Radiological impact of the Fukushima nuclear accident on the human and biota in the Republic of Korea

Dong-Kwon Keum, In Jun, Kang-Muk Lim, Young-Ho Choi
Korea Atomic Energy Research Institute, Daejeokdaero 989-111, Yuseong, Daejeon, Korea 305-353
*dkkeum@kaeri.re.kr, phone:42-868-2058

Introduction
- A severe nuclear accident occurred at the Fukushima Daichi nuclear power plants (NPP) in Japan on 11 March, 2011, and a significant amount of gaseous radioactive materials was released into the atmosphere, and dispersed by wind.
- This study presents the estimation results of the radiation dose to humans and biota in the Republic of Korea as a result of the Fukushima nuclear accident.

Human dose assessment method
- ECOSYS code (Müller and Pröhl, 1987)
- Radionuclides: $^{131}$I, $^{134,137}$Cs, $^{137}$Xe
- Measured time integrated air activity & ground deposition
- Four exposure pathways (Fig.1)
  1) internal exposures due to the ingestion and inhalation
  2) external exposures from the radionuclides in the passing cloud and from radionuclides deposited on the ground
- Five age groups: infant, 5, 10, 15, adult
- Ingestion: 8 food stuffs & 3 feedstuffs (Fig.1)
- Use of the Korean food consumption rate
- Consideration of ecological properties of rice
- Breathing rate (ECOSYS 87 model)
- Reduction factor for external exposure from cloud and soil: (ECOSYS default data)
- Iodine fraction: aerosol (0.23), element (0.27), organic bound (0.5) (from the measurement of the Chernobyl accident)
- Rainfall rates during deposition (Daejeon, March to May, 2011): 40mm

Non-human biota dose assessment method
- K-BIOTA (Korean computer code to assess the risk of radioactivity to wildlife)
- Semi-equilibrium model (CR equilibrium model, but time-dependent environmental medium activity concentration)
- Radionuclides: $^{131}$I, $^{134,137}$Cs, $^{137}$Cs
- Eight Koran reference animals and plants (Table 1)

Human dose result
- First-year effective human dose: $5.7E-5$ mSv of infant group ~ $2.0E-4$ mSv of 5 years group
- First-year thyroid human dose: $5.0E-4$ mSv of infant group ~ $3.4E-3$ mSv of 5 years group
- Life-time (70 years) effective human dose: from $1.5E-4$ mSv of infant group to $3.0E-4$ mSv of 5 years group,
- Life-time thyroid human doses: $6.0E-4$ mSv of infant group ~ $3.5E-3$ mSv of 5 years group

Conclusion
- The risk to the public and biota in the republic of Korea of the radioactivity released due to the Fukushima nuclear accident could be considered negligible.