

## How much Golden Rice has a child to eat, to prevent vitamin A-deficiency?

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RDA (Recommended Daily Allowance) of vitamin A for children: 0.3 mg/day.

RAE (Retinol Activity Equivalence): conversion factor of provitamin A:

- a) x12 : US Natl. Acad. Sci. Inst. of Medicine (IOM) January 9, 2001.
- b) x 6 : FAO/WHO, 1988.
- c) x 4 : Indian Council of Medical Research.

Current prototype Golden Rice lines contain 1.6-2.0 µg/g = 1.6-2 mg/kg

Assuming 100% bioavailability ( 50% bioavailability) leads to following values:

A child would have to eat the following amount of Golden Rice per day to meet the RDA requirement:

- a) 1 800 - 2 250 g, (3 600 - 4 500 g)
- b) 900 - 1 125 g, (1 800 - 2 250 g)
- c) 600 - 750 g. (1 200 - 1 500 g)

However:

Nutritionalists confirm that RDA represents a luxurious recommendation and expect that 30-40% of RDA would successfully defeat mortality, morbidity, and blindness.

- a) 540 - 675 g, (1 080 - 1 350 g)
- b) 270 - 337 g, ( 540 - 674 g)
- c) 180 - 225 g. ( 360 - 450 g)

And further:

Golden Rice is not supposed to provide 100% of the vitamin A-supply, but to help surpassing the border line between malnutrition and sufficient vitamin A supply by complementing other dietary components. According to a rough estimation it should supply 50% of the daily intake (fortification level: 25-30%, Natl. Nutritional Monitoring Board, Hyderabad).

- a) 270 - 337 g, ( 540 - 674 g)
- b) 135 - 168 g, ( 270 - 336 g)
- c) 90 - 112 g. ( 180 - 224 g)

And further:

Golden Rice is at the "proof of concept" state and under further development. We have carried out further transformations aiming at an increase in the provitamin A content. An increase factor of 3-5 appears feasible. Using a factor of 3 leads to:

- a) 90 - 112, ( 180 - 224 g)
- b) 45 - 56, ( 90 - 112 g)
- c) 30 - 38. ( 60 - 76 g)

And further:

Golden Rice technology will be transferred into further basic food crops, and thus probably contribute to further reduction in the amount of rice necessary.

Reliable data will, of course, become available only from nutritional and bioavailability studies with the Golden Rice varieties resulting from the breeding efforts with the local breeding lines, and from field-grown material. This requires undisturbed field experiments

Therefore:

What is already clear to date, is the fact, that the Greenpeace argument that Golden Rice will not contribute to a solution of the vitamin A-deficiency problem, and, therefore, does not pose a moral challenge to the radical Greenpeace position against field release experiments with Golden Rice, is not more than a fake argument to save a radical position. The moral challenge gains additional weight because Greenpeace has, so far, not presented any concrete scenario for an environmental hazard from Golden Rice beyond the unsubstantiated notion that "release of transgenic plants into the environment poses an unacceptable risk to the environment". In view of the foreseeable benefit from Golden Rice, Greenpeace can be expected to be a bit more concrete with its environmental argument. What is the risk from Golden Rice, which has no selective advantage in whatever environment, and which produces just a few micrograms more of an environmental neutral substance ( $\beta$ -carotene) in the endosperm, in addition to the same substance being present in large quantities in all other parts of the natural plant? How does such a (so far undefined, hypothetical) risk compare to the expected benefit? I believe that the public has a right to a more concrete answer from Greenpeace.