

# GENETIC ENGINEERING, SCIENCE FICTION AND ENVIRONMENTAL TOXICOLOGY IN A MANGA: 'COPPELION'

Various radioactivity alertness programmes and strategies have been developed. These encompass both the medical countermeasures subsequent to radiation exposure as well as longer term plans for bioremediation. 'Coppelion' provides a compelling glimpse at the wasteland left after a nuclear disaster and a peculiar new concept, namely that of the radiation-immune genetically engineered human.

Before delving into the fictional universe of 'Coppelion', it is worthy to note some relevant real life instances. In the wake of past nuclear disasters which led to large-scale release of radioactivity such as the notorious Chernobyl disaster back in 1986, and more recently, the Fukushima Daiichi nuclear disaster in 2011, Belgium had announced precautionary measures as part of a nuclear emergency plan, which included providing the whole population with iodine tablets. Medical countermeasures to radioactive exposure include use of potassium iodide, prussian blue, DTPA (diethylenetriamine pentaacetate) and filgrastim.<sup>1-7</sup>

In the science fiction world of 'Coppelion' we are initially presented with three genetically engineered girls forming the medical unit Coppelion, after a large scale nuclear meltdown. Concepts of environmental toxicology are central to the plot progression and in various instances the viewer is presented with issues of waste disposal, such as waste being dumped in the wasteland of the nuclear incident; and at one point one of the girls is treated with hyperbaric oxygen. 'Coppelion' anime television series was based on a *seinen* manga by the same name, written by Tomonori Inoue and published by Kodansha from 2008-2016. The story of 'Coppelion' plays heavily on the elements of science fiction, namely rendering the teenage girl protagonists immune to the nuclear radiation and hence able to roam freely amongst the ruins without requiring personal protective gear.

In a classical comic ballet which premiered in 1870 and bearing a similar name, namely 'Coppélia', Dr Coppélius creates



## MANGA

**Author:** Tomonori Inoue **Publisher:** Kodansha  
**Magazine:** Monthly Young Magazine **Run:** 2008 – 2016

## ANIME TV SERIES

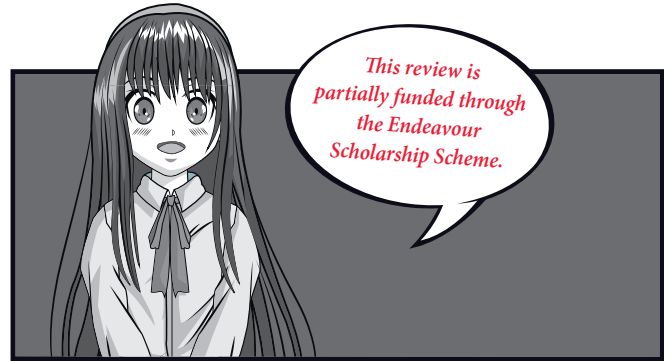
**Director:** Shingo Suzuki **Writer:** Mokoto Nakamura  
**Run:** October - December 2013

a life-sized doll. The life-sized doll or 'puppet' parallels are felt in the Coppelion story, which in turn give rise to ethically-charged questions with respect to the subjecting of these girls to genetic modification. The lead girl, Ibara Naruse, however, still retains hope and a positive outlook, in the inhospitable surroundings and challenging situations.

In practice, many biotechnology techniques have been put forth in an attempt to help decontaminate soil, such as for example, the use of immobilized photosynthetic bacteria coupled with anaerobic digestion and fermentation of lactic acid.<sup>8</sup> Scavenging-precipitation ion exchange methods<sup>9</sup> form part of the growing initiative in ecotoxicology for bioremediation.<sup>10</sup> There are both severe acute and long term consequences to health arising from the dispersion of radioactive material,<sup>11, 12</sup> hence viewing 'Coppelion' is both entertaining and topical. ❄

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**B**reast augmentation is the most common form of cosmetic surgery performed today. Most procedures involve the insertion of silicone gel-filled prostheses, which are selected for size and contour based on the woman's body habitus and preference.

The first gel-filled breast implants were developed in the early 1960's, however these suffered from high material failure rates and were initially thought to be linked to connective tissue disorders. Major redesigns and material improvements have led to the development of 4<sup>th</sup> and 5<sup>th</sup> generation implants that have semi-solid silicone filler-gel and a strong silicone capsule. These new implants have the advantage of retaining their original shape and have a lower risk for rupture.

Implant rupture is the most common complication of silicone breast implantation and is more likely to occur with increasing

implant age. This is due to weakening of the implant shell; the mean implant life span has been reported to be 13 years.<sup>1</sup>

Due to its semi-solid consistency, rupture of a silicone-filled implant may cause no symptoms and may be incidentally noticed during breast imaging studies. This contrasts with rupture of water-filled implants, which deflate rapidly producing a dramatic change in breast shape. Clinical findings of silicone breast implant rupture, when present, may include changes in breast size or shape, a palpable abnormality in the breast or axilla, pain, or skin tightening.<sup>2</sup>

Mammography does not cause implant rupture; anecdotal cases of this occurrence are likely due to implant leak that occurred prior to the mammographic examination.<sup>3</sup>

A fibrous capsule forms around the implant's shell; this represents the body's attempt to wall itself off from the foreign

