What is the half-life of vitamin A? I notice that children are given vitamin A once very 6 months

The pharmacokinetics of vitamin A (retinol) are unique because the body maintains a "two-compartment" system: a small circulating pool in the plasma and a massive storage pool in the liver.

This storage mechanism is why children can be dosed every 6 months.

The Half-Life of Vitamin A

There are two distinct half-lives to consider:

1. **Plasma Half-Life (Short):** If you measure a single dose of retinol in the blood, it disappears quickly (hours to days) as it is taken up by the liver.
2. **Biological Half-Life (Long):** This is the time it takes for the body to deplete half of its total stores. In adults, the biological half-life of liver stores is approximately **140 to 154 days** (about 5 months).

In children, the turnover is faster due to growth demands, with liver stores lasting roughly **3 to 4 months** if no new dietary vitamin A is consumed.

Why Dosing Every 6 Months Works

The 6-month interval is designed to utilize the liver as a biological battery.

1. **The "Mega-Dose":** Children in developing nations receive a massive bolus dose (typically **100,000 IU** for infants 6–11 months; **200,000 IU** for children 12–59 months). This is roughly **100–200 times** the daily recommended intake.
2. **Liver Uptake:** This high dose is not used immediately. Instead, it saturates the liver's specialized **stellate cells**, which store vitamin A as retinyl esters.
3. **Slow Release:** The liver slowly releases retinol bound to Retinol Binding Protein (RBP) into the blood to maintain steady levels (homeostasis). This storage buffer protects the child from deficiency for approximately 4 to 6 months.
4. **Toxicity Barrier:** Unlike Vitamin D, which can cause toxicity if megadosed too frequently, the liver has a high capacity to sequester Vitamin A safely, provided the doses are spaced out.

Summary Table: Vitamin A vs. Vitamin D Kinetics

Feature	Vitamin A	Vitamin D
Primary Storage Site	**Liver** (Stellate Cells)	**Adipose Tissue** & Muscle
Storage Form	Retinyl Esters	25(OH)D (in blood) / Parent D3 (in fat)
Biological Half-Life	**~140 days** (Liver Stores)	**~15–20 days** (25(OH)D in serum)
Dosing Strategy	Massive bolus every 4–6 months	Daily/Weekly (or smaller monthly bolus)
Depletion Mechanism	Tightly controlled release by RBP	Passive diffusion / Equilibrium

Key Insight for Your Research:
The 6-month schedule is a compromise. While the biological protection likely starts to fade around month 4 (especially in growing children with infections), a 6-month schedule is logistically feasible for public health distribution (often paired with vaccine drives) and sufficient to prevent mortality and severe blindness (xerophthalmia).

⁂

1. https://www-pub.iaea.org/MTCD/Publications/PDF/IAEA-VITA_web.pdf
2. https://journals.sagepub.com/doi/10.1177/0379572116630642
3. https://pmc.ncbi.nlm.nih.gov/articles/PMC8113730/
4. https://www.bmj.com/content/343/bmj.d5094
5. https://nutritionalassessment.org/vitamina/
6. https://files-profile.medicine.yale.edu/documents/e30c2b14-45eb-4f75-8761-51e327bee59b
7. https://pmc.ncbi.nlm.nih.gov/articles/PMC4515866/
8. https://www.sciencedirect.com/science/article/pii/S0022316622144238
9. https://pmc.ncbi.nlm.nih.gov/articles/PMC8925277/
10. https://www.ncbi.nlm.nih.gov/books/NBK567744/
11. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC162709/pdf/391191.pdf
12. https://academic.oup.com/ije/article/44/3/906/633272
13. https://doi.org/10.1093/jn/nxy095
14. https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2021.650823/full
15. https://pmc.ncbi.nlm.nih.gov/articles/PMC5963117/
16. https://pmc.ncbi.nlm.nih.gov/articles/PMC9575266/
17. https://journals.sagepub.com/doi/pdf/10.1177/156482650102200302
18. https://pmc.ncbi.nlm.nih.gov/articles/PMC3936689/
19. https://pmc.ncbi.nlm.nih.gov/articles/PMC8262574/
20. https://www.nfid.org/wp-content/uploads/2023/04/Call-to-Action-Vitamin-A-for-the-Management-of-Measles-in-the-US-FINAL.pdf
21. https://www.sciencedirect.com/science/article/pii/S0022316622154842
22. https://ods.od.nih.gov/factsheets/VitaminA-HealthProfessional/

23. https://www.nature.com/articles/pr19724.pdf
24. https://www.psu.edu/news/research/story/researchers-probe-link-between-newborn-health-and-vitamin
25. https://nutritionintl.org/news/all-blog-posts/better-together-vitamin-a-vaccines-for-child-survival/
26. https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(15)00039-X/fulltext
27. https://pmc.ncbi.nlm.nih.gov/articles/PMC4336526/
28. https://www.who.int/data/nutrition/nlis/info/children-6-59-months-receiving-vitamin-a-supplements
29. https://www.merckmanuals.com/professional/nutritional-disorders/vitamin-deficiency-dependency-and-toxicity/vitamin-a-deficiency
30. https://efsa.onlinelibrary.wiley.com/doi/pdf/10.2903/j.efsa.2015.4028
31. https://www.sciencedirect.com/science/article/pii/S0022316622154830
32. https://pubmed.ncbi.nlm.nih.gov/9565436/
33. https://pmc.ncbi.nlm.nih.gov/articles/PMC6140444/
34. https://www.ncbi.nlm.nih.gov/books/NBK222318/
35. https://publications.aap.org/pediatrics/article/134/3/e739/74148/High-dose-Vitamin-A-With-Vaccination-After-6
36. https://www.sciencedirect.com/science/article/abs/pii/S0002916523326315
37. https://www.nafdac.gov.ng/wp-content/uploads/Files/SMPC/DEC_21/OLPHARM-VITAMIN-A-CAPSULES-200000IU.pdf