

## Summary JFES Study Report

### **Background:**

This study of RAAF workers involved in the four formal F-111 Deseal/Reseal programs expanded earlier work undertaken by Prof Bowling following the 2001 F-111 BOI, and was recommended in the 2008/2009 JSCFADT F-111 Inquiry Report (Recommendation 18). Following government approval, the Study was announced by the then Minister for Veterans' Affairs in December 2010 in Brisbane, and the study formally commenced in March 2011.

The study utilised the latest university and medical research technologies into molecular and genetic aspects of cell biology.

This Defence-funded 3 year, \$3M Jet Fuel Exposure Syndrome (JFES) Study Report was completed on budget and on time by Prof Frank Bowling and his Mater Medical Research Institute/University of Queensland researchers on 31 July 2014. It was presented to Defence and DVA in September 2014 and has been subsequently externally peer reviewed.

The purpose of the JFES Study was to investigate whether any changes in cell biology could be found that might help explain some of the health effects reported in former F-111 Deseal/Reseal workers.

The effects of jet fuel (JP8) and its individual components, as well as the solvents used in the Deseal/Reseal processes, were investigated in laboratory studies using a cell toxicity model developed specifically for the project. The JFES Study also compared blood cells of volunteer former F-111 Deseal/Reseal personnel with age-matched controls.

### **Key Findings:**

The study demonstrated adverse cellular effects from JP8 fuel, predominantly from the kerosene component. Other fuel components varied in their effects on cell function. These findings were consistent with other recently reported studies.

In contrast, the specific Deseal/Reseal solvents (SR51 and SR51A), demonstrated either low cell toxicity or significantly lesser toxicity than jet fuel components. However, toxicity increased when solvents and fuel were mixed. The relationship between adverse cellular effects and the exposures during Deseal/Reseal employment could not be established.

Although the health effects of fuels and solvents mainly affect those parts of the body directly exposed (such as skin and lungs), the study reported that fuel components can be transported around the body attached to lipids in the blood. The report postulated that other organs besides the skin, lungs and the nervous system may be exposed to the JP8 fuel components. The clinical significance of this finding is not yet known.

Reassuringly, the study did not find any evidence of genetic or chromosomal damage in cells exposed to JP8 fuel or the Deseal/Reseal solvents (SR51 and SR51A). Some minor but consistent changes were noted in some cellular functions, but these could not be attributed directly to the JP8 or solvent exposure. Such changes have been observed following environmental and lifestyle changes. Such changes in cellular function are thought to be adaptive and reversible. None of these adaptive changes are known to have immediate or severe health consequences. However, the longer term clinical significance of such changes in cellular function is currently unknown. It is postulated that healthy lifestyles may potentially reduce any adverse effects of these changes.

The studies of peripheral blood cells did not detect any chromosomal changes, or any changes in the mitochondrial DNA compared with age matched controls. There were no mutations detected that would indicate an increased risk of cancers.

The previous studies of solvent and fuel-exposed workers showed lower self-reported health assessment ratings than controls. The current study did not reveal any dose-response gradient in relation to level of reported exposure and cellular function.

The report appropriately recognises the limitations of this study due to relatively small numbers and possible selective processes in recruiting exposed personnel to participate in the study. Also a number of years have passed between exposure and this study of molecular and cellular changes. The research into cell biology and the interaction between genetics and environmental exposures is also still very much in its infancy, and the clinical significance of the current findings remains to be elucidated.

In summary, the JFES Study has demonstrated that both JP8 fuel and, to a lesser extent, the Deseal/Reseal solvents have the capacity to cause cellular toxicity. However, the clinical significance and the relationship of these changes to the degree of exposure is unable to be determined at this stage. There was no evidence of any genetic or chromosomal damage.

The study did detect small changes in the cells of exposed workers which may influence processes within the cells of some tissues. However, the possible significance of these changes regarding human health is currently unknown.

### **Recommendations:**

On the basis of the outcomes of this study:

- Exposed veterans should be reassured that the changes to cellular functions detected are not expected to have immediate or adverse effects on their health.
- Practical efforts to minimise personnel exposure to JP8 fuel, its components, and solvents should continue.
- Consideration should be given to the appropriateness of monitoring other Defence workers who are or have been occupationally exposed to fuels and solvents.

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