

Study the Effect of the Nanomaterial of the Gold Metal Prepared by Laser Ablation Method on Healthy Human Blood

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Abstract

The golden nanoparticles were prepared by pulse laser ablation (PLA) by the liquid phase method. Lasers (Nd: Yag) (1064nm (80mJ) wavelength) are used in different pulses (200, 400, and 600), and deionized distilled liquid water (DDDW) is used. The prepared nanomaterial was added by laser ablation and with three laser pulses to a peaceful blood sample, where the nanomaterial was added in different concentrations 2, 4, 5 ml to 1 ml of blood. A blood image was taken for each sample, where the total samples became 9 samples and compared with a sample of healthy blood. It was observed that the general observation of rates and in general of all components of blood tissues has decreased significantly and very dangerous and also frightening with increasing concentration of both nanomaterial's and increased number of laser pulses per minute compared to normal rates and control sample readings

Keywords: Golden nanoparticles; Lasers (Nd: Yag); blood; laser ablation.

Introduction

Blood is a connective tissue consisting of red blood cells, white blood cells, plasma and platelets, which is absolutely necessary for living organisms, there is no life without it, where blood makes up eight percent of body mass, or about five liters, blood has many functions, it will We talk in addition to talking about red blood cells and white blood cells.

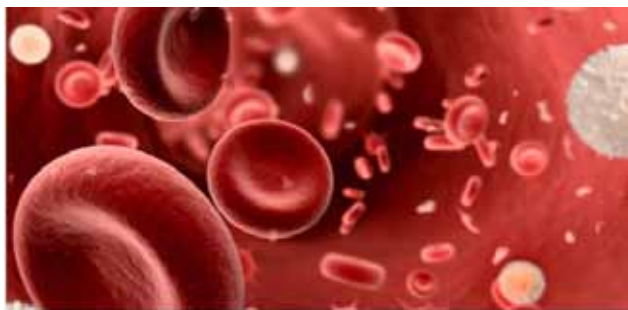


Figure (1): Shows the shape of the blood cell⁽¹⁾

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Blood functions are the defense of the body by producing antibodies that fight germs, getting rid of attacking microbes, which cause many diseases and water balance in the body, which maintains the water balance in the body, by transferring excess water from the body and intestines, or expel it from the skin as a sweat, or through the kidneys as a urine. And regulate body heat by secreting sweat to moisturize the skin, or by increasing the burning of blood sugar in order to generate energy, raise body temperature. Temporarily stop bleeding by platelets that block the bloodstream, then produce elements that help heal wounds. Substances such as oxygen, liquids, food, hormones and vitamins are delivered to all parts of the body, then returned with carbon dioxide and food waste after being converted into energy in the body with some other substances to be released into the cells. The blood components are plasma, the liquid substance in the blood, and the transparent color tends to yellow, the plasma constitutes 55% of the components of the blood, and water constitutes 90% of the blood plasma, while less than 10% of the plasma is soluble substances mostly are Proteins, in addition to vitamins and nutrients, such as glucose and amino acids. The main function of plasma is the transfusion of blood throughout the body, as well as the transport of nutrients, cellular waste products, antibodies and

coagulation proteins and hormones Maintaining the body's balance Red blood cells The cellular components in the blood, most numerous, are produced in the bone marrow. Its size is small, circular, double concave. Their shape and flexibility help them pass through small blood vessels. Red blood cells are surrounded by a membrane consisting of fats and proteins. Red blood cells contain hemoglobin. The main red blood cells transfer oxygen from the lungs to the tissues and carry carbon dioxide and waste from the tissues to the lungs to get rid of carbon dioxide, kidneys and liver to get rid of other wastes. Platelets Platelets are the smallest blood cells, made in the bone marrow⁽¹⁻⁸⁾. Their diameter ranges from 2 to 4 micrometers, ranging from 150,000-400,000 per cubic millimeter of blood, but despite the large number, they occupy a small portion of platelets that lack the nucleus and are therefore unable to divide, The lifespan of platelets ranges from seven to ten. The main function of platelets is bleeding, or wounds that stop it. White blood cells White blood cells form within the bone marrow. By producing antibodies, most white blood cells have a lifespan of only a few hours to several days, but there are some cell types that can remain in the body for many years. Each year, the greater the number of white blood cells or the regression has medical implications, many diseased white blood cells are classified into five main types, cellular neutrophils (neutrophils) specializing in the defense against bacterial infections, especially bacterial infections and burns, strokes, And wounds. Lymphocytes form a line of defense in the body against viral infections, such as cytomegalovirus viral hepatocytes and monocytes. Monocytes rise in chronic inflammation: eosinophil's rise in response to parasitic infections, basophils are primarily responsible for responding to allergies, histamine secretion, leading to aneurysm.⁽⁹⁻¹²⁾



Figure (2): Samples of Nano-particles (200,400,600) pulses

Experimental: A healthy blood sample was withdrawn from a healthy volunteer person . hence took

10 ml sample from health person, divided this sample to 10 test tubes in the amount of 1 ml in each test tube . all test tubes contain (intejent) to save blood from clotting. This healthy blood sample was mixed with laboratory sample this sample is a Nanomaterial with different concentration . three pulses (200, 400 and 600) The samples are shown in Figure (2) added this Nano-materials which have diffrent pulses to the healthy blood sample with diffrent concentrations (2, 4 and 5)ml into the three samples at the same time .At this stage, these samples placed in a roll mixer device to mixed (Nano materials and healthy blood) together to obtain the result of this mixed by laboratory test for each mixed sample. The process took (process putting mixed materials on the roll mixer device five minutes) and then began to check a sample after another, including the healthy sample in the Mindray to get a picture of blood for each sample. Note that all samples remained on the roll mixer device during the checking process of other samples. In the results of a blood imageshown in the following table with 200 pulse added to it have 2 ml of nanomaterial, gold metal to 1 ml of healthy blood, it observed a decrease in the number of units and the amount of white blood cells under the normal rate 2.191 even when compared with the sample control 7.21 and also we note a decrease in all levels of granular and non-granular without the normal rates (0.611 -1.071- 0.03-0.48) for the Neu, Lym, Mon, Eos blood cell types according to order, and this is confirmed by the low percentage of these blood cells according to the rate found in the results of the tests with 200 pulses and 2 ml of nanomaterial. It is also observed a significant decrease in the number of red blood cells compared with the normal rates and with the control sample. This led to a difference in the general characteristics of the sphere and the indicator in the readings such as the size of the HCT and the average size of the red blood cell MCV, but a rise in the average hemoglobin in one MCHC is observed. It causes many diseases, such as diseases of low red blood cells and anemia. It is also noted that these laser flashes affect the amount, size and shape of the PLT, which was also read in decreasing numbers. This is a dangerous indication that causes delayed or no blood clotting in wounds or what is known as Thrombopenia. This is also illustrated by the graphs found in the results of the blood image, where a difference in the distribution of blood cells is noted, and the decrease in the numerical pyramid of red blood cells It is noticed that the decrease in the white blood cells in the concentration of 2 ml has increased until it reached 0.42 at the concentration of 4 ml, but it returned and rose to 1.18 at 5 ml, i.e. the

increase is not a direct increase in the concentration of the nanomaterial, but it remains below the normal rates. This was also the case with RBCs, where it was 1.36 at 2 ml and 0.64 at concentration of 4 ml and then returned and decreased to 0.78 at a concentration of 5 ml of nanomaterial. The same effect was repeated on the

thrombocytopenia, where it was 52 at a concentration of 2 ml, decreased sharply at a concentration of 4 ml, then increased slightly 12 at a concentration of 5 ml, but it is also below the normal rates (100-400) and indicates a significant decrease, but rather a great risk.

Table (1): The results of the blood image after adding the gold nanomaterial with 200 pulse

No.	Parameter	2 ml	4 ml	5 ml	Control	Unit
1	WBC	2.19	0.42	1.18	7.21	10 ⁹ /L
2	Neu#	1.07	0.42	0.01	4.37	10 ⁹ /L
3	Lym#	0.61	0.00	1.14	2.22	10 ⁹ /L
4	Mon#	0.48	0.00	0.00	0.49	10 ⁹ /L
5	Eos#	0.03	0.00	0.03	0.12	10 ⁹ /L
6	Bas#	0.00	0.00	0.00	0.01	10 ⁹ /L
7	Neu%	48.5	+++++	1.4	60.7	%
8	Lym%	28.1	0.0	96.4	30.8	%
9	Mon%	21.9	0.0	0.1	6.8	%
10	Eos%	1.5	0.0	2.0	1.6	%
11	Bas%	0.0	0.0	0.1	0.1	%
12	RBC	1.36	0.64	0.78	5.14	10 ¹² /L
13	HGB	4.3	2.0	2.4	16.1	g/dL
14	HCT	8.1	2.9	3.4	45.1	%
15	MCV	59.4	44.9	43.4	87.8	fL
16	MCH	31.3	31.1	31.2	31.4	Pg
17	MCHC	52.7	69.2	71.8	35.7	g/dL
18	RDW-CV	35.8	33.4	33.3	12.5	%
19	RDW-SD	72.8	41.8	45.0	41.9	fL
20	PLT	52	8	12	204	10 ⁹ /L
21	MPV	8.0	7.7	8.3	8.4	fL
22	PDW	14.2	14.6	13.8	16.1	
23	PCT	0.41	0.06	0.10	1.72	mL/L

Results and Discussion

It has been observed that by increasing the number of laser pulses from 200 to 400 pulses when preparing the nanomaterial, gold is observed to decrease all components of blood tissue below the normal levels and further, as the level of white blood cells decreased at a concentration of 2 ml to 2.29 and at a concentration of 4 ml 1.86 and at a concentration of 5 ml to 0.37 This is due to the decrease in all types of white blood cells until some of them were completely nonexistent, which is

neutrophil, and its percentage was 0% at a concentration of 5 ml of the added nanomaterial. It was also observed that the decrease became inverse, as the rates decreased with respect to white blood cells (0.37, 1.81, 2.29) at concentrations (2,4,5) ml, and successively where it was repeated with the rates of erythrocytes (0.57,1.18,1.42) in the same sequence and also with the rates Platelets (9,43,56) ml and at the same concentrations It is noted that all parameters remain below the normal ones, but they have declined to more dangerous rates.

Table (2): The results of the blood image after adding the gold nanomaterial with 400 pulse

No.	Parameter	2 ml	4 ml	5 ml	Control	Unit
1	WBC	2.29	1.86	0.37	7.21	10 ⁹ /L
2	Neu#	1.02	0.42	0.37	4.37	10 ⁹ /L
3	Lym#	0.88	1.36	0.00	2.22	10 ⁹ /L
4	Mon#	0.37	0.06	0.00	0.49	10 ⁹ /L
5	Eos#	0.02	0.02	0.00	0.12	10 ⁹ /L
6	Bas#	0.00	0.00	0.00	0.01	10 ⁹ /L
7	Neu%	44.3	22.3	+++++	60.7	%
8	Lym%	38.2	73.1	0.0	30.8	%
9	Mon%	16.5	3.3	0.0	6.8	%
10	Eos%	0.9	1.3	0.0	1.6	%
11	Bas%	0.1	0.0	0.0	0.1	%
12	RBC	1.42	1.18	0.57	5.14	10 ¹² /L
13	HGB	4.5	3.7	1.8	16.1	g/dL
14	HCT	8.1	6.4	2.2	45.1	%
15	MCV	56.6	54.4	39.1	87.8	fL
16	MCH	31.3	31.0	31.5	31.4	Pg
17	MCHC	55.3	57.0	80.6	35.7	g/dL
18	RDW-CV	31.4	27.9	31.1	12.5	%
19	RDW-SD	60.4	50.6	32.7	41.9	fL
20	PLT	56	43	9	204	10 ⁹ /L
21	MPV	7.8	8.4	8.0	8.4	fL
22	PDW	14.1	14.0	14.1	16.1	
23	PCT	0.44	0.36	0.07	1.72	mL/L

As for the increase in the number of laser pulses to 600 pulses, an increased effect on the three main blood components, white blood cells, red blood cells and platelets, was observed. When the number of pulses increased, the WBC decrease decreased until it reached (1.15,1.27,1.98) at concentration (2, 4.5) ml, respectively, as well as with red blood cells until it reached (0.82,0.88,1.37) at the same concentrations as well as low blood platelets, where their number reached (12,15,48) at previous concentrations of nanomaterial. It

is noted that the concentration of the nucleic substance is also inversely increasing as the decrease in the blood components increases with increasing the concentration of the nanomaterial. It is noted that the effect of the number of laser pulses per minute also increases the decrease in the blood components. 2.19) consecutively is unclear, and this is exactly what happened with erythrocytes (1.37, 1.42, 1.36) at the three laser pulses in a row and was repeated with platelets.

Table (3): The results of the blood image after adding the gold nanomaterial with 600 pulse

No.	Parameter	2 ml	4 ml	5 ml	Control	Unit
1	WBC	1.98	1.27	1.15	7.21	10 ⁹ /L
2	Neu#	0.93	0.00	0.11	4.37	10 ⁹ /L

No.	Parameter	2 ml	4 ml	5 ml	Control	Unit
3	Lym#	0.75	1.24	1.12	2.22	10 ⁹ /L
4	Mon#	0.27	0.01	0.00	0.49	10 ⁹ /L
5	Eos#	0.03	0.02	0.02	0.12	10 ⁹ /L
6	Bas#	0.00	0.00	0.00	0.01	10 ⁹ /L
7	Neu%	46.6	0.6	1.1	60.7	%
8	Lym%	37.4	97.0	96.8	30.8	%
9	Mon%	14.0	1.1	1.9	6.8	%
10	Eos%	1.9	1.3	0.1	1.6	%
11	Bas%	0.1	0.0	0.82	0.1	%
12	RBC	1.37	0.88	2.6	5.14	10 ¹² /L
13	HGB	4.3	2.8	3.7	16.1	g/dL
14	HCT	7.6	4.3	45.3	45.1	%
15	MCV	55.7	48.2	31.7	87.8	fL
16	MCH	31.1	31.5	31.5	31.4	Pg
17	MCHC	55.8	65.4	70.0	35.7	g/dL
18	RDW-CV	28.7	30.1	32.5	12.5	%
19	RDW-SD	53.4	46.1	46.0	41.9	fL
20	PLT	48	15	12	204	10 ⁹ /L
21	MPV	7.9	7.4	8.0	8.4	fL
22	PDW	13.9	14.5	14.3	16.1	
23	PCT	0.38	0.11	0.10	1.72	mL/L

The general observation of the rates and, in general, of all components of the blood tissue has decreased in a very large and dangerous and also frightening by increasing both the concentrations of the nucleus and increasing the number of pulses of the laser per minute compared to the normal rates and with the readings of the control sample⁽¹²⁻¹⁵⁾.

Conclusion

It was observed when adding the gold nanomaterial to a peaceful blood sample and when taking a blood picture of each sample it was found that the general observation of the rates and in general of all components of the blood tissue has decreased very significantly and dangerous and frightening especially when increasing both the nanomaterial concentrations and increasing the number of pulses of the laser per minute Compared to normal rates and with special readings.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq.

Conflict of Interest: Non

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