Occupational exposure to pesticides
Challenges for research, evaluation and prevention

CONFERENCE

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Under the high patronage of the French Ministry for Social Affairs and Health and Women’s Rights, the French Ministry of Agriculture, Agrofood and Forestry
A considerable number of farmers and farm workers suffer from exposure to pesticides in France today. Indeed, France is one of the European countries where the most pesticides are sold: a little more than 60,000 tonnes per year for the last several years.

Several epidemiological studies carried out at international level in population groups from the agricultural sector highlight, with varying degrees of proof, links between exposure to pesticides and certain chronic diseases (cancer, Parkinson's disease, reproductive and developmental disorders, etc.). These statistical associations have recently been compiled as part of a collective expert appraisal by INSERM and a study commissioned by EFSA analysing the literature on the epidemiological data.

However, all these studies stress that, in most cases, it can be difficult to demonstrate a relationship between the effects and exposure. It is a fact that, for a large number of substances that may have been used in the past, and some of which have since been banned, there is a lack of data on the history of exposure of farmers, which could be used for post-professional monitoring or calculating compensation.

The scientific experts and risk managers therefore took the initiative of supporting research programmes and developing and enhancing risk assessment methodologies.

In addition, the use and authorisation of pesticides are governed by European Regulations. Before these plant protection products can be placed on the market, they have to undergo assessment that particularly considers risks to the health of operators and workers cultivating the crops.

In this context, ANSES, in collaboration with EFSA, is organising a conference on the current state of research regarding the exposure of workers to pesticides.

This conference will bring together French researchers and scientists, plus a few of their European and international counterparts, to discuss scientific progress in the evaluation of exposure to pesticides and foster the exchange of best practices and knowledge within the scientific community. ANSES will also be presenting the state of progress of its ongoing expert appraisal of exposure of agricultural workers, and the results of its assessment of the efficacy of personal protective equipment against pesticides. In addition, EFSA will present its new harmonised methodology for assessing non-dietary exposure to pesticides for four major population groups: operators, workers, residents and bystanders.

The aim is to report on scientific and technical advances in the study of exposure to pesticides and to discuss current practices and knowledge regarding assessment, prevention and protection as well as the outlook for this major public health issue.
Session 1 – Health effects of pesticides
Knowledge provided by epidemiology

Health effects of pesticides: results from the agricultural health study
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BIOGRAPHY
Dr. Laura BEANE-FREEMAN is an Investigator in the Occupational and Environmental Epidemiology Branch at the U.S. National Cancer Institute. She is the Co-Principal Investigator of the Agricultural Health Study, a prospective cohort of licensed pesticide applicators and their spouses. Her work focuses on the potential link between cancer and other health outcomes and pesticide exposure, through both occupational and non-occupational routes.

ABSTRACT
Pesticides are used extensively worldwide to control weeds, insects and other pests. Use has increased dramatically since the 1960s, and in 2007 it was estimated that 2.4 billion kilograms of pesticide active ingredients were applied worldwide. Their ubiquity make it imperative to conduct high quality epidemiologic studies of these chemicals. Pesticides have been linked to numerous adverse health outcomes, including cancer, non-malignant respiratory disease, neurological outcomes and developmental issues in children.

Accurate estimates of exposure in epidemiologic studies are crucial in developing reliable measures of risk and early studies, in particular, focused on broad categories that may not be related. Therefore, one of the primary methodological issues related to the epidemiology of pesticides is exposure assessment. Some of the challenges are not unique to the study of pesticides and relate more generally to the assessment of occupational exposures; however, there are some unique characteristics related to the study of these chemicals.

Although agricultural practices are changing, in many parts of the world, pesticides have traditionally been applied on family farms or small workplaces with few employees. Company records or measurements taken for occupational safety compliance and used for exposure modeling in other settings are often not available.

Therefore, other methods must be used. Many studies have relied on the self-report of pesticides; however, depending on the specific work practices, the workers applying the pesticides may not know what chemicals are being applied so may not be able to report the specific active ingredients directly. Other studies have inferred exposure to individual chemicals using a variety of methods, including individual reports of pesticide application and possibly the crop being grown, combined with auxiliary information, such as sales records, and the use of local experts to assign probability of exposure.

In addition to the identification of the specific active ingredient, the intensity of exposure is related to factors associated with application methods, the use of personal protective equipment and other factors and should be accounted for when possible. Field validation studies can be expensive and time-consuming, but provide the opportunity to assess the impact of various application scenarios on exposure levels. Occupationally, pesticides are often applied in combination with one another, or in mixtures and farmers or farmworkers may apply or be exposed to multiple chemicals through a growing season.
Exposure assessment methodologies should be designed for the specific conditions under which the epidemiologic study is being conducted.

Timing of exposure may be important and likely varies by the particular disease under study. For example, there has been much concern about the effects of pesticide exposure in vulnerable populations, such as children, infants or during the peri-conceptual period. There are also challenges related to the diagnosis of disease; while cancer registries exist for the reporting of malignancies, other outcomes often rely on self-report.

The use of medical record or physician validation of disease can be an important element of epidemiologic studies of outcomes with poor reliability. Despite these challenges and considerations, we have learned much about the health effects of occupational pesticide exposure. One example of a study that has been designed to investigate multiple health outcomes in a specific setting is the Agricultural Health Study, a prospective cohort study of licensed pesticide applicators and their spouses in two U.S. states. The focus on the applicators, mostly farmers, provides the opportunity to evaluate occupational exposure and a variety of health outcomes. These applicators are the required to obtain a license to apply restricted use pesticides and have been shown to accurately report their use of specific active ingredients. The spouses may apply pesticides themselves, but may also have non-occupational exposures related to these outcomes. Some highlights from studies of various health effects among both groups are presented here.

Occupational studies of pesticides are important because they provide information about the health risks to those actively applying or using these chemicals. However, importantly, results of these studies have implications beyond occupational or rural settings, as exposure extends into urban and suburban environments.

Literature review on epidemiological studies linking exposure to pesticides and health effects

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BIOGRAPHY
Dr Jose V. TARAZONA is the Head of the Pesticides Unit at the European Food Safety Authority (EFSA). Doctor in Veterinary Medicine, PhD in Toxicology, from 1982 to 2009 worked at the Spanish National Institute for Agriculture and Food Research and Technology (INIA). Involved in the scientific advisory board of the European Union since 1992; from 2009 to 2013 worked at the European Chemicals Agency as Chair of the Committee for Risk Assessment and Scientific Chair of the Evaluation Directorate.

ABSTRACT
EFSA is the keystone of EU risk assessment regarding food and feed safety. In close collaboration with national authorities and open consultation with its stakeholders, EFSA provides independent scientific advice and clear communication on existing and emerging risks, including pesticides.

This presentation introduces the scientific assessments linked to the regulatory process for the authorisation of pesticides in the European Union.
The focus is on the European assessment of the active pesticide substances in Plant Protection Products (PPPs), and particularly on the EFSA developments regarding epidemiological and post-marketing retrospective assessments according to Regulation (EC) No. 1107/2009.

Basically, marketing a pesticide requires a prior approval of the active substance at EU level and the subsequent authorisation of PPPs at national level. As expected for regulated products requiring pre-marketing authorisation, the regulatory assessment of pesticides is essentially a “prospective” risk assessment, based on the submission of a set of standard studies covering different hazard endpoints (data requirements have been recently updated through Commission Regulation No 283/2013), and sufficient information on the intended use conditions for conducting the exposure assessment, which is compared with the toxicological reference values during the risk characterisation. In addition, the dossier must contain a review of scientific studies published within the last ten years, as well as other available “retrospective” information such as medical surveillance data, poisoning incidents, and epidemiological studies. Obviously, this information plays an essential role in case of renewals and revisions of the authorisations.

The integration of epidemiological and other retrospective information in prospective risk assessments is very complex. It is expected to improve the hazard identification and even the hazard characterisation, but in practice, studies often have fundamental limitations, i.e. regarding exposure estimations and confounding factors.


The authors consider that despite the large volume of data and the large number (>6,000) of analyses available, firm conclusions cannot be made for the majority of the outcomes studied. This observation is in line with previous studies on environmental epidemiology of pesticides. The assessment of exposure is perhaps the most important methodological limitation of the studies. Ideally in order to derive a threshold value, the exposure estimations should provide (semi)quantitative information setting dose-response relationships or, at least, exposure gradients. Also, the exposure estimate should capture a reliable marker of the pesticides assessed relying heavily on the methodology, which was not the case for most of the studies. The definition of clinical outcomes displayed large variability and the use of unvalidated surrogate outcomes (biomarkers or physical measures used as substitutes for or predictors of specific clinical outcomes without fulfilling the criteria) were identified as additional critical elements. Studies often are related to pesticides that have already been banned in the European Union. Despite these limitations, the authors reported statistical significant associations in the meta-analysis between pesticide exposure and liver-, breast- and stomach cancer, amyotrophic lateral sclerosis, asthma, type II diabetes, Parkinson’s disease and childhood leukaemia. The associations observed for Parkinson’s disease and childhood leukaemia were supported by previous meta-analysis published in the scientific literature.

As a follow up, EFSA has identified two needs: a) for improving the design of epidemiological studies of pesticides, proposing refinements for future studies and recommendations to improve and optimize its application in regulatory pesticide risk assessments; and, b) for addressing specifically if the available toxicological data and information on mechanisms of toxicity can supports the observed associations for Parkinson’s disease and childhood leukaemia as well as if the current regulatory hazard assessment of pesticides covers both diseases. Both aspects are covered by recent mandates to the PPR Panel, supported by a set of outsourcing activities, some already launched, and complemented by two Scientific Conferences planned for 2015 and 2017, respectively.
Cancers and agriculture in France, what are the current and expected short-term lessons from the cohort Agrican (AGRIculture & CANcer)?

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BIOGRAPHY
Pierre LEBAILLY is a University Lecturer in Public Health at the University of Caen Basse-Normandie and researcher at the Centre de Lutte Contre le Cancer François Baclesse. He is coordinator of the AGRIculture and CANcer (AGRICAN) cohort and an Executive Committee member of the international consortium of agricultural cohorts coordinated by the IARC and the NCI (AGRICOH). He co-directs the INSERM Joint Research Unit (UMR) 1086 - University of Caen Basse-Normandie «Cancer & Prevention».

ABSTRACT
Even if the proportion of individuals involved in farming has decreased regularly in populations worldwide in the last decades (from 50% in 1980 to 40% in 2010), their absolute number rose from 1 billion to 1.3 billion over the same period. Farm activities induce a large range of occupational exposures (pesticides, dust, UV, solvents, diesel exhaust, detergents, viruses, nitrates, etc). However, most epidemiological studies, especially those on cancer, have focused on pesticide exposure. Agriculture is the leading professional sector for pesticide use in the world with a turnover of about 40 billion US dollars in 2010. Western Europe remains the leading market in the world for pesticide use (28%) and France is the main user in the European Union and the fifth worldwide. It is now admitted that, at least farm owners in the complex agricultural population, present lower rates of mortality globally and for the main causes of death (cardiovascular diseases, cancers...). This can be largely explained by specificities in farm owners’ life habits: their lower prevalence of smoking, as well as their somehow higher level of physical activity. On the other hand, farming and occupational exposure to pesticides in farm-related activities have been regularly associated with an increased risk of developing some chronic diseases like cancers of the prostate, haematological and brain cancers, neurological diseases and reproductive disorders. Epidemiological studies, as well as other types of research, have some limitations like the pesticide exposure assessment and the limited statistical power of many studies. To increase the statistical power especially for cancers with low incidence rates and the quality of pesticide exposure assessment, a first large prospective cohort study, the Agricultural Health Study (AHS), has been initiated in the USA in 1993. To date, few other large prospective cohorts have been conducted among agricultural population worldwide. AGRICAN (AGRIculture and CANcers) is a large prospective cohort of subjects affiliated to the French Health insurance (MSA) scheme in agriculture and studying especially cancers among active or retired males and females, farm owners or workers, living in 11 areas of France with a population-based cancer registry. Enrolment was conducted from 2005 to 2007 with a postal questionnaire. Globally, around 180,000 individuals (54% males, 54% farm owners, 50% retired) were enrolled. Causes of death and cancer incidence of members of the cohort are followed since enrolment.

Health data have been compared with the general population and first results within the cohort will also be presented on cancers (lung, prostate and bladder). Some results were also obtained on the prevalence of two respiratory diseases (chronic bronchitis and asthma). First, causes of death were analyzed until December 2010 (around 17,000 deaths and 600,000 person-years) and SMRs were significantly reduced for global mortality (SMR=0.71 in males and SMR=0.72, in females) and for death by cancer (SMR= 0.70, in males and SMR= 0.77, in females).
A total of around 7,000 new cancers were observed from enrolment to December 2009 and showed expected lower overall incidence rates and especially for smoking related cancers. However, two cancers were significantly higher (Multiple Myeloma among males, 86 cases, SIR=1.23; and cutaneous melanoma among women, 106 cases, SIR=1.26) with some non significant excesses for some others (especially lip cancer, other NHL and some leukaemia).

For internal comparisons, we analyzed the effect of two to five tasks (including direct and indirect pesticide exposure) on 13 different crops and 5 livestock. Lung cancer risk (459 cases) was higher among farmers involved in peas cultivation especially for those doing harvest (RR=2.18) and was decreased among farmers growing cattle or horses more than 20 years. Prostate cancer risk (1,664 incident cases) was increased for workers involved in four crops (sunflower, tobacco, fruit growing and potatoes) and for cattle growers (RR=1.24). Interestingly, workers on fruit growing were not at risk for prostate cancer (RR=1.04) but those having done some specific tasks like fruit harvest for more than 10 years were (RR=2.15). In order to study the effect of exposure to specific pesticides, we will not rely on self report from users. The Pestimat crop exposure matrix will allow us to study some chemical pesticide families intensively used in France and less studied in other epidemiological studies (many fungicides, some herbicides like phenylureas...) but also some pesticides frequently studied in the literature like organochlorines and organophosphates insecticides...In the next few month, we will begin to send the first follow-up questionnaires.
Session 2 – Improving knowledge on pesticides exposure and risk assessment methodologies (part 1: about the modeling)

Pesticide exposure assessment: developments and challenges

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BIOGRAPHY
Paul HAMEY is Head of the Exposure Branch in Chemicals Regulation Directorate of the UK’s Health & Safety Executive (HSE) and is responsible for human exposure assessments.

He has over 25 years of regulatory experience in assessing human exposures and risks. He has been involved EU initiatives regarding exposure assessment, eg EUROPOEM and ACROPOLIS, and has served on USA EPA Scientific Advisory Panels, and EFSA PPR Panel working groups. Paul has a BSc in Biology and an MSc in Bioaeronautics.

ABSTRACT
Occupational exposures to pesticides may be assessed: to demonstrate that proposed uses will comply with regulatory reference doses; to check compliance with occupational exposure standards at work; or as part of epidemiology. This presentation will consider the first of these.

It is accepted that risk assessment is a four step procedure involving, hazard identification, dose-response assessment, exposure assessment, and risk characterisation. The process is quantitative and exposure assessment is a critical part. However, within working lives under pre-European Community legislation pesticides regulatory assessments were often predominantly if not solely qualitative.

Quantitative exposure assessments became the European requirement in 1991 with EC Directive 91/414. This also provided for establishment of reference doses indicating, on the basis of current knowledge, the systemic dose which could be repeatedly tolerated by spray operators, workers and other people without risk to health – the Acceptable Operator Exposure Level.

In the previous decade it became accepted that pesticide exposure measurements are influenced by general physical rather than specific chemical processes and results of exposure studies could be used generically. So with the introduction of the Directive exposure data relevant for European assessments were reviewed and a database made (EUROPOEM). However, in 2003 due to the underlying quality issues the database was considered to be inappropriate for a harmonised European model. This conclusion was influenced by the availability of more modern data and recent N American and European work on database software. The quality issues of the EUROPOEM data were partly due to variation in study designs, so the project produced guidance for studies which eventually led to OECD guidance in 1997.

Over recent years on several occasions where proposed uses have failed to pass regulatory assessments, based on models established in the 1980/90s, OECD guidance compliant field data have been provided. A new database of these modern data and a predictive model, the Agricultural Operator Exposure Model, has been described for regulatory use. However, some less common application methods are still not supported by appropriate data.
The approach used to predict exposures of workers entering crops uses empirical relationships between dislodgeable foliar residues and measured exposures. Significant effort has been expended in N America on this, but European authorities have yet to access these data. Instead limited exposure data generated in Europe or from the open literature are used to support exposure assessments for a wide range of scenarios. Improving the database available in the EU is a high priority.

There is of course a need to develop models that are suitable for assessing risks from exposures to multiple chemicals. In this context it will be necessary to develop models that provide realistic distributions of exposures rather than just the current high estimates.

The overall feature of the approaches for estimating exposures of both operators and workers is a reliance on measurements of deposits collected on dosimeters over a working day, and then multiplying the deposit assumed to reach the skin by a dermal absorption percentage derived from conditions that do not reflect the dynamic nature of the exposure situation. Biological measurement of exposures is often considered to be a better method of assessing exposure as it avoids this simplification and integrates several routes of exposure. However, not all compounds can be so monitored, and data on human metabolism and excretion are required in order to scientifically interpret measurements in biological matrices. Significantly, EU legislation does not permit such data to support authorisations. Nevertheless, biological monitoring should have a role in checking true exposures.

Another aspect the current approach that is not realistic is the assessment paradigm compares a high exposure from a single day against an AOEL set to be protective of repeated exposure over several weeks or longer. Further consideration of frequency and durations of exposure is required to more realistically estimate intermediate and longer term exposures.

Regulatory exposure assessments need to adequately characterise exposures across the whole of the EU or one of three regulatory zones. Therefore, development of exposure assessment methodologies to support regulatory goals requires a pan-European not an individual member state approach. The EFSA have an important role, and have recently produced draft guidance for regulatory assessments. The EU Commission too supported the BROWSE project which reviewed and aims to improve the existing exposure models. However, it was beyond the scope of that project to generate significant new data. There remains a continuing need for more research to strengthen collective knowledge and improve regulatory models.

Guidance document on operators and worker exposure assessment

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BIOGRAPHY
Manuela TIRAMANI is working as Senior Scientific Officer in the Pesticides Unit of the European Food Safety Authority (EFSA) in Parma (Italy), which she joined in 2005; she is in charge of the toxicological assessment of plant protection products and of the exposure assessment of operators, workers, bystanders and residents at EU level.
ABSTRACT

Regulation (EC) No 1107/2009 is aimed at ensuring that the residues of plant protection products after their application following good agricultural practice and under realistic conditions of use, shall not have any harmful effects on human health. In 2010, the EFSA Panel on Plant Protection Products and their Residues (PPR) prepared a Scientific Opinion on Preparation of a Guidance Document on Pesticide Exposure Assessment for Workers, Operators, Bystanders and Residents (EFSA Journal 2010;8(2):1501), in which the approaches to exposure assessments performed by regulatory authorities were analysed and their inconsistencies highlighted.

Some of the main conclusions of the PPR Panel were that the routine risk assessment for plant protection products should continue to use deterministic methods; that a tiered approach to exposure assessment is appropriate; an acute risk assessment has to be performed depending on the toxicological profile of an active substance; for acute risk assessments, exposure estimates should normally be based on 95th centile of relevant data sets, whereas for longer term risk assessments, the starting point should be a 75th centile.

After the publication of the PPR opinion, EFSA was asked by the EU Commission to prepare an EFSA Guidance on this subject for the use in regulatory risk assessment of plant protection products, including a quality assessment of the databases made available to EFSA for this purpose, a derivation of regulatory percentiles from the most appropriate datasets for each of the commonly encountered exposure scenarios, and the preparation of an exposure calculator spreadsheet.

To prepare a Guidance Document an ad hoc working group was established to revise all the available data and procedures to assess the operator and worker exposure. In addition to what was already reported in the PPR opinion, further data were made available to the working group which were analysed and considered, as models used in routine assessing exposure of agricultural operators to plant protection products were established over 20 years ago (e.g. UK POEM, German model). A new predictive model for the estimation of agricultural operator exposure was developed in the EU (AOEM 2012) on the basis of new exposure data, representing current application techniques and practices in EU Member States. The AOEM model was considered by the EFSA Working Group as suitable for inclusion in the EFSA Guidance Document and its calculator. Furthermore the criteria for the selection of the underpinning studies are transparent and allow reproducibility of the outcomes. Based on the nature of the new dataset, not comparable to the old existing data, it was decided to replace the relevant scenario with the new data, if available. With regard to the re-entry exposure assessment, underlying studies show a high level of uncertainty in terms of quality and reliability of the data. Where approval is sought for multiple treatments, the Guidance gives advice on the potential accumulation of pesticide residues from successive treatments and their impact on the exposure assessment. In addition, the transfer of residues from the plant surface to the clothes or skin of the worker, depending on the intensity and duration of contact with the foliage, was reconsidered and revised considering whether or not it can be assumed that the worker will wear clothing that covers the arms, body and legs. In the Guidance an entire chapter was dedicated to the harmonisation of default values. Once the draft Guidance was finalised, EFSA was requested to organise a public consultation, to ensure the full involvement of Member States and other stakeholders.

The public was invited to submit comments on the draft Guidance Document and the attached calculator via an online form from 1 April 2014 to 20 May 2014. General as well as specific comments on the various chapters of the draft Guidance were received, which were addressed in a technical report including specific responses. The issues raised were considered by the EFSA working group for the finalisation and publication of the Guidance Document. The final Guidance identifies those scenarios for which exposure estimates are least satisfactory, and makes recommendations for further research that would reduce current uncertainties.
Agricultural operator exposure model (AOEM)

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BIOGRAPHY

Sabine MARTIN has been head of the Unit for the toxicology of products and their safe use of the Pesticide safety department of the Federal Institute for Risk Assessment (BfR) in Germany since 2012. She has been working at the BfR since 2005. She is responsible for the toxicological assessment of pesticides, non-dietary exposure and pesticide risk assessments for operators, workers, bystanders and residents. She has been a certified toxicologist (Eurotox) since 2012. Prior to this, she worked as a scientific officer at the Federal Environmental Agency in Germany (1991-2005). Her previous professional experience includes the ecotoxicological assessment of pesticides and chemicals. She received a PhD in Agricultural Sciences from Humboldt University (Berlin) in 1998.

ABSTRACT

A new predictive model for the estimation of agricultural operator exposure has been developed on the basis of new exposure data to improve the current agricultural operator exposure and risk assessment in the EU. The new operator exposure model represents current application techniques and practices in EU Member States (MS) and is applicable for national or zonal authorisation of plant protection products as well as for approval of active substances of plant protection products (PPP) supporting a stepwise risk assessment. 34 unpublished exposure studies conducted between 1994 and 2009 were evaluated for the new model. To ensure a very high quality of data the studies had to meet a set of quality criteria, e.g. GLP conformity or compliance with OECD guidance. Exposure data and supplementary information on the trials were used for a statistical analysis of exposure factors. The statistical analyses resulted in six validated models for typical outdoor scenarios of pesticide mixing/loading and application (two for mixing/loading (knapsack, tank) and four for application (low crop hand-held, high crop handheld, low crop tractor-mounted, high crop tractor-mounted). As a major factor contributing to the exposure of operators, the amount of active substance used per day was identified. Other parameters such as formulation type, droplet size, presence of a cabin or density of the canopy were selected as factors for sub-scenarios. For two tasks (mixing/loading knapsacks and application to low crops using hand held equipment) the corresponding datasets were too small to identify reliable exposure factors; instead the relevant percentiles of the exposure distribution were used.

The new operator exposure model is recommended in the draft EFSA draft ‘Guidance on the Assessment of Exposure for Operators, Workers, Residents and Bystanders in Risk Assessment of Plant Protection Products’ as first tier approach for exposure assessments of typical outdoor application scenarios in the EU.
Session 2 – Improving knowledge on pesticides exposure and risk assessment methodologies (part 1: about research and expertise)

Indoor and outdoor exposure of workers to plant protection products – the EU BROWSE model

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ABSTRACT

The BROWSE project (Bystanders, Residents, Operators and Workers Exposure models for plant protection products) aims to develop improved exposure models to assess the risks to operators, workers, residents and bystanders from exposure to plant protection products (PPPs). Representatives of all relevant stakeholders and end-users are involved in this process. In addition, the project will contribute to the implementation of the PPP authorization Regulation 1107/2009 and the Sustainable Use Directive.

Ghent University is the leader for the work package on worker exposure. Workers are persons who, as part of their employment, enter an area or handle a crop that has previously been treated with a PPP. The aims of the BROWSE models of exposure for workers were: to develop a new modeling framework; to incorporate recently-generated, high-quality data if available; to take account of key factors and mechanisms influencing exposure; to use recent survey data on worker practices in different Member States; to take account of clothing and PPE practices and to take account of regional & gender differences where possible.

A new conceptual model has now been developed taking into account the three exposure routes: exposure to contaminated surfaces (dermal exposure), exposure to contaminated air (inhalation exposure) and hand-to-mouth contact (ingestion exposure). The conceptual model approach is currently being implemented in a working mechanistic model for a set of priority scenarios. These scenarios are: harvesting of orchard fruit, harvesting of grapes, harvesting of indoor ornamentals and harvesting of fruiting vegetables. This process involves close collaboration with the cross-cutting themes on volatilization, transfer coefficients, statistical modeling and data management. Working with these cross-cutting themes ensures a consistent approach across the different work packages: operator, worker, bystander & resident.
MATPHYTO program: French crop exposure matrices for retrospective pesticides exposure assessment

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BIOGRAPHY

Johan SPINOSI is an agricultural engineer. He began his career with the farmers within a Chamber of Agriculture and then as a teacher in an agricultural college. He joined the Department of Occupational Health at the French Institute for Public Health Surveillance by establishing an original method to assess occupational exposure to pesticides in France using crop-exposure matrices: MATPHYTO program. This program is conducted in partnership with Umrestte, a Research Unit of the University of Lyon 1.

ABSTRACT

Plant protection products are used for decades in agriculture and a large number of active substances are available on the market in many different products. The acute effects of these substances are well known, but there is a lack of information concerning the delayed effects. They could be related to the development of serious diseases: cancer, neurodegenerative diseases, fertility problems, respiratory problems... However these diseases are multifactorial and could appear several years after an exposure to pesticides. Knowledge of past occupational exposures to pesticides is therefore mandatory.

In France, the knowledge of pesticides exposures is difficult because there is no unique, exhaustive and retrospective database concerning the pesticides used by the agricultural workers. With this concern, the Department of Occupational Health of the French Institute for Public Health Surveillance has implemented the MATPHYTO program. This program consists in developing crop exposure matrices for plant protection products. The Department of Occupational Health works in association with UMRESTTE/Lyon1 for the achievement of these crop exposure matrices.

Matrices are a tool in epidemiology of occupational risks. These databases are used to assess pesticides exposures for different crops. They assess occupational exposure of people included in studies or in monitoring programs. They allow describing the trends in exposure in defined populations for one-time exposures or, in most cases, for cumulative exposures.

The MATPHYTO program aims at developing crop-exposure matrices to pesticides in France for each main crop. These matrices describe the use of the main types of pesticides (Herbicides, Insecticides, Fungicides ...), declined by chemical groups (phenoxycetic herbicides, organophosphates ...) and specific active substances. In the first, MATPHYTO was specifically adapted for the agricultural population and covers the metropolitan crops. Recently, the program was extended to the overseas departments.

The realisation of these matrices requires a literature review for each crop studied. The available data is often incomplete and heterogeneous. For each crop, a lot of data is collected (crop and pest management, main pests and weeds, the geographical distribution of the crop...) through agricultural magazines, publications from Agreste (the statistics department of the ministry of agriculture) or the support of experts. Then this data is compiled. Different periods and geographical areas with a homogenous use of pesticides are characterised. Three exposure indicators for each active substance and chemical family are then defined for each period and each geographical area: the probability (proportion of farms using a given substance during a year), the frequency (average number of annual applications for a given substance) and the intensity (average dose used for one application of a given substance). The matrices are approved by a group of agricultural experts and are available on the Internet.
The first crop exposure matrices of the MATPHYTO program are currently applied to population data. The use of agricultural census allows assessing the prevalence of pesticides exposures for agricultural workers by sex, age, occupational period, region, etc.

The other potential applications of these matrices in monitoring and research in occupational health are:
- help to identify the occupational exposures that may be useful to the occupational medicine
- help to assess pesticides exposures in epidemiological studies

A Geographic Information System (GIS) can be used to match the crop exposure matrices with crop location data. It would be a first step to assess environmental exposures to pesticides in any place in France.

MATPHYTO is a national program that covers most of the crops in France. The data will be widely available to assist in the assessment of occupational exposure to pesticides in the French agricultural context. These exposures are estimated from the knowledge of crops that are more available data (agricultural census, individual surveys...). These matrices are scalable: they will be updated and future improvements could be provided.

MATPHYTO is a method for retrospective assessment of occupational exposure to pesticides applicable to population data and available for national surveillance in France.

ACROPOLIS project, focus on occupational issue

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BIOGRAPHY

Jacob van KLAVEREN had his education in Human Nutrition at Wageningen University. Since 2010 he has worked for the Dutch National Institute for Public Health and the Environment (RIVM) as senior scientific advisor for model development and model integration addressing complex public health and risk assessment issues. He coordinated the EU funded ACROPOLIS project and several EFSA projects.

ABSTRACT

ACROPOLIS is a European Funded project (Grant Agreement No: 245163). ACROPOLIS stands for Aggregate and Cumulative Risk Of Pesticides: an On-Line Integrated Strategy. The overall objective of the ACROPOLIS project is to improve risk assessment strategies in Europe regarding cumulative and aggregate dietary exposure. In this project a framework for cumulative and aggregate risk assessment of pesticides was developed that is scientifically sound and accessible for all actors involved in the European risk assessment and risk management. An overview of the achievements can be found on the ACROPOLIS web-site: (http://acropolis-eu.com).
Dietary exposure

Within the project a model was developed to assess the dietary cumulative exposure to compounds belonging to a cumulative assessment group (CAG) according to the requirements as set out in the 2012 EFSA guidance probabilistic dietary exposure modelling assessments (both single and multiple compound). In this EFSA Guidance an optimistic and pessimistic model run are proposed aiming, respectively, at estimating the possible lower and upper range of exposures in a population. To test the implementation of the EFSA Guidance methods in the MCRA system, cumulative dietary exposure assessment to two CAGs of triazole pesticides was estimated using national food consumption and monitoring data of several European countries.

Non-dietary exposure (occupational issues)

Aggregate exposure combines dietary and non-dietary sources of exposure, which is relevant for pesticide residues. Examples of non-dietary exposure to these chemicals are exposure through occupational farming activities, the use of consumer products, or incidental exposures experienced by residents of farms or bystanders. All these individuals are also exposed to pesticide residues via food. The conceptual framework of aggregated exposure was implemented in the MCRA system and tested addressing four different aggregated exposure scenarios in the form of case studies.

Aggregated exposure

The aggregated model is developed by Fera, DLO and RIVM. It was designed to be as flexible as possible, to accommodate existing models of non-dietary and dietary exposure, in all their forms, and to facilitate future extensions. An assessment involves: definition of an exposure question, including selection of an appropriate population, health effect and relevant compound(s); estimation of non-dietary exposures from one or more activities leading to exposure; matching non-dietary exposures with dietary exposures at the individual level; aggregation of those exposures and conversion to an appropriate common unit. If a chronic assessment is required, exposures are calculated per individual, typically representing average daily exposure. In the acute case, exposure values per individual-day should be calculated.

Validation and future perspective

Both the cumulative and the aggregate models were validated, and are transparent and fully documented. Validation was performed against simulated data where the true outcome is known, and against the factor standard program used by the US-EPA, namely DEEM-FCID. The current ACROPOLIS IT tool (cumulative model) should be described as a well-defined, workable and validated ‘proof of principle’ and it should not be seen as a fully operable software able to calculate with all European data and the large number of pesticides categorized in cumulative assessment groups. To reach this stage certain routines in the IT tool should be optimized or adjusted. These and a number of other developments will be supported by EFSA, DG SANCO and a number of member states. The aggregate exposure model within the ACROPOLIS IT tool is still in its infancy. Further exploitation depends on the interest of Member States and/or EFSA to explore it further.
Occupational exposure to pesticides in agriculture, on-going expertise at Anses

Catherine LAURENT et al.

This presentation is taken from a study by the ANSES Working Group on «Agricultural workers and pesticides», whose members are C. LAURENT, Chair, I. BALDI, Vice-Chair, G. BERNADAC, A. BERTHET, A. GARRIGOU, S. GRIMBULHER, L. GUICHARD, N. JAS, J.-N. JOUEZEL, P. LEBAILLY, G. MILHAUD, O. SAMUEL, J. SPINOSI and P. WAVRESKY, coordinated on behalf of ANSES by O. YAMADA, G. BOULANGER, A. VIGOUROUX-VILLARD and M. MERLO

BIOGRAPHY

Catherine LAURENT is a senior scientist in the French National Institute for Agricultural Research in the Department «Science for Action and Development». She has completed a full initial double training as political economist and veterinary doctor (BA, MSc, PhD Paris 7, DVM Maisons-Alfort) with a MSc in philosophy of science (Paris 1-Panthéon Sorbonne). Her current research interest is focused on how scientific knowledge is evaluated and taken into account in public intervention.

ABSTRACT

The mission of the Working Group (WG) on «Agricultural workers and pesticides», set up by ANSES in 2012, is to identify and characterise the situations in which people working on French farms (family labour, permanent and part-time employees, outside workers, etc.) are exposed to pesticides. The WG brings to bear expertise from a wide range of disciplines (agronomy, economics, epidemiology, ergonomics, exposure assessment, history, metrology, sociology and toxicology).

The term «Pesticides» is understood in the broad sense as covered by several regulations (plant protection products, biocides, certain veterinary medicines for external use), which means that a given compound may be found in each of these three types of product.

Several sources of information were analysed: scientific literature, grey literature, statistical data, and various information systems which might contain data on exposure (for example Phyt’attitude), etc.

The results of a systematic review of the available scientific literature on exposure situations in France were widely disseminated. This was then followed by a public announcement inviting further contributions in February 2014. The results show that there is little documentation about the exposure to pesticides of persons working in agriculture in France, and that the existing information is difficult to access. Fewer than a hundred articles were identified across all disciplines, for all production situations, without limit of time. The few studies available are not enough to enable a description and analysis – and, a fortiori, a ranking – of exposure situations for all agricultural workers. Although there is some, though still insufficient, information available for certain sectors and certain tasks (viticulture, arable crops, etc.), this mainly relates to the tasks required when treating the crops (preparation and application of the plant-protection products) and tells us little about situations of «indirect» exposure during post-application tasks. Some sectors of activity do not appear at all and/or have not been the subject of investigations identified in the scientific literature (livestock-keeping, arboriculture, horticulture/market gardening, seed storage, crop packaging workshops, subcontracting, etc.). Furthermore, some work situations have not or have only slightly been taken into account when characterising exposure (re-entry tasks, contact with treated plants or animals, etc.).

It has to be admitted that available information in this area is minimal. For the study to be complete, the examination of the publicly-available scientific data should be supplemented by a description and an assessment of the procedures followed and the data used to assess exposure during the administrative approval process for plant protection, biocidal and veterinary products in France.
However this kind of information is often confidential and difficult to get, which has limited the extent of the analysis. To address this deficit of information, other paths were explored based on two case studies, one on re-entry tasks in orchards and another on external anti-parasite treatments used in sheep farming. An in-depth analysis of the foreign literature on these two case studies highlights a set of issues which are not being considered by scientific and institutional debate in France. It also raises questions about the limits on extrapolating from foreign literature to situations in France. Interviews with different specialists as a part of this study revealed that the different sets of regulations governing the use of pesticides are often drawn up without due consideration of actual practice. For example, they ignore the issue of cumulative exposure resulting from the use of multiple products for one or more farm productions, and at different times of life, for people working on farms.

More generally, the regulations governing the use of pesticides (on plant protection products, veterinary medicines, biocides, personal protective equipment, etc.), and which aim to assess and advise on the dangers and how to protect against them, are extremely complex and difficult to grasp for all the actors concerned, including even the most specialised experts. It is very difficult to find and summarise the available information, to access the source data, and to transform such heterogeneous information, which is sometimes incomplete and contradictory, into operational recommendations for practical use. Given the lack of a regular advisory body for consulting all those working in agriculture on the risks related to exposure to the whole range of pesticides, and given the lack of a shared knowledge platform, the responsibility for gathering and summarizing this complex information is transferred to the people who work on farms.
Session 3 – Technical and human factors impacting exposure and protective measures

Overview of existing issues with regard to technical factors, PPE and work wear, and their impact on exposure

Rienda GERRITSEN-EBBEN
TNO, the Netherlands

BIOGRAPHY
Rienda GERRITSEN-EBBEN is project manager of several national and international (EU) projects on different topics, covering several expertises, and with various (international) partners.
She has a wide expertise in the field of occupational exposure assessment for plant protection products. She has been involved in different projects in this area, including GLP field studies on operator and worker exposure, exposure modelling and PPE. Within the FP7 BROWSE project she was work package leader of the work package on Operator exposure.

ABSTRACT

Objective
Objective of the development of new exposure models for bystanders, residents, operators and workers within the EU BROWSE project was to take into account all the mechanisms and key factors that influence the actual exposure. For both operators and workers the use of personal protective equipment (PPE) and work wear is one of these key factors, and for operators also technical factors like use of cabins, boom shielding, etc. can have an effect on their actual exposure, and should thus be taken into account during exposure assessment.

Methods
In order to investigate the effect of PPE and work wear and how these effects could be incorporated in new exposure models within the BROWSE framework, a review was carried out on the exposure reduction effectiveness of PPE and work wear, elaborating on previous work carried out by TNO in 2007. This review focused on evaluating recent literature (>2007) and projects related to this topic. Furthermore, a limited literature review evaluating technical control measures like cabins and their efficiency, the effects of booms shielding on the exposure was performed, in order to implement this into the exposure models as well.
In addition, the exposure database developed within the BROWSE project, containing both potential and actual dermal exposure data from operators and workers, was statistically analyzed to estimate the exposure reduction effectiveness for different types of PPE and work wear for different operator and worker scenarios.

Results
The review with regard to cabin efficiencies showed that cabin efficiencies can be high (>99%), but are also highly variable and depend on cabin ventilation (pressurized, over-pressure), cabin cleaning, leak tightness of the cabin, leak tightness of the filter system and cabin life.
Furthermore, cabin efficiency also depends on type of spray activity and operator behaviour. Insufficient evidence is available to underpin the efficiency for a wide range of different cabin types and therefore only a distinction was made between cabins with and without positive pressure and filtered ventilation.

With regard to the effect of boom shielding only limited evidence is available and therefore no distinction could be made between different types of boom shielding. Therefore, only a reduction factor for the presence compared to the absence of boom shielding was derived.

The review showed that much of the clothing worn by operators is not strictly PPE, in the sense that it is not CE-marked as chemical protective clothing. However, also the use of PPE in itself is not a guarantee of adequate exposure reduction, as the state of the PPE and the way it used, stored or maintained will determine how effective it will be in practice. Recent EFSA funded surveys have shown that operators often wear cotton or cotton/polyester coveralls, which is consistent with observations made in field studies in a number of EU Member States. It is difficult to identify any particular trend in the use of PPE based on the literature review. The evaluation of the studies on the performance of PPE and work wear resulted in a confirmation of the conclusions as presented in 2007. However, due to lack of data and the wide range of conditions under which the PPE and work wear have been evaluated in the field, it is difficult to draw more specific conclusions.

However, the analysis of data from the BROWSE exposure database allowed for the determination of protection factors for specific types of PPE and work clothing, and therefore creating the possibility of having a range of default values for these different types of clothing. BROWSE data, mainly based on operator studies, showed median penetration values of 3-15% for PPE and work wear and 0.5-10% for different glove types, with small differences based on the type of activity performed. The data available cover studies done over several years with a range of crops and application techniques and use of protective measures.

**Conclusions**

Both the literature review and the data analysis provided evidence for an approach that enabled the use of (ranges of) default reduction factors for PPE and work wear in the BROWSE operator (and worker) exposure models. Furthermore, technical (control) measures like the use of cabins, boom shielding, etc. but also different techniques for mixing and loading and the effect of drift reducing nozzles and nozzle maintenance by the operator were implemented in the exposure models. When new data become available, it may be possible to further refine the protection factors offered by different types of PPE and work wear or technical control measures, particularly where a common protocol has been used. Increased availability of survey data would also provide important information with regard to typical uses of PPE and work wear, which would perhaps enable differentiation in effectiveness based on application technique and/or region and thereby would enlarge their applicability domain.
Personal Protective Equipment – performance and recommendations

Thierry MERCIER

ANSES, France

BIOGRAPHY

Thierry MERCIER has a Ph.D. in toxicology. He joined the French National Institute for Agricultural Research as a regulatory toxicologist in 1997 before becoming Head of Unit, involved in the evaluation and coordination of risk assessment of pesticides. Currently he is Deputy Director of the Department of regulated products at Anses in charge of the evaluation and coordination of pesticides and fertilisers risk assessment.

ABSTRACT

According to the regulation on plant protection products (EC) N°1107/2009 when the conditions require use of protective clothing, checking of effectiveness is required.

In Europe, Council Directive 89/686/EEC (also called the “PPE directive”) is the regulatory basis relating to personal protective equipment. No specific harmonised European standard is available for protective clothing dedicated to operators using plant protection products. Moreover, most European Union member states have no specific agricultural standard for protective equipment and the same protection standards apply to workers in the chemical industry and in agriculture. Most professional pesticide users (operators) often wear working clothes such as polyester/cotton coveralls, which have high mechanical resistance. There are situations of exposure where standardized coveralls (category III Type 6 or 4 or 3) or partial standardized body clothes (i.e. gowns Category III Type 3) are reported to be worn by operators. Field operator exposure studies conducted under actual working conditions, and used in the risk assessment showed that working coveralls, in certain situations provides an effective protection against plant protection products, however these working coveralls are not certified.

In this context, performance of the most common working coveralls and PPE marketed in France was tested against penetration and permeation of different types of undiluted and diluted plant protection products according to ISO standard 27065:2011 “Protective clothing - performance requirements for protective clothing worn by operators applying pesticides”.

In order to determine the protection factor provided by PPE in field condition, and to compare with the available operator exposure studies, the efficiency of a working coverall combined with a certified partial body (i.e. gowns Category III Type 3) was studied in vineyards.
Variability of exposure to pesticides according to the spraying equipment used: how can we reduce the operator’s exposure?

Sonia GRIMBUHLER

National Research Institute of Science and Technology for Environment and Agriculture (IRSTEA), Montpellier

BIOGRAPHY

Sonia GRIMBUHLER has worked since 2006 as a researcher in exposure science at IRSTEA (National Research Institute of Science and Technology for Environment and Agriculture).

She manages a group of agricultural engineers, ergonomics experts, risk assessors, pharmacists and technologists involved in the reduction of exposure to chemicals (and more specifically plant protection products), and who take into account the activities of operators and workers.

ABSTRACT

The various uses of plant protection products can lead to a whole range of environmental contamination situations and also expose sprayer operators, farm workers and people living near farmland.

Operator exposure is not homogeneous. It varies widely according to the part of the body in question and the different handling phases. Handling operations range from making up the spray and treatment to cleaning and maintenance of the spraying equipment. The sprayer itself is a vital factor in determining exposure.

Variability of exposure according to activity

When preparing the pesticide mixture, the operator fills the main tank with clean water, doses out the products, adds them to the tank and mixes them. The operator’s exposure during this phase is determined by a range of factors, including handling concentrated products having various chemical formulations and pesticide packaging of different shapes and sizes, contact with a dirty sprayer refilled several times a day on large farms, tank capacity and the quantity of mixture sprayed over the crops. The operator also comes into contact with different sprayer components, including the induction bowl, tank, filling aperture, ladder and operator seat.

During application of the spray, which is the longest phase, exposure can be greatly reduced by ensuring the tractor, self-propelled or high-clearance sprayer is fitted with a cabin, as long as it is properly maintained and kept clean. However, operators are still exposed when working on the equipment, which includes unblocking the nozzles or manually unfolding or folding the spraying ramp.

Cleaning the equipment also involves exposure to the diluted product due to splashing but also to the concentrated product when cleaning specific parts like the filters, which are not always readily accessible. Farmers are not usually aware of this risk, considering that the product is no longer in the tank.

To understand this variability in exposure, we need to consider the work environment, hazards and operator activities.

One of the main issues involves determining to what degree exposure is impacted by a) the size and corpulence of the operator and b) the size, shape and accessibility of sprayer components, along with the tools and products needed for this task.

This presentation aims to identify and characterise hazardous situations in relation to sprayers so as to put forward technical and/or organisational solutions to reduce operator exposure, based on analyses:

- of the needs and constraints of both users and manufacturers of spraying equipment,
- during the different tasks involving farmers handling plant protection products, of the farmer’s activity
- contact between the operator and the spraying equipment.
Skin contact is predominant in exposure to pesticides, which is why this is the focus of our study. In Europe, directive 2009/127/EC lays down guidelines on the design of crop-spraying machines, and stipulates the need to ensure workers’ safety and health. French standards NF EN ISO 4254.1, NF EN ISO 4254.6 and NF EN ISO 16119.1 to 3 refer to this directive and serve as a baseline for sprayer manufacturers.

There is a wide range of spraying equipment, with different spraying methods, coupling systems, tank volumes, access to the filling aperture etc. Certain sprayer components and operations entail significant operator contact. Indeed, there is also contact through elements other than the sprayer itself. An analysis of activities reveals functional interactions between these elements and highlights the needs to be considered when designing future sprayers to ensure exposure is kept to a minimum.

One way of reducing exposure would be to limit contact between operators and the equipment, dirty tools and products, or even keep operators away from plant protection products. Is this currently possible? Is an unmanned sprayer conceivable or unrealistic?

The use of pesticides in French viticulture: a badly controlled technology transfer!
Alain GARRIGOU
University of Bordeaux/INSERM/ISPED, France

BIOGRAPHY
Alain GARRIGOU is assistant professor in ergonomics at the University Institute of Technology, department of HSE (Hygiene Safety and Environmental Department), University of Bordeaux. He is also researcher at the LSTE (Occupational Health and Environment Laboratory of the ISPED (Institute of public health, epidemiology and development). His recent research topics are dealing with working conditions in high risk. This different studies or researches are leading in a transdisciplinary way with toxicology, public health, safety, psychology and anthropology.

ABSTRACT
This paper aims to address the limits of prevention practices only focussed on PPE in context of pesticides in French vineyards. The chosen approach draws from an anthropological approach as well as from developments in ergotoxicology applied to the French vineyard work. We shall discuss the use of pesticides from the point of view of the transfer of technology. Our recent research has shown that this technology transfer was not completely controlled by the different stakeholders.

First we will underline that the general principles of prevention distinguish three levels of safety. The first concerns actions taken at the source, eliminating the hazard or replacing a dangerous process or product by one that is less dangerous. The second level focuses on setting up collective or personal protective equipment, with the emphasis on collective protective measures, deemed more effective than personal protective equipment. The third level consists in planning for first aid and rescue if an unwanted event occurs in respect to the risk in question. In that perspective the use of PPE has to be considered as the last »wheel » of the prevention system.
Then we shall discuss the questions of PPE design and use in a perspective of a transfer of technology issue. We will highlight that they were designed for industrial work and organisations, situations that have little in common with the real working conditions in agriculture.

The work environment and the environmental factors are much less predictable and controllable than in industrial setting (suits may get torn with vegetation, the sprayer tank can overflow, nozzles can get blocked, the weather can vary greatly and in turn greatly change the strenuousness...). In that respect, the efficiency of PPE can be discussed.

Our recent research have shown that the type 4 suits which were recommended until recently by prevention institutions were only partially effective. Furthermore, although this is the class of coverall recommended by the prevention management institutions (Ministry of Agriculture and CCMSA, [10]), it is clear that the tests on resistance to permeation by liquids for these coveralls are not conducted using active substances featured in pesticides but with various sulphuric acid and sodium hydroxide-based solutions. We must also remind that the effectiveness of a suit to pesticide permeation and penetration depends on the particular relationship between the material it is made of and the active substances of the pesticides. Believing that there is on the market a generic suit that would protect against all pesticides is an illusion.

Under normal use and reuse conditions of suits over a long period of time, we can understand that the active substances in pesticides can migrate through the fabric of the suit, hence accumulating and contaminating the farm workers. This may explain the surprising results of the Pestexpo study. Indeed a measurement of skin contamination made with gauze patches revealed that suit wearing workers were on the whole more contaminated than workers who did not wear PPE. These results wreaked havoc among the health and safety community.

Besides, the use of PPE also implies significant physiological constraints concerning the thermal regulation, even more during situation with high physical demand.

We will also develop that PPE cannot only be approached from a technical standpoint (are they right for the substance?). PPE involve subjective and social dimensions. Indeed, they are perceived as a symbol of prevention, which in itself conveys different representations for different stakeholders. Workers explain that local people sometimes see them as “astronauts”, or that using PPE gives a negative image of wine growing, as if the “vineyards and the wine were contaminated by harmful substances” or in the words of another worker “the public sees us and thinks that we are polluters.” Several interviewees said that they no longer wore PPE as they had been stopped from doing so by local residents. As they were wearing a suit, they were polluters.

Our analysis of winegrower activity, and more precisely the situations of pesticide use, has highlighted the fact that the need for protection has become a complex activity in itself. This self-protection activity and the prevention of delayed health risks are not fully a part of the wider system made up of tending to the vineyard, the production of large quantities of quality grapes, or wine-making. It generally does not take long for winegrowers to realise that simplistic prevention measures soon become inapplicable in real situations. For example, how to treat a vineyard with a closed cab equipped with a filtration system when the outside temperature is 25°C as the temperature inside the cab will be 35°C? Workers will be led to open the side windows to lower the temperature. Another example; after several treatments, the windows are covered with pesticide spray that compromises visibility. Then again, worker will open the windows to manoeuvre more easily. Pesticides can then penetrate the cab.

We will conclude by discussing the limits of the focus only on PPE without systemic perspective for enhancing the equipment design, the work organisation and the training. We will also underline the risks to transfert the juridic responsibility of illness to the worker even if the PPE are not totally efficient.
Round Table – Occupational exposures: challenges and preventive measures reflecting current knowledge and practices

Occupational exposure to pesticides: the limits of technical solutions

Nathalie JAS
Unité RiTME – INRA, France

BIOGRAPHY
Nathalie JAS is an historian and sociologist of science and a researcher at the French National Institute for Agronomical Research (INRA). Her current work analyzes hazardous chemicals have been governed since the end of the nineteenth-century. She has recently co-edited two books on the topic, both with Soraya BOUDIA: Toxicants, Health and Regulation since 1945 (Pickering & Chatto, London, 2013) and (Powerless Science?: Science and Politics in a Toxic World (Berghahn Books, Oxford & New York, 2014).

ABSTRACT
This paper puts the current mixture debate in a long term perspective. It shows that since the end of the 1940’s chemical mixtures have regularly been (re)discussed by groups of scientists, worried by the possible detrimental effects of the presence in the environment of thousands of toxicology almost unknown chemicals. These discussions were held within the scientific frames of the period they took place, often integrating the newest chemical/biological knowledge of the time. Yet, until recently, these debates were never considered seriously by regulatory bodies. On the contrary the ways in which the political and administrative regulation of toxic chemicals had been developed de facto ignored them or set them aside.

The growing concerns over endocrine disruptors as well as the vivid socio-technic controversies they have given rise to, have again put forward the mixture issue, which this time has found its way within political debates and regulatory agencies. Because of the historical development of the toxicant regulation, the challenge faced by the regulatory bodies is now not only this of the scientific complexity of chemical mixtures effects, it is also this posed by regulatory paradigms and practices which are not designed for such issues.
The French Agency for Food, Environmental and Occupational Health & Safety (ANSES)

The French Agency for Food, Environmental and Occupational Health & Safety (ANSES) was created on 1 July 2010 as a scientific body operating in the fields of food, the environment and work, the health and welfare of animals and plant health. The core role of ANSES is to assess health risks to facilitate public policy-making. ANSES is a public authority reporting to the Ministries of Health, Agriculture, the Environment, Labour and Consumer Affairs.

Through its surveillance, expert appraisal, research and reference activities, the Agency covers the full range of risks (microbiological, chemical or physical) to which individuals might be exposed, voluntarily or otherwise, throughout their lives, whether via exposure in the workplace, during transport, recreation or via food intake. This activity entails independent scientific appraisals by groups of experts from different horizons, taking into account the socio-economic dimensions of risk.

To carry out its various missions, the Agency relies particularly on a network of eleven reference and research laboratories, recognized at the international level in several areas or disciplines. It employs 1350 agents and calls on around 800 external experts through its expert groups.

ANSES is also responsible for veterinary medicinal products and it examines applications for the marketing of pesticides and biocides, as well as chemicals within the framework of the European REACh regulations. In addition, it works in partnership with many external agencies, both national and international.

The Agency is open to society and thus attaches great importance to discussions with all stakeholders. It carries out its investigations openly and shares its information with the various groups concerned: associations, the scientific community, local authorities, trade unions, etc.

Its Board of Administrators, which represents the five Colleges of the Grenelle environmental round table, sets up themed committees that help define directions and priorities for the ANSES work programme, and informs the Agency of the concerns of civil society.

ANSES systematically publishes its work on its website www.anses.fr and organises or participates in about twenty scientific events per year.

Follow the Agency on Twitter: @Anses_fr
The European Food Safety Authority (EFSA)
Committed to ensuring that Europe’s food is safe

**A science-based organisation that protects and informs consumers**

EFSA provides impartial, high-calibre scientific advice to help inform decisions of policy makers about food-related risks. This is a crucial part of an institutional framework in the European Union (EU) that ensures the safety of consumers, as well as animals and the environment from any risks associated with the food chain. EFSA’s key activity is scientific risk assessment, a specialised field of applied science that involves reviewing scientific data and studies to evaluate risks associated with certain hazards. The Authority also has an important role in communicating its advice to its principal partners, stakeholders and the public at large in a timely, clear and meaningful way, helping to bridge the gap between science and the consumer.

**Europe working together for safer food**

In 2002 after a series of food-related alerts that impacted on human health and shook public confidence, the EU adopted the General Food Law1, providing a comprehensive framework for the EU’s science-based food regulatory system. Key elements were the functional separation of risk assessment and risk management and the establishment of EFSA. While EFSA took on the role of risk assessor, EU risk managers2 retained control over regulatory decision-making, policy and prevention and control measures. A crucial aspect in the success of this system lies in the active engagement and co-operation with stakeholders and partners at European and national levels.

**Increasing focus on transparency and openness**

Transparency (access to data, information and documents) and openness (engagement) have been key values for EFSA since its creation in 2002. Adherence to these values helps to legitimise EFSA’s work and ensure accountability to society. The Authority has implemented, and continues to develop, important measures to support openness and transparency goals. However, EFSA recognises that society’s expectations regarding scientific bodies have grown in the last ten years. Technology has advanced and channels of engagement have multiplied giving more stakeholders the means to be involved in EFSA’s work.

In July 2014, EFSA launched the Open EFSA initiative to explore how it can better meet these expectations and also understand the implications they have for the Authority’s organisational set up. EFSA published a discussion paper that defines a conceptual framework, a step-by-step methodology and a plan for the Authority’s transformation into an Open EFSA over the coming years. As part of this commitment, the Authority asked for feedback on its proposals through a public consultation. Over the next two years, EFSA will finalise a list of possible actions, carry out a cost/benefit analysis and, from 2016 onwards, roll out the actions as and when possible.

Executive Director Bernhard Url said: “EFSA is committed to opening up its scientific processes to the widest possible extent and to being more understandable to its partners, stakeholders and the public at large.”

For more information:  www.efsa.europa.eu  twitter.com/EFSA_EU  youtube.com/EFSAchannel

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1 Regulation EC 178/2002
2 European Commission, European Parliament and EU Member States