THE ROLE OF ORGANOPHOSPHATE EXPOSURE IN THE AETIOLOGY OF DEPRESSION & SUICIDALITY AMONGST FARM WORKERS ON GRAPE FARMS IN THE WESTERN CAPE PROVINCE, SOUTH AFRICA

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AIM OF THE STUDY

To investigate whether long-term exposure to organophosphate pesticides (OP’s) was associated with psychological factors or conditions that predispose to suicide, specifically depression, amongst farm workers on grape farms in the Western Cape.
Farm workers are often exposed to unsafe working conditions, particularly sometimes daily exposure to OP’s

- *Occupational Health and Safety Act, Act 85 of 1993*
  
  ‘every employer shall provide and maintain a working environment that is safe and without risk to the health of its employees’

  
  everyone has ‘the right to an environment that is not harmful to their health or well-being’
• OP’s are most lethal pesticides - designed to target nervous systems of insects, but humans equally susceptible (neural functioning of mammals & insects are similar)

• Globally OP’s & carbamates most commonly used insecticide in agriculture & gardening - responsible for 80% reported toxic exposures (Antonijevic & Stojiljkovic 2007)

• 1999: Grape sector largest user of pesticide in South Africa (Dalvie et al, 2009)
• Chlopyriphos, most commonly used OP in the grape sector - associated with neurotoxic effects in humans (Schultz et al, 2001; Dalvie et al, 2009)

• OP exposure - cause of acute and chronic poisoning amongst farm workers and farm residents in South Africa (Dalvie et al, 2009), Africa (Ohaya-Mitoko, 1997; Hanshi, 2001) and globally (Stallone & Beseler, 2002)

• A relationship between OP exposure and depression cited in global studies (Amr et al, 1997; Smits, 2000; Jamal et al, 2002; Beseler et al, 2006 & 2008)
• Ali et al (1979) - neurotransmitters, dopamine (DA), norepinephrine (NE) and serotonin significantly decreased in rats 10 days after exposure to OP’s

(Depression occurs when serotonin, DA & NE are decreased in the brain)

• Studies on humans suggest a positive association between depression, suicide and serotonin levels in the CNS (Oquendo & Mann 2000; Grohol 2005)
Breede Valley: Western Cape Province

Wine Grape Area: 9 / 66 farms

convenience sample

• 5 farms - Slanghoek
• 4 farms - Louwshoek
Breede Valley: Western Cape Province

Table Grape Area: 60 / 201 farms random selection
48 (80%) participated in study

- 22 farms - Hex River
- 9 farms - Orchard
- 15 farms - De Doorns
- 1 farm - Brandwacht
- 1 farm - Nuy
METHODS

- Cross-sectional survey of 817 farm workers
- Occupational & Environmental Exposure assessed with an administered questionnaire
- Neuropsychiatric Outcomes – current levels of depression, impulsivity and suicidal ideation of participants, assessed with 7 standardised instruments
RESULTS

Demographic, Occupational Information  \( (n = 817) \)

Gender (M:F)  
486:331

Farm type workers (wine : table grape)  
179:638

Age (years)  
35 ±10

Cumulative Exposure

Years worked in agriculture  
14 ±10

Tractor driver (222 males : 5 females )  
227 (28%)

Head (lead) sprayer (137 males : 1 female)  
138 (17%)

Years worked as a tractor driver and / or head sprayer  
15 ±13
Past pesticide poisoning positively associated with psychiatric disorders (GHQ-28; OR: 2.17) and depression (GHQ Severe Depression Subscale; OR: 1.62)

Positive association found between reports of environmental exposure (smelling pesticides in the home on spraying days) and depression (GHQ Severe Depression Subscale) (OR: 1.66)
RESULTS

- Female farm workers reported higher levels of depression and suicidal ideation ($p < 0.01$) and were more impulsive ($p = 0.01$) than male workers – link with suicidal ideation

- Female farm workers received less PPE than males (2:3 items)

- Workers who received one or no items of PPE had increased risk of being depressed (OR: 1.90)

- More females reported being treated for a psychiatric illness (1.7:1); ‘nerves’ (7:1) and hypertension (1.7:1)
Farm Workers not wearing appropriate PPE while working in the vineyards
Workers on table grape farms appeared to be more advantaged than wine grape workers

- received more items of PPE (3:2, p < 0.01)
- had a higher socio-economic status (4:3, p < 0.01)

Wine grape farm workers appeared to be significantly more depressed, impulsive and had more suicidal ideation (p< 0.01), than table grape workers
RESULTS

- *Psychiatric illness* was a significant predictor for psychiatric disorders, (GHQ, OR: 4.83), general distress (physical, physiological and psychological) (BSI, OR: 3.55) and depression (OR: 2.36 – 6.02)

- *Low socio economic status* was a significant predictor for psychiatric disorders, (GHQ, OR: 1.62), general distress (physical, physiological and psychological) (BSI, OR: 1.90), depression (OR: 1.53 – 1.90) and impulsivity (BIS-II, OR: 1.48)
There was no evidence for a positive association between cumulative pesticide exposure and any adverse neuropsychiatric outcomes.

However, a notable finding of the study was the positive association found between reports of environmental exposure (smelling pesticides in the home) and depression, which could suggest that environmental exposure may be an important cause of depression-related symptoms in the grape farming sector.
THANK YOU FOR PARTICIPATING IN THIS SESSION