

## **Effect of static magnetic fields and blood lymphocyte cells transformation**

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### **Abstract**

The effected of static magnetic field on blood lymphocyte cells transformation was studied in this work , blood samples from 3 healthy fill people were collected.

Some of them are considered as control. The rest were exposit to magnet field of different file densities.

Having values 0.1, 0.2, 0.3, 0.4, and 0.5 tests for different exposure times which are 30, 60, 90, 120, 180 and 180 minutes. The blood cells were stimulated with photo heamgg luteinize. Then they are inoculated for 72 hours and the magnetic increases lymphatic transformation percentage to about double value compared to control cells. The exposure time increase the percentage also.

### **Introduction:**

The magnetic field is one of the important fields that have a direct impact in our day life. It is utilized to generate electricity, attracting heavy Bowie loside its application in non destructive testing and controlling process storing information in computers can also be done by magnetic materials [1, 2, 3]

Magnetic field is also useful in medical diagnosis and therapy [4,5].

It can be used in medical imaging this technique is known as magnetic Resonance imaging techniques specially for soft tissue [6,7].

Recently magnetic field is used in therapy for curing some diseases [8,9] this effect may be related to effect of magnetic field on cells water, blood, stimulation of growing and activity of cells, blood and immune system [10,11] unfortunately these researches do not have little work and the effect of magnetic field on immune system specially Lymphocyte cells.

The results of research to use magnetic field in curing some disease motivate to do this research which is concerned with the effect of static magnetic and methods are written in sections section 3 is concurred with result.

The discussion and conclusion are exhibited in section 4 and 5 respectively.

### **(2-1) Materials and methods:**

In this work blood samples were exposed to magnetic field having different strengths at different exposure times.

#### ***(2-2) magnetic field generates:***

The magnetic field generate consist of two coils wound around to magnetic bars.

The coils are delivered by dc current dc generator.

#### ***Blood sample:***

The experiment was done on blood sample for three healthy fit person. 5ml is collected for each person. The blood samples were treated by heparinised sterile tubes after one hour from samples are 150 blood samples.

#### **(2-3) Magnetic exposure:**

The samples are exposed to static magnetic field by using dc current the samples were located between. Two magnetic piles which can move apart freely with maximum distance of 12cm. the magnetic field was changed by changing the current value, the blood samples were put in water path of 37i when exposed to magnetic field. The control samples are exposed is different magnetic fields of intensities 0.1, 0.2, 0.3, 0.4 and 0.5 tesla respectively for each magnet strength the exposure time is changed to be 60, 90,120,150 and 180 minute.

### (2-4) The lymphocyte test:

The lymphocyte test and analysis blood samples were for 72 hours at 37°C then the blood cells were inoculated and developed by coma day the percentage of transformation cells of lymphocyte cells were determined as shown in the tables below The percentage of transformation cells to lymphocyte cells for control and exposed samples and their relation to magnetic field intensity and exposure time were displayed graphically.

3. The following tables and graphs shows effect of magnetic field and exposure time on lymphocyte transformation.

Table 1: exposures time 30 min Transformation percentages.

No of S	Control	0.1T	0.2T	0.3T	0.4T	0.5T
S1	36	57	62	60	60	60
S2	25	45	54	49	51	52
S3	31	49	57	55	56	55

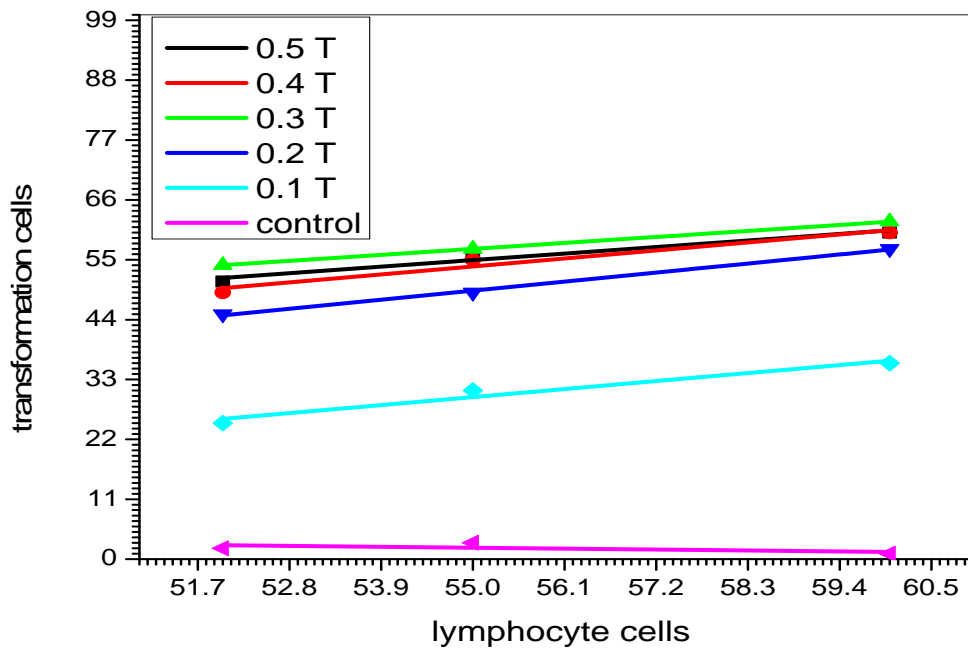
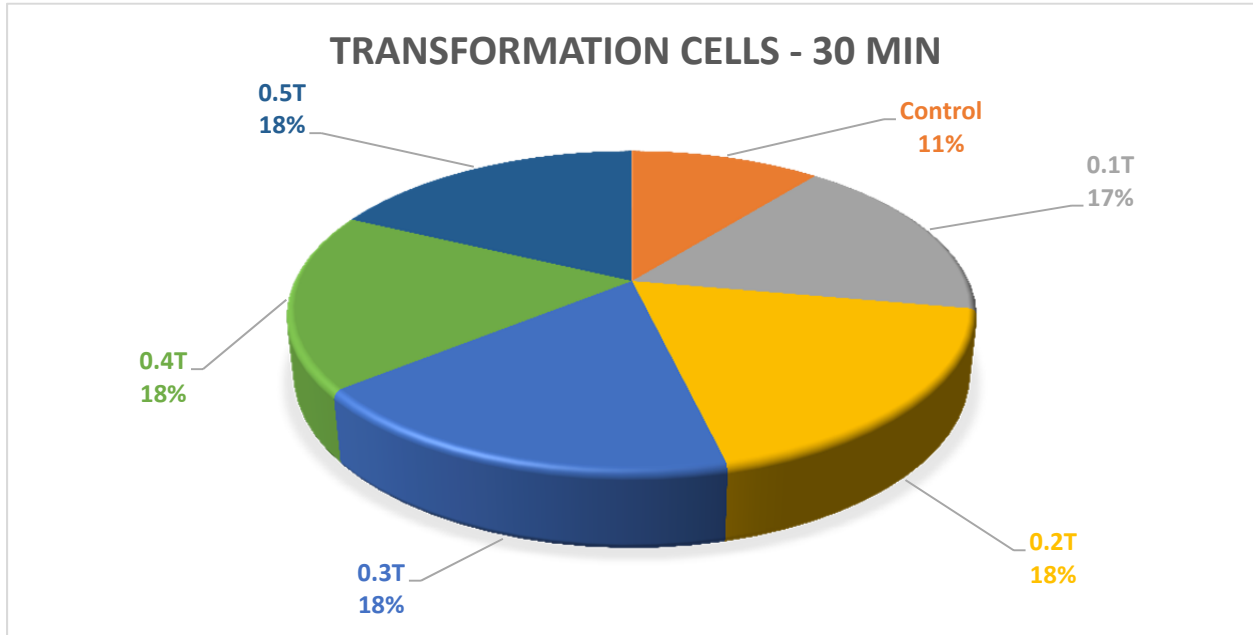


Fig (1) effect of static magnetic field within the range (0.1T-0.5T) on the blood samples transformation for Lymphocyte stimulated with phytohemagglutinine (PHA), at 30 min time of exposure.

**Table 2: exposures times 60 min Transformation percentages.**

No of S	Control	0.1T	0.2T	0.3T	0.4T	0.5T
S1	36	59	67	64	62	64
S2	28	56	60	61	59	62
S3	33	59	65	60	58	61

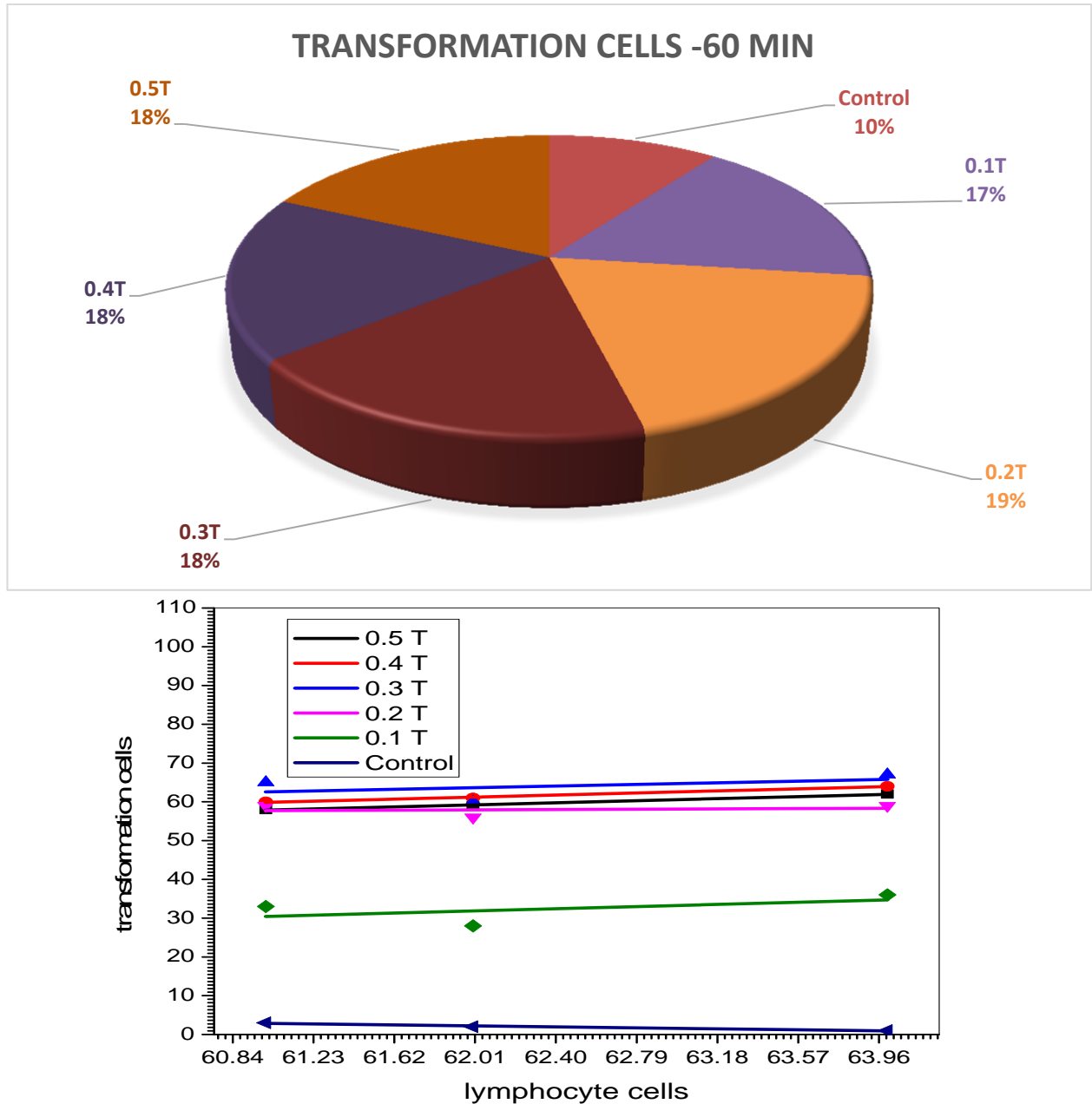
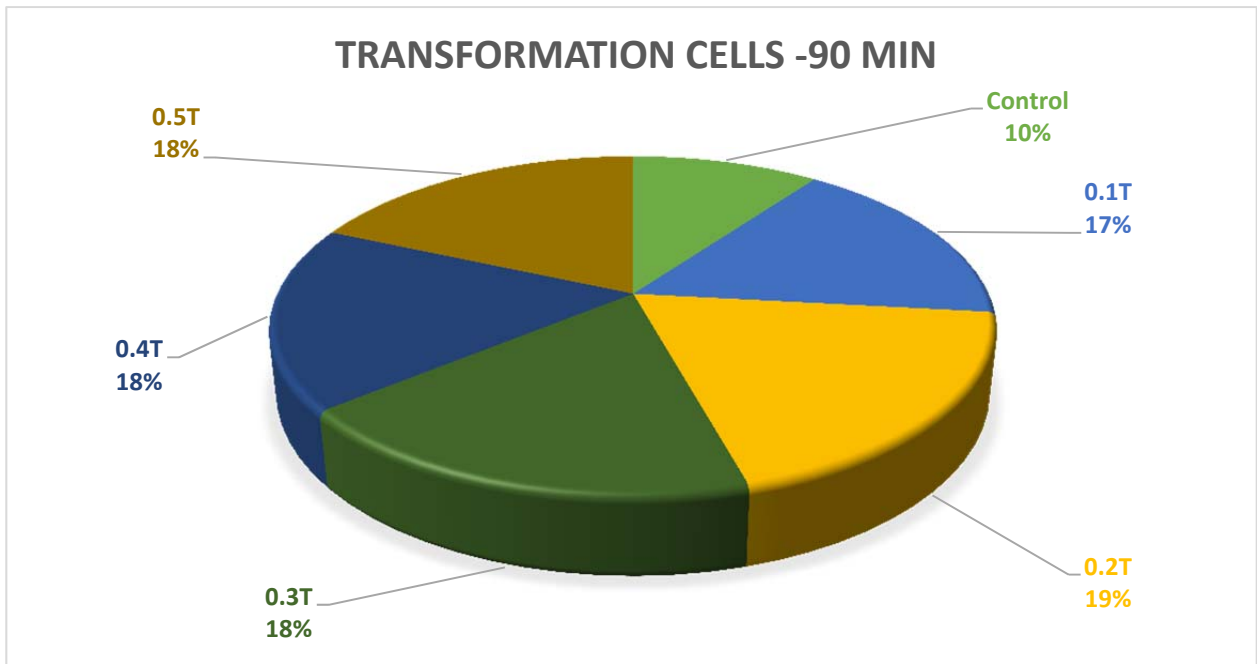


Fig (2) effect of static magnetic field within the range (0.1T-0.5T) on the blood samples transformation for Lymphocyte stimulated with phytoheha magglutinine (PHA), at 60 min time of exposure.

**Table 3: exposures times 90 min Transformation percentages.**

No of S	Control	0.1T	0.2T	0.3T	0.4T	0.5T
S1	36	60	68	66	63	66
S2	28	57	61	60	58	63
S2	33	62	66	61	59	60





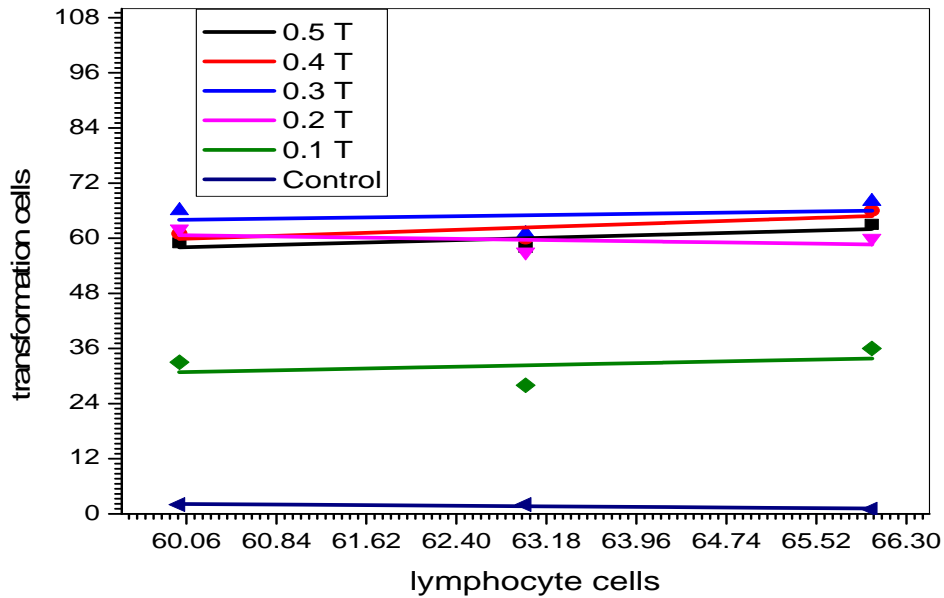
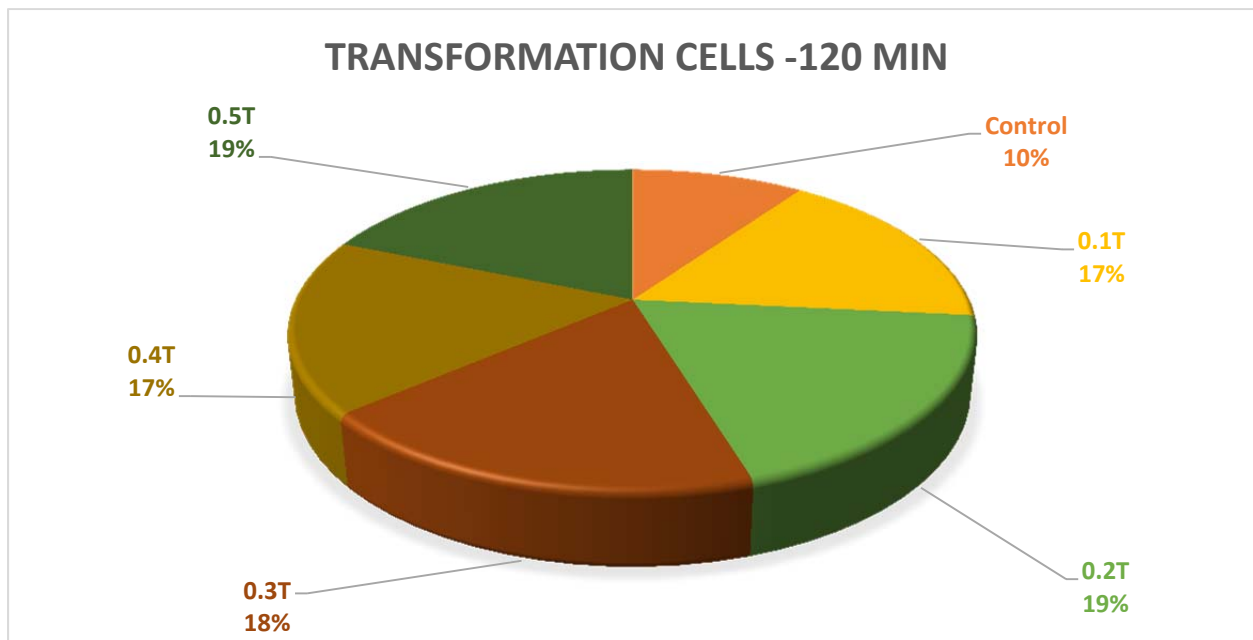


Fig (3) effect of static magnetic field within the range (0.1T-0.5T) on the blood samples transformation for Lymphocyte stimulated with phytohemagglutinine (PHA), at 90 min time of exposure.

**Table 4: exposures times 120 min Transformation percentages.**

No of S	Control	0.1T	0.2T	0.3T	0.4T	0.5T
S1	36	62	69	68	65	69
S2	28	59	63	62	60	64
S3	33	63	67	62	59	60



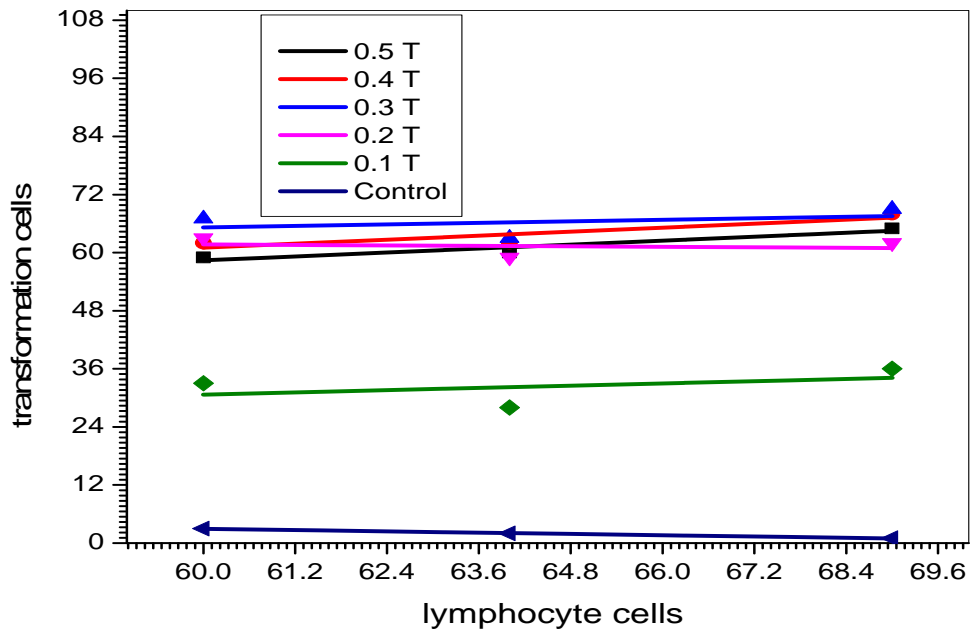


Fig (4) effect of static magnetic field within the range (0.1T-0.5T) on the blood samples transformation for Lymphocyte stimulated with phytohemagglutinine (PHA), at 120 min time of exposure.



**Table 5: exposures times 180 min Transformation percentages.**

No of S	Control	0.1T	0.2T	0.3T	0.4T	0.5T
S1	36	77	79	77	76	78
S2	28	71	79	70	68	62
S3	33	73	78	77	75	76

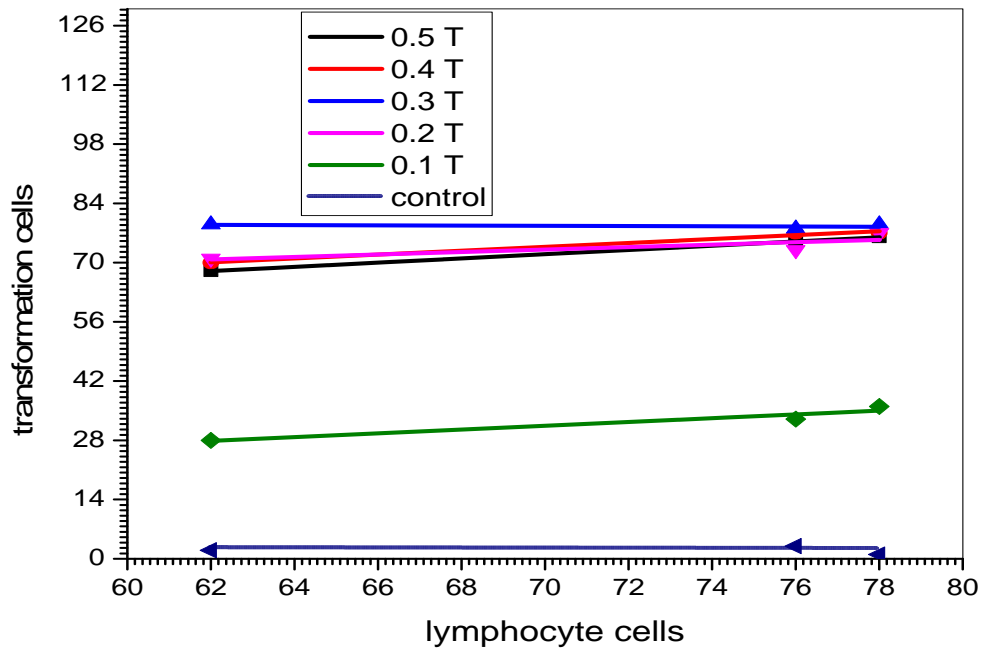
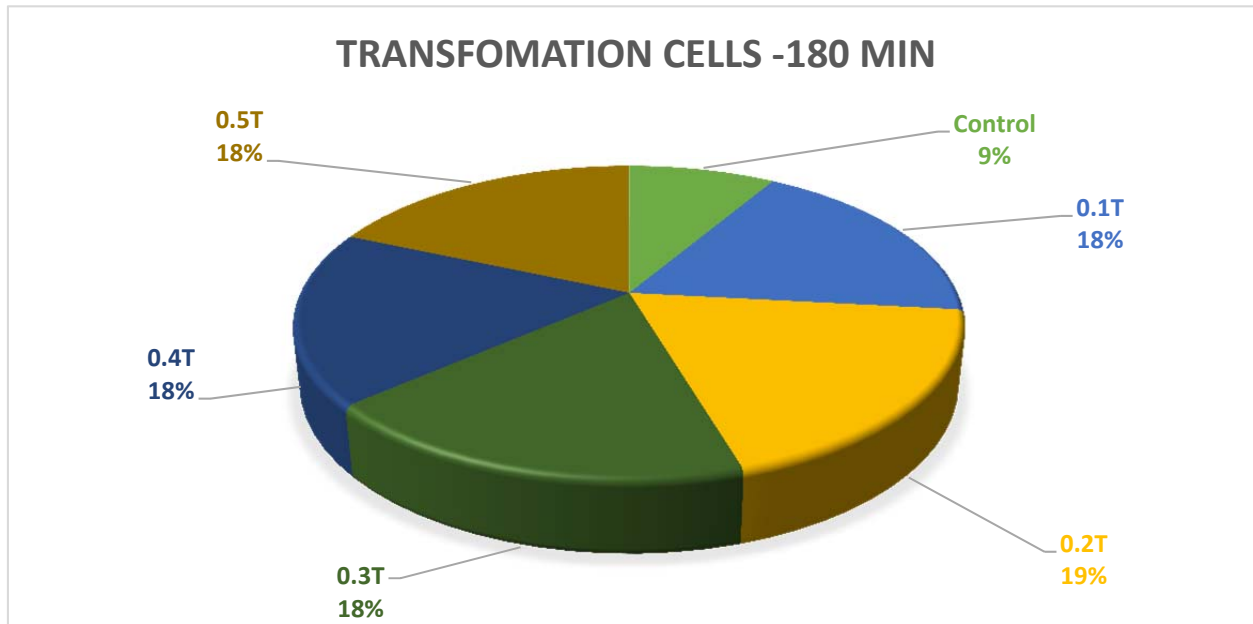


Fig (5) effect of static magnetic field within the range (0.1T-0.5T) on the blood samples transformation for Lymphocyte stimulated with phytohemagglutinine (PHA), at 180 min time of exposure.



**DC Magnetic device**

## **Discussion**

In view of the figures (1-5) It is clear that the application of static magnetic fields increases to control samples transformation. the percentage increases upon increasing the magnetic field density from 0.1 to 0.2 false then it almost stop increasing after that with fluctuation percentage in the range of (1—17 ) percentage. The exposure time in general increases transformation percentage for all applied magnetic strengths.

## **Conclusion**

The exposure of blood to magnetic fields increases lymphocyte transformation percentage considerably. The percentage increases when increasing exposure time.



## References

1. Al-Omran, A. H. and Al-Mashhadani, A. H. and Al-Moudares, H. A. J. (2009). Biological Effect of Static Magnetic Field on Peripheral Blood Leukocyte. 3rd Conference of College of Science. University of Baghdad.
2. Aarnson, S. A. (2004). Molecular and Cellular Biological Effects of Power Frequency Electric and/ or Magnetic Fields.  
"<http://www.marino/studies/Aarnson.Report.html>.
3. Adey, W. R. (2012). Biological Effects of Low Energy Electromagnetic Fields on The Central Nervous System. Plenum Press, New York. 359-379.
4. Andrew, A. M. (2009). Electromagnetic Energy in the Environment and human Disease. Clinical Ecology volume III number (3)
5. Furthe, R. V.; Theda, L. V. and LeigiltP. C. (2011). In Vitro Determination of Phagocytosis and Intercellular Killing By Polmorphonuclear and Mononuclear Phagocytosis. Hand book of Experimental Immunology. Vol. 2, Cellular Immunology. Third edition, Blackwell Scientific Publication.
6. Kittel, C. (2012). Introduction To Solid State Physics. Chapter15 Berkeley, California.
7. Marino, A. A. (2011). Intermediary Metabolism. BENS 1996 Representation,  
<http://www.Ortho.Isume.edu/Faculty/Marino/BEMS.html>,
8. Meneghini, R. (2012). Iron homeostasis, oxidative stress and DNA damage. Free Radio Biol. Med. 23:783-792
9. National Institute of Environmental Health Services & U.S. Department of Energy. (2011). Electric & Magnetic Fields Associated with the use of Electric power.