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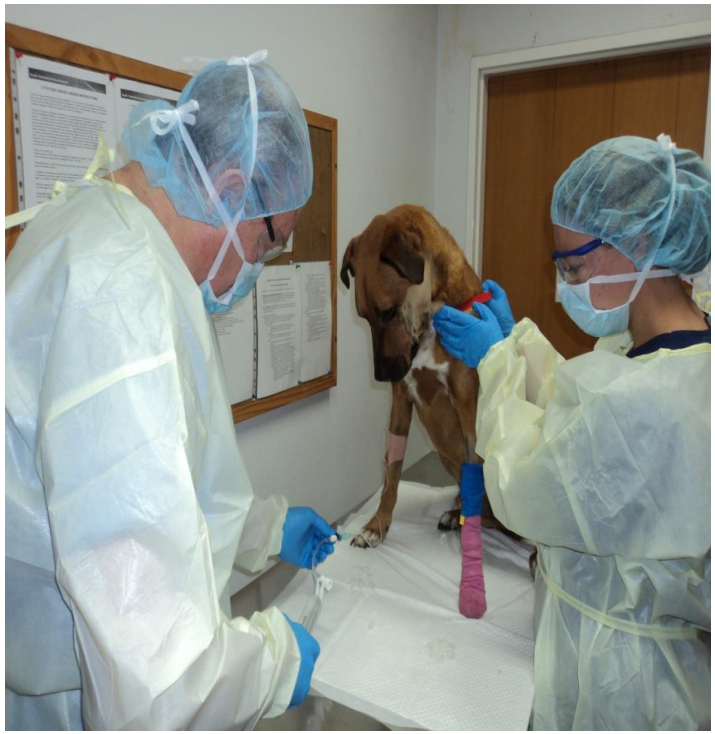

Regulatory verification with occupational hygiene monitoring on safe use of cytotoxic drugs in veterinary practices

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Snap Shot: we will cover…

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1. Results of on-site verification
   - of compliance with Australia *Work, Health and Safety (WHS) legislation* using Checklists
   - Interview with workers

   on safe use, handle and storage of cytotoxic drugs (CTD)

   in veterinary clinic and animal hospitals

2. Results of occupational surface monitoring for CTD contamination

3. Effectiveness of integrating occupational surface monitoring with regulatory verification

Workplace carcinogens:
exposure and health effects

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- WHO estimated that there are 152,000 deaths per year globally from exposure to carcinogens at work (Driscoll *et al.,* 2005)

- In Australia, approximately 2 to 11% of reported cancers are attributable to past **occupational** exposure (Cancer Council, Australia, 2008)

- All CTD are either known or suspected to be carcinogenic, mutagenic, and/or teratogenic

- The margin of safety for CTD is very narrow and therefore carries a relatively significant occupational risk.

Workplace carcinogens:
exposure and health effects

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- Use of CTD for **veterinary patients** to treat systemic cancer, such as lymphoma, or as an adjunct to surgery or radiation for treating microscopic disease

- A recent Australian epidemiology study with 321 **female veterinarian** participants suggested a link between increased risk of birth defects and handling CTD by pregnant women (Shirangi *et al*., 2014)

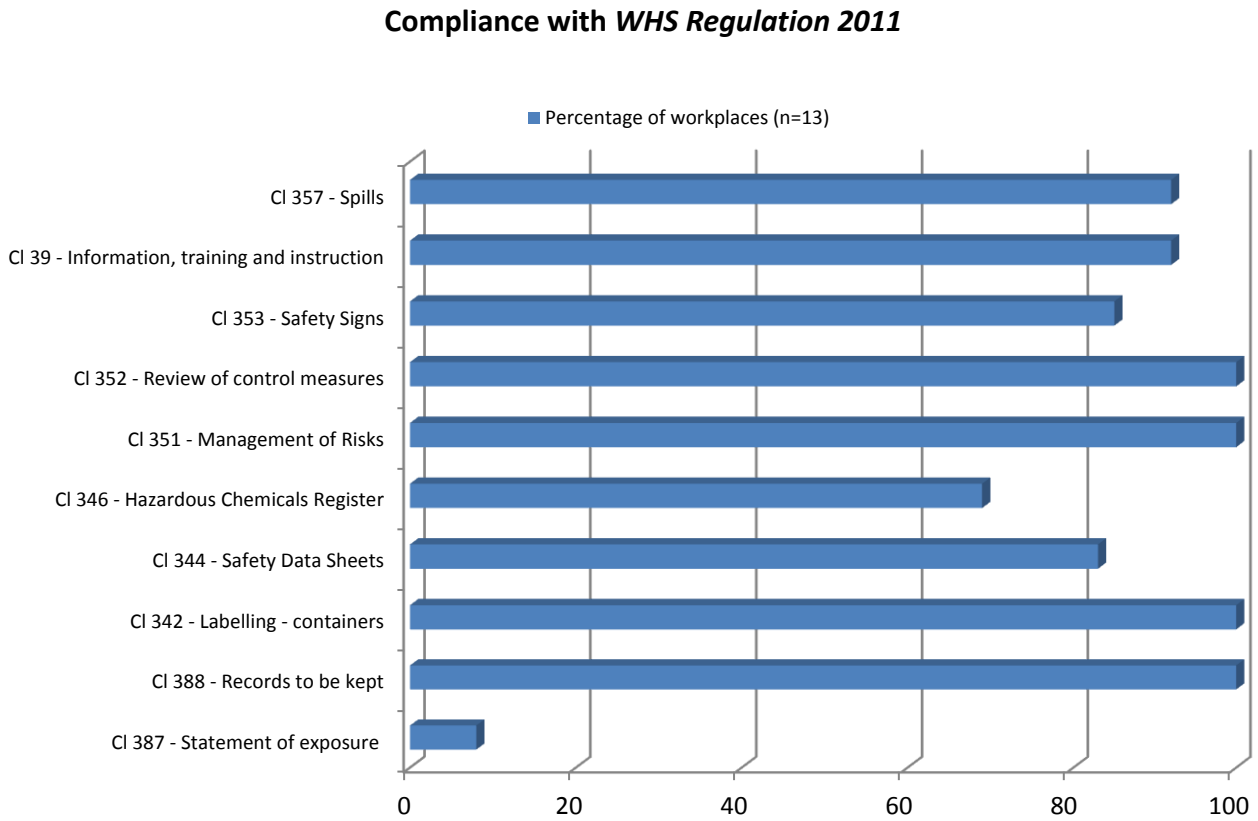
- No published studies on surface monitoring of CTD contamination in the **veterinary care sector** in Australia

On-site Verification visit

- conducted in 13 veterinary clinics and hospitals in metropolitan Sydney and regional NSW
- Verification on compliance using checklist
  - Ten key clauses (cl) under *WHS Regulation 2011* that are relevant to carcinogen use
- Face to face consultation
  - Minimum 1 worker with potential of CTD exposure
  - Evaluation of knowledge on CTD, including
    - potential health effects
    - Safe work procedure
    - Use of personal protective equipment (PPE)
    - Spills Management…

Documentation Verification Outcome

Compliance with *WHS Regulation 2011* clauses related to carcinogen use



Checklist **Compliance** in risk management and control measures was relatively high

Low level of compliance was in provision of the Statement of Exposure (e.g. cl 387)

Consultation Outcome

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Face to face Consultation

(Minimum 1 worker with greater potential of CTD exposure per site):

- Cancer treatment with CTD is infrequent
- Good knowledge on safe work and decontamination practice
- Treatment almost exclusively conducted by the veterinarians
- Use of closed systems for drug delivery in most clinics
- Appeared to lack awareness on the intrinsic hazards of cytotoxic drug

Surface Monitoring for CTD Contamination

- conducted in 6 verification visits at 2 veterinary clinics and 2 animal hospitals
  - ➢ Sampling coincide with when animals (patients) treated with CTD
  - ➢ Samples collected before and soon after treatment.
  - ➢ Validated swab sampling protocol (ISOPP Standards of Practice, 2007)
  - ➢ Eight (8) CTD were analysed

(Cyclophosphamide,Methotrexate, Gemcitabine, Cytarabine, Ifosamide, Doxorubicin, Vincristine and Etoposide)

Swab Sampling Protocol (ISOPP Standards of Practice, 2007)

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1.Select sampling locations including cytotoxic drug delivery, storage, treatment and waste disposal

1.Sampling must coincide with when pets (patients) treated with cytotoxic drugs. Samples collected before and soon after treatment.

2.Use Liv-Wipe 70% alcohol swabs, where possible, a 5cm x 5cm template was used.

3.Samples stored at 4^{o}C. and delivered within 24 hours to laboratory for analysis.

4.Samples analysed for eight cytotoxic drugs including cyclophosphamide, Methotrexate, gemcitabine, cytarabine, Ifosamide, Doxorubicin, Vincristine and Etoposide

5.Swab desorbed with 0.1% formic acid and analysed by ultra performance liquid chromatography-tandem mass spectrometry (UPLC/MS)

Surface monitoring outcome

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Table 1: Task- or function-based locations for surface sampling

(A total of 73 swab samples were collected from 9 types of locations: associated with cytotoxic drug delivery, storage, treatment and waste disposal)

Locations	Type of surface samples	Samples*
Containers	Drug bottles, pre-packed drug intravenous (IV) bags	2 (13)
Preparations	Preparation trolleys/table, syringes, containers	0 (13)
Drug storage	Refrigerator shelves/handles/floor, shelves	2 (9)
Treatment area	Veterinary infusion in line/pole, treatment door handle, pump keypad, floor underneath	1 (7)
PPE	Disposable gloves, booties, veterinarian's palm	0 (8)
Waste	Purple bin lid and outer rim, purple bags on trolley, sharp bin lid	0 (11)
Toilets	Tap and handles, wash basin handle	0 (4)
Outside areas	Non-treatment area bench and floor	0 (2)
Miscellaneous /administration	Keyboard in treatment room, nurses workstation, spill kit, pet pillow and wrapping towel	0 (6)

***No of contaminated samples (No. of samples collected at a specific location)**

Surface monitoring outcome (Cont'd)

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Table 2: Cytotoxic drugs detected at each of the contaminated locations

Locations where surface contamination was detected	% of contaminated samples (no. of samples)	Cyclophosphamide Range (ng)	Cytarabine Range (ng)
Containers Drug bottles, pre-packed intravenous bags	15.4% (n=13)	6.3 - 89.0	ND
Drug storage area Refrigerator shelves/handles/floor, shelves	22.2% (n=9)	6.8	79.1
Treatment area Veterinary infusion in line/pole, treatment door handle, pump keypad, floor underneath	14.3% (n=7)	3.54	ND

ND = Not detected; **ng** = nanograms
NOTE: Minimum level of detection (LOD) for cyclophosphamide and cytarabine is 3 ng/sample

Surface monitoring outcome (Cont'd)

Limitation on data evaluation:

- Small samples size
- Patient load were not recorded
- In-frequent use of CTD
- Verification visits to the workplace announced in advance
- Quantitative assessment is not meaningful

Good news:

- Identified the high risk CTD contaminated locations at individual workplace

Evidence based Recommendations
to reduce CTD exposure

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1. Residue CTD contaminants found on used bottles and fridge handle
   - Re-enforce training on safe work and decontamination procedure
   - Label and assigned cytotoxic drug storage area (segregation)
   - Label the ‘used/reformulated’ cytotoxic drug bottles
   - Keep in sealed double bags
   - Stringent use of appropriate PPE

2. Residue CTD contaminants found on treatment floor
   - Label and assigned CTD treatment area
   - Re-enforce training on safe work and decontamination procedure
   - Use of closed systems for drug delivery
   - Stringent use of appropriate PPE

Integration to Application:
Documentation Verification with hygiene monitoring

- Provision of evidence based recommendation to workplace
  - The potential link between inadequate compliance in the Safety Data Sheet (SDS) management to the lack of knowledge of the intrinsic hazard of CTD
    - Improve on training and hazard information provision
  - CTD contamination detected despite good knowledge and documentation of safe work practice
    - More stringent use of PPE and extra control measure on specific area of CTD management
- A useful 'snapshot' for policy makers
- Risk based identification of other stakeholder (CTD **suppliers**) to prevent worker exposure to CTD

Key Message

Integration of hygiene monitoring
provide a comprehensive investigation
in the regulatory verification of
safe use of hazardous chemicals

References

- Driscoll T, Nelson D I, Steenland K, Leigh J, Concha-Barrientos M, Fingerhut M, Prüss-Ūstün A, (2005) The Global Burden of Disease Due to Occupational Carcinogens. American Journal of Industrial Medicine 48:419-431

- Position Statement- Occupational Carcinogens (2008) Cancer Council Australia, November:1-6

- Sugiura S, Asano M, Kinoshita K, Tanimura M, Nabeshima T (2010) Risks to health professionals from hazardous drugs in Japan: A pilot study of environmental and biological monitoring of occupational exposure to cyclophosphamide. *J Oncol Pharm Practice* 17(1):14-19.

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Questions