

# **Nuovi contaminanti emergenti e rischi per gli organismi marini**

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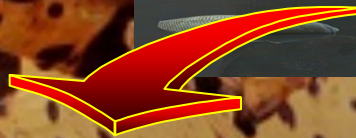
*Università Politecnica delle Marche*

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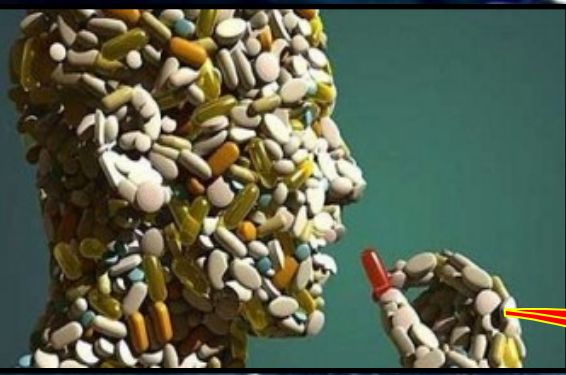


# *Inquinanti chimici nell'ambiente marino*





# Inquinanti emergenti....?





# ESEMPI DI DISTRUTTORI ENDOCRINI AMBIENTALI



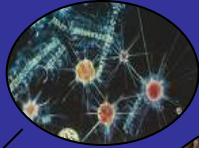


# EFFETTI DEI DISTRUTTORI ENDOCRINI

Gabbiano reale 124 ppm

X 50.000

Fitoplancton 0.0025 ppm



Zooplancton 0.123 ppm



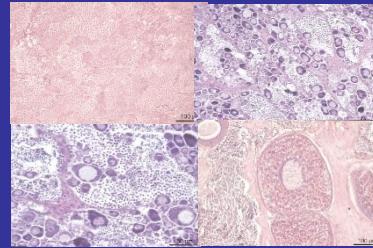
Uova gabbiano 124 ppm



Avannotti 1.04 ppm



Trota 4.83 ppm



Tessuto testicolare con graduale infiltrazione oociti primari e secondari



Il 10% dei pesci maschi del fiume Tyne (UK) ha tessuto ovarico in quello testicolare



Gasteropodi  
Imposex, sterilità,  
mascolinizzazione  
tratto genitale



Alligatori Florida. Elevata mortalità embrionale e pochi maschi per bassa concentrazione di testosterone (induzione aromatasi da organoclorurati)



Uccelli marini. Alterazioni di livelli ormonali e della sex ratio, fragilità guscio uova



Leoni marini di San Francisco  
Immunosoppressione e riduzione del successo riproduttivo



Orso polare: 4 esemplari ermafroditi su 100 (PCB)



Malformazioni e mortalità su molte specie di anfibi

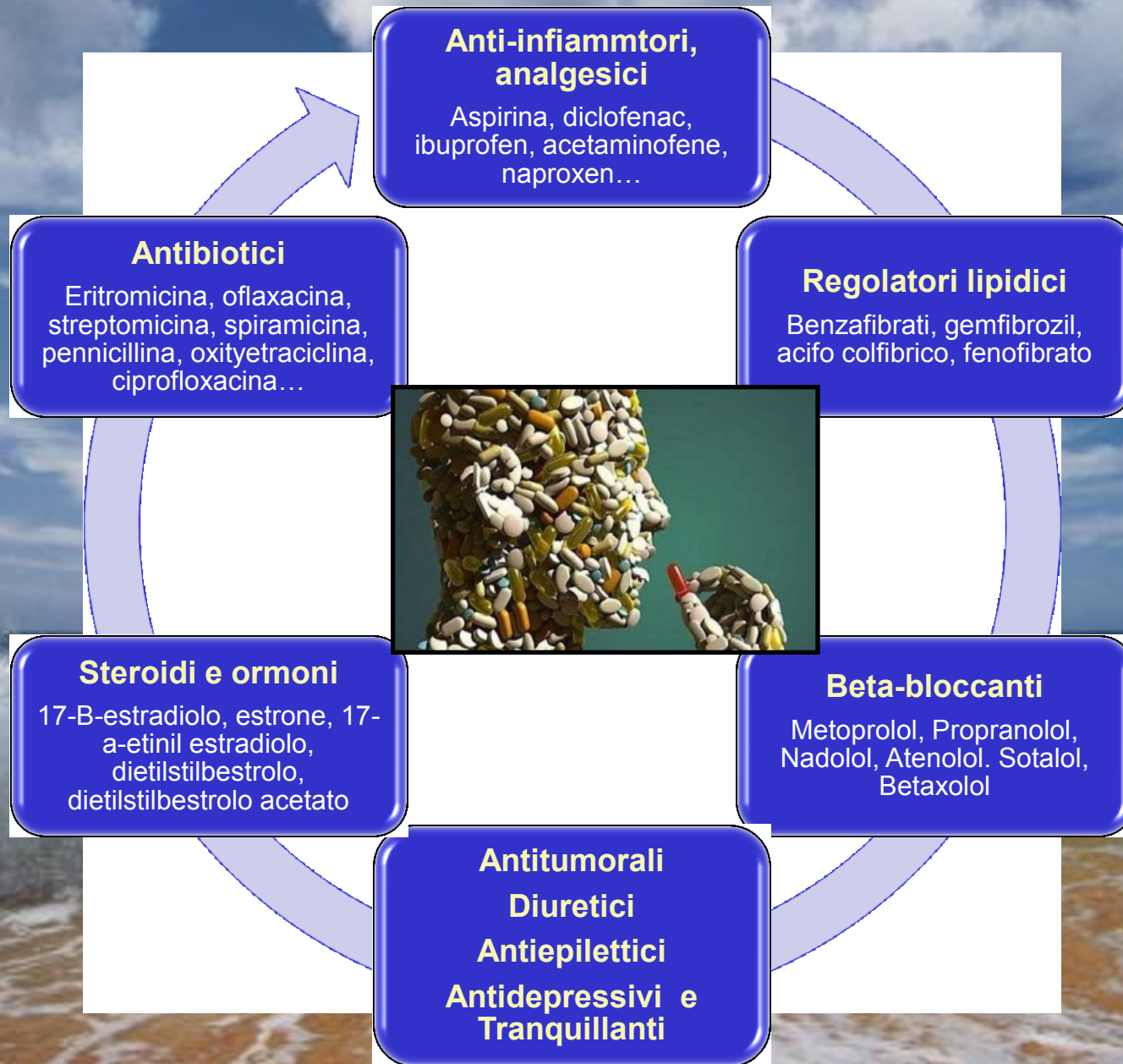


Beluga (estuario St Lawrence): alterazioni ormonali e dell'apparato riproduttore, ermafroditismo, aumento lesioni tiroidee, tumori





# FARMACI NEGLI AMBIENTI ACQUATICI





# FARMACI NEGLI AMBIENTI ACQUATICI



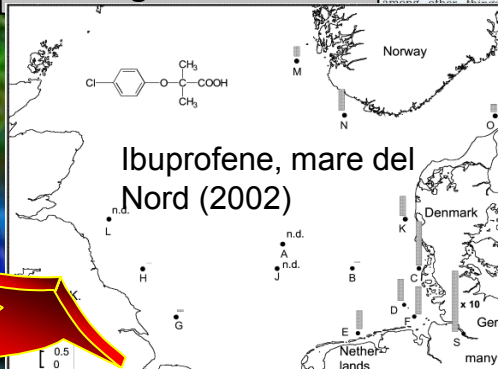
La Repubblica, 4 agosto 2005:  
Scoperte tracce di cocaina nel Po  
"Scorrono quattro chili al giorno"

## In Our Streams: Prozac and Pesticides

**W**ASTEWATER-TREATMENT PLANTS are pretty good at getting rid of common pollutants like bacteria and heavy metals, but a nationwide survey last year showed that plenty of manmade chemicals still get through. U.S. rivers and streams are tainted with pesticides, anti-epilepsy drugs, and other pharmaceuticals. The country low—less than some cases—but whether they're more gradually, and those are the ones that treatment-plant operators should concentrate on removing.


Once they have figured out how the dozens of compounds on their list are dispersed, USGS and other scientists will address the question of how dangerous they are to human health—research that should take several more years. "We have no evidence that these chemicals are harmful at these levels," says Kolpin. "But we also have no proof that they aren't."

—M.D.L.






# EFFETTI DEI FARMACI NEGLI AMBIENTI ACQUATICI



Le concentrazioni tossicologicamente attive in test acuti di laboratorio sono spesso 100-1000 volte maggiori di quelle ambientali



Significa che non avremo effetti tossici nell'ambiente naturale...?





# EFFETTI DEI FARMACI NEGLI ORGANISMI ACQUATICI



17 $\alpha$ - ETINILESTRADIOLO  
a concentrazioni ambientali di  
ng/L femminilizzazione  
dei pesci maschi



**DICLOFENAC** (anti-infiammatorio non steroideo) a valori ambientali di 1.2  $\mu\text{g/L}$  blocca la produzione di prostaglandine con danni cellulari nei reni e nelle branchie della trota iridea *Oncorhynchus mykiss*



*Carassius auratus*

## GEMFIBROZIL

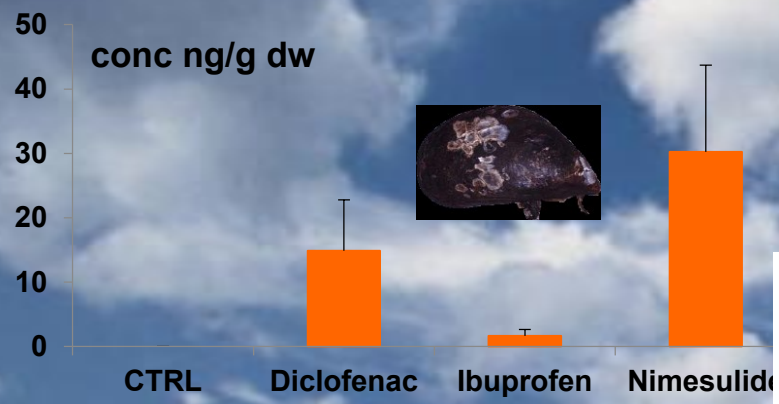
(regolatore lipidico dei fibrati), a livelli ambientali di 1,5  $\mu\text{g/L}$ , abbassa il colesterolo e riduce indirettamente la sintesi del Testosterone fino al 50%

Anti-depressivi (Prozac), alterano la metamorfosi nelle rane

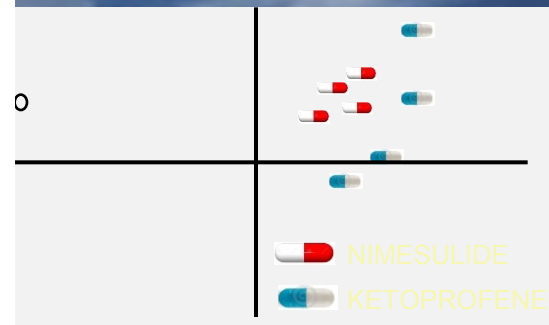
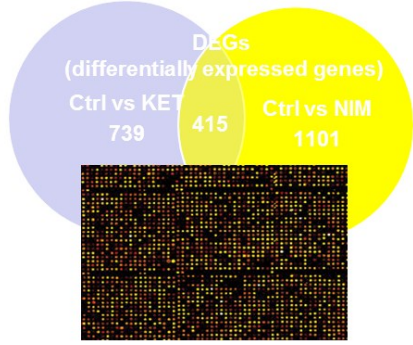
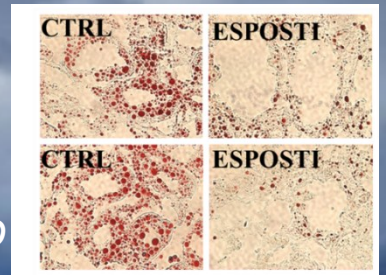




# FARMACI IN ADRIATICO: DATI PRELIMINARI E PROSPETTIVE



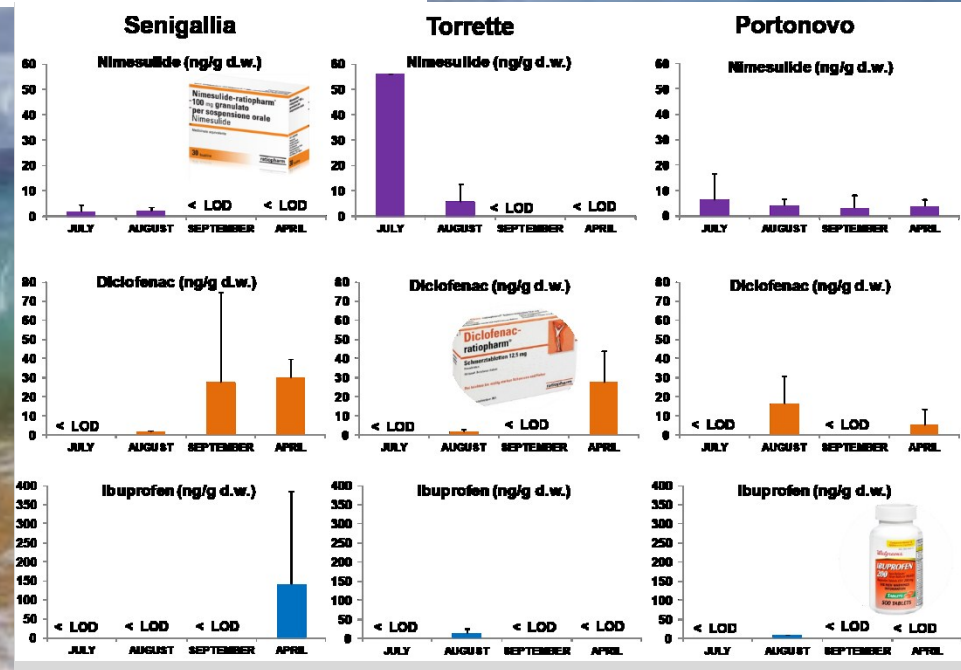
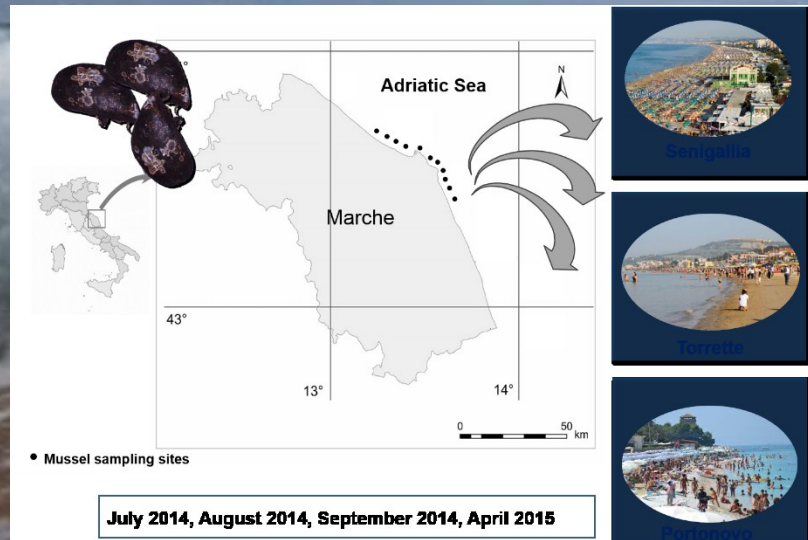
*i farmaci possono essere accumulati dai mitili e indurre alterazioni biologiche a livello molecolare, cellulare e fisiologico*



## Strategia Marina (MSFD)

Gaps informativi: .. scarse informazioni su alcune categorie di contaminanti.

## Tracce di farmaci misurati nei mitili in Adriatico:









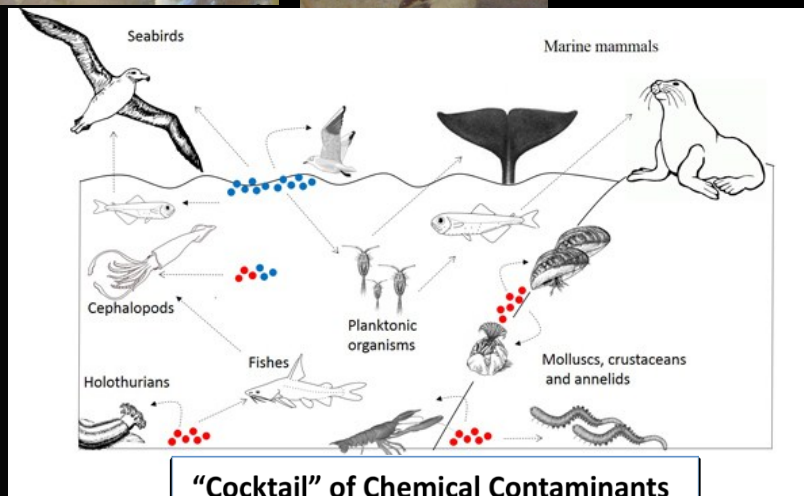
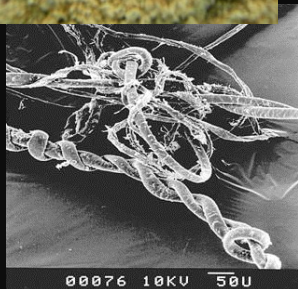
# TIPICI EFFETTI DELLE PLASTICHE IN MARE



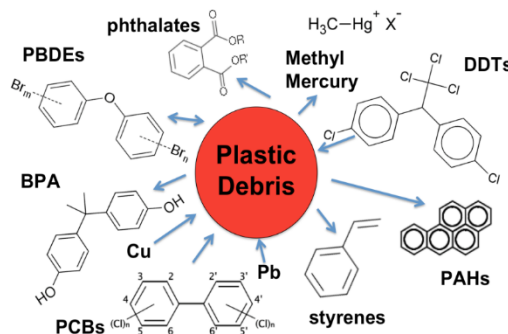


# NUOVI RISCHI ECOTOSSICOLOGICI DELLE MICROPLASTICHE

Accumulate nel biota, inducono pseudosazieta, danni fisici e meccanici ...ma possono anche "accumulare" inquinanti e trasferirli nella rete trofica

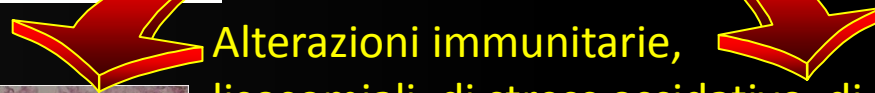
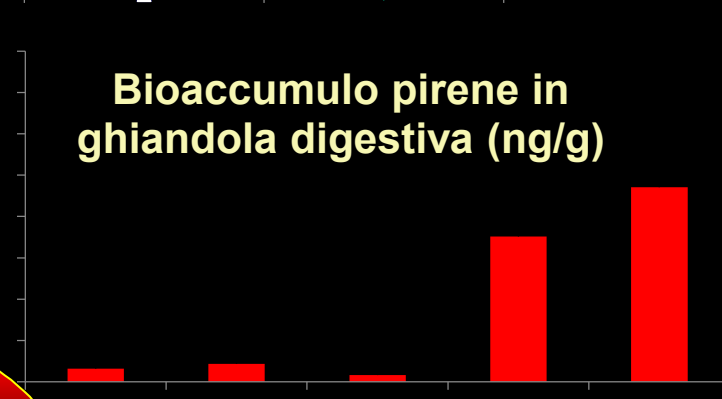
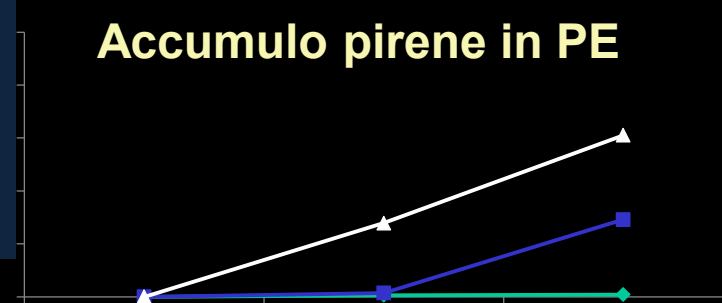
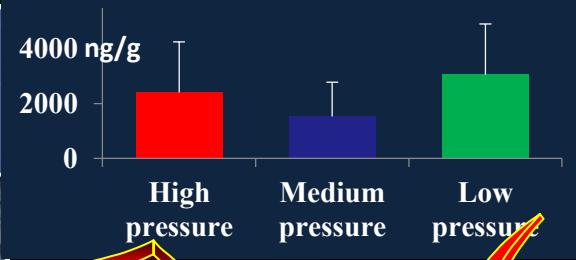
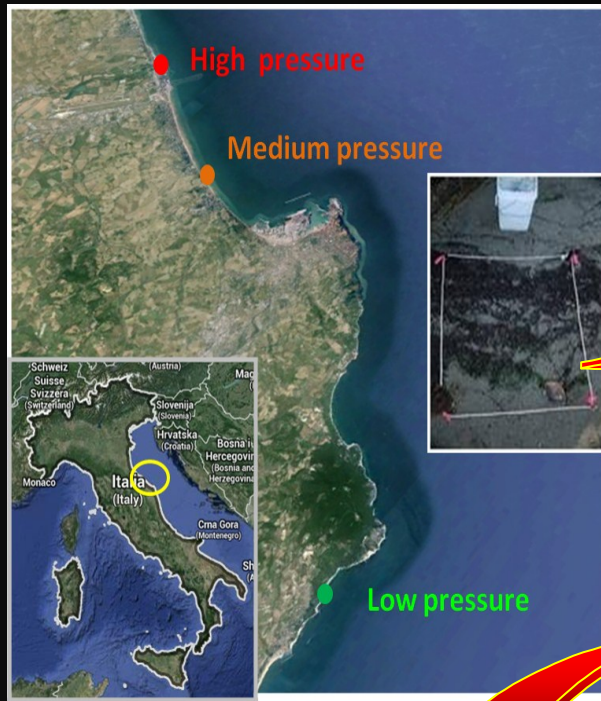


## "Cocktail" of Chemical Contaminants

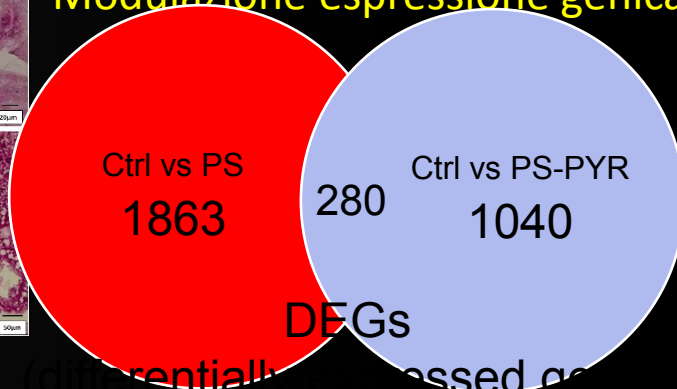
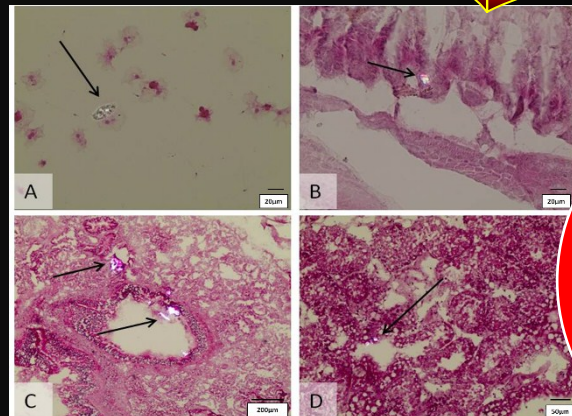




# MICROPLASTICHE, IDROCARBURI, ACCUMULO E TOSSICITA' IN ADRIATICO



Alterazioni immunitarie, lisosomiali, di stress ossidativo, di genotossicità, neurotossicità  
Modulazione espressione genica



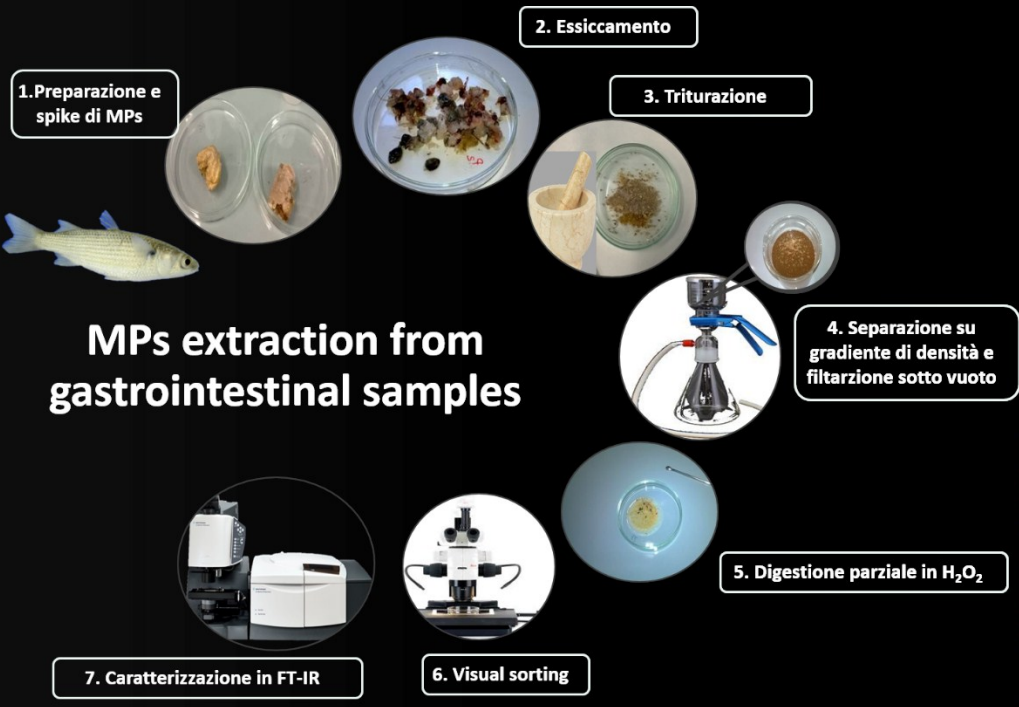
Environmental Pollution 155 (2015) 211–222  
 Comments lists available at ScienceDirect  
**Environmental Pollution**  
 Journal homepage: [www.elsevier.com/locate/envpol](http://www.elsevier.com/locate/envpol)

Pollutants bioavailability and toxicological risk from microplastics to marine mussels

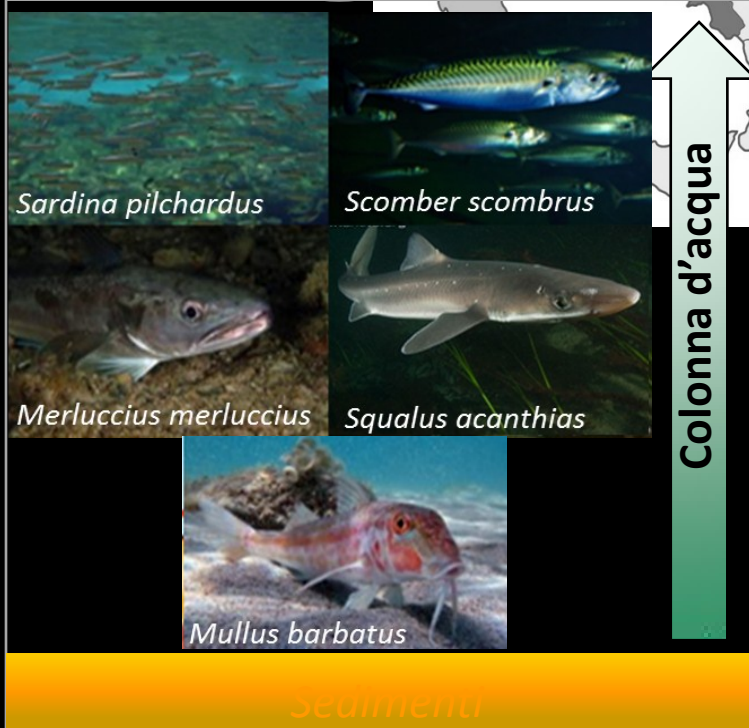
Carlo Giacomo Avio<sup>a</sup>, Stefania Gorbi<sup>a</sup>, Massimo Milan<sup>b</sup>, Maura Benedetti<sup>c</sup>, Daniele Fattorini<sup>a</sup>, Giuseppe d'Errico<sup>a</sup>, Marianna Pauletto<sup>a</sup>, Luca Bargelloni<sup>a</sup>, Francesco Regoli<sup>a,\*</sup>



# MESSA A PUNTO DELL'ESTRAZIONE E CARATTERIZZAZIONE DELLE MICROPLASTICHE NEGLI ORGANISMI ADRIATICI



MPs extraction from gastrointestinal samples



Marine Environmental Research xxx (2015) 1–9

Contents lists available at ScienceDirect

**Marine Environmental Research**

journal homepage: [www.elsevier.com/locate/marenvrev](http://www.elsevier.com/locate/marenvrev)

ELSEVIER

Experimental development of a new protocol for extraction and characterization of microplastics in fish tissues: First observations in commercial species from Adriatic Sea

Carlo Giacomo Avio, Stefania Gorbi, Francesco Regoli\*

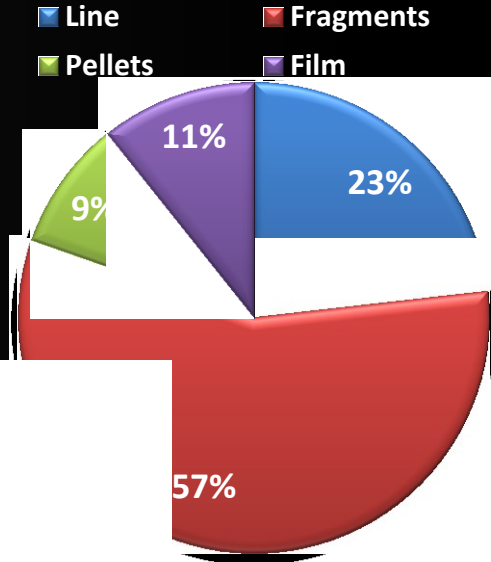
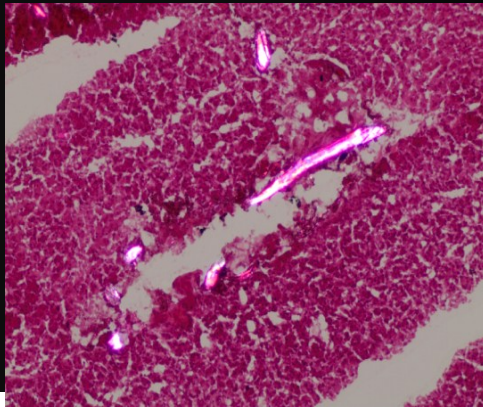
Dipartimento di Scienze della Vita e dell'Ambiente (DISVA), Università Politecnica delle Marche, Ancona, Italy

sedimenti

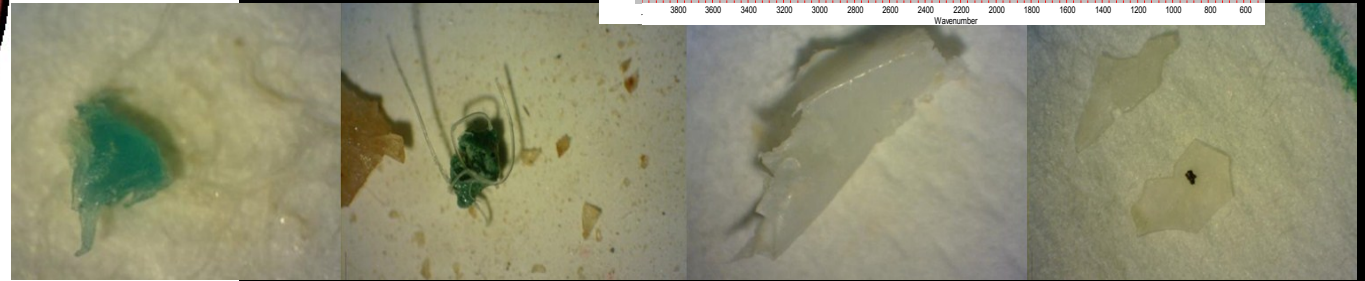
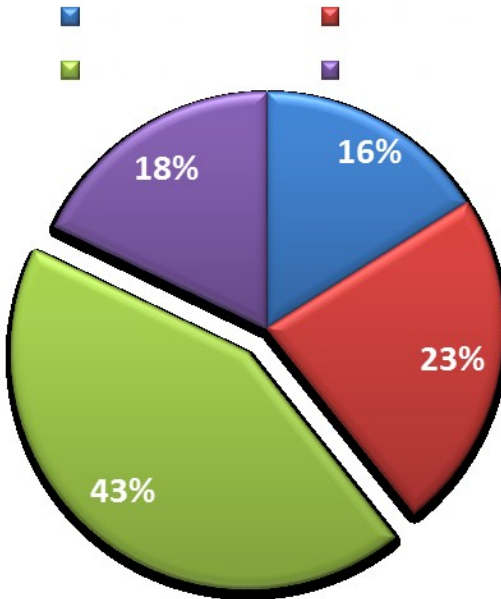
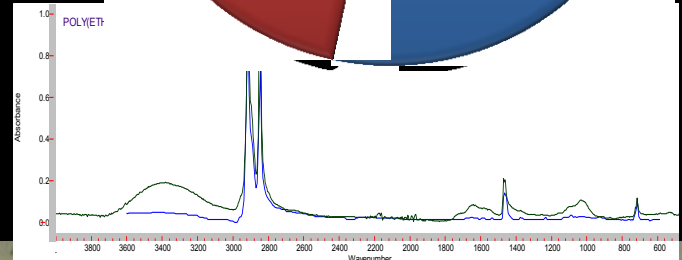
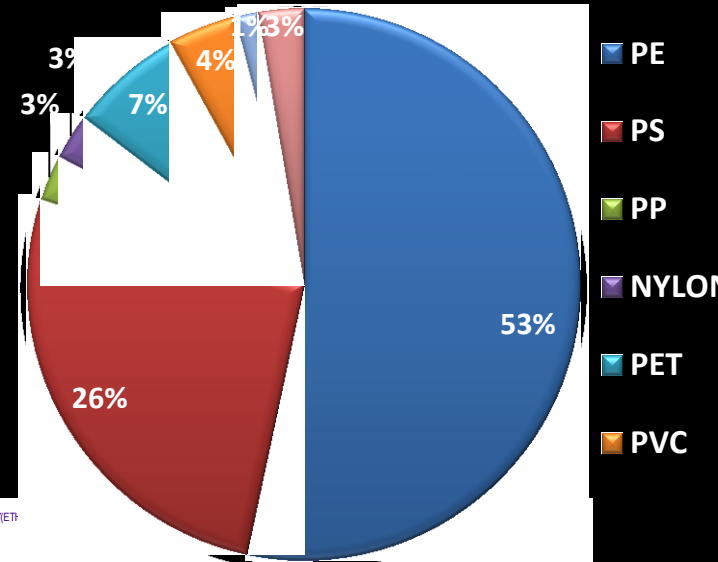


# MICROPLASTICHE NEI PESCI DELL'ADRIATICO

Il 35% dei pesci analizzati contiene microplastiche con punte del 70% in alcune specie bentoniche



## Tipologia di polimero

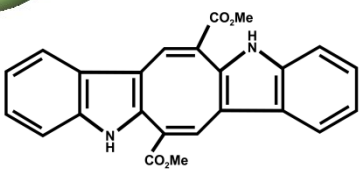




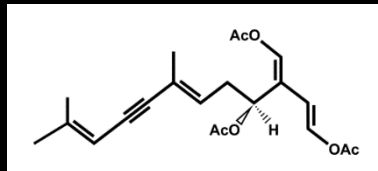




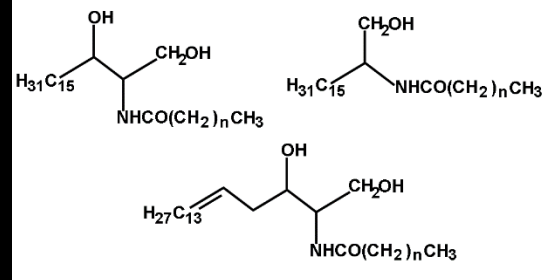
# Cosa sappiamo dei metaboliti algali prodotti da *C. racemosa*...?



caulerpina

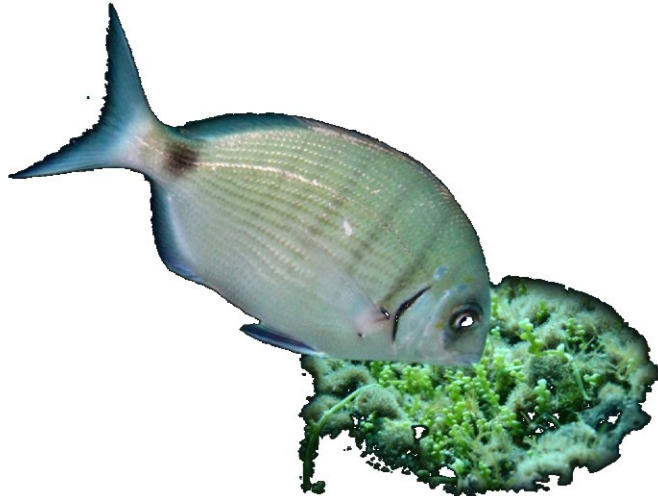


caulerpenina



caulerpicina

Ecology



La Caulerpa è entrata nella dieta del sarago

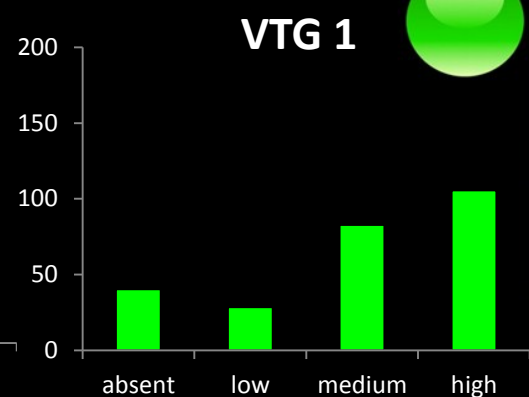
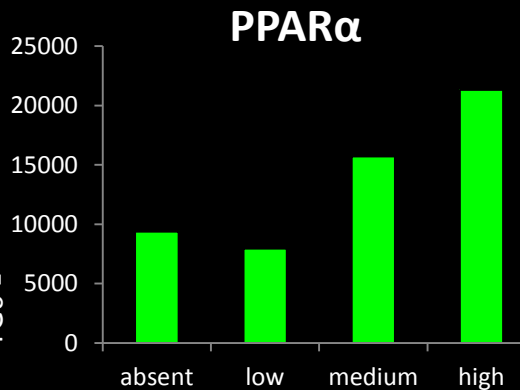
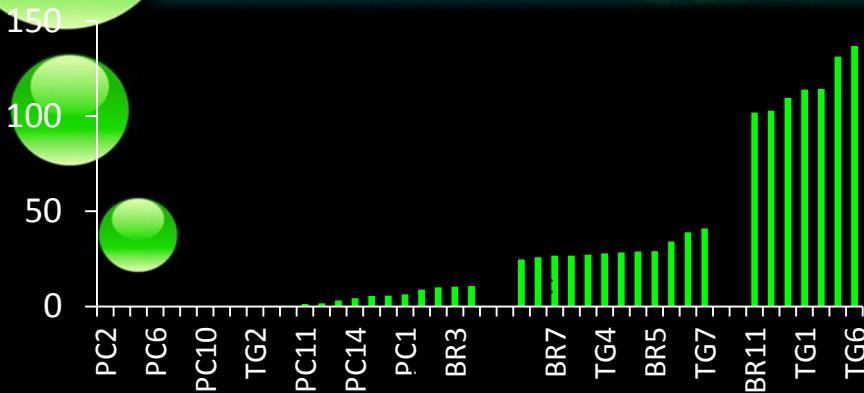


Toxicology

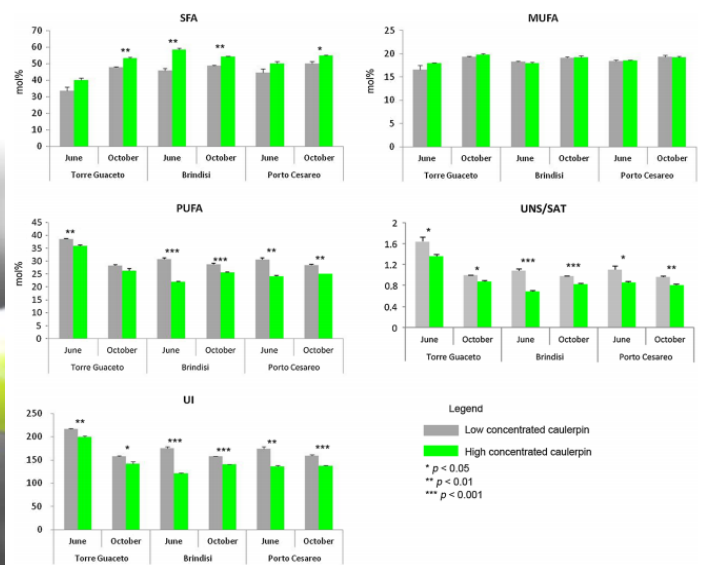
Chemistry



# Accumulo di caulerpina e effetti sul metabolismo lipidico e la riproduzione



## Profilo acidi grassi



## IL FATTO QUOTIDIANO 28 Agosto 2015

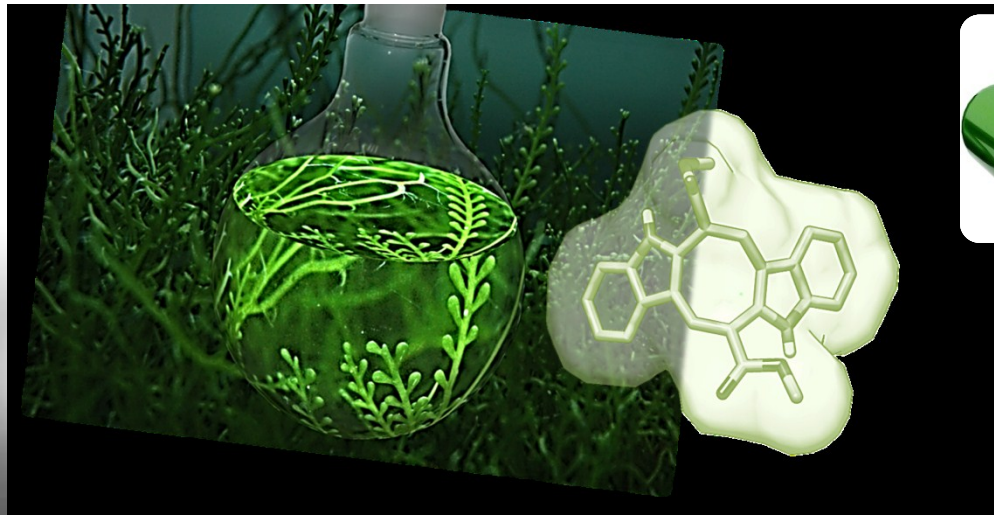
Napoli, saraghi immangiabili e prezzo crollato.  
 “Colpa di un’alga che distrugge i grassi. Forse utile contro il colesterolo”



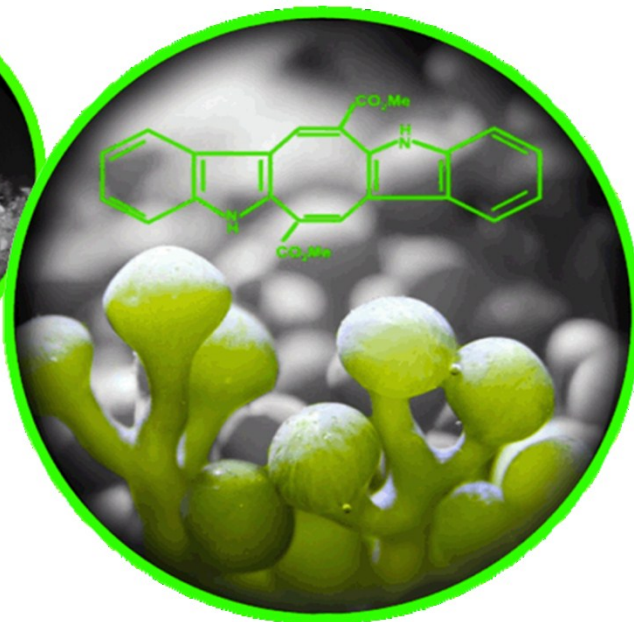
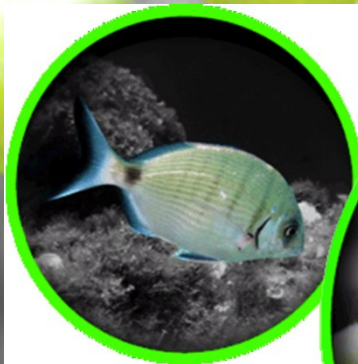
<http://st.ilfattoquotidiano.it/wp-content/uploads/2015/08/sarago-675.jpg>



# TRASFORMIAMO UNA MINACCIA IN UNA RISORSA: IL CASO DI *Caulerpa racemosa*



CAULERPINA E' IN GRADO DI ATTIVARE MECCANISMI  
LOGICI SIMILI A QUELLI PRODOTTI DAI FARMACI PER  
METABOLISMO LIPIDICO.





# Il problema GLOBALE

- Grandi progressi della ricerca scientifica, metodi diagnostici sempre più sensibili e primi recepimenti normative (MSFD e lista sostanze pericolose e prioritarie)
- Difficile prevedere e misurare la magnitudine delle conseguenze
- Implicazioni negative
  - Alterazione del ciclo dell'acqua
  - Uso delle risorse
  - Perdita di ricchezze biologiche
  - Esposizione/Tossicità umana ed animale





# Niente allarmismi...dalla scala globale a quella nazionale e locale, interazione tra ricerca, politica e società

Design for life and end-of-life



Packaging per 1ml product	0.2	0.5	0.5	1.0
Recyclability		High	Low	Very Low
Value of recycle	High		Low	



Opportunità

Conoscenza

Informazione

Attività e servizi

Educazione



Where Can I Properly Dispose of My Medications?

Lake City Public Utilities and Police and the Salt Lake County Sheriff's Office have proper disposal programs for their residents (ring locked, mounted steel collection bins in front of their stations). Each agency then collects and destroys drugs. Bring your unused prescription and over-the-counter medications to the following locations:

- Station West 700 South, Salt Lake City

Funding

The Utah Department of Environmental Quality is offering law enforcement agencies a one-time pollution prevention grant, up to \$1,000, to establish a "Drug Collection for Proper Disposal" program.

This funding can be used to pay for: collection boxes, signage, evidence handling, incineration, advertising or associated expenses.

To find out more about this program and how to apply, please visit:

[www.MedicationDisposal.utah.gov/funding.htm](http://www.MedicationDisposal.utah.gov/funding.htm)

Proper Disposal of Prescription Drugs in Utah

and Over-the-Counter Drugs in Utah

Facts About Prescription Drug Disposal

- \* Unused medications improperly disposed of can harm you and your environment.
- \* Drugs can be scavenged and illegally sold.
- \* Children and animals could be poisoned if they find and swallow drugs.
- \* When drugs are flushed, they are not removed by the sewage treatment facilities and septic tank systems and can enter the soil, surface water, and groundwater.



### DURATA RIFIUTI

- LETTERA: CON UN GIORNO (1 MESI)
- BOTTIGLIA IN PLASTICA: DA 100 A 1000 ANNI
- SPORTINA IN PLASTICA: 450 ANNI
- BOTTIGLIA DI VETRO: 4000 ANNI
- SCARTELLA DI COTONE: DA 10 A 100 ANNI
- SCARTELLA DI ALLUMINIO: DA 200 A 500 ANNI
- SCARTELLA DI COTONE: DA 10 A 100 ANNI

### PROTECT LAKE ERIE— We Drink It!

More than 50 pharmaceuticals have been identified in E.A. waters

#### Medicine Collection Day

April 26, 2008  
10:00 a.m. — 2:00 p.m.  
Cruise Boat Terminal Building  
\*Start at the Regional Music Library and the Intermodal Transportation Center

Pre-registration is mandatory by April 21, 2008. To pre-register call (514) 425-7773. Your medications will not be taken unless you have pre-registered.

**NEVER FLUSH** or pour unused medicine down the drain, unless otherwise directed. Bring it to the Medicine Collection Day.

- \*Protect Lake Erie—Our drinking water comes from it
- \*Prevent accidental childhood poisonings
- \*Reduce abuse of unused prescription drugs

**Do NOT Bring:** Illegal Drugs, Suboxone, Medical Marijuana, Cereals, Creams, Vitamins, Pet Medications, Hazardous Waste (gas, pesticides, oil, paint)

**You Can Bring:** Prescription Medication, Over the Counter Medication, Cereals, Vitamins, Pet Medications, Hazardous Waste (gas, pesticides, oil, paint)



VIENI CON ME A PULIRE LE SPIAGGE!

un Mare da PULIRE

Aprile 2012 La Costiera - 22 Aprile 2012 Genova  
9:00 - 12:00 JNF Océanographie



Information





# Grazie per l'attenzione

*Prof. Francesco Regoli, Dipartimento di Scienze della Vita e dell'Ambiente, Laboratorio di Ecotossicologia e chimica ambientale, [f.regoli@univpm.it](mailto:f.regoli@univpm.it)*

