OREGON HEALTH AUTHORITY
IMMUNIZATION PROGRAM

TYPHOID: INJECTABLE AND LIVE ORAL VACCINES [1, 2, 3]	
Last Reviewed	26 March 2019
Last Revised	26 March 2019
This order expires	31 July 2021

- Deletion of excursion table per manufacturer.

- When indicated: oral cholera vaccine should be administered before the oral typhoid vaccine, and at least 8 hours should separate the cholera vaccine and the first dose of typhoid vaccine.[10]

I. Oregon Model Immunization Protocol:

1. Check the ALERT Immunization Information System (IIS) to determine whether the patient needs this vaccine and any other vaccines.
2. Screen clients for contraindications and precautions.
3. Provide a current Vaccine Information Sheet (VIS), and answer any questions.
4. Record all required data elements in the client's permanent health record.
5. Give Typhim Vi IM or oral Vivotif per table 1.
6. Ask client to remain seated on the premises for 15 minutes after vaccination to decrease the risk of injury should they faint.

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Health Officer Signature Date

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Health Officer Signature Date

II. Table 1. VACCINE SCHEDULE

Vaccine[2, 3]	Preferred Age Range	Dose, Route or Administration	Number of Doses	Spacing Interval	Re-vaccination*
Vivotif® (PaxVax)	≥6 years	1 enteric coated capsule taken by mouth on alternate days (day 1,3, 5, 7) for a total of 4 capsules§	4‡	48 hours between doses◊	The complete 4-dose series every 5 years
Typhim Vi® (sanofi)	≥2 years	0.5mL IM	1		One injection every 2 years

*When continued or renewed exposure is expected.

◊**Vivotif®:** Missed doses: prolonging the interval between doses by 2–4 days does not interfere with immunity achieved after the concluding dose of the basic series. Ingest all 4 capsules within 10 days.[6]

§Instruct patient and review the following instructions. Provide manufacturer's instruction card:[2]

a) Inspect blister pack to ensure that foil seal and capsule are intact.
b) Each capsule should be taken on an empty stomach. Swallow one capsule one hour before a meal with cold or lukewarm water (≤37°C or 98.6°F), on alternate days (day 1, 3, 5, 7). Indicate days on instruction card.
c) Do not chew capsule.
d) Swallow as soon as possible after placing in mouth.
e) Do not expose capsule to direct sunlight.[2]
f) It is essential to replace unused vaccine in the refrigerator between doses.[2]
g) Patient should call vaccine administrator if vaccine is taken incorrectly or mishandled.

‡**Dispense vaccine with prescription label and provide client with adequate insulation for safe transport** (e.g., provide sufficient ice on warm days to protect vaccine until client can get the vaccine into cold storage). Do not freeze.[2]

III. Table 2. LICENSED VACCINES

Product Name	Vaccine Components	Preferred Age Range	Route	Re-vaccination
Vivotif®[2] (VaxPax)	*Salmonella* Typhi Ty21a: 2.0–10.0x10^9 colony-forming units Nonviable *S.* Typhi Ty21a: 5–50x10^9 bacterial cells Sucrose: 3.3–34.2 mg Ascorbic acid: 0.2–2.4 mg Amino acid mixture: 0.3–3.0 mg Lactose: up 200 mg Magnesium stearate: 3.6–4.0 mg	≥6 years of age	PO	Every 5 years
Typhim Vi®[3] (sanofi)	*Salmonella* Typhi Ty2 strain: 25 µg Formaldehyde: ≤100 µg Phenol: 0.25% Sodium Chloride: 4.150 mg Disodium phosphate: 0.065 mg	≥2 years of age	IM	Every 2 years

	Monosodium phosphate: 0.023 mg			

IV. A. GENERAL RECOMMENDATIONS FOR USE

1. Typhoid vaccines are not indicated for routine immunization of individuals in the United States. Immunization against typhoid fever is indicated for the following groups:
    a. Travelers to areas in which there is a recognized risk of exposure to *S.* Typhi, particularly those who will have prolonged exposure to potentially contaminated food and drink.
    b. Persons with intimate exposure (e.g., continued household contact) to a documented *S.* Typhi carrier
    c. Microbiology laboratorians who frequently work with *S.* Typhi. [1]
2. Current CDC advisories should be consulted with regard to areas with a risk of exposure to *S.* Typhi. Travelers should use caution in selecting food and water, even if vaccinated. Infections with drug resistant strains can be fatal. See also travel apps for: TravWell, Can I Eat This?, and the 2018 Yellow Book.[5]
3. Typhoid vaccines will not protect against serotypes of *Salmonella* other than Typhi.[2,3]

IV. B. SPECIFIC RECOMMENDATIONS FOR USE

Vivotif®[2]

1. Oral typhoid vaccine is indicated for persons six years of age or older.[1]
2. Oral vaccines can be administered simultaneously or at any interval before or after other live vaccines (injectable or intranasal) if indicated. This includes Yellow Fever live, attenuated vaccine or immune globulin if indicated.[1]
3. Immunization (i.e., ingestion of all four doses) should be completed at least one week prior to potential exposure to *Salmonella* Typhi.[1]
4. Re-immunization is recommended every five years for persons under conditions of repeated or continued exposure to *Salmonella* Typhi.[1,2]

TyphimVi®[3]

1. Injectable typhoid vaccine is indicated for persons two years of age or older.[1,3]
2. Re-immunization is recommended every two years for persons under conditions of repeated or continued exposure to *Salmonella* Typhi.[1,3]
3. Immunization should occur at least two weeks prior to potential exposure to *Salmonella* Typhi.[1,3,4]

V. A. GENERAL CONTRAINDICATIONS

1. History or hypersensitivity to any component of the vaccine.[2,3]

V. B. VACCINE-SPECIFIC CONTRAINDICATIONS

Vivotif®[2]

1. Do not give during an acute febrile illness. Postpone if persistent diarrhea or vomiting is occurring.[1,2]
2. Safety of the vaccine has not been demonstrated in persons deficient in their ability to mount a humoral or cell-mediated immune response, due to either a congenital or acquired immunodeficient state including treatment with immunosuppressive or antimitotic drugs. The vaccine should not be administered to these persons regardless of benefits.[1,2]
3. Oral typhoid vaccine should not be given to people taking antibacterial agents as these may inactivate the vaccine. Vivotif® should not be given until at least 3 days after the last dose of antimicrobial agent and, if possible, antimicrobial agents should not be started within 3 days of the last dose of Vivotif® vaccine. A longer interval should be considered for long-acting antimicrobials (e.g., azithromycin).[1,2,7]
4. Do not administer to children less than six years of age.[1,2]

V. B. VACCINE SPECIFIC CONTRAINDICATIONS Cont.

TyphimVi® [3]

1. Typhim VI should be given to a pregnant woman only if clearly needed.[3]

2. When possible, delaying vaccination with TyphimVi® until the second or third trimester to minimize the possibility of teratogenicity is a reasonable precaution.[3]

VI. PRECAUTIONS

Vivotif®[2]

1. The antimalarial agents mefloquine and chloroquine and the combinations atovaquone/proguanil and pyrimethamine/sulfadoxine can, at doses used for prophylaxis, be administered together with Vivotif®; however, the manufacturer advises that other antimalarial agents only be administered at least 3 days after the last vaccine dose.

   When needed, administer higher doses of proguanil at least 10 days after the last dose of Vivotif®.[1,2,6]

TyphimVi®[3]

1. Acute or febrile illness may be reason for delaying use of this vaccine except when, in the opinion of the physician, withholding the vaccine entails a greater risk.3
2. TyphimVi® should not be used to treat a patient with typhoid fever or a documented carrier.

VII. A. Table 3. SIDE EFFECTS AND ADVERSE REACTIONS Vivotif®[2]

Number followed for Safety*	Adverse Reaction % after 3 doses (n = 483)
Systemic Complaints	
Abdominal Pain	6.4%
Nausea	5.8%
Diarrhea	2.9%
Vomiting	1.5%
Fever	3.3%
Headache	4.8%
Rash	1.0%
*Package insert, page 4[2]	

VII. B. Table 4. SIDE EFFECTS AND ADVERSE REACTIONS AMONG ADULTS TyphimVi®[3]

Number followed for Safety*	Adverse reactions within 48 hours n (%) Trial 1 1 lot (n = 54)	Trial 2 2 lots combined (n = 98)
Local Reaction, Injection site		
Pain	22 (40.7%)	26 (26.5%)
Redness	2 (3.7%)	5 (5.1%)
Swelling	8 (14.8%)	5 (5.1%)
Systemic Complaints		
Fever ≥100°F	1 (1.9%)	0
Nausea	1(1.9%)	8 (8.2%)
Vomiting	1 (1.9%)	0
Diarrhea	0	3 (3.1%)
Tiredness (malaise)	13 (24%)	4 (4.1%)
Headache	11 (20.4%)	16 (16.3%)
Muscle pain	4 (7.4%)	3 (3.1%)

*Patients were 18–40 years of age. Data from package insert, page 16, Table 3

VII. C. Table 5. SIDE EFFECTS AND ADVERSE REACTIONS AMONG CHILDREN TyphimVi®[3]

Number followed for Safety*	Adverse reactions within 48 hours n (%) n = 175
Local Reaction, Injection site	
Pain	25 (14.3%)
Redness	12 (6.9%)
Swelling	5 (2.9%)
Systemic Complaints	
Reported feverishness	5(2.9%)
Impaired limb use	0
Decreased activity	3 (1.7%)
Headache	0
*Patients were 1–12 years of age. Package insert, page 17, Table 4,	

VIII. OTHER CONSIDERATIONS

1. Epinephrine hydrochloride solution (1:1,000) and other appropriate agents and equipment must be available for immediate use in case of anaphylactic or acute hypersensitivity reaction.[1,2]
2. Individuals with altered immunocompetence may have reduced immune responses.[1,2]
3. It is not known whether typhoid vaccines are excreted in human milk. Use with caution in nursing mothers.[1,2]
4. Vivotif□ vaccine can be administered simultaneously or at any interval before or after other live vac¬cines (injectable or intranasal) or immune globulin if indicated.[1]
5. When indicated: oral cholera vaccine should be administered before the oral typhoid vaccine, and at least 8 hours should separate the cholera vaccine and the first dose of typhoid vaccine.[10]
6. The importance of vaccination and other preventive measures for typhoid fever is heightened by increasing resistance of *Salmonella* serotype Typhi to antimicrobial agents, including fluoroquinolones, in many parts of the world. Even if vaccinated, infections with drug-resistant typhoid strains can be fatal.[1]
7. Paratyphoid fever, caused primarily by *Salmonella enterica* serotype Paratyphi A, but also by serotypes Paratyphi B (tartrate negative) and C, is an illness clinically indistinguishable from typhoid fever and responsible for as many as 50% of enteric fever cases in many countries. Neither typhoid vaccine is labeled in the U. S. for prevention of paratyphoid fever.[1]
8. Either vaccine can be used for revaccination, within the appropriate time interval.[1]
9. Typhim Vi®: Persons deficient in producing antibodies, whether due to genetic defect, immunodeficiency disease, or immunosuppressive therapy, may not obtain the expected immune response. This includes patients with asymptomatic or symptomatic HIV-infection, severe combined immunodeficiency, hypogammaglobulinemia, or agammaglobulinemia; altered immune states due to diseases such as leukemia, lymphoma, or generalized malignancy; or an immune system compromised by treatment with corticosteroids, alkylating drugs, antimetabolites or radiation.[3]
10. No data have been reported on the use of either vaccine in pregnant women. In general, live vaccines (Vivotif®) [2] are contraindicated in pregnant women.[1, 2]

11. Polysaccharide vaccine (TyphimVi®)[3] should be given to pregnant women only if clearly needed.[1]

IX. A. STORAGE AND HANDLING

All clinics and pharmacies enrolled with the Vaccines for Children (VFC) Program must immediately report any storage and handling deviations to the Oregon Immunization Program at 971-673-4VFC (4823).

TyphimVi®:[3]

- TyphimVI® is a clear, colorless solution
- Store at 2°–8°C (36°–46°F)
- Do not freeze
- No Latex

Vivotif®: [2]

- Vivotif® is not stable when exposed to ambient temperatures
- Ship and store between 2°C and 8°C (36°F–46°F)
- Expiration date is valid only if the product has been maintained at 2°C–8°C (36°F–46°F).
- Do not expose capsule to direct sunlight.[2]
- No Latex

X.ADVERSE EVENTS REPORTING

Public providers are to complete the Vaccine Adverse Events Reporting System (VAERS) report online at https://vaers.hhs.gov/reportevent.html

Private providers are to report events directly to VAERS and can read about options on how to do so at https://vaers.hhs.gov/reportevent.html .

To request this material in an alternative format (e.g., Braille) or to clarify any part of the above order, contact the Oregon Health Authority Immunization Program at 971-673-0300 and 711 for TTY. For other questions, consult with the vaccine recipient's primary health care provider or a consulting physician.

Electronic copy of this immunization protocol is available at: immunization protocols

REFERENCES

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8. PaxVax Berna of Switzerland (formerly Crucell), phone: 1-800-533-5899, 8:00 AM to 5:00 PM Eastern Standard Time; ask for the Medical Department.
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