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The process to identify dermatological effects of pesticides is based on:

- 1) Identification of the pesticides used in the banana plantations.
- 2) Identification of different populations, with different exposure, to be studied: three groups (workers, people living around the banana plantations and Referents). Pictures 1 and 2.
- 3) Preparation and application of a specific questionnaire. Pictures 3 and 4.
- 4) Preparation of the patches: two batteries, a standard one and another battery with pesticides used in the banana production. Pictures 5, 6 and 7.
- 5) Clinical observation after 48 hours. Pictures 8, 9, 10, 11, 12, 13 and 14.
- 6) Clinical observation after 96 hours. Pictures 15, 16, 17, 18, 19 and 20.

A survey was conducted among banana workers, surrounding populations of banana plantations and people apparently non exposed to pesticides, called referents, in a banana production area in Quevedo, Los Rios, Ecuador.

42 workers, 35 subjects living around a banana plantation and 19 referents were voluntarily recruited and completed all the requirements of the study. They were approximately 90% of the people initially invited to participate. Patch tests with pesticides frequently used in the banana production, like thiabendazole, chlorpyrifos, imazalil, mancozeb, benomile, glyphosate, propiconazole, break-thru (tego), difenoconazole (sico), ethopros (mocup) and chlorothalonil, were patched in the back of the subjects together a standard battery.

After 48 and 96 hours examination, 18 out of 42 workers (42.8%), 11 out of 35 subjects (31.4%) belonging to population living close to a banana plantations and 5 out of 19 non exposed group (26.3%) showed reactions to different pesticides like chlorothalonil, chlorpyrifos, mancozeb, difenoconazole, break-thru, glyphosate, ethopros, propiconazole, imazalil and benomile commonly used in the banana production. Only one (thiabendazole) of the list of pesticides was not found as a cause of the skin reactions in this study. Table I and Figure 1.

This study showed two aspects of the problem:

- 1) All these positive reactions to pesticides indicate that this people was previously exposed to these products: workers at the workplaces and people at home or nearby their living areas, and.
- 2) Clear dermatological effects were detected after those previous exposures. Contact dermatitis were identified and should be considered as occupational and environmental health effects of aerial and manual fumigation in the banana plantations.

## WHAT IS OUR INITIAL PROPOSAL?

- 1) Stop aerial spraying with dangerous pesticides
- 2) Stop aerial spraying in living areas
- 3) Stop aerial spraying when workers are in the field - improve work organization and planning for spraying
- 4) Alert people with enough time before spraying pesticides
- 5) To establish a buffer area of 300 meters from the plantation to living areas to avoid people at home or children at school to be exposed to pesticides
- 6) Protect workers in the workplaces
- 7) Do not use dangerous or banned pesticides
- 8) Enforcement to companies to comply with rules and the best practices.
- 9) Availability of occupational and environmental health services to prevent and to assist workers and population in the banana production areas.
- 10) Strict respect to the reentry times after pesticides application according with technical recommendations for each pesticide.
- 11) Dermatological studies should be done among workers and people living around the banana plantations to identify sensitizing to pesticides used there and to prevent these disorders.

We thank Dr. H. Penagos and Dr. S. Palacios for their collaboration in the dermatological study.



1. Study population (workers)



2. Study population (population living around banana plantations and referents)



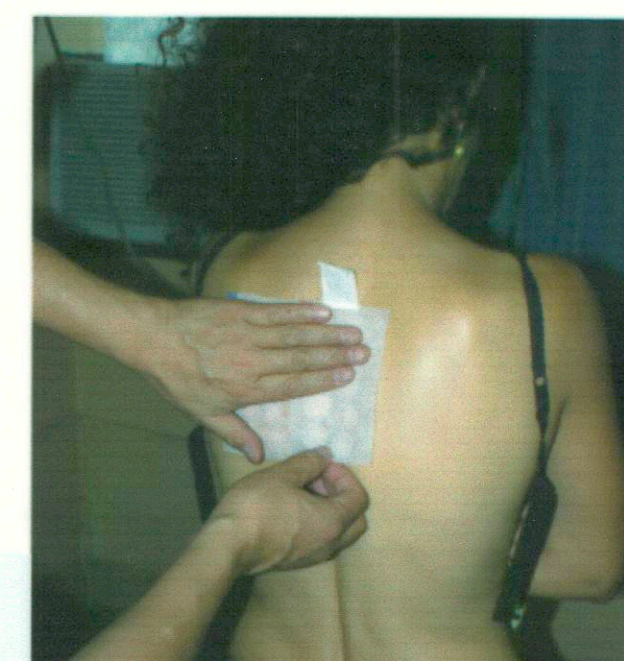
3. Application of questionnaires.



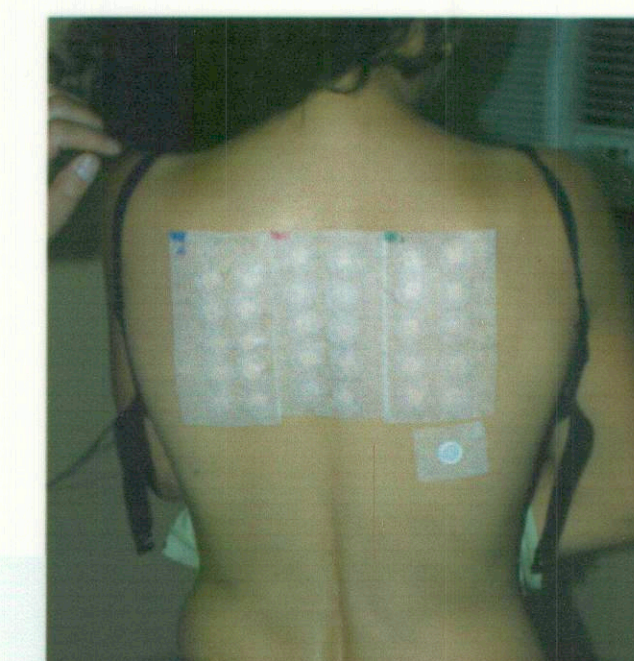
4. Application of questionnaires.



5. Preparation of dermal patch tests.



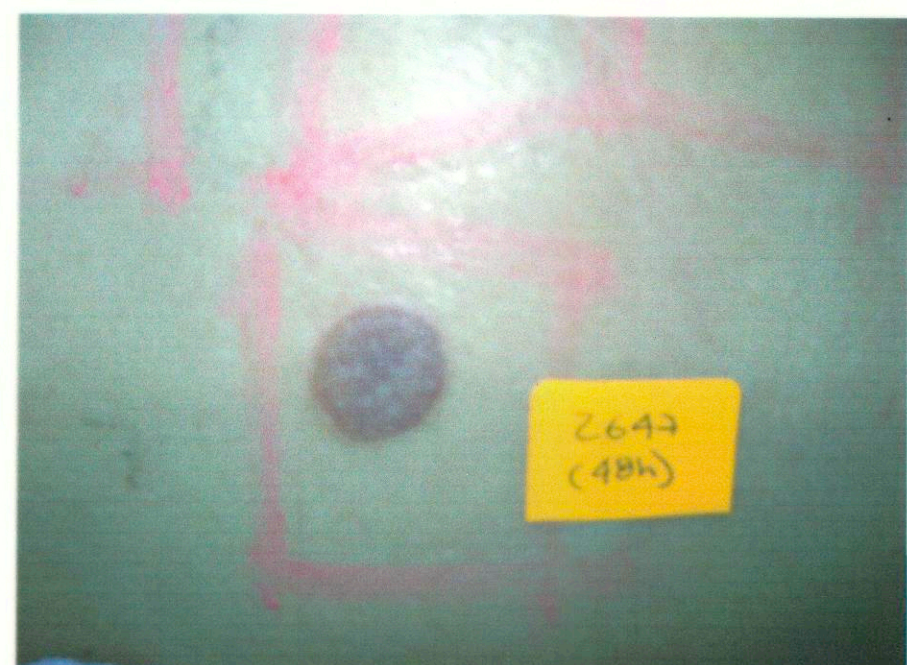
6. Application of dermal patches.



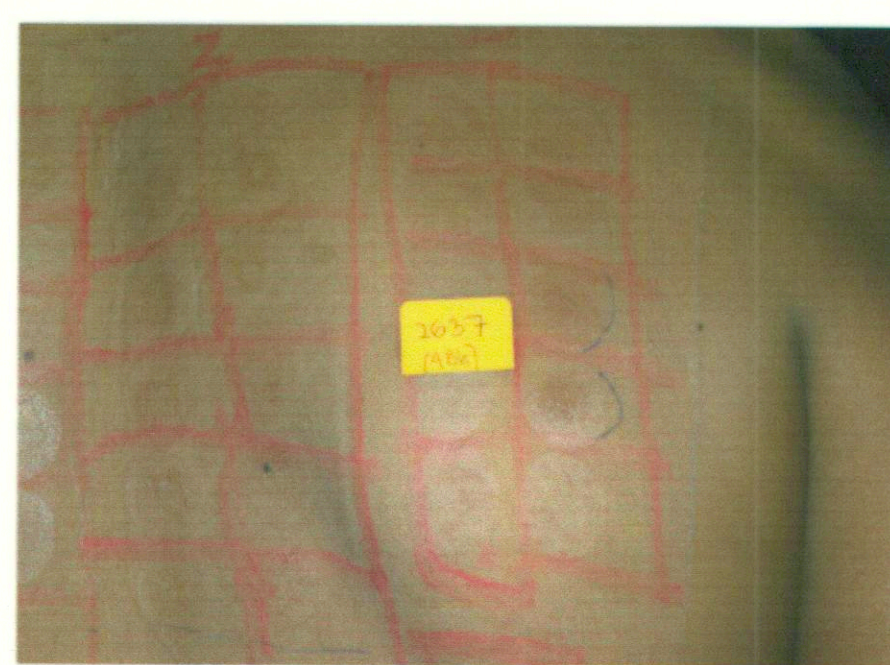
7. Application of dermal patches.



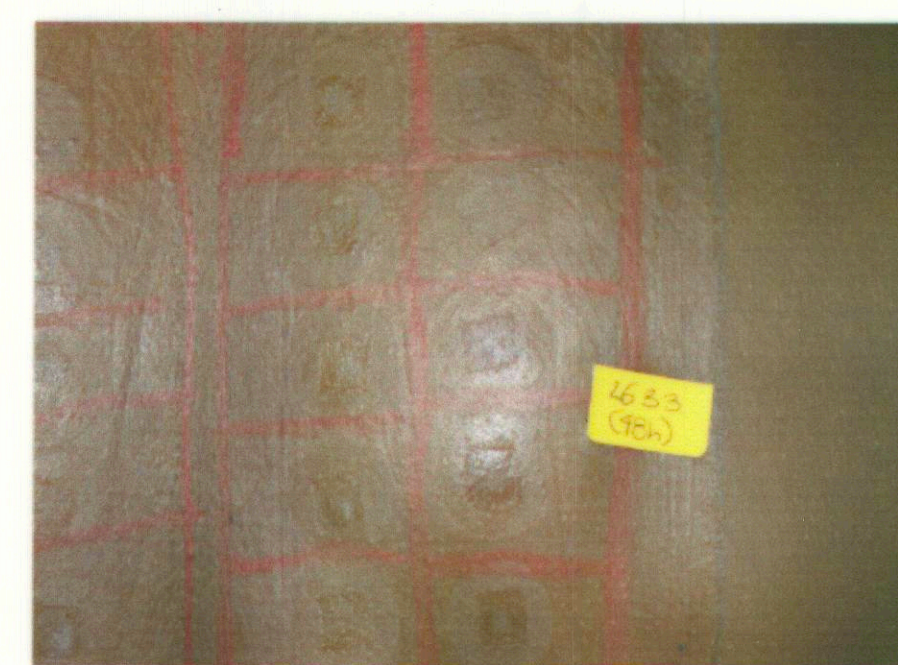
8. UV light to identify skin changes.



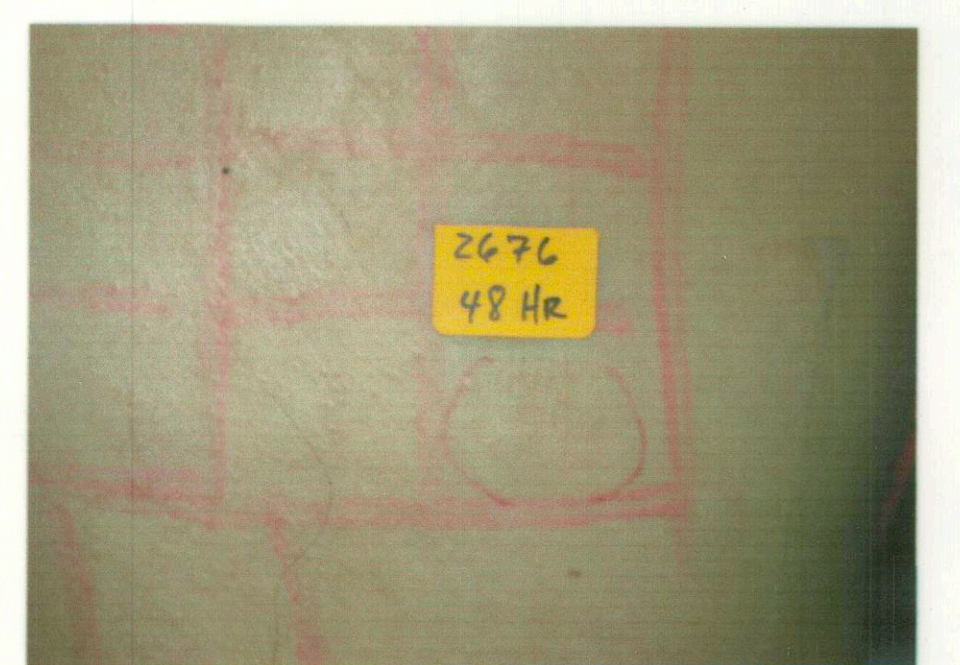
9. Skin reaction to chlorothalonil at 48 hours examination.



10. Skin reaction to break-thru and difenoconazole at 48 hours examination.



11. Skin reaction to difenoconazole and ethopros at 48 hours examination.



12. Skin reaction to ethopros at 48 hours examination.



13. Skin reaction to difenoconazole at 48 hours examination.



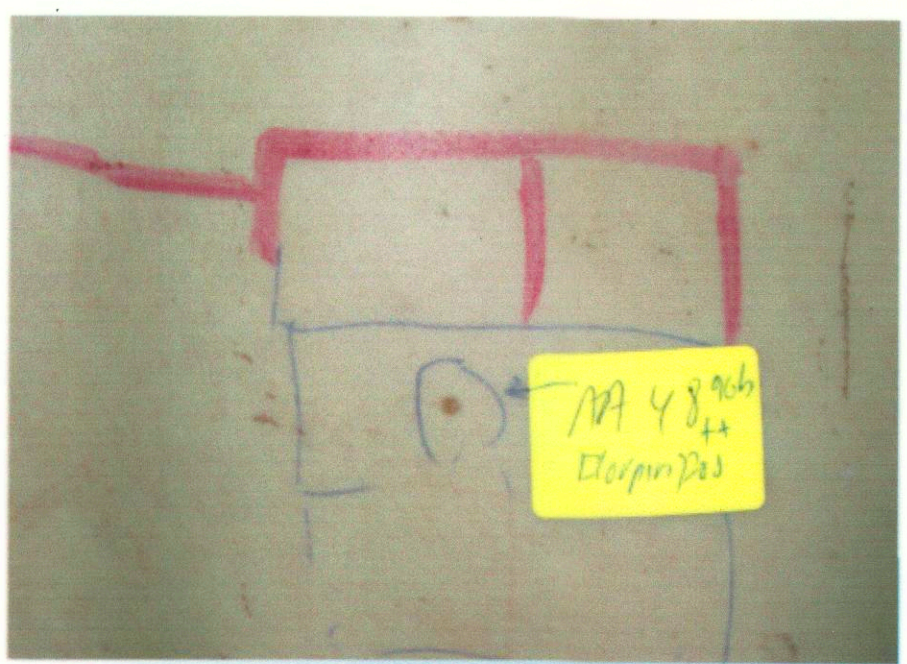
14. Skin reaction to imazalil and break-thru at 48 hours examination.



15. Skin reaction to chlorothalonil, ethopros and propiconazole at 96 hours examination.



16. Skin reaction to ethopros at 96 hours examination.



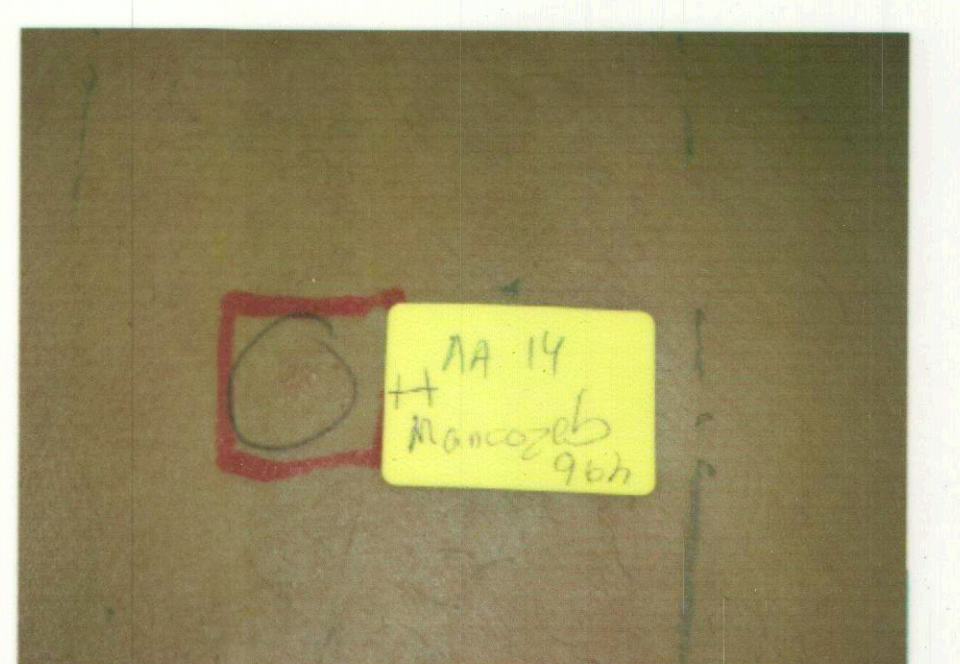
17. Skin reaction to chlorpyrifos at 96 hours examination.



18. Skin reaction to difenoconazole and ethopros at 96 hours examination.



19. Skin reaction to propiconazole at 96 hours examination.



20. Skin reaction to mancozeb at 96 hours examination.

TABLE I- Exposure to Pesticides and Dermatological Effects in the Banana Plantations Area, Quevedo, Ecuador, 2009.

| Group   | N   | Mean of Age (years) ± St Dv | Type of pesticides  |
|---|---|-----------------------------|---|
| WORKERS   | Total<br>(42)<br>(100%)<br>(33 Male and 11 Female)            | 39,9 years<br>±11,6         | Imizalil, Mancozeb, Benomile, Glyphosate, Propiconazole, Break-Thru, Difenoconazole, Ethopros, Chlorothalonil, Chlorpyrifos |
|   | Positive reactions to Pesticides<br>(18)<br>(42,8%)           |                             |   |
| POPULATION LIVING AROUND THE BANANA PLANTATIONS | Total<br>(35)<br>(100%)<br>(5 Male and 30 Female)             | 33,9 years<br>±13,7         | Glyphosate, Break-Thru, Difenoconazole, Ethopros, Chlorothalonil  |
|   | Positive reactions to pesticides<br>(11)<br>(100%)<br>(31,4%) |                             |   |
| REFERENTS                                       | Total<br>(19)<br>(100%)<br>(4 Male and 15 Female)             | 39,4 years<br>±12,6         | Break-Thru, Difenoconazole, Ethopros, Chlorothalonil  |
|   | Positive reactions to pesticides<br>(5)<br>(26,3%)            |                             |   |

FIGURE 1- Extension of Pesticides Dermatological Effects in this study

| Pesticide      | Workers    | Surrounding Population | Referents  |
|----------------|------------|------------------------|------------|
| Difenoconazole | ██████████ | ██████████             | ██████████ |
| Ethopros       | ██████████ | ██████████             | ██████████ |
| Break-thru     | ██████████ | ██████████             | ██████████ |
| Chlorothalonil | ██████████ | ██████████             | ██████████ |
| Glyphosate     | ██████████ | ██████████             | ██████████ |
| Imazalil       | ██████████ | ██████████             | ██████████ |
| Mancozeb       | ██████████ | ██████████             | ██████████ |
| Benomile       | ██████████ | ██████████             | ██████████ |
| Propiconazole  | ██████████ | ██████████             | ██████████ |
| Chlorpyrifos   | ██████████ | ██████████             | ██████████ |