Reproductive Sterility as a Tool for Prevention and Control of Invasive Aquatics

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USDA currently allows only *P. brigesii* to be sold and shipped in the US

Pomacea brigesii

Will leave aquatic plants intact

Produced in Florida

Some established populations recorded in USGS database

Asolene spixi

Will eat aquatic plants

No longer in trade

No established populations recorded in USGS database

Can reproductively sterile *P. brigesii* and *A. spixi* be produced as new ornamental snail products?

Pomacea brigesii

Sterile *P. brigesii* could be sold without any requirement for USDA approval.

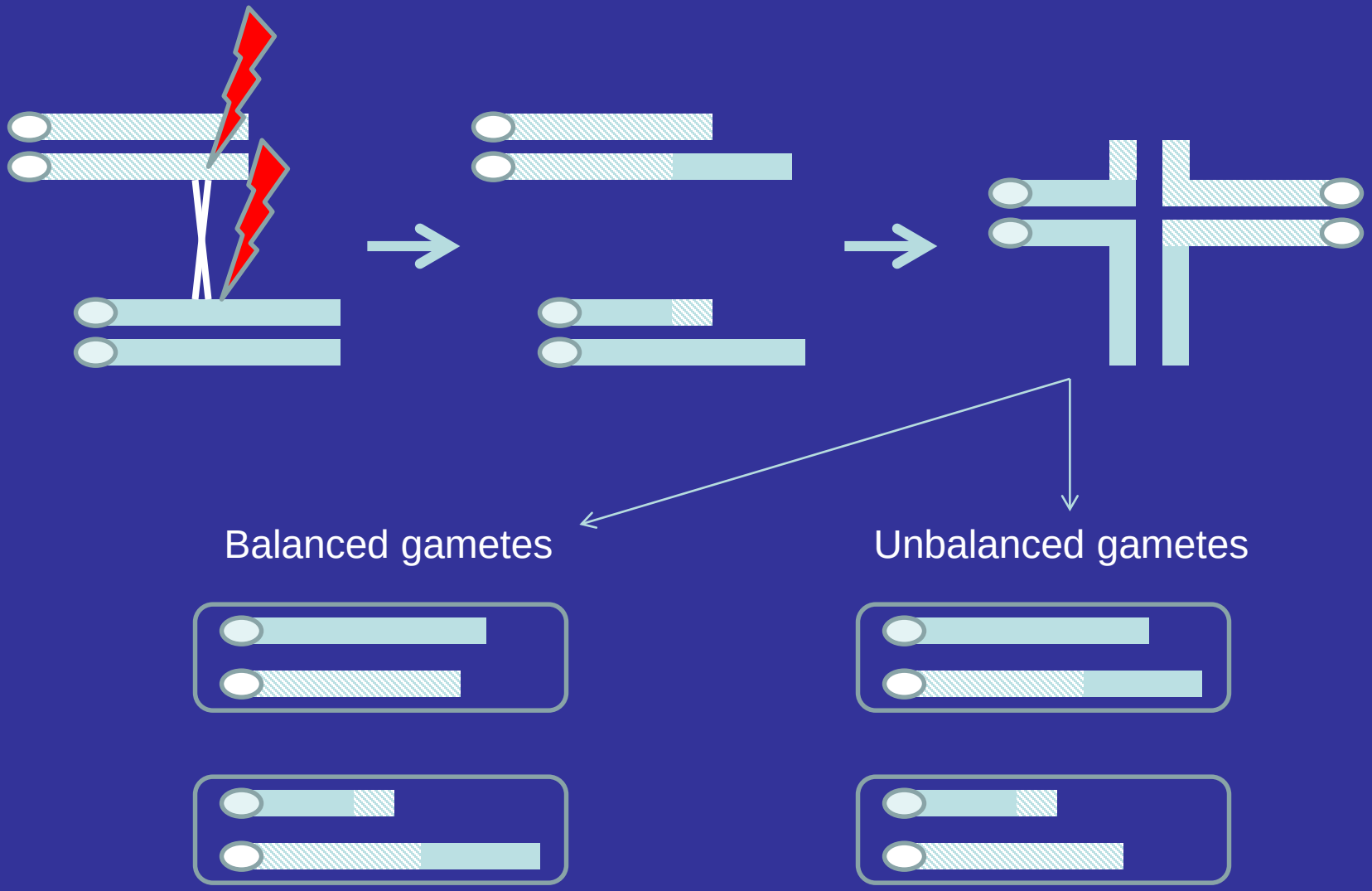
Is there a potential market for sterile *P. brigesii?*

Asolene spixi

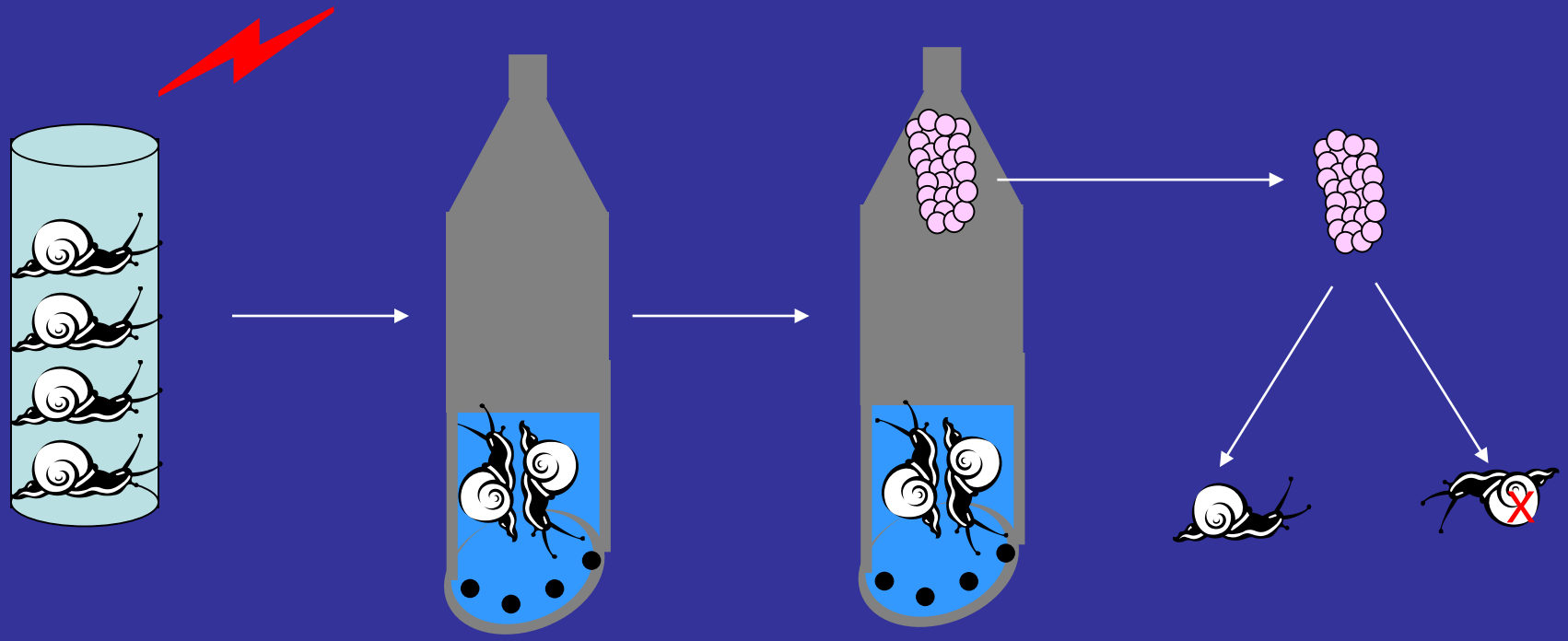
Sterile *A. spixi* cannot be sold without USDA approval.

Is there a potential market for sterile *A. spixi?*

Irradiation of Chromosomes Produces Translocations That Pair Abnormally During Meiosis



What dose of radiation (x-rays) will render snails reproductively sterile?



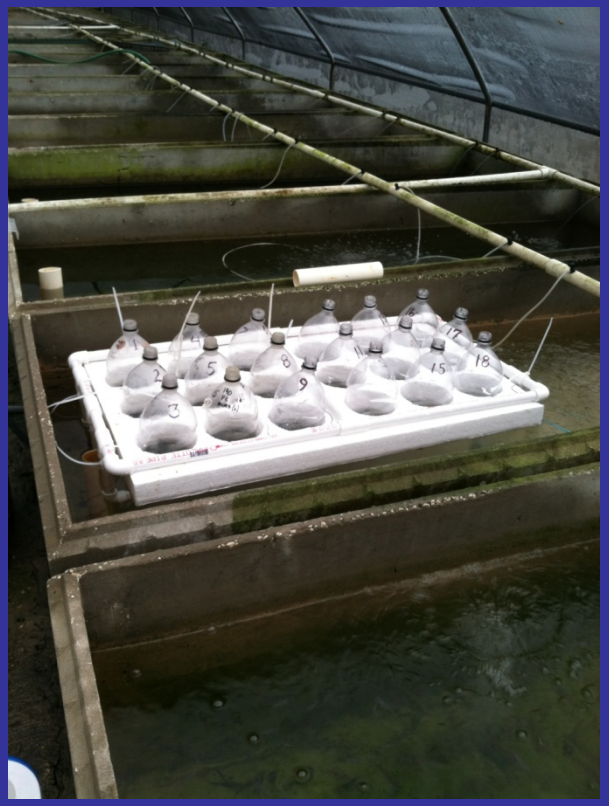
Irradiate snails

Mate irradiated snail to wildtype

Collect eggs

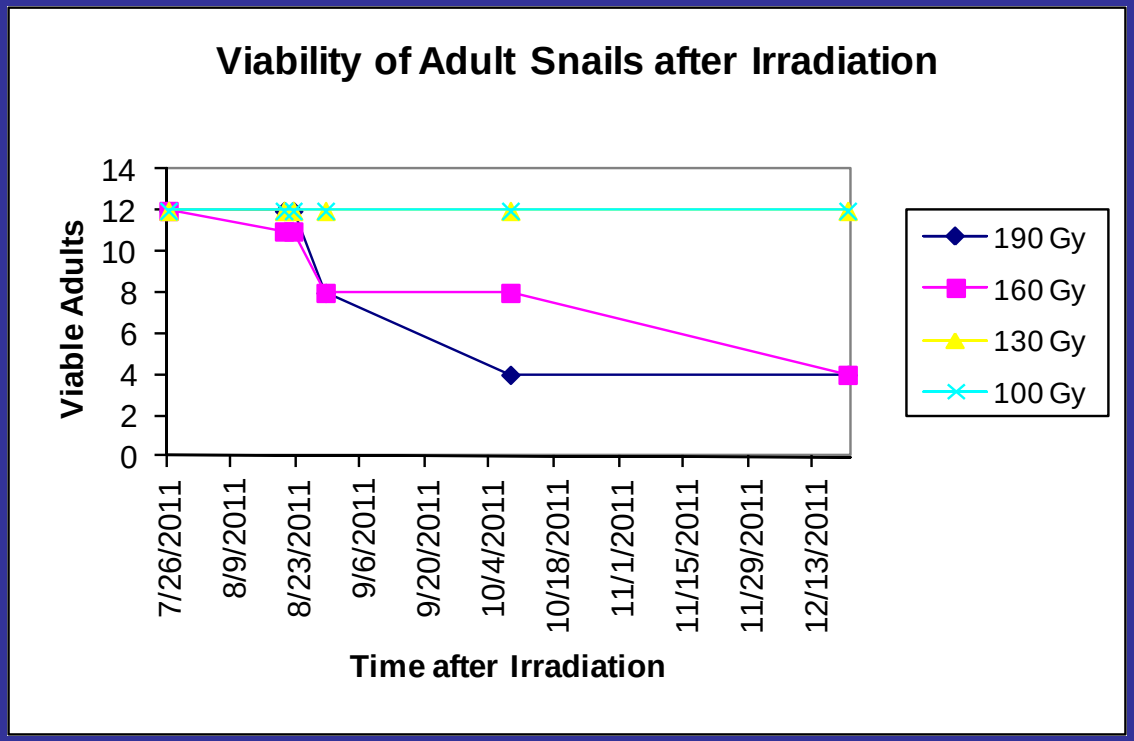
Determine if eggs hatch into snails that survive

Aquaculture Industry Participation



Dave Rawlins of Rawlins Tropical Fish Farm monitors the snail mating chambers and makes fertility assessments.

Viability of Irradiated *P. brigesii* Adults Decreases at Doses of Radiation Above 130 Gy.



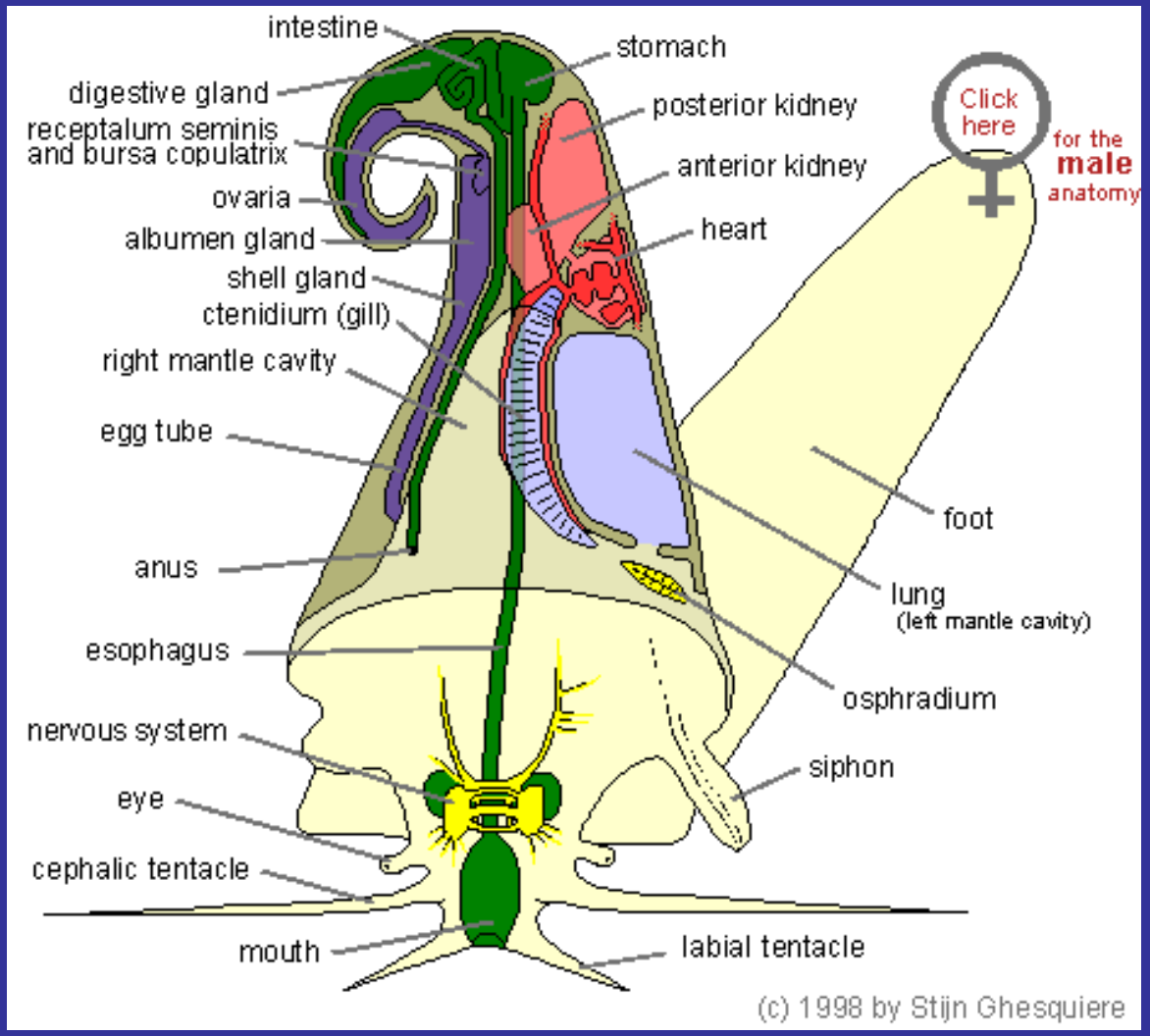
Fertility is reduced in irradiated snails in two ways:

1. Egg production is decreased
2. Fertility of eggs is reduced

Genetic Alternatives to Radiation to Produce Sterile Snails

1. Triploidy
2. Chromosomal Translocations

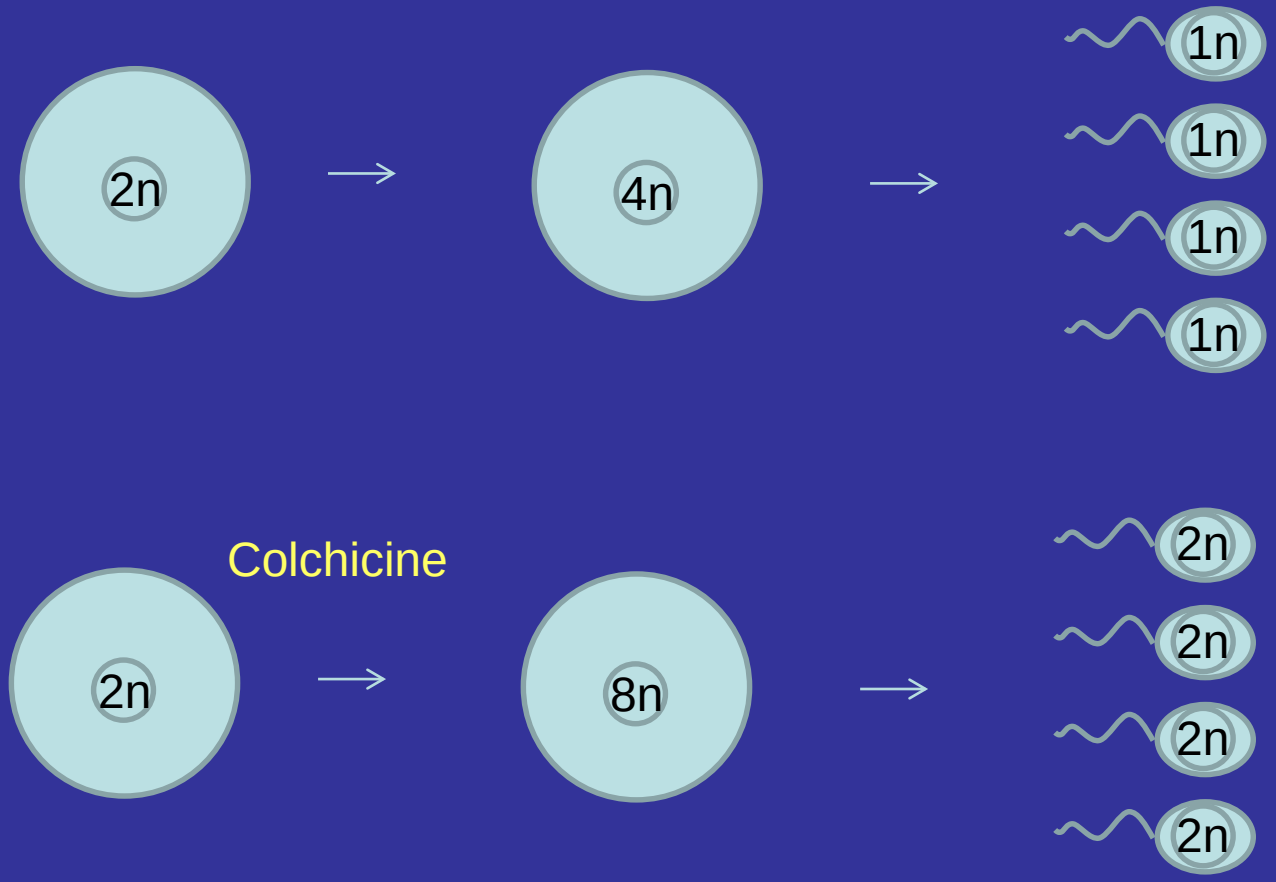
Fertilization is Internal In Apple Snails, Complicating the Use of Drug Treatments to Produce Triploids.



Mating Snails Provide a Source of Zygotes for Drug Intervention to Induce Triploidy

Photo Jess Van Dyke

Drug Intervention During Gametogenesis to Increase Ploidy

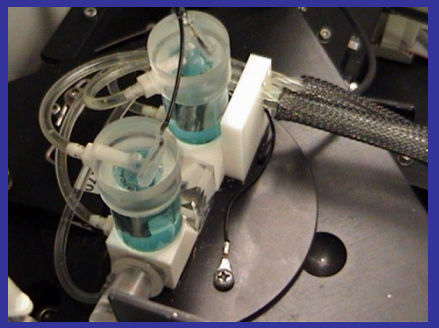


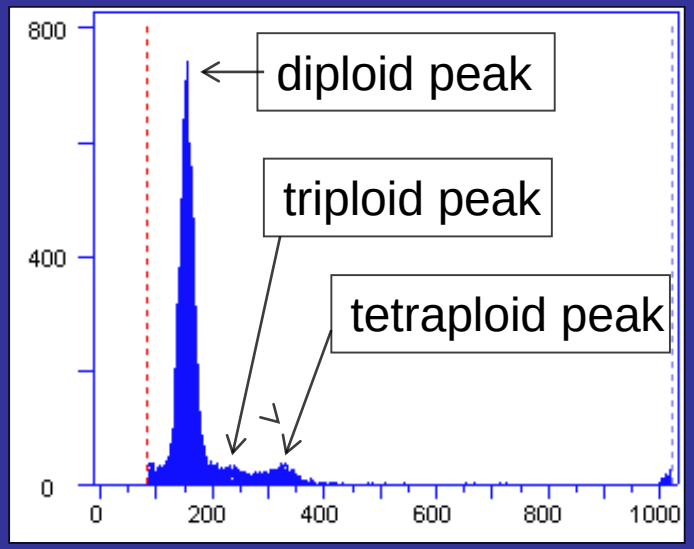
If Triploids are Produced Following Fertilization, They Should be Detectable in the Egg Mass

Drug treat mating snails

Harvest eggs

Analyze eggs by flow cytometry



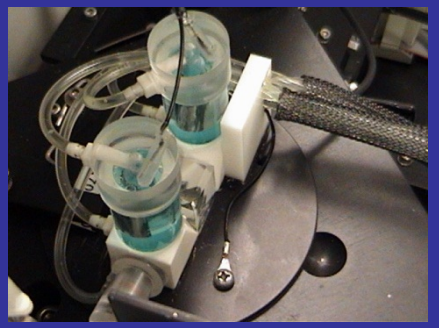


Can Triploids be Induced by Drug Treatment of Post-fertilization Zygotes within Mating Ssnails?

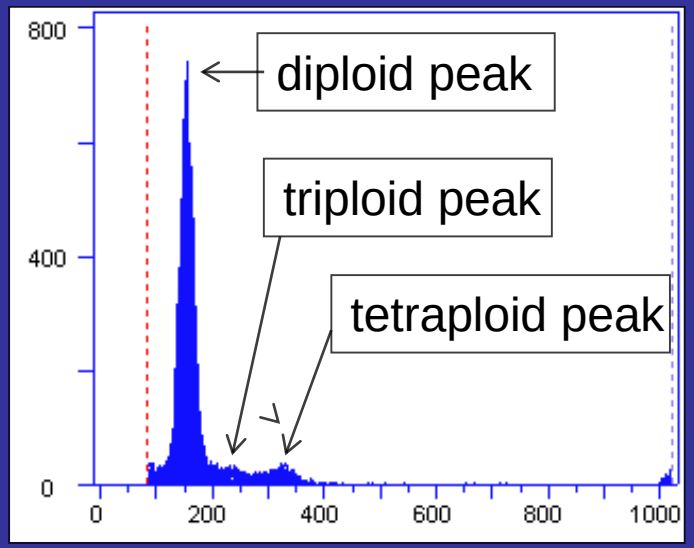
Drug treat mating snails

Harvest eggs

Analyze eggs by flow cytometry

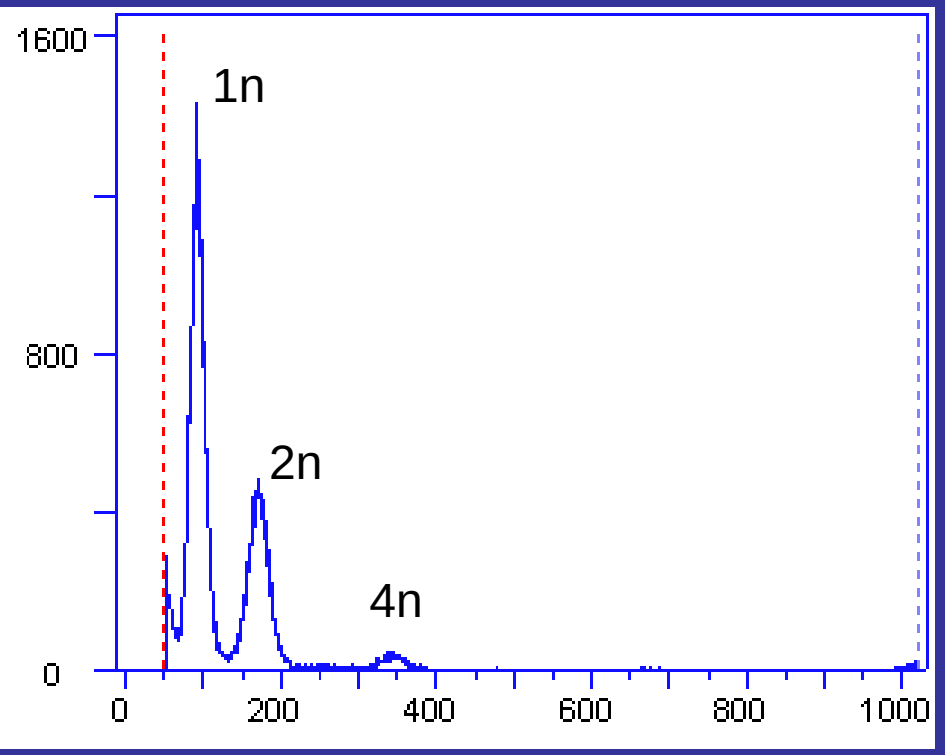


No triploids observed in egg masses

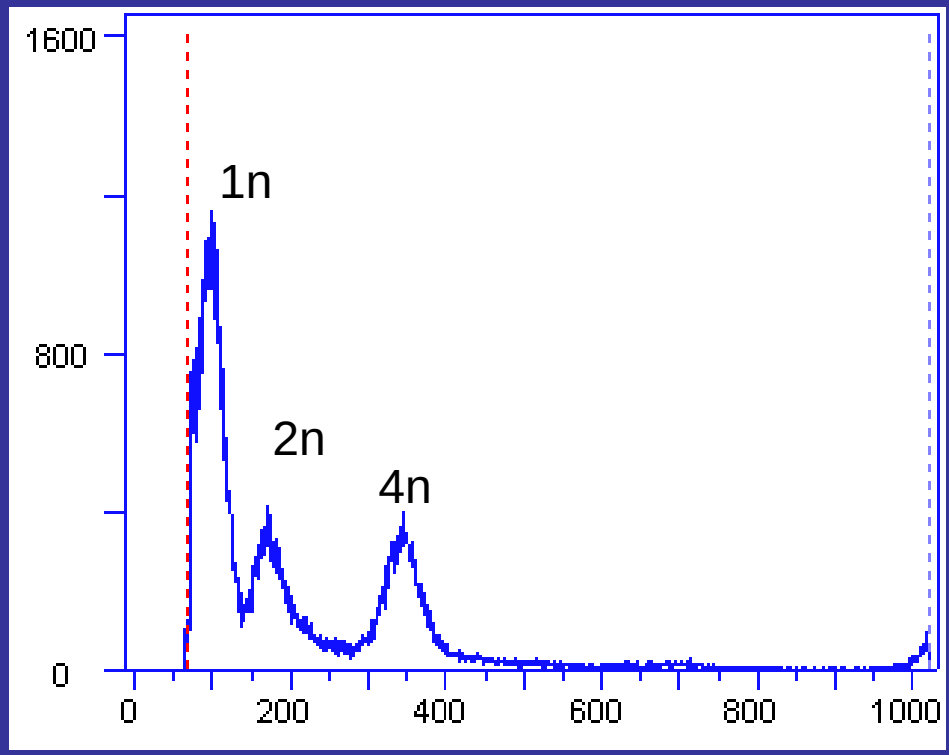


Drug Intervention Results in Detectable Changes in the Ploidy Distribution of Cells In the Gonad

Before drug treatment

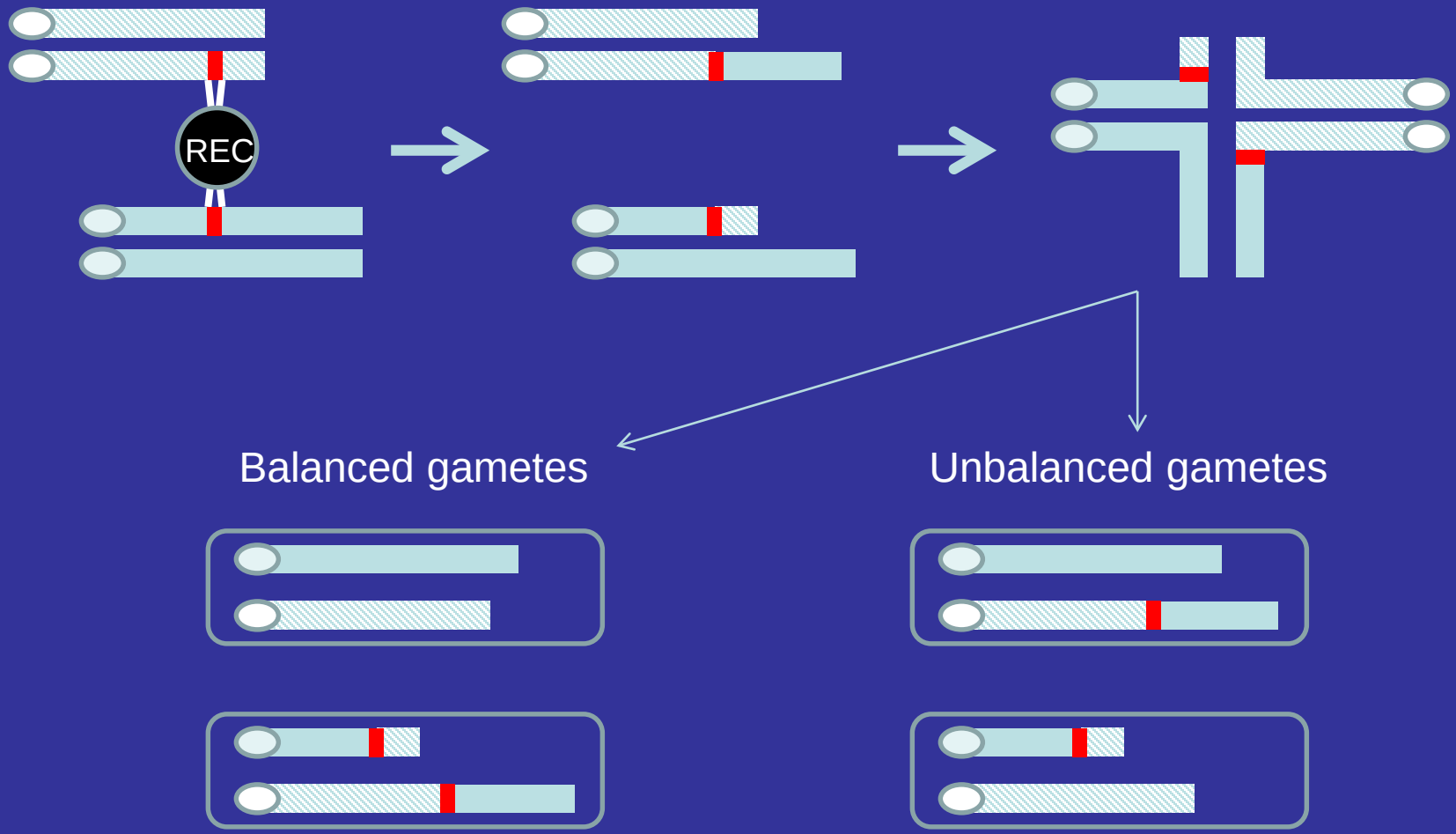


After drug treatment



Additional work is required to determine whether these changes reflect a change in the ploidy of sperm

Recombination Between Chromosomes can Produce Translocations That Pair Abnormally During Meiosis



Conclusions

Mortality is high when snails are irradiated to produce translocation chromosomes.

Drug treatment of snail gonads with colchicine has not produced triploids.

Directed recombination is being investigated as an alternative to irradiation treatment to produce chromosomal translocations.