

CURRICULUM VITAE ET STUDIORUM

1953 Born in Modena, Italy, on October 3

1984 Degree in Biological Science, University of Modena

1989 PhD in Animal Biology, University of Bologna

1989 Temporary Researcher, Consorzio Frasassi, Ancona.

1990 Researcher in Genetics, Department of Animal Biology, University of Modena

2002 Associate Professor in Genetics, Department of Agricultural and Food Science, University of Modena and Reggio Emilia

2010 Vice director of PhD School of AGRICULTURAL SCIENCES, TECHNOLOGIES AND BIOTECHNOLOGIES

Member of Societies

Associazione Genetica Italiana (AGI)

Società Italiana di Genetica Agraria (SIGA)

European Cytogenetics Association (ECA)

Genetic Society of Canada (GSC)

Reviewer

Editorial Board of *Caryologia*

Human Reproduction

Pest Management Science

European Journal of Entomology

Chromosome Research

Total citations (01-07-2014)

3127

h index

27

RESEARCH INTERESTS

Genome organization in pest crop insects with particular emphasis to 1) structural and functional role played by heterochromatic highly repeated DNA sequences and rDNA genes in the holocentric chromosomes of different aphid species; 2) genetic basis of pesticide resistance in pest crop insects.

Aphids are lymph sucking insects, very important for agricultural entomology, due not only to their direct parasitic action against crops, but also because they represent active vectors of crop virosis. The researches carried out in my lab intends to furnish a multidisciplinary approach (cytogenetics and molecular) to the study of genome organization in aphids, with particular emphasis of genetic mechanisms generating insecticide resistance of these pest crop insects. From several years, this research unit is engaged in getting a better analysis of karyotype in different aphid species through the employment of modern cytogenetic techniques taking into account that the holocentric nature of aphid chromosomes (in particular the absence of constrictions) has strongly hindered the karyological analysis in this taxon. The more interesting results has been obtained with the C banding technique that has allowed us to show a preferential localization of heterochromatin on X chromosome. Moreover, particularly interesting is the "fluctuating" behaviour of C bands, correlated to the condensation state of X chromosome, and the absence of equilocal distribution of heterochromatin. These cytogenetics information have been integrated with data coming from molecular techniques, such as analysis and comparisons of highly repeated DNA sequences (DNA

satellites and rDNA genes). The analysis of the molecular characteristics of highly repeated DNA sequences, together with a comparison of their nucleotide sequences and their chromosomal localization allowed us to get useful information to the comprehension of the evolutionary processes which are at the base of the diversification between organisms. Moreover, these information provide a starting point in order to analyze both cytological and molecular mechanisms which are involved in genetic variability also within obligated parthenogenetic strains of aphids. In this connection, recent analyses demonstrated the presence of interclonal (but in some cases also intracolonial) karyotype variations originated during parthenogenetic generations of *M. persicae*. The interest of these findings is emphasized by considering that chromosomal rearrangements could affect aphid's host choice and resistance to different insecticides, thus influencing adaptation and also speciation events.

We have also focused our attention on the study of the genetic basis of insecticide resistance utilizing the peach potato aphid *Myzus persicae* as a tool.

At now two target site mutation are largely diffused among *M. persicae* European populations: a) Point mutations in the gene sequence coding for the sodium channel protein (*kdr*, knockdown resistance). This mutation provokes the resistance towards pyrethroids and DDT; b) a modified acetylcholinesterase (MACE) which results insensitive towards dimethylcarbamates. Recently we have set up a rapid RFLP-PCR strategy able to put in evidence both *kdr* and MACE phenotypes starting from genomic DNA since the point mutations considered responsible for "MACE" and for "kdr" phenotypes remove the restriction sites for the enzymes *SspI* (MACE) and *BssSI* (*kdr*) respectively.

Chromatin anomalies and DNA damages in mammalian spermatozoa in relation to the use of pesticides and/or other endocrine disrupters.

Several studies carried out in my lab have shown that anomalies of chromatin structure are involved in male infertility. These anomalies, not currently detectable by standard WHO semen analysis, may escape our attention and have implications when the spermatozoa are used for assisted reproduction techniques. In addition to anomalies related to the deposition of protamines other studies have shown that a variable fraction of ejaculated human spermatozoa possess nicked DNA. The origin of nuclear DNA damages in human sperm is not clearly understood. Two hypotheses have been proposed: a) the presence of ejaculated sperm with damaged DNA is indicative of problems occurring during sperm maturation; b) these DNA breaks are indicative of an apoptotic degeneration which failed the precocious elimination of these gametes from the genetic pool. In the last years we were involved in the INUENDO Project funded by the European Commission which was aimed to address reproductive toxicity of dietary persistent organochlorine pollutants (POPs). Couple fertility and male reproductive function were investigated in four regions, Greenland, Sweden, Warsaw and Kharkiv. Male and female serum concentrations of POPs were related to reduced fertility among Inuit couples. In all regions decreasing progressive sperm motility with increasing CB-153 serum concentrations was observed. In addition, the study revealed a remarkable high level of sperm chromatin integrity and low level of sperm DNA damage among Inuit men that may explain why Inuits may escape the rather strong PCB related effect on sperm chromatin found among Caucasian men. Moreover, the study revealed several associations between POP blood levels and male reproductive hormones as well as Y/X sperm chromosome ratio but strong heterogeneity between regions complicates the interpretation. Some associations may be related to heterogeneous exposure profiles and others may appear because of multiple comparisons, confounding or artefacts of the study design.

In conclusion, the study indicates that POPs in the male adult may interfere with his reproductive function without major impact on fertility or sperm counts in European populations. PCBs seem more to blame than DDT. No-effect thresholds cannot be established. Findings provide limited evidence that xenobiotic disruption of endocrine regulation is at stake but do not exclude

mechanisms related to receptor function. The study does not address effects of fetal and childhood

MAIN RESEARCH PROJECTS AS CO-ORDINATOR

- Identificazione di DNA satelliti in diverse specie di afidi. Advanced Research Project funded by Università di Modena. 1996
- Approccio citogenetico e molecolare allo studio di Omotteri di interesse agrario. Research Project funded by Consiglio Nazionale delle Ricerche (Comitato Scienze Agrarie). 1997
- Identificazione di geni responsabili della resistenza a insetticidi fosfororganici nel lepidottero fitofago *Cydia molesta*. Applied Research Project funded by SIPCAM-OXON and co-funded by Università di Modena. 1999
- Analisi citologica e molecolare delle rotture presenti nel DNA di spermatozoi di eiaculati umani in relazione a condizioni di infertilità maschile Research Project funded by Italian MURST (Ministero Università Ricerca Scientifica). 1999
- Indagini sulle basi molecolari dei meccanismi di resistenza diffusi tra le popolazioni italiane di *Myzus persicae* e *Bemisia tabaci*. Project funded by Italian MURST (Ministero Università Ricerca Scientifica). 2001
- Meccanismi generanti variabilità genetica in afidi a riproduzione partenogenetica. Project funded by Italian MURST (Ministero Università Ricerca Scientifica). 2001
- Biopersistent organochlorines in diet and human fertility. Epidemiological studies of time to pregnancy and semen quality in Inuit and European populations. INUENDO European Commission 2002-2005. Local Unity co-ordinator
- L'afide verde del pesco *Myzus persicae* come modello per lo studio delle basi genetiche della resistenza agli agrofarmaci in artropodi di interesse agrario. Project funded by Italian MURST (Ministero Università Ricerca Scientifica). 2005
- Ricerche sulla resistenza di *Carpocapsa* e *Cydia molesta* ai fitofarmaci impiegati nella difesa di melo, pero e pesco in Emilia-Romagna. Research Project funded by Emilia-Romagna Region. 2006-2009.
- Basi biochimiche e molecolari della resistenza agli agrofarmaci nel lepidottero *Cydia pomonella*. PRIN finanziato dal MURST (Ministero Università Ricerca Scientifica). 2007