American Journal of Biomedical Science & Research

www.biomedgrid.com

ISSN: 2642-1747

Research Article

The Possibility of Influencing Viruses by Spin Supercurrent

Liudmila B Boldyreva*

The State University of Management, Moscow, Russia

***Corresponding author:** Liudmila B Boldyreva, The State University of Management, Moscow, Russia

To Cite This Article: *Liudmila B Boldyreva. The Possibility of Influencing Viruses by Spin Supercurrent. A Review. Am J Biomed Sci & Res. 2021 - 11(6). AJBSR.MS.ID.001688.* DOI: 10.34297/AJBSR.2021.11.001688.

Received: January 22, 2021; **Published:** February 03, 2021

Abstract

The main properties of viruses (they replicate inside the cell of all type of life forms, from animals and plants to microorganisms; have the shape from simple helical and icosahedral forms to more complex structures; are surrounded by protective protein "coat"; have very small size equal to the one-hundredth the size of most bacteria) determine the properties of the physical process that may influence viruses. It is shown in this work that spin supercurrent may be such a process.

One of the methods of influencing viruses is to change their form, for example, to deform and even unwind their helical forms. The spin supercurrent is distinct from other physical processes, most notably, in that it transforms angular momentum and, consequently, as a result of its action a change in the form of interacting objects may take place. Spin supercurrent may emerge between any objects having spin, independent of shielding these objects by electromagnetic and molecular screens. The effectivity of spin supercurrent's action is maximal if interacting objects are in ultra-low doses. In this work, examples of effective interaction of some substances in ultra-low doses and biological systems accomplished by means of spin supercurrent are considered. In particular, they include the action on a biological system of ultra-low doses of ionizing radiation, ultra-low doses of biologically active substance, metal nanoparticles and low-intensity non-ionizing electromagnetic radiation. The two latter actions are characterized by the possibility to deform and even unwind the helical form of DNA.

As spin supercurrent may arise between the viruses and quantum objects of biological system containing the viruses, the action of this current may result in the adaptation of viruses to the biological system containing the viruses.

Keywords: Viruses, Biology, Spin Supercurrent, Spin, Ultra-Low Doses, Quantum Object

Introduction

The first attempt to describe the phenomenon of long transport of spin polarization (spin supercurrent) was made by M. Vuorio [1]. In 2008, Russian scientists Y. Bunkov, V. Dmitriev, and I. Fomin were awarded the Fritz London Memorial Prize for their studies of spin supercurrent in superfluid ^{3}He-B [2-4]. The action of spin supercurrent is aimed at equalizing the spin's characteristics of the interacting objects. The effectivity of spin supercurrent's action, that is, the degree of such equalization, may be maximal if interacting objects are in ultra-low doses. The spin supercurrent is distinct from other physical processes in that it transforms angular momentum and, consequently, as a result of its action the change in the form of interacting objects may take place. Spin supercurrent may emerge between any objects having spin, independent of shielding these objects by electromagnetic and molecular screens.

In this work the examples of effective interaction of some substances in ultra-low doses and a biological system by means of spin supercurrent are considered. In particular, they include the action on a biological system of ultra-low doses of ionizing radiation, ultra-low doses of biologically active substance, metal nanoparticles and low-intensity non-ionizing electromagnetic radiation. The two latter actions are characterized by the possibility to deform and even unwind the helical form of DNA.

The analysis of the properties of spin supercurrent and viruses shows that the spin supercurrent may effectively influence viruses, that is this current is able to change the viruses' characteristics.

1. The viruses consist of one of the types of nucleic acid (DNA-deoxyribonucleic acid or RNA-ribonucleic acid), that is, viruses are quantum objects having spin.

The spin supercurrent emerges between any objects having spin: electrically charged and neutral, magnetized and non-magnetized, constituting a living and non-living system.

2. The viruses are surrounded by a protective protein "coat".

   The action of spin supercurrent is not shielded by electromagnetic and molecular screens.

3. The viruses have the shape from simple helical and icosahedral forms to more complex structures.

The spin supercurrent transforms angular momentum and, consequently, as a result of its action the change in the form of interacting objects may take place.

It is an experimental fact that 3D nanoparticles while penetrating into a DNA molecule having a helical shape may deform and even unwind the helix; as shown in work [5] the action of nanoparticles on a biological system may be performed by spin supercurrent.

4. Viruses have very small size equal to the one-hundredth the size of most bacteria.

The effectivity of spin supercurrent's action is maximum if the interacting objects are in ultra-low doses.

The article consists of four Sections

In Section 1, some properties of spin supercurrent are considered.

In Section 2, the examples of action of low-intensity physical factors on biological systems are given: the action of ultra-low doses of ionizing radiation, the effects of ultra-low doses of biologically active substances, the action of metal nanoparticles (including their influencing the form of DNA), and the action of low-intensity non-ionizing electromagnetic radiation.

Some properties of spin supercurrent

The properties of spin supercurrent listed in this Section are discovered in experiments with superfluid ^{3}He-B [2-4]. In superfluid ^{3}He-B, spin supercurrent emerged if there was a violation of the "stiffness" of spin part of the order parameter, that is under the non-zero difference in the values of respective angles of deflection and precession of precessing spins of ^{3}He atoms.

1. The value of spin supercurrent $(I_{ss})_z$ in the direction of the orientation (axis $\mathbf{z}$) of the precession frequencies of the ^{3}He atoms' spins in superfluid ^{3}He-B is determined to be

$$(I_{ss})_z = -g_1 \partial\alpha / \partial z - g_2 \partial\beta / \partial z, \quad (1)$$

where α is the angle (phase) of precession, β is the angle of deflection, g_1 and g_2 are coefficients depending on β.

2. In accordance with the principles of quantum mechanics, the process equalizing the value of order parameter in a quantum system described by a single wave function must be dissipative-free (otherwise the system ceases to be described by a single wave function).

3. The action of spin supercurrent is aimed at equalizing the values of characteristics of spin structures between which it arises. Let us consider it in detail: the characteristics of interacting spin structures are given in figure 1. **S** is spin, $\boldsymbol{\omega}_1$ and $\boldsymbol{\omega}_2$ are the spins' precession frequencies oriented along axis z, α_1 and α_2 are the angles of precession (determined relative to reference line r.l.) of spins, β_1 and β_2 are angles of deflection of spins. (Figure 1).

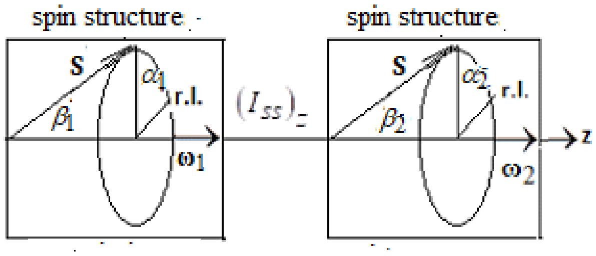

Figure 1: The schema of interaction of spin structures. $(I_{ss})_z$ is a spin supercurrent between spin structures, α_1 and α_2 are the angles of precession; β_1 and β_2 are the angles of deflection; ω_1 and ω_2 are the precession frequencies oriented along axis z; **S** is spin, r. l. is a reference line.

Based on equation (1), spin supercurrent $(I_{ss})_z$ between these spin structures may be written in the form:

$$(I_{ss})_z = -b_1(\alpha_2 - \alpha_1) - b_2(\beta_2 - \beta_1), \quad (2)$$

where b_1 and b_2 are coefficients that are respectively dependent on coefficients g_1 and g_2 introduced in Eq. (1);

$b_1 > 0$, $b_2 > 0$. As a result of this action, the following inequalities hold: $|(\beta')_2 - (\beta')_1| < |\beta_2 - \beta_1|$ and

$$|(a')_2 - (a')_1| < |\alpha_2 - a_1| \quad (3)$$

where α_1' and α_2' are the values of angles of precession α_1 and α_2 after the action of spin supercurrent, β_1' and β_2' are the values of angles of deflection β_1 and β_2 after the action of spin supercurrent.

If to assume that before the action of spin supercurrent the precession angles α_1 and α_2 associated with the respective precession frequencies $\boldsymbol{\omega_1}$ and $\boldsymbol{\omega_2}$ ($\boldsymbol{\omega_1}$ and $\boldsymbol{\omega_2}$ are taken to be independent of time *t*) are $\alpha_1 = \omega_1 t$ and $\alpha_2 = \omega_2 t$, then from Eq. (3) it follows that one of the conditions of equalizing the precession angles is:

$$\Delta\omega = \omega_2 - \omega_1 \to 0 \ . \qquad (4)$$

4. The spin supercurrent is not shielded by electromagnetic and molecular substances**.**
5. The action of spin supercurrents is most effective at small number of interacting spin structures.

Let us estimate the total spin supercurrent I_{sum} emerging between an arbitrary spin structure and other *w* spin structures. The total spin supercurrent I_{sum} is determined to be $I_{sum} = \sum_{i=1}^{w} I_i$ where I_i is the spin supercurrent between an arbitrary spin structure and the *i*-th spin structure from *w* spin structures in question. Using Eq. (2), we obtain $I_{sum} = -\sum_{i=1}^{w}(b_1\Delta\alpha_i + b_2\Delta\beta_i)$, where $\Delta\alpha_i$ and $\Delta\beta_i$ are respectively the difference in the precession angles and the difference in deflection angles of spin structures determining current I_i. If all the values and signs of $\Delta\alpha_i$ and $\Delta\beta_i$ are respectively equiprobable and $w\to\infty$, then

$$I_{sum} \to 0 \ \cdot \qquad (5)$$

Condition (5) means that spin supercurrents cease to be the predominating factor that governs the result of interaction of considered spin structures and it will be determined by other physical factors. Thus, the action of spin supercurrents is most effective at a small number of interacting spin structures.

6. In 1949, R, R. Feynman for denotation of force fields in his diagrams [6] introduced virtual particles created by quantum objects. The properties of virtual particles depended on the interaction in which they were involved. For example, electric and magnetic interactions are accomplished by so-called virtual photons consisting of two oppositely charged virtual particles having spin.

As spin supercurrent emerges between spin structures, that is, between the objects having spin, and, according to Feynman's model, every quantum object is a spin structure as creating a virtual photon having spin, then spin supercurrent may emerge between any quantum objects.

The Examples of Action of Low-Intensity Physical Factors on Biological Systems

In this Section, the examples of action of low-intensity physical factors on biological systems are given: the action of ultra-low doses of ionizing radiation, the effects of ultra-low doses of biologically active substances, the action of metal nanoparticles (including their influencing the form of DNA), and the action of low-intensity non-ionizing electromagnetic radiation. As shown in references [5,7], the effect of all the above-mentioned factors on biological systems may be explained by the action of spin supercurrent emerging between virtual photons created by quantum objects that constitute the biological system, on the one hand, and by quantum objects influencing the biological system, on the other hand.

The action of ultra-low doses of ionizing radiation

An example of action of ultra-low doses of ionizing radiation on biological systems is shown in figure 2: it presents a schematic character of the dependence of human mortality (caused by leukemia) on the value of equivalent dose *d* of ionizing radiation. The curve is based on the data published in Britain, Japan, Russia, the USA, and collected under E. Burlakova guidance (the Russian Academy of Science) [8-9].

Introduced in figure 2 the death rate *K* equals the ratio of the number of deaths per 100000 person-years to the number of deaths caused by the equivalent dose *d* of about 23 mSv (*the equivalent dose is a dose of radiation that takes into account the specificity of action of any type of ionizing radiation on a biological tissue (or organ) of a human on the basis of weighted radiation factors.)*

(It is noteworthy that there is a range of values of *d* (at about 75 mSv), where the magnitude of *K* is less than that for the background value of *d* (about 2 mSv). It may be said that ultra-low doses of ionizing radiation in this range have a therapeutic effect.)

As the ionizing radiation consists of quantum objects (photons, elementary particles and atomic nuclei), spin supercurrents emerge between the objects that constitute ionizing radiation and biological systems. (Figure 2).

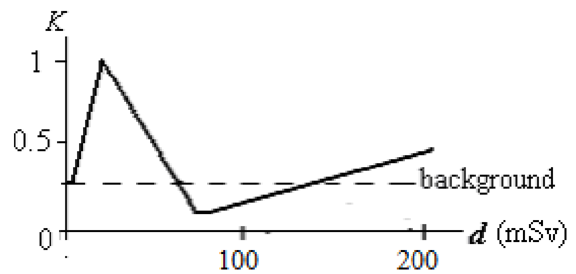

Figure 2: The schematic character of the dependence of human mortality (caused by leukemia) on the equivalent dose *d*. *K* is the ratio of the number of deaths per 100000 person-years caused by the action of arbitrary value of dose *d* to the number of deaths at *d*~23 mSv.

The effect of ultra-low doses of biologically active substances on biological systems

The ultra-low doses are taken to be those with concentrations of 10^{-13}M or lower [8]. Note that introduction of a substance in doses of 10^{-12} – 10^{-13}M into an organism will result in about 10 down to 1 molecules of the substance to be contained in a cell. That is, at concentrations of less than 10^{-13}M there will be, from the point of view of classical physics, no molecules of the substance in a cell. This effect is characterized, in particular, by the following properties:

1. The kinetic paradox: the effect of a biologically active substance in ultra-low doses on a cell or an organism is the strongest when the latter contains the same substance but in doses that are some orders of magnitude greater than the ultra-low doses used.

It is possible that Hahnemann's law of similars (*similia similibus curantur*) [10] can be seen as a consequence of the kinetic paradox.

2. A non-monotonic, polymodal (oscillatory) dose-response (or dose-effect) dependence. In most cases, activity maxima are observed within definite ranges of doses, which are separated by so-called "dead zones". There are also cases where a change in the "sign" of the effect is observed in the dose dependence.

3. The effect of a biologically active substance in ultra-low doses may not be shielded by molecular substances. For example, in the book by P. Bellavite and A. Signorine [11] we find: "There is some preliminary evidence demonstrating a homeopathic effect not only of solutions but also of closed ampoules containing solutions and placed in contact with the system to be regulated (human or animal)."

It is shown in [7] that the above-mentioned features of effect of ultra-low doses of biologically active substance on a biological system may be explained by the properties of spin supercurrent. In particular: kinetic paradox is due to fulfillment of condition (4) in case when the biologically active substance used is already contained in the organism influenced but in doses that are some orders of magnitude greater than the ultra-low doses used; a non-monotonic, polymodal (oscillatory) dose-response (or dose-effect) dependence may be a consequence of discreteness of spectra of precession frequencies characterizing interacting spin structures (respectively $\boldsymbol{\omega}_1$ and $\boldsymbol{\omega}_2$) at which the condition (4) is fulfilled.

It is the property of the absence of dissipativity of spin supercurrent that allows the ultra-low doses of biologically active substance to influence biological systems.

The action of metal nanoparticles on biological systems

The main applications of metal nanoparticles in medicine are targeted drug delivery, treatment, diagnosis, monitoring, and control of diseases. As follows from the current studies, the medical effect of metal compounds on the cell of a biological organism is not determined in many cases by the action of ions of the metals. For example, the toxic effect of Ag nanoparticles on bacteria [12] and fish embryos [13] cannot be reduced to the action of Ag+ ions in equivalent concentrations. Experiments show the increase in the efficacy of action of metal nanoparticles on a biological system at decreasing the size of nanoparticles. For example, in experiments with *E. coli* the nonmonotonic dependence of toxic effect of Ag nanoparticles on the size of the latter was established [12]; the type of dependence of normalized toxicity rate T_r / T'_r, $(T_r = T'_r \; at \; d = 9nm)$ on the nanoparticle size *d* is shown in figure 3.

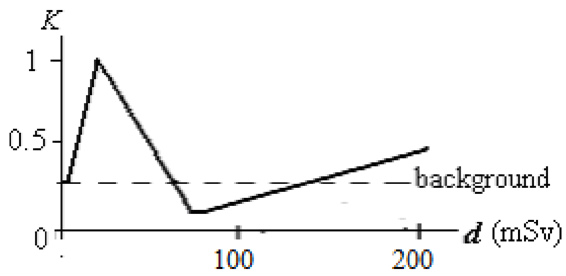

Figure 3: The type of dependence of normalized toxicity rate T_r / T_r', (*Tr=Tr' at d=9nm*) on the nanoparticle size *d*.

The medical action of nanoparticles does not depend significantly on the presence of a protective shell. For example, there are conclusions drawn by the researchers of the medical effect of Ag nanoparticles [12]: "Antimicrobial effect of Ag nanoparticles is clearly expressed not only in water medium, but also in studies of solid materials with nanoparticles deprived of their protective shell."

It is shown in [5] that the above-mentioned features of effect of metal nanoparticles on a biological system testify that the effect may be accomplished by spin supercurrents.

Action of metal nanoparticles on forms of biological systems

As the action of spin supercurrent is aimed at equalizing the angular momentum, spin supercurrent may influence the forms of interacting objects. This may account for the experimental fact that 3D nanoparticles while penetrating into a DNA molecule, having helical forms, deform and even unwind them. One of the examples of such nanoparticles are fullerenes (molecular compounds which are convex bounded polyhedrons composed of carbons); computer simulation has shown that fullerenes, namely, spherical C60 molecules, are potentially dangerous to DNA molecules [14]. The possibility of influencing the form of a biological system is inherent to dendrimers as well (3-dimension hyperbranched macromolecules). Dendrimers of the 3D and higher generations having the form close to a sphere are used as nanoparticles for drug-delivery systems [15].

The low-intensity non-ionizing electromagnetic radiation

According to [16], frequency ω_{ph} of a circularly polarized photon is the frequency of precession of photon's spin. It follows that the photon being a quantum object having spin may interact by spin supercurrents with quantum objects that constitute viruses. This interaction may be maximum effective at fulfilling the condition analogous to condition (4).

$$\omega_{vir} \approx \omega_{ph}, \qquad (6)$$

where ω_{vir} determines the spin precession frequency characteristic of viruses.

Thus, low-intensity electromagnetic radiation (its flux density is less than 1 $\mu W/cm^2$ [8]) may influence biological system similar to action of ultra-low doses of biologically active substances on biological systems.

The action of low-intensity non-ionizing electromagnetic radiation on a biological system has the following features:

1. The photon's frequency at the effective action of it on a biological system, due to equality (6) equals the spin precession frequency characteristic of viruses. That is, the properties of viruses can be analyzed while using the low-intensity electromagnetic radiation.
2. It is possible to create photons with nonplanar polarization or, which is the same, with nonplanar orientation of precession frequency of photon's spin, for example, at passing light through a magnetized medium the light polarization twisting may take place (the Faraday effect [17]). Such photons may deform and even unwind the helical forms of viruses similar to the action of dendrimers and fullerenes.
3. As the spin supercurrent passes through various shielding screens including electromagnetic screens, then a paradoxical situation may take place: the action of electromagnetic radiation on BS is affected through the electromagnetic screens.

Discussions

The action of a biological system on vegetables

There are examples of possibility of non-contact effect of some humans (the so-called psychics) on ambient objects. In 2011, Japanese researchers, H. Kokubo, O. Takagi, and Y. Nemoto, conducted unique experiments on psychics' non-contact effect on vegetables. Cucumber slices were used and the concentrations of the gas emitted by the slices were measured [18].

The recurring zones of the increased concentrations of gas emitted by the slices were observed. The characteristics of the recurring zones (number, form, and thickness of zones; the distances between them) were determined by the psychic's ability to create these zones (the psychic was at the center of the circles). An approximate schematic picture of the observed recurring zones is shown in figure 4: the radius r of the external zone in these experiments was only limited by the size of the setup (r~250cm); and the thickness δ of the maximum concentration zone was ~15cm. (Figure 4).

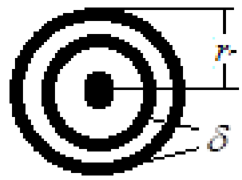

Figure 4: Approximate schematic picture of observed recurring zones created by a psychic: r is the radius of external zone, and δ is the thickness of the maximum concentration zone.

The character of observed recurring zones is explained if to assume that the action of psychic on cucumber slices is performed by spin supercurrents [19]. Based on similar experiments it may be supposed that humans with special ability, the so-called psychics, may influence viruses.

Conclusion

As follows from the properties of spin supercurrent and above-considered phenomena, the spin supercurrent possesses all necessary characteristics for effective influencing viruses:

- the spin supercurrent may influence viruses in cells of all type of life forms;
- the spin supercurrent's influence is independent of the presence of cell's protective protein "coat";
- the spin supercurrent may change the form of viruses;

- the spin supercurrent's influence is most pronounced if interacting objects are in ultra-low doses, the latter is one of main characteristics of viruses.

The effective action of spin supercurrents on viruses may take place at interaction of viruses with, for example, ultra-low doses of ionizing radiation, ultra-low doses of biologically active substance, metal nanoparticles, low-intensity non-ionizing electromagnetic radiation.

As spin supercurrent may arise between the viruses and quantum objects of biological system containing the viruses, the action of this current will decrease the difference between the values of some characteristics of viruses and those of biological system containing the viruses. Thus, by means of spin supercurrent the adaptation of viruses to the biological system containing the viruses may take place.

References

1. Vuorio M (1976) Relaxation by magnetic counterflow in superfluid 3He. J Phys C: Solid State Phys 9(11): pp 267.
2. Borovik-Romanov AS, Bunkov Y, Dmitriev V, Mukharskii Y, Sergatskov D, et al. (1989) Investigation of Spin Supercurrents in 3He-B. Phys Rev Lett 62(14): 1631-1634.
3. Bunkov Y (2009) Spin Superfluidity and Coherent Spin Precession. J Phys Condens Matter 21(16): pp 164201.
4. Dmitriev V, Fomin I (2009) Homogeneously Precessing Domain in 3He-B: Formation and Properties. J Phys Condens Matter 21(16): pp 164202.
5. Boldyreva LB (2014) The Physical Aspect of the Effects of Metal Nanoparticles on Biological Systems. Spin supercurrent. Nanomaterials and Nanosciences 2(1): 7.
6. Feynman R (1949) Space-time approach to quantum electrodynamics. Phys Rev 76: 769-789.
7. Boldyreva LB (2011) An Analogy Between Effects of Ultra-low Doses of Biologically Active Substances on Biological Objects and Properties of Spin Supercurrents in Superfluid 3He-B. Homeopathy 100(3): 187-193.
8. Burlakova E, Goloshchapov A, Zhizhina G, Konradov A (1999) New Aspects of the Mechanisms of Effects of Low-Intensity Irradiation in Small Doses. Radiation Biology. Radioecology 39(1): 26-33.
9. Yablokov A (2002) The Myth of Safety of Low Doses of Radiation. Moscow: pp 456.
10. Hahnemann S (1796) Versuch über ein neues Prinzip zur Auffindung der Heilkräfte der Arzneisubstanzen, nebst einigen Blicken auf die bisherigen. Erster Teil des Artikels in Hufelands Journal, II. Band, Drittes Stück: 391-439.
11. Bellavite P, Signorine A (2002) Emerging Science of Homeopathy, North Atlantic, Books Berkeley, California: 6-9.
12. Egorova E (2010) Biological effects of silver nanoparticles. In Silver Nanoparticles: Properties, Characterization and Applications: 221-258.
13. Asharani PV N, Wu YL, Gong Z, Valiyaveettil S (2008) Toxicity of Silver Nanoparticles in Zebrafish Models. Nanotechnology 19(25): 255102.
14. Zhao X, Striolo A, Cummings P (2005) C60 binds to and deforms nucleotides. Biophysical Journal 89(6): 3856-3862.
15. Nanjwade B, Bechra H, Derkara G, Manvi FV, Nanjwade V, et al. (2009) Dendrimers: emerging polymers for drug-delivery systems. Eur J Pharm Sci 38(3): 185-196.
16. Weber M, Lynn K (2000) Three Photon Annihilations of Positrons and Positronium in Solids with Two Detectors in Coincidence. Radiat Phys Chem 58(5-6): 749-775.
17. Richardson F, Riehl J (1977) Circularly polarized luminescence spectroscopy. Chem. Rev 77: pp 773.
18. Kokubo H, Takagi O, Nemoto Y (2011) Spatial Distribution of Healing Power. Biophysical Approach to BIO-PK Around a Human Body. Studie des Monats-Gesellschaft für Anomalistik: pp 15.
19. Boldyreva LB (2018) The Physical Aspect of Some Magic Rites. Spin Supercurrent. Global Journal of Science Frontier Research: (A) Physics and Space Science 18(6): 8-19.