Yellow Fever	Primary vaccination	Booster vaccination	Protection	Comments
Stamaril® **Dose:** 0.5ml **Application:** s.c. **Ingredients:** • Live attenuated (17D) YF virus strain. The vaccine virus is cultivated in chicken embryos/eggs and, thus contains egg protein(s) • No adjuvant **Stability:** • Unused vaccine must be discarded within 1 hour after reconstitution	**Children >9 months of age and adults:** • single dose **Immunocompromised:** • See comment under contraindication • Consider YF vaccination 4 weeks before any immunosuppression! **Note:** The yellow fever vaccination must be administered by an authorized doctor or center. It is officially valid 10 days after primary vaccination. Documentation in WHO approved vaccination card is mandatory. ('International Certificate for Vaccination'). *Swiss ECTM*: After a 2nd dose the remark *"life of person vaccinated"* is *documented in the section "valid until"* in WHO approved vaccination cards ('International Certificate for Vaccination'), example see below.	Single booster dose after 10 years, if indicated* **Special indications:** **Revaccination every 10 years or antibody titre testing in:** • Patients with controlled HIV infection • Laboratory workers handling wild-type YF virus **Revaccination irrespective of time after primo-vaccination or antibody titre testing in:** • Patients with non-suppressed HIV viral load + CD4 >200 cells/µL (CD4 value not older than 6 months) • Women who were pregnant at primo-vaccination (single booster in case of re-exposure) • Children vaccinated below the age of 2 years (single booster in case of re-exposure) • Persons who received hematopoietic stem cell transplantation after YF vaccination (depending on immunosuppression, but not before 2 years after transplantation) • Person with immune modulatory or immunosuppressive drug treatment: see comment under contraindication	Protective antibody levels in 80 - ≥99% of vaccinees within 10 days and in ≥99% within 28 days following primary vaccination.	**Remarks to special points within the SOP:** • As specified in the International Health Regulations (IHR), countries may demand proof of yellow fever (YF) vaccination from travellers as a requirement for entering the country under certain circumstances. • * In 2016, WHO changed their recommendation from YF booster doses every 10 years to a single dose, which is considered to confer life-long protection [1,2]. However, this decision was based on limited data and mainly from endemic populations, potentially exposed to natural boosters (through contact with infected mosquitos), which does not apply to travellers from non-endemic regions. In addition, it is known that a small minority of vaccinated persons do not develop neutralizing antibodies after a single dose of the YF vaccine. As several experts have raised concerns about the WHO single dose strategy [3-6], the Swiss Expert Committee for Travel Medicine recommends a **single booster dose ≥10 years** (max. 2 doses/life-time) in immunocompetent persons after primovaccination before considering life-long immunity. **Indication:** • Travel to YF endemic region, see YF map or country page. • According to countries' entry requirement, see country page. **Adverse events:** *Frequent* (1/100–1/10): • Pain, local erythema and/or induration at injection site, arthralgia, myalgia local lymphadenopathy • Flu-like symptoms (4–7 days after vaccination) *Rare, but potentially life-threatening* [7]: • Severe allergic reactions: 1.3/100'000 doses (risk declines with age, highest in persons ≤18y = 2.7/100'000) • Yellow fever vaccine-associated neurotropic disease (YF-AND): risk ~0.4–0.8/100'000 doses; highest risk in children <6(–9) months and older people, increasing to 1.6–2.5/100'000 doses in persons 60–70 years old. Risk limited to primary vaccination. • Yellow fever vaccine-associated viscerotropic disease (YF-AVD): risk ~0.3–0.4/100'000 doses; increasing to 1/100'000 doses in persons 60–70 years old and 2.3–4/100'000 doses in persons >70 years old. Risk limited to primary vaccination. **Absolute contraindications:** • Children <6 months • Egg protein allergy (generally, persons who are able to eat eggs or egg products may receive the vaccine. Otherwise consider allergy testing ± desensitization [8]) • Thymus disorders associated with abnormal immune-cell function (myasthenia gravis, thymoma). According to CDC [9], there is no evidence of immune dysfunction or increased risk of YF vaccine–associated serious adverse events in people who have undergone

To be documented:

- Absence of:
  1. chicken-egg allergy (can you eat eggs?)
  2. thymus gland disorder
  3. underlying medical condition(s) altering the immune status
  4. intake of drugs impairing immune function(s)
  5. pregnancy
- Women of child-bearing age should wait 4 weeks after receiving YF vaccine before conceiving (get informed consent signed)
- ≥60 years: communicate increased risk for developing YF-AVD and YF-AND

Note:

- The issuance of fake YF vaccination certificates is a well-known and serious problem in various countries in Africa. Reports of falsified YF vaccination certificates have so far come from Angola, Kenya, Cameroon, Nigeria, Zambia, Zimbabwe, South Sudan, Tanzania and Uganda. ECTM therefore recommends that yellow fever vaccination certificates issued in the above-mentioned countries be considered invalid and that the persons concerned be vaccinated again against yellow fever

Example how to fill out the YF certificate:

incidental thymectomy or who have had indirect radiation therapy in the distant past; these people can be vaccinated.

- Immunosuppression (immunosuppressive therapy [some medication may be allowed, an expert advice is recommended!]., symptomatic HIV infection [vaccination is safe in asymptomatic HIV infected persons with suppressed viral load and CD4 cell counts ≥200 cells/µL (≥15% of total lymphocytes in children <6 years)], malignant neoplasms, primary immunodeficiencies, transplant patients [all solid organ and bone marrow transplant recipients within 2 years of transplantation, and all transplant recipients who take immunosuppressive drugs >2 years after transplantation], radiation therapy [current or within <3months, if chest involved or in context of hematopoietic malignancy).
- Medical immunosuppression: see separate information sheet.

Relative contraindications:

- Pregnancy: unlike other parenteral live vaccines, pregnancy is not an absolute contraindication for YF vaccination, weigh risk against benefit.
- Breastfeeding: YF vaccination should be avoided if the child is below 9 months of age. Reason: Vaccine viruses can pass into breast milk. In isolated cases, breastfed babies have contracted meningoencephalitis after the mother's YF vaccination. When nursing mothers cannot avoid or postpone travel to high risk endemic regions, these women should be vaccinated; consider stopping breast-feeding or pump/discard milk for at least 2 weeks before re-breastfeeding).
- Children ≥6–9 months: travel to endemic areas should be avoided or postponed. Consider vaccination if travel to areas with significant risk of yellow fever is unavoidable.
- Adults ≥60 years of age: discuss benefit of vaccination vs. age-related risk of YF-AVD/YF-AND individually.

Interactions:

- If parenteral live viral vaccines (MMR, varicella, zoster, YF [note: rule does NOT apply to oral vaccines!]) are not concurrently given at the same visit, it is recommended that ≥4 weeks should be allowed between live virus vaccine administrations. This recommendation is based on the observation that smallpox vaccination results in a lower immune response when injected 4-20 days after measles vaccination (Petralli et al. 1965).
- Concomitant YF and VZV vaccination should be avoided, if possible. There is some evidence in children that simultaneous administration of YF and MMR vaccines may reduce seroconversion rates [10-12]. However, priority is to vaccinate and not to miss chances to vaccinate, meaning: in the case of short timing concomitant vaccination of YF and MMR can be done.
- A possibly increased rate of side effects has been observed in persons concomitantly vaccinated against YF and TBE (personal communication B. Beck). In the absence of systemic data and because of a potential role of "antibody-dependent enhancement" between flaviviruses and the additional risk of decreased titres (YF, TBE, JE), consider avoiding concomitant vaccination against flaviviruses [13].
- Timing of YF vaccination ideally more than 3 months after and more than 2 weeks before administration of immunoglobulins.

Laboratories performing YF antibody titre testing:
Testing for YF specific antibodies by a "Plaque Reduction Neutralisation Test [PNRT]" which demands 1 ml of serum or plasma; samples can be sent, appropriately packed, uncooled with normal postal service.

1. Zentrale Labordiagnostik, Bernard-Nocht-Institut für Tropenmedizin
   Bernhard-Nocht-Strasse 74
   20359 Hamburg
   Phone:+ 49 40 42818-444, Email: labordiagnostik@bnitm.de
   Auftragsformular: https://www.bnitm.de/fileadmin/media/de/documents/labordiagnostik/Eschein_04_17_Viro.pdf

2. Leiden University Medical Center (LUMC)
   Clinical Microbiological Laboratory
   Building 1, E4-P; PO Box 9600; 2300 RC Leiden / The Netherlands
   Phone: +31 71-5263585 (administration)/ +31 71-526111 , Fax: +31 71-526698

References:
[1] WHO. Vaccines and vaccination against yellow fever: WHO Position Paper, June 2013--recommendations. Vaccine 2015;33:76-7.
[2] Gotuzzo E et al. Efficacy and duration of immunity after yellow fever vaccination: systematic review on the need for a booster every 10 years. Am J Trop Med Hyg 2013;89:434-44.
[3] Grobusch MP et al. Yellow fever revaccination guidelines change - a decision too feverish? Clin Microbiol Infect 2013;19:885-6.
[4] Campi-Azevedo AC et al. Booster dose after 10 years is recommended following 17DD-YF primary vaccination. Hum Vaccin Immunother 2016;12:491-502.
[5] Amanna IJ et al. Questions regarding the safety and duration of immunity following live yellow fever vaccination. Expert review of vaccines 2016;15:1519-33.
[6] Vasconcelos PF. Single shot of 17D vaccine may not confer life-long protection against yellow fever. Mem Inst Oswaldo Cruz 2018;113:135-7.
[7] Lindsey NP et al. Adverse event reports following yellow fever vaccination, 2007-13. JTM 2016;23.
[8] Rutkowski K et al. Administration of yellow fever vaccine in patients with egg allergy. Int Arch Allergy Immunol 2013;161:274-8.
[9] Center for Disease Control and Prevention (CDC), Travelers Health, Yellow Book 2020, Chapter 4, Yellow Fever. Available at: https://wwwnc.cdc.gov/travel/yellowbook/2020/travel-related-infectious-diseases/yellow-fever
[10] Goujon C et al. CHRONOVAC VOYAGEUR: A study of the immune response to yellow fever vaccine among infants previously immunized against measles. Vaccine 2017;35:6166-71.
[10] Michel R et al. Observational study on immune response to yellow fever and measles vaccines in 9 to 15-month old children. Is it necessary to wait 4 weeks between two live attenuated vaccines? Vaccine 2015;33:2301-6.
[12] Nascimento Silva JR et al. Mutual interference on the immune response to yellow fever vaccine and a combined vaccine against measles, mumps and rubella. Vaccine 2011;29:6327-34.
[13] Kayser M et al. Human antibody response to immunization with 17D yellow fever and inactivated TBE vaccine. J Med Virol 1985;17:35-45. CID 2014; 58(3), e 44-100 Rubin et al.