

## Development of an assay for Soy Isoflavones in Women's Hair

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**Abstract:** Soy isoflavones, at adequate dosage, have estrogenic and anti-thyroidal effects in animals and humans that can either be beneficial or adverse, depending on consumers' physiological status. Hence, this study presents the assay of soy isoflavones in hair, aiming to give new information about a person's isoflavones exposure, when health issues related to estrogenic or thyroidal effects are observed. Aqueous or organic extraction procedures following acidic, basic or enzymatic digestions were tested on 60 volunteer's hair samples from a hairdresser and from the clinical trial 2017T2-29. The acidic digestion method was the most efficient regarding isoflavones. A specific inquiry was developed to assess dietary habits of French consumers based on the analysis of 12,707 food labels from France. It was used to check for the reliability of the new assay method. A score for the consumer's exposure to isoflavones was built considering, among other parameters, soy-based diet and foodstuff containing soy as an ingredient, i.e. "hidden-soy". The correlation between this score and isoflavones measurements in hair reached 0.947;  $p < 0.001$ . Therefore, providing that relevant data are considered to assess isoflavones exposure, hair which smoothen daily isoflavones intakes' variations, is a relevant tissue to assess human isoflavones exposure for subsequent health analysis.

**Keywords:** soy isoflavones; consumer exposure; hair samples; dietary inquiry; digestion method

### Abbreviations:

DAI: Daidzein aglucone form

IFS: Isoflavone Food score

GEN: Genistein aglucone form

IHS: Isoflavone Hair score

### Data presented:

Supplementary material S1: Dietary Inquiry Proposed to Volunteers

Supplementary material S2: Matrix used to Calculate IFS and IHS

Supplementary material S3: Evidencing a Questionable Answer to the Food Questionnaire

Supplementary material S4: Pearson Regression Correlation Between Individual Isoflavones and HIS

## Supplementary materials

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#### Supplementary data S1: Dietary Inquiry

##### Subject and study parameters

Study acronym	<input type="text"/>	Promotor's name	<input type="text"/>
Subject code	<input type="text"/>	Inquiry date	<input type="text"/>
Investigator ID	<input type="text"/>	Investigator's name	<input type="text"/>

##### Hair treatments questionnaire

Sex of the volunteer	<input type="text"/>	Subject's age	<input type="text"/>	Casual treatment since	<input type="text"/>
Natural colour of the hair	<input type="text"/>	Last colouring	<input type="text"/>	Casual product used	<input type="text"/>
Shampoo frequency	<input type="text"/>	Colouring frequency	<input type="text"/>	Last product used	<input type="text"/>
Hair length	<input type="text"/>	Last perm	<input type="text"/>	Casual product used	<input type="text"/>
Cutting frequency	<input type="text"/>	Perm frequency	<input type="text"/>	Last product used	<input type="text"/>

##### Food consumption profile

Food habits	I eat at home 3 times a day	I eat in a canteen 3 times a day	I eat in a restaurant 3 times a day	Cooking practices	Frequency per week (number of times)
<input type="checkbox"/> Omnivorous	<input type="text"/> 2 times a day	<input type="text"/> 2 times a day	<input type="text"/> 2 times a day	<input type="text"/> Frying	<input type="text"/>
<input type="checkbox"/> Vegetarian	<input type="text"/> once a day	<input type="text"/> once a day	<input type="text"/> once a day	<input type="text"/> Vapor cooking	<input type="text"/>
<input type="checkbox"/> Lacto-vegetarian	<input type="text"/> I go to the fast-food once a week	<input type="text"/> I eat in my office	<input type="text"/> at least once a week	<input type="text"/> Boilling	<input type="text"/>
<input type="checkbox"/> Vegan	<input type="text"/> I don't have 3 meals a day	<input type="text"/> I have snacks all day	<input type="text"/> I have food supplements	<input type="text"/> Grill	<input type="text"/>
<input type="checkbox"/> Flexivegetarian	<input type="text"/> I am a small-eater	<input type="text"/> I am a medium-eater	<input type="text"/> I am a big-eater	<input type="text"/> Wok/Oven	<input type="text"/>
For how-long have you been on this diet?	<input type="text"/>	If your case is not considered please tell us if you have a specific diet (allergies, ...)	<input type="text"/>	Which food supplements	<input type="text"/>

# Supplementary materials

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### Supplementary data S1: Dietary Inquiry (continued)

#### Consumption of foodstuff based on "plant-milk"

1	Do you drink soy-milk?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>
2	Do you eat soy-yogurts?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>
3	Do you eat soy-cream?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>
4	Do you eat soy-cheese or tofu?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>
5	Do you drink "plant-milks" (coconut, haseInut, almond, rice...)	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>

**Supplementary materials**  
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Supplementary data S1: Dietary Inquiry (continued)

**Consumption of elaborated dishes**

6	<b>Do you eat soy-based products</b> <span style="color: blue;">Which season</span> (Saussages, burgers, minced meat, balls...)	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never	<table border="0" style="width: 100%;"> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">1/2</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">spoon</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">1</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">glass</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">2</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">bowl</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">3</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">plate</td> </tr> </table>							1/2		spoon		1		glass		2		bowl		3		plate
	1/2		spoon																				
	1		glass																				
	2		bowl																				
	3		plate																				
7	<b>Do you eat meat-based elaborated dishes?</b> <span style="color: blue;">Which season</span> (paté, sauces...)	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never	<table border="0" style="width: 100%;"> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">1/2</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">spoon</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">1</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">glass</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">2</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">bowl</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">3</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">plate</td> </tr> </table>							1/2		spoon		1		glass		2		bowl		3		plate
	1/2		spoon																				
	1		glass																				
	2		bowl																				
	3		plate																				
8	<b>Do you eat fish-based elaborated dishes?</b> <span style="color: blue;">Which season</span> (surimi, paté...)	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never	<table border="0" style="width: 100%;"> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">1/2</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">spoon</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">1</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">glass</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">2</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">bowl</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">3</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">plate</td> </tr> </table>							1/2		spoon		1		glass		2		bowl		3		plate
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	1		glass																				
	2		bowl																				
	3		plate																				
9	<b>Do you eat vegetable-based elaborated dishes?</b> <span style="color: blue;">Which season</span>	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
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	1/2		spoon																				
	1		glass																				
	2		bowl																				
	3		plate																				
10	<b>Do you eat pizzas?</b> <span style="color: blue;">Which season</span>	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never	<table border="0" style="width: 100%;"> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">1/2</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">spoon</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">1</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">glass</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">2</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">bowl</td> </tr> <tr> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">3</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="width: 20px; text-align: center;">plate</td> </tr> </table>							1/2		spoon		1		glass		2		bowl		3		plate
	1/2		spoon																				
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	3		plate																				

# Supplementary materials

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### Supplementary data S1: Dietary Inquiry (continued)

11	Do you eat fresh elaborated dishes?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>
12	Do you eat meat-based canned dishes?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>
13	Do you eat nuggets frozen or not?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>
14	Do you eat Kebbabs or hamburgers?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>
15	Do you eat meat-balls frozen or not?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<div> <input type="text"/> 1/2           <input type="text"/> spoon         </div> <div> <input type="text"/> 1           <input type="text"/> glass         </div> <div> <input type="text"/> 2           <input type="text"/> bowl         </div> <div> <input type="text"/> 3           <input type="text"/> plate         </div>

Supplementary materials  
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Supplementary data S1: Dietary Inquiry (continued)

16	Do you eat "escaloppe cordon bleu" frozen or not?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size																	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<table><tr><td><input type="text"/></td><td>1/2</td><td><input type="text"/></td><td>spoon</td></tr><tr><td><input type="text"/></td><td>1</td><td><input type="text"/></td><td>glass</td></tr><tr><td><input type="text"/></td><td>2</td><td><input type="text"/></td><td>bowl</td></tr><tr><td><input type="text"/></td><td>3</td><td><input type="text"/></td><td>plate</td></tr></table>	<input type="text"/>	1/2	<input type="text"/>	spoon	<input type="text"/>	1	<input type="text"/>	glass	<input type="text"/>	2	<input type="text"/>	bowl	<input type="text"/>	3	<input type="text"/>	plate
<input type="text"/>	1/2	<input type="text"/>	spoon																						
<input type="text"/>	1	<input type="text"/>	glass																						
<input type="text"/>	2	<input type="text"/>	bowl																						
<input type="text"/>	3	<input type="text"/>	plate																						
17	Do you eat stuffed vegetables frozen or not?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size																	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<table><tr><td><input type="text"/></td><td>1/2</td><td><input type="text"/></td><td>spoon</td></tr><tr><td><input type="text"/></td><td>1</td><td><input type="text"/></td><td>glass</td></tr><tr><td><input type="text"/></td><td>2</td><td><input type="text"/></td><td>bowl</td></tr><tr><td><input type="text"/></td><td>3</td><td><input type="text"/></td><td>plate</td></tr></table>	<input type="text"/>	1/2	<input type="text"/>	spoon	<input type="text"/>	1	<input type="text"/>	glass	<input type="text"/>	2	<input type="text"/>	bowl	<input type="text"/>	3	<input type="text"/>	plate
<input type="text"/>	1/2	<input type="text"/>	spoon																						
<input type="text"/>	1	<input type="text"/>	glass																						
<input type="text"/>	2	<input type="text"/>	bowl																						
<input type="text"/>	3	<input type="text"/>	plate																						
18	Do you eat frozen ground beef?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size																	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<table><tr><td><input type="text"/></td><td>1/2</td><td><input type="text"/></td><td>spoon</td></tr><tr><td><input type="text"/></td><td>1</td><td><input type="text"/></td><td>glass</td></tr><tr><td><input type="text"/></td><td>2</td><td><input type="text"/></td><td>bowl</td></tr><tr><td><input type="text"/></td><td>3</td><td><input type="text"/></td><td>plate</td></tr></table>	<input type="text"/>	1/2	<input type="text"/>	spoon	<input type="text"/>	1	<input type="text"/>	glass	<input type="text"/>	2	<input type="text"/>	bowl	<input type="text"/>	3	<input type="text"/>	plate
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<input type="text"/>	2	<input type="text"/>	bowl																						
<input type="text"/>	3	<input type="text"/>	plate																						
19	Do you eat industrial biscuits?	Which season	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	Casual portion size																	
	<input type="text"/> several a day	<input type="text"/> everyday	<input type="text"/> sometimes a week	<input type="text"/> once a week	<input type="text"/> < once a week	<input type="text"/> several a month	<input type="text"/> < once a month	<input type="text"/> never	<table><tr><td><input type="text"/></td><td>1/2</td><td><input type="text"/></td><td>spoon</td></tr><tr><td><input type="text"/></td><td>1</td><td><input type="text"/></td><td>glass</td></tr><tr><td><input type="text"/></td><td>2</td><td><input type="text"/></td><td>bowl</td></tr><tr><td><input type="text"/></td><td>3</td><td><input type="text"/></td><td>plate</td></tr></table>	<input type="text"/>	1/2	<input type="text"/>	spoon	<input type="text"/>	1	<input type="text"/>	glass	<input type="text"/>	2	<input type="text"/>	bowl	<input type="text"/>	3	<input type="text"/>	plate
<input type="text"/>	1/2	<input type="text"/>	spoon																						
<input type="text"/>	1	<input type="text"/>	glass																						
<input type="text"/>	2	<input type="text"/>	bowl																						
<input type="text"/>	3	<input type="text"/>	plate																						

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**Supplementary materials**  
**Bensaada et al.**

Supplementary data S1: Dietary Inquiry (continued)

**Legume consumption raw or cooked**

<b>20</b>	<b>Do you eat legumes like beans, lentils, peas</b>	<b>Which season</b>	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never							<table border="0" style="display: inline-table; vertical-align: top;"> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1/2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">spoon</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">glass</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">bowl</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">3</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">plate</td></tr> </table>		1/2		spoon		1		glass		2		bowl		3		plate
	1/2		spoon																					
	1		glass																					
	2		bowl																					
	3		plate																					
<b>21</b>	<b>Do you eat chick-peas?</b>	<b>Which season</b>	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never							<table border="0" style="display: inline-table; vertical-align: top;"> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1/2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">spoon</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">glass</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">bowl</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">3</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">plate</td></tr> </table>		1/2		spoon		1		glass		2		bowl		3		plate
	1/2		spoon																					
	1		glass																					
	2		bowl																					
	3		plate																					
<b>22</b>	<b>Do you eat soybeans ?</b>	<b>Which season</b>	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never							<table border="0" style="display: inline-table; vertical-align: top;"> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1/2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">spoon</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">glass</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">bowl</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">3</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">plate</td></tr> </table>		1/2		spoon		1		glass		2		bowl		3		plate
	1/2		spoon																					
	1		glass																					
	2		bowl																					
	3		plate																					
<b>23</b>	<b>Do you eat mungo-sprouts?</b>	<b>Which season</b>	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never							<table border="0" style="display: inline-table; vertical-align: top;"> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1/2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">spoon</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">glass</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">bowl</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">3</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">plate</td></tr> </table>		1/2		spoon		1		glass		2		bowl		3		plate
	1/2		spoon																					
	1		glass																					
	2		bowl																					
	3		plate																					
<b>24</b>	<b>Do you eat alfalfa or clover sprouts?</b>	<b>Which season</b>	<input type="text"/> Winter	<input type="text"/> Spring	<input type="text"/> Summer	<input type="text"/> Autumn	<input type="text"/> All year	<b>Casual portion size</b>																
	<input type="text"/> several a day <input type="text"/> everyday <input type="text"/> sometimes a week <input type="text"/> once a week <input type="text"/> < once a week <input type="text"/> several a month <input type="text"/> < once a month <input type="text"/> never							<table border="0" style="display: inline-table; vertical-align: top;"> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1/2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">spoon</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">1</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">glass</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">2</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">bowl</td></tr> <tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">3</td><td style="border: 1px solid black; width: 30px; height: 20px;"></td><td style="padding: 0 5px;">plate</td></tr> </table>		1/2		spoon		1		glass		2		bowl		3		plate
	1/2		spoon																					
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	2		bowl																					
	3		plate																					

**Supplementary materials**  
**Bensaada et al.**

Supplementary material S2: Calculation of IFS and HIS

Hair						Multiplying factor
Length	Short 0,5	Medium 0,2	Long 0,1		A	a = A + B + C
Frequency of cutting	<2 month 0,5	<4 month 0,2	>4 month 0,1		B	
Treatments	Shampoo 0,5	Colouring 0,2	Perm 0,1		C	

Dietary tendencies						Multiplying factor
Big eater 1,5	Medium eater 1	Small eater 0,5			D	b = D
Diet duration (months) E		Hair length F			G=E/F	c = a + b

Vegan 1	Vegetarian 0,8	Lactovegetarian 0,8	Flexitarian 0,5	Omnivore 0,2	a
Asian 1	Exotic 0,8	Gluten free 0,2	Lactose free 0	Other	b
Wok/Oven 1	Vapor 0,8	Grill 0,5	Frying 0,2	Boiling 0	c
Ultratransformed 1	Industrial 0,5	Home-made 0,2			d
Canteen >3 times/week 1	Fast food >2times /w 0,8	Restaurant > 2times/w 0,5	Home > 3times/w 0,2		e



**Supplementary materials**  
**Bensaada et al.**

Supplementary material S2: Calculation of IFS and HIS (continue)

**Soy-consumption**

Soy juice	Every day 2	> once a week 1	< once a week 0,5	never 0	f	
Soy yogurt	Every day 0,8	> once a week 0,3	< once a week 0,1	never 0	g	
Soy cream and icecream	Every day 2	> once a week 1	< once a week 0,5	never 0	h	
Soy cheese and tofu	Every day 1	> once a week 0,5	< once a week 0,2	never 0	i	
Other plant juices	Every day 0	> once a week 0	< once a week 0	never 0	j	
Other soy products (miso, tempeh...)	Every day 2	> once a week 1	< once a week 0,5	never 0	k	
Meat based dishes	Every day 0,2	> once a week 0,1	< once a week 0	never 0	l	If Canteens, increased to the upper level
Fish based dishes	Every day 0,2	> once a week 0	< once a week 0	never 0	m	If Canteens, increased to the upper level
Vegetables based dishes	Every day 0,4	> once a week 0,2	< once a week 0	never 0	n	If Canteens, increased to the upper level
Pizzas	Every day 0,1	> once a week 0	< once a week 0	never 0	o	If Canteens, increased to the upper level
Elaborated dishes	Every day 0,3	> once a week 0,1	< once a week 0	never 0	p	If Canteens, increased to the upper level
Canned recipes	Every day 0,2	> once a week 0,1	< once a week 0	never 0	q	If Canteens, increased to the upper level
Nuggets	Every day 0,2	> once a week 0,1	< once a week 0	never 0	r	If soy increased to the upper level
Hamburgers / Kebabs	Every day 0,5	> once a week 0,2	< once a week 0,1	never 0	s	If soy increased to the upper level
Meat balls	Every day 0,5	> once a week 0,2	< once a week 0,1	never 0	t	If soy increased to the upper level

**Supplementary materials**  
**Bensaada et al.**

Supplementary material S2: Calculation of IFS and HIS (continue)

Escalope cordon bleu	Every day 0,2	> once a week 0,1	< once a week 0	never 0	u	If soy increased to the upper level
Stuffed vegetables (tomatoes, cabbages...)	Every day 0,2	> once a week 0,1	< once a week 0	never 0	v	If Canteens, increased to the upper level
Frozen minced steaks	Every day 0,5	> once a week 0,2	< once a week 0,1	never 0	w	If Canteens, increased to the upper level
Industrial biscuits	Every day 0,15	> once a week 0,1	< once a week 0	never 0	x	If Canteens, increased to the upper level
Other legumes	Every day 0,2	> once a week 0,1	< once a week 0	never 0	y	
Chick peas	Every day 0,2	> once a week 0,1	< once a week 0	never 0	z	
Soy seeds	Every day 3	> once a week 2	< once a week 1	never 0	aa	
soybean sprouts	Every day 0,5	> once a week 0,2	< once a week 0,1	never 0	ba	
Alfalfa or clover sprouts	Every day 3	> once a week 2	< once a week 1	never 0	ca	
Food supplements	Soy/Alfalfa/Clover 1	Others 0	None 0		da	

**Isoflavone Food Score (IFS)**

$$\text{IFS} = \text{SUM}(a:da) * c$$

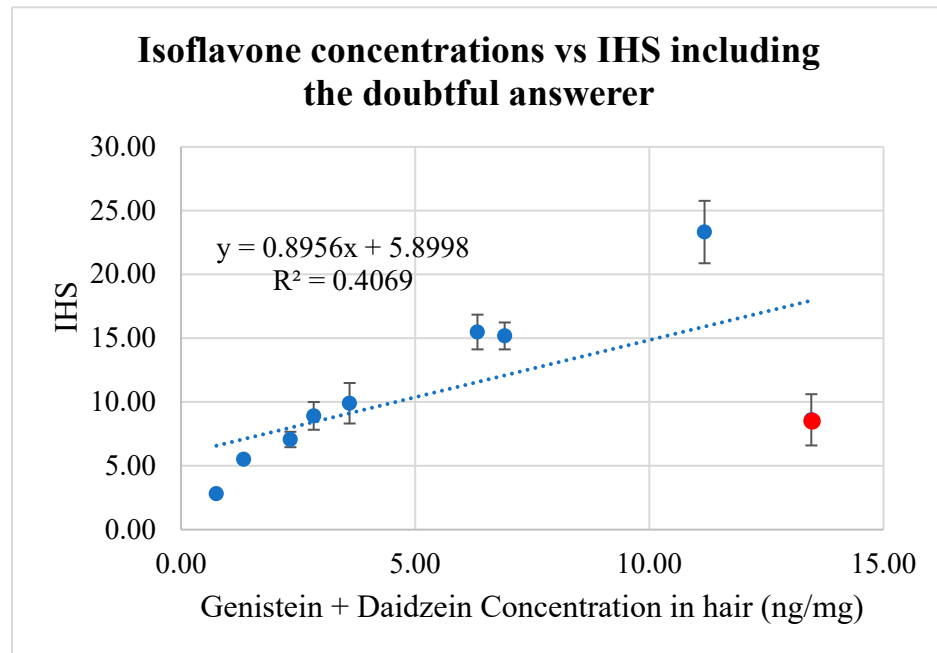
**Isoflavone Hair Score (IHS)**

$$\text{IHS} = \text{IFS} * G$$

Supplementary materials  
Bensaada et al.

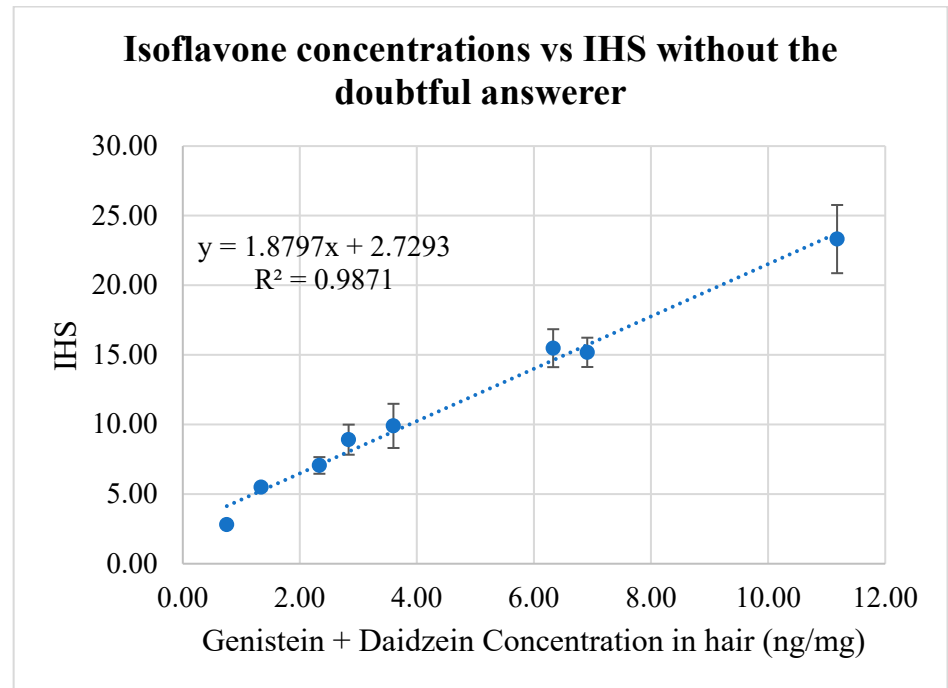
Supplementary material S3: Evidencing a Questionable Answer to the Food Questionnaire

A



N= 9; r = 0.638 p<0.1

B



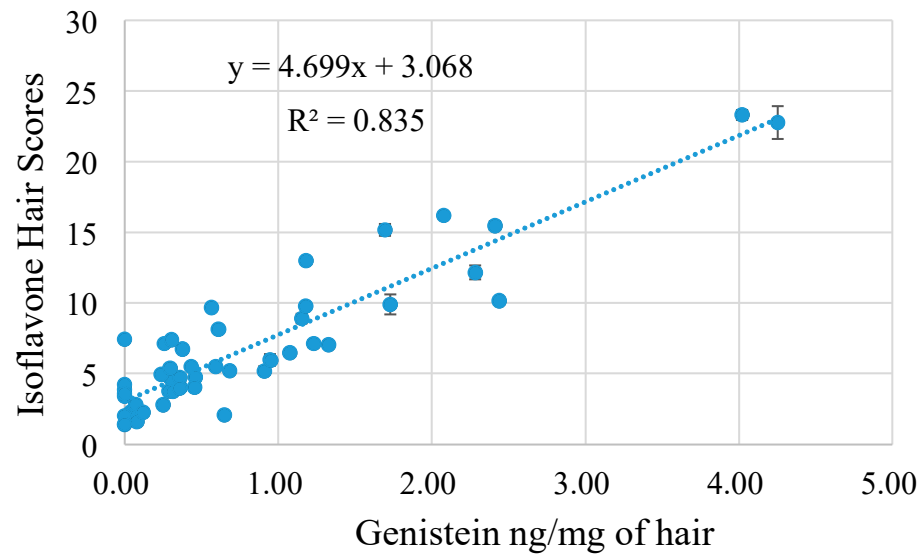
N = 8; r = 0.993 p<0.001

Supplementary materials  
Bensaada et al.

Supplementary material S4: Pearson Regression Correlation Between Individual Isoflavones and IHS

A

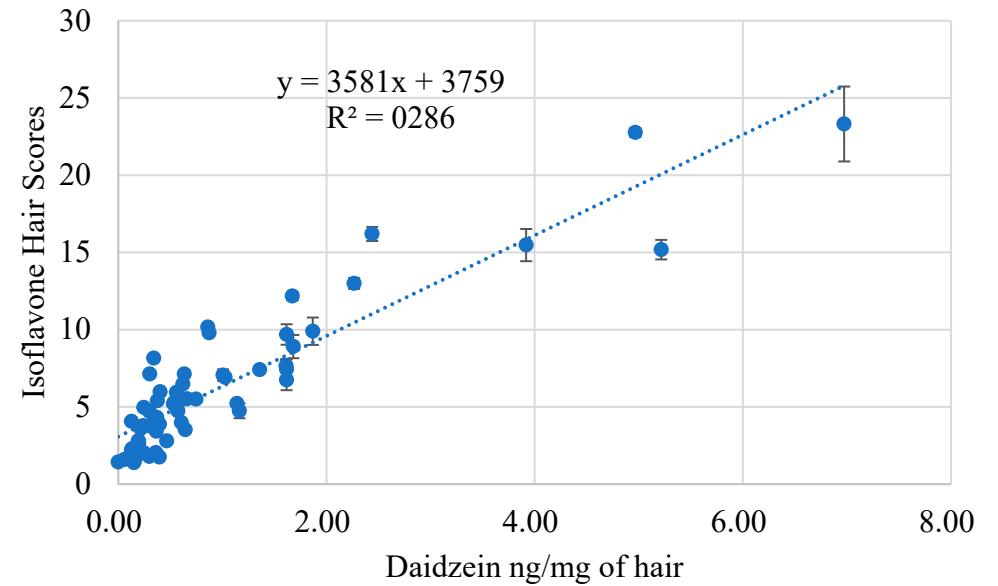
**Correlation of Genistein hair level with IHS**



$N = 60$ ;  $r_G = 0.914$   $p < 0.001$

B

**Correlation of Daidzein hair level with IHS**



$N = 60$ ;  $r_D = 0.91$ ;  $p < 0.001$