# REMI
# French microbiological monitoring network for shellfish growing areas

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## Objectives & characteristics

REMI is managed by Ifremer since 1989, in order to :

➲ Evaluate and monitor faecal contamination levels (*Escherichia coli* /100 g Flesh and Intravalvular Liquid – F.I.L.) of shellfish production areas in order to determine the microbiological quality of the growing area,

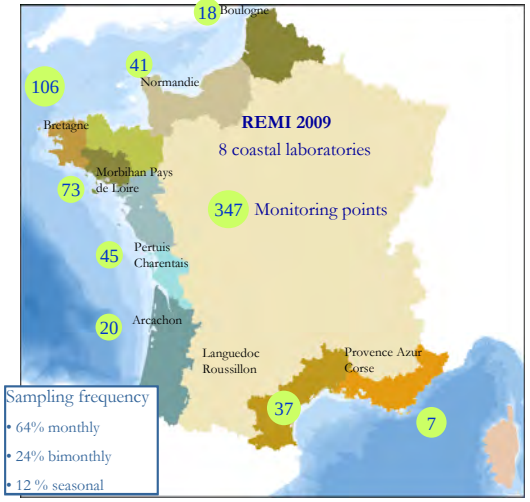
➲ Detect and monitor unusual contamination events.

Results obtained are used by competent authority to take any appropriate measures to protect consumer health and to update sanitary classification according to European regulation EC n° 854/2004.

To meet these objectives, REMI is organised in two complementary monitoring types : **regular** and **alert**.

Usually a single point is defined to be representative of the quality of an delinated area. This point should be located in an exposed area in order to set off alert monitoring.

- 347 monitoring points are sampled for one or two molluscan species :
  - ✓ 101 points : Burrowing bivalve - mains species : clams (43), cockles (35);
  - ✓ 266 points : Non burrowing bivalve – mains species : oysters (162), mussels (101);
- Methods used : NF V 08 106 impedance-based method & European reference method XP ISO/TS 16 649-3.
- About 3 600 results are collected annually and stored in the national databank Quadrige² which compiled more than 88 000 REMI's data since 1989.




**Map 1 :** localisation of costal laboratories & monitoring points.

## Microbiological quality assessment

Data obtained in an area for the last 3 years within the regular monitoring are compiled. At least 24 data are necessary to evaluate the area quality (12 for stable areas). Interpretation is done with the threshold fixed by Regulation EC n°854/2004 completed with French standards (fig 1), this assessment is carried out for burrowing and non burrowing shellfish.

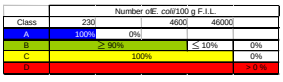
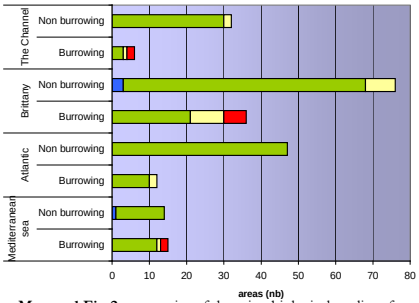



**Fig. 1** : microbiological threshold


**Map and Fig 2** : categories of the microbiological quality of areas (split into coastal regions and species) from 2006-2008

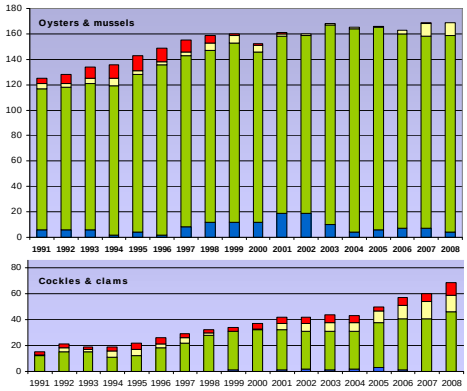



**Fig 3** : Evolution of the microbiological quality of growing area since 1989

The quality of 238 areas classified in 2009 was determined (insufficient data for remaining areas). Only 4 areas were of A quality, while most of the areas had B quality (201 areas), 23 areas C quality level, and 10 D quality level. For areas classified in 2009, all the historic quality assessments were determined by three years sliding data sets since 1989 (Fig. 3). The results of the 10 past years were annually treated for trend analysis (Mann-Kendall test), in order to carry out an assessment of the evolution of the microbiological level in point. Majority of points (166) did not present any significant changes in their microbiological quality, however 54 points (22 %) showed a significant increase in microbiological contamination while 31 points had a significant decrease (12 %).

## Alert monitoring

Alert monitoring were triggered in the following scenarios :

- Preventive (information about pollution events, heavy rainfall…)
- Contamination events (as detected during regular monitoring)
- Persistent contamination (if two consecutive results were above threshold defined for each class)

If persistent contamination was detected, weekly monotoring was carried out until two consecutive results were below the alert threshold.

**Alert threshold**
✓ class A ≥ 230 & 1000 *E. coli*/100 g F.I.L.
✓ class B ≥ 4600 *E. coli* /100 g F.I.L.
✓ class C ≥ 46000 *E. coli* /100 g F.I.L.

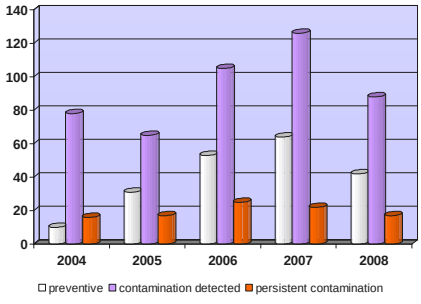
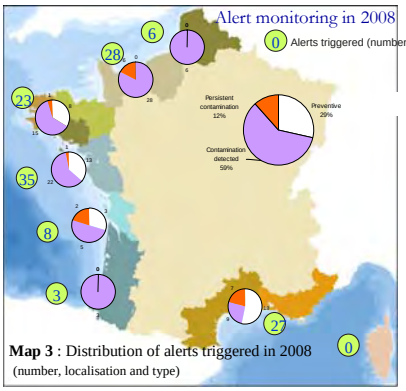



**Fig 4** : Evolution of alert monitored from 2004 to 2008 (type & number)




**Map 3** : Distribution of alerts triggered in 2008 (number, localisation and type)

## Discussion & conclusion

The microbiological monitoring and classification in Europe is based on faecal indicator *E. coli* monitoring in live bivalve mollusc. As a result of the implementation of the microbiological threshold defined by European legislation since 01/01/2006, almost all A quality areas have disappeared, and most areas show B quality. Percentage-wise, the C quality category is more frequently observed for areas with burrowing bivalves like clams and cockles.

From these results, a few elements can be pointed out :

✓firstly : the contamination levels are different between the burrowing and non burrowing bivalves. Thus, it is important to examine separately the evolution for each type of species.

The evolution since 1989 shows for the oyster and mussels an improvement of the quality from 1989 to 2002. Since then, a decrease is observed (less A quality areas and some more C quality areas), confirmed by statistical analysis for some points. For cockles and clams, an increasing number of zones have sufficient data to assess their quality (thanks to continuous improvements in the monitoring network).

✓Secondly : the contamination situation and its evolution are very different from one area to another and should be examined closely for each area,

✓Thirdly : the alert monitoring has increased since 2004, and has become now an important part of the monitoring. Preventative alerts alone account for 32 %.