General Description
Multiple Micronutrient Powder 5 component (MNP5), single-use 1 gram sachets, packs of 30 sachets in customised/country specific layouts. MNP5s are designed for point of use fortification of complementary foods for children and vulnerable populations to address anaemia and vitamin and mineral deficiencies.

Indications
Micronutrient supplementation/food fortification in emergencies. Micronutrient supplementation/food fortification in complementary foods for breast-fed infants. Micronutrient supplementation/food fortification for young children where dietary micronutrient intakes are insufficient.

Target Group
Multiple micronutrient 5 component powder is used for children 6–23 months of age.

Technical Specifications
Raw materials
All materials used shall be of food or pharmaceutical grade and their selection and approval must take into consideration origin, transport, storage, processing, handling and the intended use of the finished product.

Vitamins and minerals
Vitamins and minerals used in the premix shall correspond to the monographs of the latest additions of official pharmacopoeias: BP, Ph.Eur, Ph.Int, USP. MNPs shall meet food chemical codex (FCC) for Identity and Purity criteria and may

Excipients
The formulation shall be in the base of dextrose anhydrous maltodextrin (DE 11-14) or another suitable carrier, with the addition of silica dioxide, tricalcium phosphate or other suitable flow agents. Excipients shall meet the requirements of not more than 6% moisture (loss-on-drying) and shall comply with FCC Standard for food additives (1.3.4) and the International Pharmacopeial monograph for Oral powders. Single nutrients contained within the MNP formulation that require antioxidants as excipients to prevent oxidation shall be approved for use in young children.

Composition per one gram sachet
Iron 12.5 mg (as coated Ferrous fumarate, NaFe EDTA* or Ferrous bisglycinate)*
Vitamin A 300 µg of retinol, (as dry CWS vitamin A acetate or palmitate beadlets)
Zinc 5mg of elemental zinc (as Zinc sulphate, oxide or gluconate)
Vitamin C 30mg (as ascorbic acid or sodium ascorbate)
Folic acid 160µg
Maltodextrin q.s.
(See Appendix 2 for guidance on addition rates)

*Max 2.5mg of elemental iron from NaFeEDTA, the remaining 7.5mg of iron shall be added from another approved form.

Physical and organoleptic characteristics
Fine, off white, slightly yellow, speckled, odorless powder; having a bland taste which has minimal impact on the taste, smell or color of the food when mixed. The formulation shall be a stable, dry preparation that can be uniformly blended with the food the child is eating. Product should be a fine, granular powder without segregation.

**Formulation Notes**
To minimize water content of the formulation anhydrous forms of vitamins and minerals are preferable. The product should be manufactured in a humidity controlled environment and the sachet filling done under nitrogen or with limited exposure to air. Some nutrients may require microencapsulation to ensure shelf life, to help prevent oxidation through nutrient-nutrient or nutrient-food interactions and to minimise bitter and metallic tastes within the formulation. This is particularly relevant for iron and Vitamin C. For further guidance on the forms of vitamins and minerals used, please consult the reference Home Fortification Technical Advisory Group’s manual on micronutrient powder composition, July 2013, available at: http://hftag.gainhealth.org/sites/hftag.gainhealth.org/files/HF-TAG%20MNP%20Composition%20Manual.pdf

**Product Segregation**
As the powder could be heterogenous in its particle size, segregation of the powder needs to be carefully monitored. The beadlet ingredients (vitamin A) and encapsulated ingredients have a high propensity to segregate within the powder mixture.

**Statement of quality**
UNICEF enforces strict quality standards starting from raw materials to movement of the finished product throughout the supply chain. Quality refers to the bioavailability, chemical, microbiological, physical and stability attributes that a product should maintain if it is to be deemed suitable for therapeutic or supplementary use.

**Safety Reference Standards**
USP 2021, Microbial Enumeration Tests - Nutritional and Dietary Supplements USP

MNs shall be free from objectionable matter. It shall not contain any poisonous or deleterious substances, including microbial contaminants, anti-nutritional factors, heavy metals or pesticides in amounts that may represent a hazard to health, and with microbiological limits as detailed below:

**Microbiological criteria**
Total CFU-max $10^3$/g.
Yeast/molds-max $10^2$/g.
Escherichia coli-negative in 10g.
Salmonella sp-negative in 50g.
Staphylococcus aureus-negative in 10g.
Saskia dePee et al. Quality criteria for Micronutrient powder products: Report of a meeting organized by the World Food programme and Sprinkles Global Health Initiative.

**Contaminants**
Heavy metals, residual solvents and other contaminant levels need to meet the limits as set out by the current USP, BP Ph. Eu or Ph.Int.

<2232> Elemental Contaminants in Dietary Supplements:

<table>
<thead>
<tr>
<th>Element</th>
<th>PDE*(μg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic (inorganic)</td>
<td>15μg/day = 0.015mg/day/1g sachet</td>
</tr>
<tr>
<td>Cadmium</td>
<td>5μg/day = 0.005mg/day/1g sachet</td>
</tr>
<tr>
<td>Lead</td>
<td>10μg/day = 0.01mg/day/1g sachet</td>
</tr>
<tr>
<td>Mercury (total)</td>
<td>15μg/day = 0.015mg/day/1g sachet</td>
</tr>
<tr>
<td>Methylmercury (as Hg)</td>
<td>2μg/day = 0.002mg/day/1g sachet</td>
</tr>
</tbody>
</table>

*Permitted daily exposure.

**Standard shelf life**
Shelf life studies shall demonstrate the product has levels of all nutrients within specification at minimum 24 months at temperatures of 25 degrees Celsius and 60% RH or 30 degrees Celsius and 65% RH. Shelf life studies for zone IV(b) conditions are also required if the product will be delivered to countries with hot and humid climates. Please refer to the WHO guidelines for Stability testing: Stability testing of active pharmaceutical ingredients and finished pharmaceutical products. World Health Organization WHO Technical Report Series, No.953, 2009.
http://apps.who.int/medicinedocs/en/d/j5517e/12.html

**Uniformity of Content and Mass**
UNICEF requires suppliers to adhere to the standards for uniformity of content and mass as set out in the WHO monograph for oral powders: http://apps.who.int/phint/en/p/docf/

**Analytical Requirements**
Certificate of Analyse should include tests of the following:
All active components on label (all vitamins and minerals) (see methods in reference 2)
Microbiological criteria (see methods in reference 3) Moisture (LOD) <6%

**Manufacturing Standard**
Overall food safety management environment.
The product will be manufactured within a quality and food safety management environment in accordance with recognized international standards and best practices and/or guidelines, such as Codex Alimentarius and the ‘Code of Practice for Food Premix Operations’ (PanAmerican health Organization (FCH/NU/66). Other standards and food safety approaches such as ISO, GMP and HACCP (Annex 5 of the U.S. Department of Health and Human Services, and FDA 199 Food Code) are highly recommended. Pharmaceutical companies manufacturing this product must comply with a Quality Management System commensurate with Good Manufacturing Practice (GMP) according to WHO (Technical Report Series 961).

**Packaging**
Primary packaging
Packaging material shall guarantee proper hygiene and stability of the vitamin and mineral powder, following Codex Alimentarius Standards when applicable, and be made of material that is safe (at least food grade; e.g. complying with FDA/CFSAN, white list or with regulations from national health authorities). Packaging material shall provide a barrier to light, air (oxygen) and moisture to ensure the product is stable for minimum 24 months. Packaging to be made of aluminum-laminate: polyethylene-aluminum—printed polyethylene or PET or another suitable material. Suppliers are required to provide packaging specifications.

**Secondary packaging**
Sachets shall be packed inside a cardboard box or a sealed bag made of aluminum laminate, polyethylene or a film coated bag. The secondary packaging material shall be suitable to be fitted in a cardboard box for storage and bulk shipment.

**Labelling**
Country Office/Partner to provide layouts for primary and secondary packaging. Labelling shall be appropriate for the consumer, taking into consideration nutritional habits, type of food consumed, as well as other culturally sensitive aspects, e.g. images of children or food appearing on the label.

**Consumer Guidance Messages**
Breastfeeding is recommended for 24 months and exclusively for 6 months. Do not use if the sachet or package is torn or damaged.

**Shelf life**
24 months

**Storage conditions**
Do not store above 30°C
Store in tightly closed original packaging, protect from moisture. Keep out of reach and sight of children

**Instruction for use**
Mix the sachet contents with a small portion of solid or semi-solid food just before serving.

**Pictogram Guide**
Show a small spoon in the pictorial description demonstrating the powder should be mixed with food.
Do not use images that could be interpreted unfavourably; include a picture of an infant older than 6 months that is ethnically specific for the region.

**Cautionary Programme Note**
This is not a replacement for any additional nutritional interventions, which shall continue alongside use of this product. Breastfeeding should be encouraged to be continued if MNPs or MNP 5 component are part of a complimentary diet for the infant (See label requirements for mandatory message).

**Dosage**
Children aged 6-23 months shall be given one dose (i.e. one sachet) each day.

**Adverse Effects**
No adverse events have been reported during the use of MNP 5 component. However, supplemental iron and zinc has been reported to cause mild gastrointestinal upset in sensitive individuals, particularly if consumed on an empty stomach.

**Target population**
Children 6 to 23 months of age.
A Certificate of Analysis is required for every batch supplied against UNICEF Supply Division Purchase Orders.

The principal tests listed below must be performed in order to check if the quality of MNP meets above requirements. Additional analyses shall be defined in case of further quality assessment.

**List of compulsory tests for Certificate of Analysis and reference methods:**

**Active Constituents**
- All vitamins USP 29
- Vitamin B12 USP 29
- Minerals USP 29

**Microbiological testing Method**
- Total CFU max. 3000cfu/g USP29 (2021)
- Yeast/mould max. 300cfu/g USP29 (2021)
- E-coli neg/10g USP29 (2021)
- Salmonella neg/50g USP29 (2021)
- St. aureus neg/10g USP29 (2021)

**Appendix 1**
Halal and Kosher Vitamins
Sources of vitamins and minerals can often contain animal products. Certain countries may request halal or Kosher certificates for products, UNICEF may request that certification is provided for these countries. Specific attention shall be paid to vitamin A and D as these are often manufactured using animal products as excipients.

**GMO free requirements**
Many countries request that imported products are GMO free. Naturally derived vitamin E and corn derived maltodextrin can often be manufactured from GMO soy or corn and thus could lead to customs delays without adequate certification. UNICEF may request GMO free certification if required by the importing country office.

**Appendix 2**
Suggested addition rates to account for shelf life degradation.

- Vitamin A 400µg RE (130-150%)
- Vitamin C 30mg (120-150%)
- Folic Acid 90µg (125-150%)

**Appendix 3**
Relevant standards and References

1. International Pharmacopeial standard for Oral powders:
http://apps.who.int/phint/en/p/docf/
2. USP Monograph for Oil and water soluble Vitamins with Minerals Tablets
   http://www.pharmacopeia.cn/v29240/uspnf24a50_m88698.html

3. USP 2021, Microbial Enumeration Tests - Nutritional and Dietary Supplements

4. USP 232, Elemental Impurities - Limits

5. USP, General Chapter on Inorganic Impurities: Heavy metals


7. Codex Alimentarius : GUIDELINES FOR VITAMIN AND MINERAL FOOD SUPPLEMENTS CAC/GL 55 – 2005

8. Codex Alimentarius GENERAL GUIDELINES ON SAMPLING CAC/GL 50-2004

9. Codex Alimentarius: ADVISORY LISTS OF NUTRIENT COMPOUNDS FOR USE IN FOODS FOR SPECIAL DIETARY USES INTENDED FOR INFANTS AND YOUNG CHILDREN CAC/GL 10–1979

10. Food Chemical Codex STANDARD 1.3.4 IDENTITY AND PURITY
    www.comlaw.gov.au


