Agreed Work Order Form

In respect of the Food Standards Agency Call-Off Agreement dated 1st January 2017 between the **FOOD STANDARDS AGENCY** and **FERA SCIENCE LIMITED (the** "**Call-Off Agreement**")

Customer to complete:

Parties to Additional Services:	The Food Standards Agency and Fera Science Limited a company incorporated in England and Wales (registered with number 09413107) and whose registered office is at Rochester Row, London, SW1P 1QT (the "Company").
Customer day to day contact (name, email, telephone):	[redacted]
Additional Services Title:	Turmeric Survey
Additional Services Ref:	FS430403
Start Date:	4th February 2021
End Date:	31st March 2021

Details of work requirement:

FSA Call-Off	A Request for Quote (RFQ) form will be completed by the FSA.
Main Deliverables and Performance Indicators	The Company shall perform the Additional Services in accordance with the specification of requirements within the RFQ at **Annex A** and the terms of the Call-Off Agreement. In particular, the Company shall comply with any timelines and provide any deliverables set out in the RFQ.

[redacted]	[redacted]			
Total cost of Additional Services (Call-Off Day Rates set out in Schedule 10 of the Framework Agreement shall apply to the additional services set out in this Work Order).	[redacted] Total cost should be quoted less VAT which should be added to invoices at the prevailing rate.			
Cost by Financial Year	2020/21			
	[redacted]			

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

Annex A – Request for Quotation

Request for Quotation (RFQ)

DETAILS OF REQUIREMENT AND APPROACH

Summary

The consumption of turmeric supplements is increasingly popular and is reported to provide numerous health benefits including antioxidant, analgesic, anti-inflammatory, antiseptic, anticarcinogenic, chemopreventive, chemotherapeutic, antiviral, antibacterial, antifungal and antiplatelet activities [1]. However, in recent months there has been a number of reports of hepatotoxicity linked to the consumption of these supplements. Such reports and scientific publications led to a review of the safety of turmeric and curcumin by the UK Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT). The statement issued by COT in November 2019 concluded "Given past reported contamination issues with turmeric supplements, the Committee concluded that there would be value in commissioning a chemical analysis of turmeric supplements and raw/powdered turmeric available on the UK market".

The request received from the FSA was to:

- Develop and validate in-house method(s) for measuring curcumin in turmeric containing supplements, ground/powdered turmeric and raw/fresh turmeric.
- Develop and validate in-house a method for measuring piperine in turmeric containing supplements.
- Purchase turmeric containing supplements (n=15), ground/powdered turmeric (n=10) and raw/fresh turmeric (n=5) from a mixture of local outlets and over the internet.
- Analyse all 30 samples for trace elements and curcumin.
- Analyse all supplement samples for piperine content.
- Optional testing on all supplement samples (depending on budget) for other potential residues and contaminants, e.g. pesticides, mycotoxins and plant toxins.
- Optional testing on all supplement samples (depending on budget) to carry out analytical screening studies to determine other substances (natural or contaminants) present that may be linked to the hepatotoxicity associated with the consumption of these supplements.

[1] Alok A., Singh I.D., Singh S., et al. (2015) Curcumin – Pharmacological Actions And its Role in Oral Submucous Fibrosis: A Review. Journal of Clinical and Diagnostic Research, **9**: 1-3.

[2] https://cot.food.gov.uk/sites/default/files/2020-09/made%20accessible%20in%20word%20TOX%202019%20-%2074%20First%20draft%20for%20Turmeric%20%20Dec%202019%20cm_accessibleina

dobepro.pdf

Approach

Task 1. Develop and validate in-house methods for measuring curcumin in turmeric containing supplements, ground/powdered turmeric and raw/fresh turmeric
Following existing publications and IUPAC guidelines for in-house method validation method(s) of analysis will be established for the determination of curcumin in turmeric and turmeric containing supplements.

Task 2. Develop and validate in-house a method for measuring piperine in turmeric containing supplements
Following existing publications and IUPAC guidelines for in-house method validation method(s) of analysis will be established for the determination of piperine in turmeric containing supplements.

Task 3. Purchase turmeric containing supplements (n=15), ground/powdered turmeric (n=10) and raw/fresh turmeric (n=5) from a mixture of local outlets and over the internet
The sampling plan will be agreed with the FSA and will be purchased by Fera. As these samples will not form part of an official FSA survey then the provision of a letter informing brand owners of the reason for the purchase will not be carried out.

Task 4. Trace elements and curcumin analysis
Details of the elements to be tested for can be found in the section “Metals we can screen for” at:
https://www.fera.co.uk/metals-analysis.html All 63 elements will be analysed by ICP-MS using a UKAS accredited method.
The methodology developed and in-house validated in Task 1 will be followed to analyse the 30 turmeric containing samples for curcumin.

Task 5. Piperine analysis
The methodology developed and in-house validated in Task 2 will be followed to analyse the 15 turmeric supplement samples for piperine.

OPTIONAL TESTING
Pesticide residues - Those residues that may be expected to be present in turmeric will be tested for. The presence of a number of pesticide residues has previously been reported in turmeric.
See page 21 of:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/932348/expert-committee-pesticide-residues-food-annual-report-2019.pdf

Details of the full suite of UKAS accredited pesticide residues offered at Fera can be found

at:
https://www.fera.co.uk/food-safety/popular-services/pesticide-residues-testing.html

Mycotoxins and plant toxins – The main mycotoxins of concern for turmeric are aflatoxins and ochratoxin A. Analysis will be conducted according to UKAS accredited methodology: https://www.fera.co.uk/ao-package-aflatoxins-b1-b2-g1-g2-total-and-ochratoxin-a.html
Tropane alkaloid plant toxins such as atropine and scopolamine may also be present. Fera has experience of testing for tropane alkaloids using methodology described in an FSA survey:
https://www.food.gov.uk/research/agricultural-contaminants/monitoring-of-tropane-alkaloids-in-food

Analytical screening – Each of the supplement samples will be subjected to a suite of analytical tests to determine the presence of natural constituents, other contaminants and potential adulterants. Headspace GC-MS analysis will be carried out to detect volatile substances, GC-TOF-MS to detect semi-volatile substances and LC-TOF-MS to detect non-volatile and polar substances. Peaks detected in the chromatograms obtained from the sample analysis will be interrogated to determine the accurate mass and identities proposed by comparison with in-house databases and databases available on the internet such as ChemSpider.

Task 6. Reporting
The FSA will be kept informed of progress by email and follow up telephone call (if required) at fortnightly intervals.
The data generated will be evaluated and reported. Quality assurance data will also be provided.

Project timeframe
The project will commence on 18th January and the draft final report will be submitted by 31st March 2021.

Risks
The project involves the development of two methods of analysis and the speed at which they are successfully developed, and the validation data derived will influence the project timeline. The FSA will be updated on progress at fortnightly intervals such that any slippage in the project timeframe (which is already short) is communicated.

Quotation Reference	**FS430403**
Contract Title	**Turmeric survey**
Name of Organisation	**Fera Science Ltd**

BREAKDOWN OF TOTAL PROPOSAL COSTS (Excluding VAT)

[redacted]		
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
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[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
Total proposal costs – with optional testing Excluding VAT (£)	**£59,001**	**£59,001**
Will you charge the Food Standards Agency VAT on this Proposal?	Yes	

[redacted]