Actions

As an IAEA Collaborating Center for HAB studies, PNRI has been actively involved in the validation process, R&D work and technology transfer activities for RBA training of BFAR personnel at PNRI.

In 2006 and 2009, PNRI participated in an international collaborative study for the validation and acceptance of RBA as an official method of analysis for PSP.

Collection of Harmful Algae

Field uptake studies in Juag Lagoon (Philippines); a site experiencing Harmful Algal Blooms. A natural laboratory wherein uncontaminated mussels are immersed and uptake/depuration of harmful algal toxins is observed. [photo source: www.iaea.org]

In 2007, a series of seminars on RBA were conducted for BFAR personnel followed by a workshop in 2008.

Since 2004, PNRI has accepted fellows/researchers from other countries for training on RBA. Expert missions done by PNRI scientists have also facilitated capacity building of other countries for RBA work.

R&D projects were also being conducted by PNRI to improve the RBA technology and further extend its application.

With the RBA Tech Transfer project, PNRI will facilitate the establishment of an RBA facility for BFAR.

Under the same project, the present PNRI RBA facility will be upgraded for accreditation as an international reference laboratory for PSP assays.

RBA training of BFAR personnel at PNRI

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Receptor Binding Assay for Red Tide Toxin Monitoring

Harmful algal blooms (HABs), commonly known as “redtide,” produces toxins that are harmful to human and animal health. These toxins get concentrated in the tissues of shellfish, and people who eat these shellfish may suffer from paralytic shellfish poisoning (PSP) which can be fatal.

According to the Bureau of Fisheries and Aquatic Resources (BFAR), the country experienced 540 red tide outbreaks in 27 regions from 1983-2010. These have caused some deaths and millions of pesos in losses in the fishing industry due to extensive harvest bans and prices of seafood dropping by as much as 40%.

PNRI has established the first RBA laboratory geared towards the technology transfer of RBA tothe regulatory setting, and is also implementing HAB-related researches. This led to its recognition as an International Atomic Energy Agency Collaborating Center in HAB Studies starting in 2007.

Advantages of RBA over the MBA

Reception binding assay (RBA), which uses a radioactive isotope to test the presence of redtide toxin sin shellfish, is a more promising alternative to the current standard method in the Philippines, the mouse bio assay (MBA) which requires sacrificing live mice:

RBA	MBA
Highly specific,l ow variability of results	Affected by age and gender of the mouse, the test solution is highly variable
Low detection limit (0.4 ug eq saxitoxin /100gmeat)	Detection limit close to safety limit of 60 ug eq saxitoxin /100g meat (37 ug eq saxitoxin/100g meat)
Requires 1 rat brain per 40 samples	Requires 3 mice per sample
Recommended methods in CODEX Alimentarius	No longer accepted in Europe and may eventually be excluded from the list of Official Method of Analysis for PSP in CODEXA limentarius

Methodology

RBA uses membrane receptors prepared from a rat brain or rat skeletal muscle tissues. The toxins extracted from shellfish are combined with radio labeled toxins (tritiumor iodine radioisotopes) and are made to react directly with the receptor. The level of toxicity in the shellfish is inversely proportional to the amount of radio labeled toxin that has reacted, and can be measured quantitatively by the amount of radioactivity bound to the receptor. The equipment used to detect the radioactivity is highly sensitive, thus it can easily measure even low levels of the toxin. On the otherhand, in MBA, shellfish toxicity is indicated by the death of the mice, thus considerable amount of the toxin has to be present for it to be detected.

Outcomes

- Enhanced early warning and more effective monitoring and management of HABs in the country.

  Prevention of PSP relies on the effective environmental monitoring of seawater and shellfish resources in the country. The RBA technique will provide early warning of PSP occurrence, consequently reducing the risk of shellfish poisoning.

- Economic growth on the country’s shellfish industry
  The superior detection capability and less uncertainty of the assay will greatly help fish farmers by lessening the economic blow of prolonged and extensive harvest bans. It will also increase reliability in the safety of the country’s marine products in the global market.

Strategies

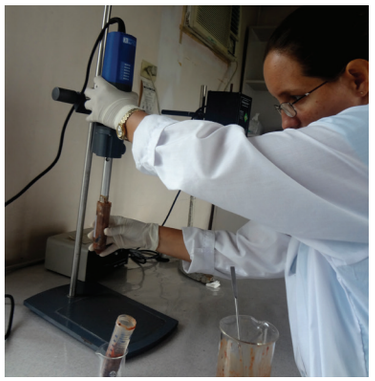
- Transfer the RBA technology enhanced by PNRI-DOST to the end-user, the Bureau of Fisheries and Aquatic Resources-Department of Agriculture (BFAR-DA), the Philippines’ regulatory and monitoring body in the management of harmful algal blooms.

A researcher at PNRI working in the production of an iodine-125 (^{125}I)-labeled ligand for RBA application

- Adoption of RBA into the regulatory setting to complement and eventually replace MBA for PSP monitoring

  RBA has been certified by the Association of Official Analytical Chemists (AOAC) as an official method for PSP assay as a result of the validation work conducted in collaboration with the International Atomic Energy Agency (IAEA) and the National Oceanic and Atmospheric Administration (NOM). The PNRI participated in this validation work.

  The PNRI RBA facility aims to be accredited under ISO17025 to serveas model and reference laboratory for other countries interested in using RBA technology for HAB management. This will gain the recognition of assay results by countries importing seafoods from the Philippines.



An IAEA fellow from Cuba training at the Philippine Nuclear Research Institute on receptor binding assay for paralytic shellfish poisoning