

# Comment on MPI Technical Paper 2014/24

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## Introduction

I have been asked by Catherine Cheung of Climate Justice Taranaki to comment on the scientific validity, or otherwise, of a report entitled “Report on the Targeted Surveillance of Milk from Animals Potentially Exposed to Petrochemical Mining Wastes”, technical paper no. 2014/24 issued by the Ministry of Primary Industries, August 2014. The report is anonymous.

## Summary Comment

From a scientific viewpoint, if the objective was to determine if cows were being exposed to drilling wastes, it is difficult to give the study any credibility. If the objective was to determine if the presence of petrochemical compounds in milk represent a health hazard, that has only been partially answered (and the answer, for the compounds tested, is probably not, but note endocrine disrupter effects below). However, potentially the most significant impact on the dairy industry may be consumer perceptions of “industrial waste” appearing in milk. The report expends considerable effort in arguing why what has been detected may not originate from drilling wastes – this approach is somewhat concerning.

## Comment on the structure of the study:

- The most serious fault is lack of control farms. A properly structured study would have a similar number of control farms paired with the study farms to match soil type, size, breed of cow, production and management as closely as possible. Without this structure it is impossible to perform an adequate statistical analysis of the results and thus determine if the animals are likely to have been exposed to drilling wastes or not.
- Sampling is likely to have occurred at the wrong time of year. Allowing cows to lose condition in autumn is poor management. Although fat concentration in milk may be up to 20% higher in autumn, maximum mobilisation of body fat in a cow occurs shortly after calving and is independent of management. Moreover, since cows graze lower over winter and ingest more soil, this is the time that maximum accumulation of undesirable compounds in body fat is likely to be reached. Sampling should also include colostrum. It should be noted some farmers graze cows off-farm for a period during the winter and this needs to be taken into account. The proportion of the herd grazed off, or whether it is done at all, can vary widely from year to year.
- The decision not to include meat sampling seems misguided. It would be prudent to at least sample fat from bobby calves and any cows or calves that die during the spring period.

## Comment on the results and conclusions:

- Barium: Most selenium prills applied to dairy farms are in the form of sodium rather than barium selenate. The injectable form of barium selenate is not commonly used on dairy farms. There is no indication in the results summary as to whether prills have or have not been applied to any of the farms or at what time of year and in what form if they have. Although barium sulphate is a low risk material it may be a useful marker as to whether drilling waste has mixed with the topsoil. It is possible that the barium derived from drilling waste has different isotopic ratios to natural Taranaki soil barium which would allow differentiation.

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- BTEX: According to the paper referred to, the link between toluene levels in pasture and  $\beta$ -carotene degradation seems speculative. Benzene is the most toxic of the BTEX compounds. It is also the most volatile and could be expected to disappear from the soil surface during a warm summer. Moreover, benzene is rapidly metabolised by the liver (toluene less so) into various cytotoxic compounds. Thus although benzene may not appear in milk at detectable concentrations, its metabolites may. There appears to have been no attempt to check for metabolites in milk.
- MOSH: The detection of long chain MOSH is of note due to their propensity to bioaccumulate. The report speculates on their origin but there appears to have been no survey carried out on the study farms to ascertain possible sources. Very few veterinary medicines contain long chain hydrocarbons. There is one oil based vaccine but that is used during winter and only on a relatively small proportion of farms. As the shorter chain hydrocarbons are highly volatile, longer chain MOSH would be more likely to persist in the environment. The statement that “petrochemical wastes produced in Taranaki are expected to more commonly contain shorter chain rather than longer chain hydrocarbons” (5.1.3) is inaccurate.
- PDBE: There is no reference supplied for the range in values of these compounds detected in New Zealand. It is noted the upper value given in Table 3 (section 5) is the value detected on Farm C. Either very little testing has been carried out in New Zealand or this farm represents a high exposure property by national standards.

#### **Other considerations:**

Substances present in drilling and fracking wastes have been implicated as reproductive endocrine disruptors with effects occurring at minute concentrations (1). Another study reports the effects of exposure of animals to drilling fluids in the US, the most common impact being that of reduced reproductive performance (2). It would thus seem prudent to carry out an analysis of the reproductive performance of the herds under investigation and compare results to both the paired control farms and the national average.

The potentially most serious problem in determining any impacts on milk quality is determining what to test for. Over 900 different compounds are used in drilling muds and fracking fluids worldwide. In many instances, manufacturers may not reveal the exact make-up of different mixes, claiming “commercial sensitivity”. Oil companies rely on the presentation of Material Safety Data Sheets (MSDS's) of chemicals added to drilling muds and fracking fluids to support a contention that drilling wastes are likely to have little or no environmental effects. A survey carried out in the US noted that a large proportion of MSDS's are incomplete or vague with respect to their constituent compounds and are lacking information on possible ecological effects (3). This can also be a feature of information supplied by oil companies to support resource consent applications in Taranaki. Such lack of information is common and a feature of the “light-handed regulation” noted by the Parliamentary Commissioner for the Environment with respect to drilling in Taranaki.

Recent reports that animals are being exposed to newly spread drilling wastes are of particular concern. (4) That the Taranaki Regional Council is unwilling to prevent this happening is somewhat disquieting since animals are likely to be exposed to much higher concentrations of drilling wastes if adequate time for biodegradation has not elapsed.

## References

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- (2) Bamberger M and Oswald RE: Impacts of Gas Drilling on Human and Animal Health. *New Solutions : A Journal of Environmental and Occupational Health Policy*. 22 (1): 51-57. 2012
- (3) Colborn T, Kwiatkowski C, Schultz K, Bachran M: Natural Gas Operations from a Public Health Perspective. *Human and Ecological Risk Assessment*, 17: 1039–1056. 2011
- (4) [www.radionz.co.nz/news/rural/246717/scientist-backs-oil-waste-intervention](http://www.radionz.co.nz/news/rural/246717/scientist-backs-oil-waste-intervention)