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# UHAS-MIDA

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Documentation



**UNIVERSITY OF HEALTH  
AND ALLIED SCIENCES**  
— *Health for Development* —

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# TABLES OF CONTENT

1. Welcome to UHAS-mida Project.....	2
2. Team and App Information.....	2
2.1 App Name: UHAS-mida.....	2
2.2 Development & Design Team: .....	2
2.3 Consulting team: .....	2
3. About Document File.....	3
4. Tools and Hardware Requirements Declaration .....	3
4.1 Software Requirements .....	3
4.2 Hardware Requirements.....	3
5. Setup Instructions.....	4
5.1 Fetching git code to local system.....	4
5.2 Setting up .....	4
5.3 Running the application .....	4
6. How to Use .....	5
6.1 The Data Entry Section.....	5
6.1.1 CSV file upload.....	5
6.1.2 Manual Data entry.....	8
6.2 The Admin section.....	8

## 1. WELCOME TO UHAS-MIDA PROJECT

UHAS-MIDA is an open-source web-based software tool that calculates the red blood cell (RBC) concentration and blood volume during malaria in children determined using a stable isotope of chromium ( $^{53}\text{Cr}$  as the label) during gas chromatography-mass spectrometry in selective ion monitoring (GC/MS-SIM) analysis. A key component involves the determination of the compositions of the most abundant naturally occurring isotopes of chromium ( $^{50}\text{Cr}$ ,  $^{52}\text{Cr}$ ,  $^{53}\text{Cr}$ ), and converting the proportions into a 3x3 matrix and its inverse. Other inputs included in the calculations are; internal standard ( $^{50}\text{Cr}$ ), baseline correction, weight of blood, density of red cells and plasma, in order to calculate (vi) the outputs: the volume of blood/kg body wt. and RBC concentration (ng/mL). The inverse is then used to calculate the 'corrected' MS ion abundances. UHAS-MIDA supports the user to efficiently determine RBC concentration and fluid volume loss.

## 2. TEAM AND APP INFORMATION

### 2.1 App Name: UHAS-MIDA

**version:** 2021.01

**license:** MIT

### 2.2 Development & Design Team:

1. Emmanuel Bentil Odoom
2. John-Bosco Diekuu
3. Samuel Agana

### 2.3 Consulting team:

1. Dr. Daniel Abaye
2. Ernest Yeboah Boateng

**University of Health and Allied Sciences,  
PMB 31, Ho,  
Volta Region, Ghana**

### 3. ABOUT DOCUMENT FILE

The purpose of this file is to provide an overview, setup instructions and a general information of the project.

**Note: Any dependencies added / modified to this project which affect the running of the code in this git repository must be listed in this file.**

## 4. TOOLS AND HARDWARE REQUIREMENTS DECLARATION

### 4.1 Software Requirements

- Operating System (Windows, Linux, or Mac)
- Apache
- OpenSSL
- MySQL
- Browser (Chrome, Firefox, Edge, etc)

**NB: XAMPP, WAMP or MAMP can be used since it has Apache, OpenSSL and MySQL.**

### 4.2 Hardware Requirements

- Minimum 1GB RAM
- Minimum 2GB Hard disk space

## 5. SETUP INSTRUCTIONS

UHAS-MIDA is a web-based application. This implies, the setup process is similar to setting most web-based applications.

### 5.1 Fetching git code to local system

- Clone the project repository from GitHub using either by visiting [https://github.com/bentil078/Abaye-et-al\\_UHASmida.git](https://github.com/bentil078/Abaye-et-al_UHASmida.git) in your browser or using the command:
  - `git clone bentil078/Abaye-et-al_UHASmida`
- Change current working directory to Project directory
  - `cd Abaye-et-al_UHASmida`

### 5.2 Setting up

- Start Apache and MySQL
- If using XAMPP:
  - Open localhost in a browser
  - Go to phpmyadmin and create a database. (If using MySQL, open a terminal or CMD to create the database)
- Create a Database called uhas\_mida. (NB: You can give it a name of your choice as well)
- Import uhas\_mida.sql from the root folder into the created database to create the needed tables.
- Open connect.php from the root folder and add database password to password area if database is password protected. (NB: If the database name is different from uhas\_mida enter the new name as the database name)

### 5.3 Running the application

If setting up is successful and connected without errors, open a browser and enter localhost/foldername (If the repo was renamed after download) or open a web browser and visit localhost/Abaye-et-al\_UHASmida.

If successful, the homepage of the software appears.

## 6. HOW TO USE

There are two parts of the software.

1. The Data entry section
2. The Admin Section

### 6.1 The Data Entry Section

To access the data entry section, enter [http://localhost/ Abaye-et-al\\_UHASmida](http://localhost/Abaye-et-al_UHASmida) (i.e. [http://localhost/folder\\_name](http://localhost/folder_name)). The data entry section allows a user to either upload a csv file to populate the individual fields except for the gender and PID fields or to input values corresponding to the fields themselves.

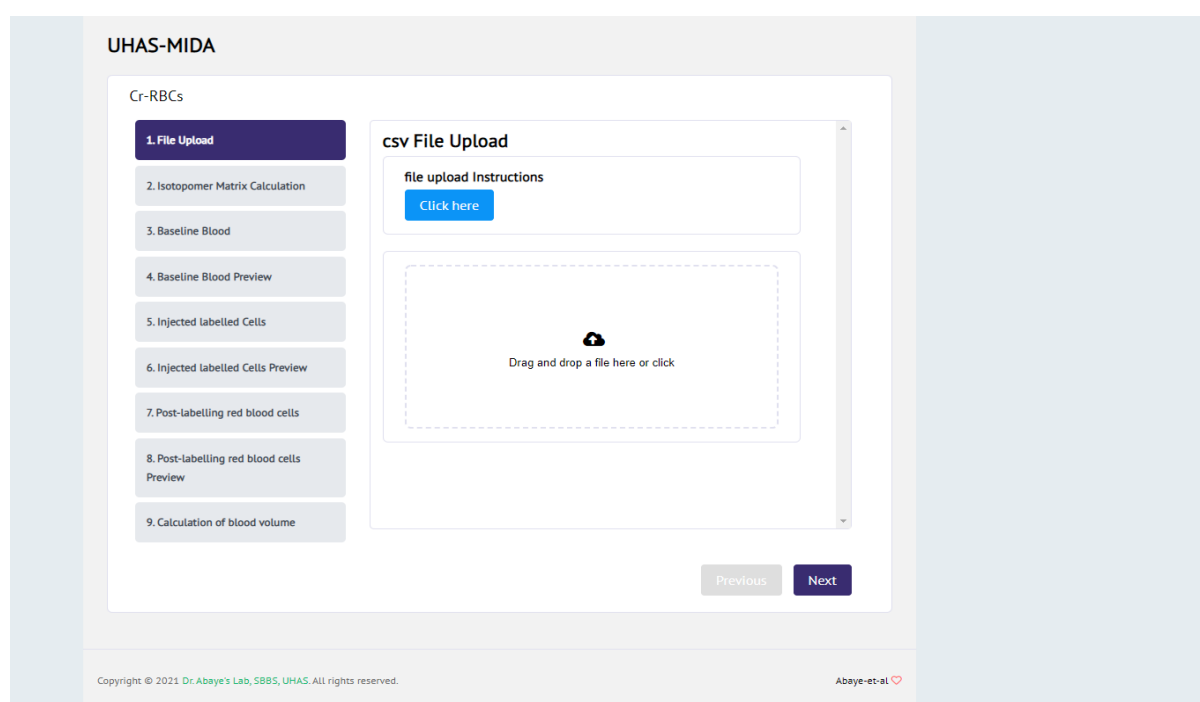


Figure 1: UHAS-mida client page

#### 6.1.1 CSV file upload

To upload a csv file, download the sample file under “file upload instruction”. It contains sample data which can be used. Update the content of the file to suite your data. The updated file can be dragged and dropped on the upload section or click on the upload section and locate the updated csv file to upload (See figure 1 above).

# UHAS-MIDA

Cr-RBCs

1. File Upload

2. Isotopomer Matrix Calculation

3. Baseline Blood

4. Baseline Blood Preview

5. Injected labelled Cells

6. Injected labelled Cells Preview

7. Post-labelling red blood cells

8. Post-labelling red blood cells Preview

9. Calculation of blood volume

## Isotopomer Matrix Calculation

	Natural	Spike	Label
*358*	<input type="text" value="0.74330"/>	<input type="text" value="0.03838"/>	<input type="text" value="0.01453"/>
*356*	<input type="text" value="0.03851"/>	<input type="text" value="0.85802"/>	<input type="text" value="0.00075"/>
*359*	<input type="text" value="0.16814"/>	<input type="text" value="0.00551"/>	<input type="text" value="0.87242"/>

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Abaye-et-al

Figure 2: matrix page

Click on next to go to the next page, verify and validate the data that has manually been populated. Click on inverse to calculate the inverse of the matrix and reset to clear all data fields in the matrix (see figure 2 above). Go to the next page.

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## Raw Mass Data

ID 
Gender

Weight  kg
Hct blood

### Baseline Blood(Red Cells)

Rep 1

52	90932.587	m/z	50	246139.40	m/z	53	19431.986	m/z
----	-----------	-----	----	-----------	-----	----	-----------	-----

Rep 2

52	86929.012	m/z	50	235095.84	m/z	53	18440.94	m/z
----	-----------	-----	----	-----------	-----	----	----------	-----

Rep 3

52	83403.350	m/z	50	234434.56	m/z	53	17503.603	m/z
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Figure 3: Baseline page

Enter the ID of the sample and select the gender related to the sample. Check the remaining data fields and click next if everything is correct. Do same for the remaining pages.

NB: The ID input and gender selection plays a vital role in all the calculations.

### UHAS-MIDA

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#### Calculation of blood volume

Calculation of blood volume

ID : FSM11

Gender : female

Weight : 12.65

Date: Wed Sep 01 2021

Concentration 53Cr in infusate, Cinf	947.5727	ng/ml
Concentration of 53Cr in blood, Cwb	4.2631	ng/ml
Infusate	volume	1.96 ml

Previous

Finish

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Figure 4: Calculation of blood volume



Cr-RBCs

1. File Upload  
2. Isotopomer Matrix Calculation  
3. Baseline Blood  
4. Baseline Blood Preview  
5. Injected labelled Cells  
6. Injected labelled Cells Preview  
7. Post-labelling red blood cells  
8. Post-labelling red blood cells Preview  
9. Calculation of blood volume

Infusate	volume	1.96	ml
	hct-inf	0.21	
Volume of red cells infused, V <sub>inf</sub>	0.4116	ml	
Red cell volume, V <sub>wb</sub>	91.4876	ml	
Hct blood	0.19		
Blood volume	481.5139	ml	
F-corrected blood volume	580.1372	ml	
Red cell volume/weight, V <sub>wb</sub> /wt	7.2322	ml/kg	
Blood volume/weight	45.8606	ml/kg	

Previous
Finish

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Calculation of blood volume page is the final and also, the final preview page for client section. If any of the data is invalid or empty, a N/A appears in the field that holds the calculated data.

### 6.1.2 Manual Data entry

Manual data entry starts from the Isotopomer Matrix calculation page. The user has to enter all the data corresponding to each of the fields except for uploading a file.

Follow the steps and check the calculation of blood volume page to ensure that you have values for all calculations.

Click on finish after either Manual Data entry or file upload, this will save all records into the database which can be accessed and viewed in the admin section.

## 6.2 The Admin section

The admin section can be accessed by visiting [http://localhost/Abaye-et-al\\_UHASmida/admin](http://localhost/Abaye-et-al_UHASmida/admin) (i.e. [http://localhost/folder\\_name/admin](http://localhost/folder_name/admin)) in any browser. The admin

section allows a user to view all records in a table format, view individual entered data and delete records.

Cr-RBCs

Cr-RBCs

Show 50 entries

SEARCH PID:

#	PID	Gender	Weight	HCT_Blood	Action
1	FSM11	female	12.65	0.19	<a href="#">view</a>
2	fs001	male	12.65	0.19	<a href="#">view</a>
3	fsm002	male	12.65	0.19	<a href="#">view</a>

Showing 1 to 3 of 3 entries

Previous 1 Next

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Figure 5: Admin Section

To view individual records, click on the view button corresponding to the row record. The view button allows the user to check final preview or calculated data.

The record can be deleted if it contains errors or when it isn't needed anymore.

Calculation of blood volume ×

**Calculation of blood volume**  
ID: FSM11  
Gender: female  
Weight: 12.65 kg

Concentration 53Cr in infusate, Cinf	947.5727	ng/ml
Concentration of 53Cr in blood, Cwb	4.2631	ng/ml
Infusate	volume	1.96 ml
	hct-inf	0.21
Volume of red cells infused, Vinf	0.4116	ml
Red cell volume, Vwb	91.4876	ml
Hct blood	0.19	
Blood volume	481.5139	ml
F-corrected blood volume	580.1372	ml
Red cell volume/weight, Vwb/wt	7.2322	ml/kg
Blood volume/weight	45.8606	ml/kg

Delete Close