircraft Airbus model a three-two-one departing from Lester B. Pearson International Airport, in Toronto to arrive in Vancouver and then return to Toronto that day. Ms. Rivers, who learned that one of the aircraft's two air packs was broken and she invoked her right to refuse dangerous work. The employer contacted Hso gas and he conducted an investigation to the work refusal. The grounds of ms.

Rivers refusals were based on a previous incident in 2004 when she operated in a three-two-one aircraft under similar circumstances with one broken air back. During that, flight she became ill and experienced symptoms consisting of headache, nausea, fatigue, and a lack of coordination. Now, based on all the available evidence, and Mr. Shirreff argued that it is not possible to ascertain with any degree of a certainty whatsoever what lead to the symptoms

reported by Mrs. Rivers in 2004 flight, even if it is to be assumed that there was an exposure event, the following is not known. For example, in this case it was not known. What's the specific type of volatile organic compounds and their concentrations level during the flight. It was not known what the concentration of total VOC was during the flight. Was not known whether the type and concentration of VOC or the total VOC actually present, it would generally be expected to cause the type of symptoms that Ms Rivers reported. The lastly, what it was not known is if so, the relative significance of operating with the broken air pack in the circumstances were also not known at the time. This case clearly shows that volatile organic compounds, VOCs, could be present in the work-related environments. However, in this case, we do not have clear indication of what type of chemicals present. We don't have clear indication of concentrations being measured. We have asymptomatic person linking the symptoms to the current air packs being broken at the time. In the first case, what you heard is really a possibility of VOCs being present in the workplace. And how one is trying to connect to the presence of VOCs to their symptoms at the time. However, that case really lacked details with respect to the type of concentrations of the VOCs altogether. Let's look at the second case, specifically the decision number 2301 slash 09I, 2010, ONWSIAT 936, CanLii. Let's jump into this case. But what you will see is a significant difference between this case number two and case number one. Specifically, you will hear chemical names and you'll also hear concentrations. Let's jump into it. At the hearing, the worker testify that in 1988, she began her employment with the accident employer a company that manufactures silicone rubber seals and related products for hydraulic and other industrial application. The worker continued her employment with the accident employer until 2004 when according to her testimony, she laid off work due to symptoms that she attributed to her workplace. So in 2005, years later after the work ended, and industrial hygiene and environmental consultant performed an air monitoring study the employer's premises where the worker was employed. A report under study was included in the case materials and the copy of the report will be provided to the medical assessors retained for this case. The sapling methodology was also outlined in the report. Report basically noted that the sampling strategy was established by management and employee representatives in conjunction with the consultant based on a walk-through survey of the plant and process review regarding applicable material safety data sheets, MSDS. It also indicated that personal samples were collected for formaldehyde and VOCs, volatile organic compounds from three workers performing heat press operations in the East and West Wing of the plant. And the two workers in the so-called white room. What you see here immediately is that this case is quite different from the first case because here we have a environmental consulting performing air monitoring study and that was not available in the case one. So how did they go about sample collecting and monitoring? Samples were collected for quartz silica, respirable and total particulate formaldehyde volatile organic compounds. Methyl isobutyl ketone, methyl ethyl ketone, xylene and ethylbenzene. You can quickly see here that many of these are very highly volatile organics that are liquid state, that have very low boiling point, so they can go into vapor phase. You recognize Benzene and it's analog such as xylene shown here. Analytically. No detectable airborne quartz silica particles was found in the personal samples elected on the extruder operators and in the personal sample collected on the work in the micro room. The quartz silica exposure for all three workers were calculated to be below the current zero-point ten mg per meter cubed time-weighted average exposure value. Those workers were tested. But of course, the quartz silica particles was tested. two personal respirable particulate samples collected on the extruder operators revealed exposure of about 0.098, which is still below 0.25 mg per cubic meter, which is below the three MG per cubic meter time-weighted Exposure value for total respirable particulate, so-called NOC. The two MG per cubic meter for talc. Analytically, no detectable, respirable particles such as silica was found in the personal sample collected on the finishing area, employee working in the mica room. The respirable particulate exposure for this worker was calculated

to be well below 34 total particulate and the dock ducks. So we see the particulates are not of interest here and they're very low. The Personal exposures for total particulate found for the extruder operator, whereas 0.39 mg per cubic meter and 0.43, which is also well below ten mg per cubic meter for total particulate. Now, while silica particulate were very low positive formaldehyde exposures were found for all seven personal samples collected. Positive formaldehyde may come from decomposition products from the rubber products. These exposures ranged between 0.0073 ppm all the way to 0.06 ppm, depending on the operator. All exposures found were below the current one ppm value cutoff and the proposed 0.3 ppm ceiling exposure value. They were still found to be present but low below the cutoff point. The positive VOC exporters were found in two of the seven personal samples collected around 3.3 mg per meter per cubic meter for the Desma 23 operator in the white room. And about 9.4 mg per cubic meter for the extruder operator, the VOC for DEsma 23 operator sample, were tentatively identified as acetone, methylene chloride, and n-butyl acetate. And these are of course, well-known VOCs. The VOC for the extruder sample were identified as unknown high boiling point hydrocarbons. Very interesting and were not identified. Now in general, the solvents present, such as methyl isobutyl, ketone methyl ethyl ketone xylene and ethylbenzene associated with the primer adhesive and their respective thinners were detected in both the personal sample collected on the worker, carrying out the mixing and spraying in the area collected in the primer room. All solvent levels on an individual and a combined basis were found to be below regulated exposure criteria. Conclusion, this case shows us that incremental testing was performed on particulate on well-known volatiles in various plant locations on various instruments while they are solvents, VOCs detected, identified formaldehyde as well. The actual levels were well below the cutoff point and the particulates that were found all across the plant. We're also well below the kind of in addition to the economy cases we talked about on the topic of VOC, you can also find VOC information specifically under Health Canada website in the section of volatile organic compound. This document clearly described that most people are not affected by short-term exposure to the low levels of VOC now typically found in home. However, the long-term exposure to low levels needs to be more understood and better understood. And we still don't know the health effects from these kinds of exposures. Now the long-term exposure to high levels of the VOC, however, can have a significant effect on the human health. For example, in industrial workers, exposure to high levels of some of the VOCs had been linked with increased cancer rates. For example, VOC such as benzene formaldehyde. And you can see these compounds resonating with the second case that we heard about, the low-level is typically found in homes. There is essentially no risk of developing cancer for both benzene and formaldehyde. Now, all of the cancer risk for formaldehyde in homes is negligible. It may cause irritation if levels exceed. Health Canada's residential indoor air quality for formaldehyde regulation. What are some indoor sources of VOC based on the Health Canada list? Vehicle exhaust, cigarette smoke, building materials, household products, off-gassing from furnishing and so on. This site also has a nice list of volatile organic chemicals, such as formaldehyde, benzene you've heard about, but also list organic such as xylene, acetaldehyde, toluene, ethylbenzene, and naphthalene. Those are listed as volatile organic compounds. And you can actually go and explore each one of them if you're interested. You just heard the forensic podcast on the topic of VOCs. I hope you enjoy that.