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Study reveals tobacco's toll on women's placentas

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Smoking while pregnant causes severe DNA damage to cells in the placenta and significantly impairs its function, new University of Otago research suggests.

The new findings emerge from an analysis of 236 placenta samples donated by women in the Otago Placenta Study (OPuS) after delivery. Of these women, 52 smoked throughout their pregnancy, 34 gave up smoking four weeks before delivery or earlier, and the remaining 150 were non-smokers.

The study results will appear in the January edition of the international journal *Human Pathology*.

Lead author Dr Tania Slatter of the Department of Pathology says smoking in pregnancy has long been linked to lower birth weights and increased risk of serious complications, though the exact mechanisms are unknown.

Now, Dr Slatter and colleagues have identified greatly increased rates of double-strand DNA breaks in smokers' placental cells. Such breaks are a severe form of DNA damage that can lead to cells becoming genetically unstable.

They also found that the more cigarettes a woman smoked, the greater the DNA damage.

"Our study also showed a clear link between higher rates of double-strand breaks and lower birth weights and earlier delivery in mothers who smoked," Dr Slatter says.

Moreover, the researchers found evidence of impaired placental cell function through reduced expression of at least three proteins key to foetal nourishment and growth. Additionally, DNA repair mechanisms in placental cells showed signs of being compromised in the smoking group.

Dr Slatter says previous research had identified another type of placental DNA damage in smokers, known as DNA adducts, but her team is the first to show that double-strand breaks also occur.

DNA damage levels in the placentas of 34 women in the study who had been smoke-free for more than four weeks before giving birth were found to be similar to that of non-smokers and their DNA repair mechanisms appeared to be working properly once more.

"This finding reinforces the message that women who are smoking in pregnancy can still reduce their chances of complications—and potentially give their child a better start— if they quit. Of course, it is vastly preferable to be a non-smoker during pregnancy, but this research highlights that it is still better to quit late than never."

Dr Slatter and her co-authors, who included pathologist Dr Noelyn Hung and obstetrician Dr Celia Devenish, thanked the families in the study who donated samples of their placentas and the midwives who supported their participation. The project was funded by the Healthcare Otago Charitable Trust.

Provided by University of Otago