Chapter 11: Smallpox vaccine and vaccination in the Intensified Smallpox Eradication Programme

By the time the **Intensified Smallpox Eradication Programme (1967-1980)** was launched, vaccination was already widely practiced across the world. However, many endemic countries still lacked a **high-quality, heat-stable vaccine** that could be effectively distributed under challenging environmental conditions. This chapter discusses the challenges, improvements, and innovations in smallpox vaccine production, distribution, and administration, which played a key role in achieving global eradication.

Vaccine requirements for the intensified programme

The success of the eradication programme depended on the **availability of potent, heat-stable vaccines**. Initially, vaccine quality varied significantly, and WHO faced major obstacles, including:

- **Shortages in vaccine supply** due to limited global production.
- **Inconsistencies in vaccine quality**, with some batches lacking potency or heat stability.
- **Logistical challenges in distribution**, especially in tropical regions.

To address these issues, WHO established **quality control mechanisms**, ensuring vaccines met international standards before being used in the field.

Development of improved vaccines

Efforts to improve vaccine quality included:

1. **Survey of Vaccine Producers (1967)** – WHO evaluated vaccine production facilities worldwide to standardize manufacturing practices.
2. **Freeze-Dried Vaccine Production** – Unlike earlier liquid vaccines that lost potency quickly, freeze-dried vaccines remained stable for months in high temperatures.
3. **Strains of Vaccinia Virus** – Different strains were used, but the **Lister strain** became the most widely adopted due to its **strong immune response and stability**.
4. **Heat Stability and Potency Testing** – WHO developed rigorous **heat-stability tests** to ensure vaccines could survive distribution in remote areas.

New vaccination techniques

To improve vaccine delivery, **new tools and techniques** were introduced:

- **Bifurcated Needle** – A simple and cost-effective device that improved vaccine uptake and reduced wastage.
- **Jet Injectors** – Used for mass vaccination campaigns, particularly in areas with high population density.
- **Modified Scarification Methods** – Improved techniques were developed to reduce contamination and maximize vaccine effectiveness.

Ensuring Vaccine Availability

WHO coordinated **vaccine donations from multiple countries**, with the **USSR, the USA, and European nations** providing millions of doses. Over time, production in **endemic countries** increased, making vaccine supply more sustainable.

Final phase: Discontinuation of vaccination

Following smallpox eradication in **1980**, routine smallpox vaccination was **discontinued worldwide**, except for military personnel and laboratory workers handling variola virus. However, research on **vaccinia virus as a vector for other vaccines** has continued, demonstrating its potential in combating other infectious diseases.

Conclusion

The **success of smallpox eradication** was directly linked to improvements in **vaccine quality, production, and delivery methods**. WHO's efforts in ensuring vaccine potency and stability, combined with **innovative vaccination techniques**, allowed for the complete elimination of smallpox, making it one of the greatest achievements in global public health.