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Part of the Cotecna Group

HERBALS

COMPLIANCE & SAFETY TESTING

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HERBALS

The aging population is an irreversible global trend that is a crucial catalyst for Dietary-Supplements market development. Preventive healthcare has been a buzz around major developed economies with people associating healthy living with better appearance and social persona.

The degree of innovation in the dietary supplements market is quite high, with many companies constantly developing new products and formulations to meet the evolving needs and preferences of consumers. The market is characterized by a wide range of products, including vitamins, minerals, botanicals, amino acids, and other substances, each with its own unique blend and formulation.

Regarding Herbals, Neotron offers comprehensive compliance and safety analyses for raw materials, intermediate or finished products throughout the supply chain.

NEOTRON
ANALYTICAL APPROACH

FOOD **PHARMA**

SUPPLEMENTS

STEP 1
CHOICE OF METHOD

When choosing the method, feasibility must be verified in relation to the specific customer matrix.

STEP 2
PRODUCT SPECIFIC METHOD VERIFICATION

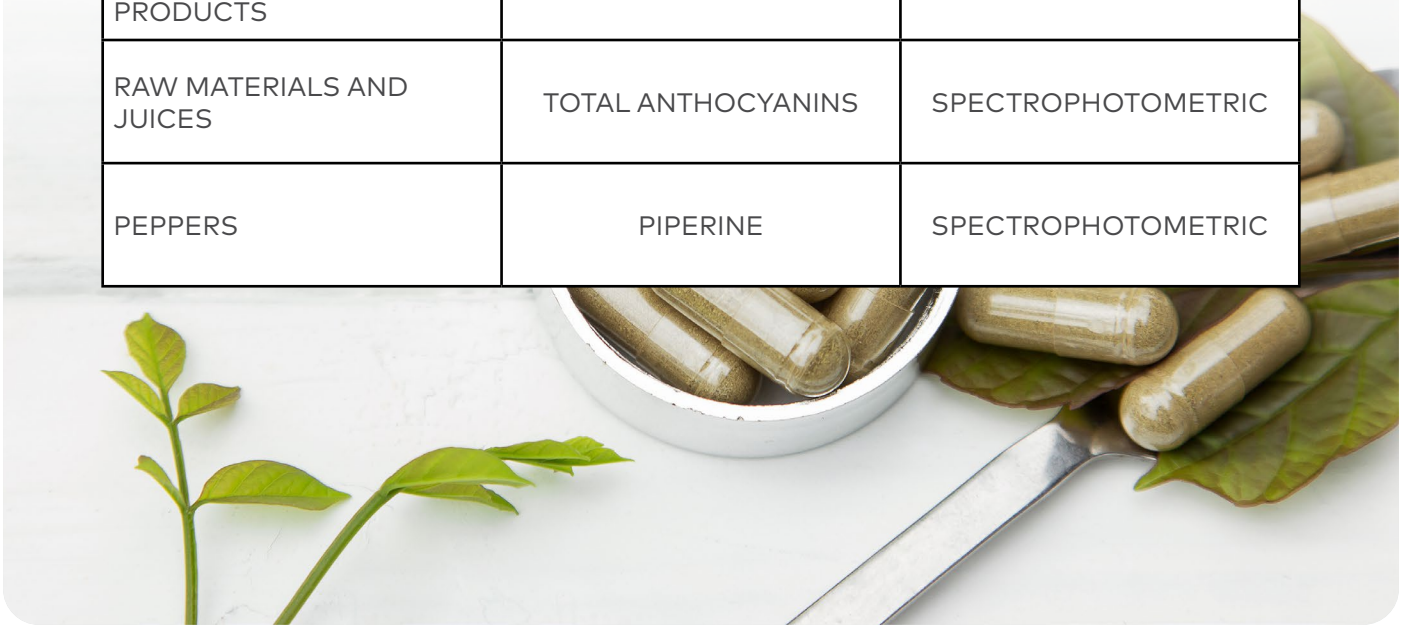
This activity is aimed to guarantee the robustness of the applied method.

COMPLIANCE ANALYSIS

Our dietary division can propose different solutions regarding the compliance of raw materials and finished products. The Neotron team, also depending on specific customer needs, will be able to guide you in choosing non-specific analysis, relating to the entire class of organic compounds, or specific assays relating to the active substances to be identified and quantified.

Below you will find a list of potential matrices with analytical proposals on raw materials and finished products:

MAIN methods for the quantification of the entire organic compound class		
PRODUCT	**ANALYTES**	**TECHNIQUE**
ALL RAW MATERIALS AND FINISHED PRODUCTS *(to be verified during analysis)*	POLYPHENOLS	SPECTROPHOTOMETRIC
CRANBERRY & FINISHED CRANBERRY-BASED PRODUCTS	PROANTHOCYANIDINS	SPECTROPHOTOMETRIC
RAW MATERIALS AND JUICES	TOTAL ANTHOCYANINS	SPECTROPHOTOMETRIC
PEPPERS	PIPERINE	SPECTROPHOTOMETRIC



MAIN specific methods for the quantification of the single active compound			
PRODUCT	**TYPE**	**ANALYTES**	**TECHNIQUE**
Grape seed extract, fruit and grape extract, red wine, black elderberry, blueberry, cranberry, blackcurrant, apple	Raw Material	**PROCYANIDINS:** Procyanidin A2, Procyanidin B1, Procyanidin B2, Procyanidin C1	HPLC-FLD LC-MS/MS
Finished products containing raw material reported above	Finished products		
Tea leaves (*Camellia sinensis*); guava, chocolate, red wine; fruit and extract of grapes, apricots, blackberries, cherries, broad beans, fennel seeds	Raw Material	**CATECHINS:** Catechin, Catechin Gallate, Epicatechin, Epi-catechin Gallate, Epi-gallo-catechin, Epigallocatechin-3-gallate, Gallo-catechin, Gallo-catechin Gallate	HPLC-DAD/FLD LC-MS/MS
Finished products containing raw material reported above	Finished products		
Fruit and extract of blueberry, cranberry, blackberry, raspberry, elderberry, acai berry	Raw Material	**ANTHOCYANINS:** Cyanidin 3,5-diglucoside, Cyanidin 3-arabinoside, Cyanidin 3-galactoside, Cyanidin 3-glucoside, Cyanidin 3-rutinoside, Cyanidin 3-sambubioside, Delphinidin 3-glucoside, Delphinidin 3-sambubioside, Malvidin 3,5-diglucoside , Malvidin 3-galactoside, Malvidin 3-glucoside, Pelargonidin 3-glucoside, Peonidin 3-glucoside	HPLC-DAD LC-MS/MS
Finished products containing raw material reported above	Finished products		
Dry and liquid extract of liquorice and liquorice root *Glycyrrhiza glabra*	Raw Material	**GLYCYRRIZIC ACID**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Turmeric	Raw Material	**CURCUMIN and CURCUMINOIDS**	HPLC-DAD LC-MS/MS
Finished products containing raw material reported above	Finished products		
Black pepper	Raw Material	**PIPERINE**	HPLC-DAD
Finished products containing raw material reported above *(method suitability on finished product necessary)*	Finished products		

MAIN specific methods for the quantification of the single active compound			
PRODUCT	**TYPE**	**ANALYTES**	**TECHNIQUE**
Cinnamon	Raw Material	**CUMARIN**	HPLC-FLD LC-MS/MS
Finished products containing raw material reported above	Finished products		
Berberina vulgaris	Raw Material	**BERBERINE**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Saffron	Raw Material	**CROCINE AND SAFRANAL**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Red chili pepper and capsicum	Raw Material	**CAPSAICIN**	HPLC-DAD
Finished products containing raw material reported above *(method suitability on finished product necessary)*	Finished products		
Ginseng	Raw Material	**GINSENOSIDES**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Lemon balm and rosemary, in leaves, dry and liquid extract	Raw Material	**ROSMARINIC ACID**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
***Polygonum cuspidatum*, grapes, red wine, blueberries**	Raw Material	**RESVERATROL**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Tea, black tea, matcha	Raw Material	**L-THEANINE**	HPLC-DAD LC-MS/MS
Finished products containing raw material reported above	Finished products		

MAIN specific methods for the quantification of the single active compound			
PRODUCT	**TYPE**	**ANALYTES**	**TECHNIQUE**
Bitter orange *(Citrus aurantium or bitter orange)*	Raw Material	**SYNEPHRINE AND OCTOPAMINE**	LC-MS/MS
Finished products containing raw material reported above	Finished products		
Hypericin *(Sain John's wort or Hypericum perforatum)*	Raw Material	**HYPERICIN**	HPLC-DAD
Finished products containing raw material reported above *(method suitability on finished product necessary)*	Finished products		
Prunus, cranberry, sage, rosemary	Raw Material	**URSOLIC ACID**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Prunus, cloves, quinoa, amaranth	Raw Material	**OLEANOLIC ACID**	HPLC-DAD LC-MS/MS
Finished products containing raw material reported above *(method suitability on finished product necessary)*	Finished products		
Ivy, quinoa, amaranth	Raw Material	**HEDERAGENIN**	LC-MS/MS
Finished products containing raw material reported above	Finished products		
Red yeast rice	Raw Material	**MONACOLINE K**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Rhubarb	Raw Material	**REINE**	HPLC-DAD LC-MS/MS
Finished products containing raw material reported above	Finished products		
Bearberry, pear	Raw Material	**ARBUTIN**	HPLC-DAD LC-MS/MS
Finished products containing raw material reported above	Finished products		

MAIN specific methods for the quantification of the single active compound			
PRODUCT	**TYPE**	**ANALYTES**	**TECHNIQUE**
Sugar beet	Raw Material	**BETAINE**	LC-MS/MS
Finished products containing raw material reported above	Finished products		
Citrus fruits: grapefruit, bitter orange or *citrus aurantium*, lemon	Raw Material	**NARINGIN and HESPERIDIN**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Hops, buckwheat germ	Raw Material	**RUTINE**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
***Sophora japonica*, tea, coffee, cereals, capers, grapefruit, asparagus**	Raw Material	**TROXERUTIN**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Chamomile, apple and elderberry	Raw Material	**QUERCETIN**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Chamomile	Raw Material	**GALLIC ACID**	HPLC-DAD LC-MS/MS
Finished products containing raw material reported above	Finished products		
Soy	Raw Material	**ISOFLAVONOIDS**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Mangosteen	Raw Material	**MANGOSTINE**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Lichens (usnea)	Raw Material	**USNIC ACID**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Magnolia bark	Raw Material	**HONOKIOLO, MAGNOLOL**	HPLC-DAD
Finished products containing raw material reported above	Finished products		

MAIN specific methods for the quantification of the single active compound			
PRODUCT	**TYPE**	**ANALYTES**	**TECHNIQUE**
Coffee	Raw Material	**TERPENES (cafestol, caveol, 16-omc) and CAFFEINE**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Cocoa	Raw Material	**THEOBROMINE**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Mushrooms (shiitake mushrooms) and yeast, tomato	Raw Material	**ERGOSTEROL**	HPLC-DAD
Finished products containing raw material reported above *(method suitability on finished product necessary)*	Finished products		
Clove oil and cloves (*Syzygium aromaticum*)	Raw Material	**EUGENOL**	GC-FID
Finished products containing raw material reported above *(method suitability on finished product necessary)*	Finished products		
Cranberry, strawberries, walnuts, grapefruit, goji berries	Raw Material	**ELLAGIC ACID**	HPLC-DAD
Finished products containing raw material reported above	Finished products		
Chamomile	Raw Material	**MELATONIN**	HPLC-FL
Finished products containing raw material reported above	Finished products		

METHOD DEVELOPMENT BASED ON CUSTOMER NEEDS

Can't find the active herbals, you're interested in, in the table above?
Neotron, thanks to its internal R&D department, is able to develop methods for the determination of active compounds deriving from Herbals not expressly present in the table.

PHARMACOPOEIA ANALYSIS

Neotron is able to support customer on a specific monograph test related to herbal matrices.

SAFETY ANALYSIS

The safety of plant-based supplements is the result of an integrated set of factors such as suitable production structures, the adequacy of the systems and effective control of the process. The control of the production process must be a pro-active control capable of identifying possible risk factors and intervening promptly to restore normal conditions.

Understood by a uncontaminated product by micropathogenic organisms and physical & chemical contaminants, safety is one of the fundamental points that guarantees the quality of the raw material and the consumer's saftey when taking the finished product.

Below we report the main tests performed by Neotron as part of the safety evaluation:

MICROBIOLOGY PROPOSAL

Neotron's microbiological laboratory can support its customers with specific analytical packages relating to microbiological controls. Below we list the main proposed parameters:

ISO methods according to CeIRSA Guidelines for "spices and aromatic herbs"

- Count of microorganisms at 30°C (ISO 4833-1)
- Presumptive Bacillus cereus count (ISO 7932)
- Beta-glucuronidase-positive Escherichia coli count (ISO 16649-2)
- Count of coagulase-positive staphylococci (ISO 6888-1)
- Count of Enterobacteriaceae (ISO 21528-2)
- Mold counts at 25°C (NF V08-059:2002)
- Detection of Salmonella spp. (ISO 6579-1) in 25 g (UC1* or UC5**)
- Count of Listeria monocytogenes (ISO 11290-2) (UC5**) or detection of Listeria monocytogenes (ISO 11290-1) in 25g (UC1*)

**1 sample unit*
*** 5 sample units*

Ph.Eur. Methods (Chapter 5.1.8: microbiological requirements for herbal drugs)

- Microbial count in TSA
- Yeast count
- Mold Count
- Bile-Tolerant Gram-Negative Bacteria count
- Detection of Escherichia coli (Ph. Eur.) in 1 g
- Detection of Salmonella spp. (Ph. Eur.) in 25 g

MOLECULAR BIOLOGY PROPOSAL

Neotron's Molecular Biology laboratory can support its customers with specific analytical packages relating to specific controls. Below we list the main proposed parameters:

- **GMO Analysis**
- **ALLERGENS**
- **IDENTIFICATION OF PLANT SPECIES (NGS technique)**

RESIDUES AND CONTAMINANTS

Neotron's Chemical laboratory can support its customers with specific analytical packages **Both in ISO and GMP** relating to chemical controls of Residues and Contaminants. Below we list the main proposed parameters:

- **Pesticides:** according to Pesticide Residues EU Pharmacopoeia or Internal Neotron analytical packages
- **Fumigants (E.g. Ethylene oxide)**
- **Mycotoxin:** Aflatoxins, Ochratoxin, Pyrrolizidine Alkaloids
- **Hydroxyanthracenes**
- **Allergenic substances in accordance with REGULATION (EU) 2009/1223 and its amendments**
- **Organic contaminants:**
  - Polycyclic aromatic hydrocarbons (PAH)
  - Mineral oil hydrocarbons (MOSH/MOAH/POSH)
  - Solvent residues
  - Dioxins
  - Nicotine, 3-MCPD, Acrylamide
- **Radioactivity**

MARKET TRENDS & NEOTRON PROPOSAL

References:

- Fortune Business Insights
- Research and Markets
- DataM Intelligence
- Markets and Markets
- Vantage market research

ALGAE-BASED SUPPLEMENTS

What are they?

There are numerous algae-based supplements on the market; in fact, they allow a supply of proteins and essential amino acids that the body needs to function properly and which it must take in through food, as it cannot synthesize them independently. They are also sources of vitamin A, group B vitamins, mineral salts such as calcium, iron and magnesium.

What are the fields of application?

- For athletes: they can contribute to the maintenance of muscle mass, promote correct oxygenation of the muscles, help counteract muscle fatigue
- To regulate thyroid function
- Against tiredness and fatigue
- When you want to stimulate the immune system
- For stronger hair and nails
- To stimulate the metabolism
- If you need to purify and detoxify your body
- To regulate intestinal transit

Market Trend

Worldwide demand for algae supplements accounts for a market value of **US$ 1.1 billion in 2023** and forecasted to reached **US$ 2.07 billion by the end of 2033**. Across the study period (2023 to 2033), the global algae supplements market is **projected to expand at a healthy 6.5% CAGR**.

Neotron Proposal

On Raw Material:

- Compliance: FUCOXANTHIN
- Safety package

On Finished Product:

- Compliance: FUCOXANTHIN
- Vitamins, aminoacids, Minerals
- Safety package

ST. JOHN'S WORT-BASED SUPPLEMENTS

What is St. John's Wort?

St. John's wort *Hypericum perforatum* is a plant belonging to the Guttiferae family, quite widespread in Europe.

Its flowering tops are rich in substances, such as hypericin and hyperforin, with important biological activities.

What are the fields of application?

It contributes to:

- Normal mood
- Relaxation and mental well-being

Market Trend

Valued at around USD 250 million in 2020, with an **estimated annual growth rate of 5–7%**.

Neotron Proposal

On Raw Material:

- Compliance: HYPERICIN
- Safety package

On Finished Product:

- Compliance: HYPERICIN
- Vitamins/Insulin/Minerals/ Folic acid
- Safety package

ASHWAGANDHA-BASED SUPPLEMENTS

What is Ashwagandha?

Ashwagandha is a small evergreen shrub that grows in India, the Middle East and some parts of Africa.

Its botanical name is Withania somnifera and it is also known as Indian ginseng and winter cherry. The active chemical ingredients are known as withanolides.

What are the fields of application?

- Reduction of stress symptoms that can lead to anxiety and depression
- Helping people with insomnia to sleep
- Increased muscle mass, strength, endurance and energy
- Reduce inflammation
- Reduction of cholesterol and triglyceride levels
- Improved brain function, including memory

Market Trend

The global ashwagandha extract market was valued at **$864.3 million in 2021**, and is **projected to reach $2.5 billion by 2031**, growing at a **CAGR of 11.4%** from 2022 to 2031.

Neotron Proposal

On Raw Material:

- Compliance: WITHANOLIDE A
- Safety package

SPERMIDINE-BASED SUPPLEMENTS

What is spermidine?

It is a precious endogenous substance, extracted from wheat/soya/legume germ, capable of combating oxidative stress in cells and increasing immune defenses.

What are the fields of application?

- Diet and physical activity to combat oxidative stress
- Increase immune defenses

Market Trend

The market value of Spermidine is expected to grow at a **CAGR of 10.42%** from 2023 to 2030.

Neotron Proposal

On Raw Material or Finished Product:

- Compliance: SPERMIDINE
- Safety package

SHIITAKE MUSHROOM SUPPLEMENTS

What is Shiitake?

Shiitake is an extraordinary mushroom known for its beneficial properties; on the one hand, it contains lentinan, a beta-glucan similar to some cereals, which helps to reduce cholesterol levels and hypertension. Additionally, shiitake benefits include prebiotic effects, which stimulate the growth of healthy bacteria in the intestinal flora, improving digestion.

What are the fields of application?

- Strengthening the immune system
- Reduction of cholesterol and hypertension levels
- A prebiotic effect that protects the intestinal flora

Market Trend

Global shiitake mushroom market is expected to grow from USD 2.3 Billion in 2021 to **USD 4.7 Billion** by 2030, at a **CAGR of 8.3%**.

Neotron Proposal

On Raw Material:

- Compliance: ERGOSTEROL
- Safety package

On Finished Product:

- Compliance: ERGOSTEROL
- Safety package
- Aminoacids/Vitamins/Minerals

PANAX GINSENG SUPPLEMENTS

What is Ginseng?

The term ginseng designates numerous species belonging to the Araliaceae family. In Chinese medicine, the drug obtained from these plants, made up of the roots, has a thousand-year tradition behind it, made up of the most varied therapeutic uses.

What are the fields of application?

> Useful support during periods of stress characterized by physical and mental tiredness, for those who feel weak or in convalescence

Market Trend

Ginseng market size is **USD 0.525 billion in 2023** and will grow at a **CAGR of 4.80%** from 2023-2030.

Neotron Proposal

On Raw Material:

> Compliance: GINSENOSIDES
> Safety package

On Finished Product:

> Compliance: GINSENOSIDES
> Safety package
> Vitamins

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