World Journal of Pharmaceutical Sciences
ISSN (Print): 2321-3310; ISSN (Online): 2321-3086
Available online at: http://www.wjpsonline.org/
Original Article

Harmful effects of humans' environmental factors and drugs, and advices for a safer live; a study on ants as models

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Received: 11-12-2020 / Revised Accepted: 23-12-2020 / Published: 23-12-2020

ABSTRACT

We study on ants as models the effects of products used by humans. Here we summarize our last findings as we previously did, four times, for our first findings. We report the impact of environmental continuous lighting, noise, odors, and manmade electromagnetism, then those of the drugs sativex, chloroquinine, hydroxychloroquine, oxybutynin, and mirabegron, giving advices for reducing their side effects. After that, we recall the adverse effects of statins, Rennie and alprazolam and suggest safer alternatives. Finally, we emit a few personal pharmacological considerations.

Key words: alprazolam, chloroquine, cognition, mirabegron, oxybutynin, pollution, Rennie, Sativex, statin, social relationship

INTRODUCTION

Using ants as models, we study the side effects of situations and drugs commonly used by humans. Apart the publication of each of these works, we also propose to editors a summary of a few of these works for the readers' convenience. Until now, we have published four such summaries [1, 2, 3, 4]. Here, we present our fifth summary, in which we briefly report our findings on the side effects of four environmental factors (continuous lighting, noise, odors, electromagnetism field) and of five drugs (Sativex, chloroquine, hydroxychloroquine, oxybutynin, mirabegron), proposing each time a safer solution. In addition, we recall the previously reported side effects of three drugs often consumed by elderly persons. These three drugs allow treating hypercholesterolemia (statins), stomach acidity (i.e. Rennie®) and anxiousness (alprazolam). The elderly patients often consume in addition a drug for treating their urinary-incontinence. Though duly treating their illness, these four drugs consumed by elderly patients present adverse effects and impact thus their life. In the same way we did for the drug allowing treating urinary-incontinence, we propose a safer use or a safer alternative for the three considered drugs often consumed by elderly persons. Here below, we shortly relate information on the factors and the drugs examined, we briefly explain our methods,

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How to Cite this Article: Harmful effects of humans' environmental factors and drugs, and advices for a safer live; a study on ants as models. Marie-Claire Cammaerts. World J Pharm Sci 2021; 9(1): 34-45.

we summarize our findings and comment them, and we conclude with personal considerations.

Information on the four examined factors

Nocturnal lighting and its consequences on nature is named "photopollution". It is well documented on the web site https://en.wikipedia.org>wiki>Lightpollution. Longcore and Rich [5] reported its astronomical and ecological impacts. Many animals are affected by nocturnal lighting, among others amphibians and reptiles [6], birds [7], bats [8], insects [9]. More information is given in a paper devoted to this subject [10]. In the present work, we assessed physiological and ethological traits on ants firstly living under normal lighting, then on the same ants maintained under diurnal and nocturnal lighting, i.e. continuous lighting.

High environmental noise (= noise pollution) has a negative impact on ecosystems [11] and affects many organisms [12, 13]. Details can be found in our paper on the subject [14]. We have examined the effects of two kinds of noise on ants' several physiological and ethological traits: a brutal one, i.e. beats, and a smooth one, i.e. flowing water noise, no noise being the control situation.

The impact of environmental odors on the physiology and behavior of animals and humans has not yet been largely investigated. Some information however proves that such an impact effectively exists. Among others, Lawless [15 and references therein] describes the effects of odors on humans' mood and behavior, and on the basis of her scientific analysis of 18 research works, Herz [16] concluded that environmental odors effectively influenced the humans' mood, behavior and physiology, Such effects of odors occur *via* an impact on receptors located in precise brain zones [17 and references therein]. The dentist Lehner observed that ambient odor of orange decreased the anxiety of female patients [18]. We thus used ants for investigating on this subject. We set pieces of onion on the foraging area of two ant colonies, and later, pieces of lavender on the foraging area of two other colonies, and compared several of these ants' physiological and ethological traits with those previously assessed of ants maintained without added odors.

The most presently important pollution is caused by the continuously increasing manmade electromagnetism. Its impact on nature and humans has not initially been recognized, but nowadays, there exist a very big amount of scientific works which demonstrate such a harmful impact. Dr Moskowitz lists the most pertinent of these works on his web site (http://bit.ly/saferemr201111) which should be looked to for having an objective opinion on this essential subject.

Information on the five examined drugs

The most efficient drug nowadays used for treating patients suffering from multiple sclerosis is a cannabis-based one: Sativex. Extensive literature on the subject can be found in [19]. Briefly, Sativex contains delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD). These active substances effectively reduce the patients' pain perception, acting on the central nervous system and as a muscle-relaxant. Several clinical studies statistically revealed this wanted effect [e.g. 20 – 25]. However, Sativex present several adverse effects, e.g. dizziness, tiredness, weight loss, memory impairment [26 – 29]. We intended to examine on ants the side effects of Sativex, as well as its loss of effect after weaning.

Chloroquine and hydroxychloroquine are two 4-aminoquinone drugs used to treat persons suffering among others from malaria, rheumatoid arthritis, lupus erythematosis, and the Covid-19 pandemic [30, 31, 32, 33]. They are efficient, but slight overdose may cause adverse effects such as psychosis, depressions, retinopathy, anorexia, central nervous system problems [34, 35]. Their elimination half-time is about 1 – 2 months [31], what leads to their accumulation in the body and to harmful effects due to involuntary overdose. More information on the subject is reported in [36]. We intended to examine, on ants as models, the physiological and ethological side effects of chloroquine and hydroxychloroquine and to try finding a solution for using them as safety as possible.

The disabling urinary-incontinence is still now essentially treated thanks to anticholinergic drugs, such as oxybutynin, which efficiently block the action of acetylcholine on the bladder detrusor muscle [37]. However, these drugs act also on several muscarinic receptors present in the brain, the hart, and smooth muscles. They present thus several adverse effects, among others dry mouth, constipation, blurred vision etc… [38]. A list of these unwanted effects is available on the Drugs.com Website. More information on the subject is given in [39]. We decided to explore this medicinal topic and to examine, using ants as models, the impact of oxybutynin on several physiological and ethological traits.

Since the anticholinergic drugs commonly used for treating urinary-incintinence have several harmful effects, other safer medicines were researched and adrenergic receptor agonistic ones, which act otherwise, have been found. Mirabegron is one of these novel drugs and has apparently very few side

effects. The side effects often reported (e.g. in the notice joined to the drug package, on internet sites as [reference.medscape.com>drug>mirabegron]) are dry mouth, headache, dizziness, high heart rate, tiredness. Nothing can be found as for the impact of mirabegron on the individuals' sensory perception, social relationship, cognition, learning, memory, adaptation, habituation, dependence, and loss of the effect after weaning. In order to partly somewhat fill this gap and because we had previously examined the side effects of the anticholinergic drug oxybutynin, we intended to study as usual, on ants as models, the potential side effects of the selective β3-adrenoreceptor agonist mirabegron drug.

Information on three previously examined drugs and their safer alternatives

Statins are used for treating hypercholesterolemia. However, over time, they appeared to present several adverse effects such as muscular pain, tiredness, and memorization difficulties [40, 41, 42]. Due to these adverse effects, safer alternatives to simvastatin have been researched. Alirocumat is an efficient drug, but it is expensive and, being an antibody, it may have many adverse effects. Arterin®, the red yeast of rice, is a natural drug containing lovostatin, a statin which efficiently decreases the amount of cholesterol [43]. Using ants as models, we examined successively the side effects of simvastatin and of arterin. More information on the subject is available in [44, 45].

To decrease the acidity of the stomach, drugs containing aluminum hydroxide are often used, but, though being efficient, they present several harmful side effects. They are thus commonly replaced by drugs containing calcium and magnesium carbonates which have at first sight very few side effects. However, consuming these drugs may cause tiredness, headache, muscular weakness, and confusion [https://www.webmd.com/.../calcium-and-magnesium-carbonates.../...; https://www.drugs.com › ... › Calcium Carbonate Tablets (Antacid)]. We could not but examining on ants as models the physiological and ethological potential side effects of such a drug, Rennie®, each tablet of which contains 680mg calcium carbonate and 80mg magnesium carbonate. Having found that this drug had effectively several adverse effects, we looked for a safer alternative. We finally considered that the natural green clay may be such an alternative [www.cfaitmaison.com/sante/argile.html ; www.justebien.fr/bienfaits-argile-verte/]. We thus studied the potential side effects of this natural product just like we did for Rennie®.

Antidepressants and anxiolytics are among the most consumed drugs in the world. The nowadays most used anxiolytic is a benzodiazepine, alprazolam, which is not entirely safe [http://www.psychomedia.qc.ca/medicaments/qu-est-ce-que-le-xanax-alprazolam]. The adverse effects commonly reported are decrease of appetite, sleepiness, memorizing and thinking difficulties, aggressiveness, and dependence. These effects are not well defined, some of them are still debated, and better knowledge of them is required [https://fr.wikipedia.org/wiki/Alprazolam/html;http://www.worldlingo.com/med/enwiki/fr/Alprazolam/html; https://www.ibsr.be]. We thus intended to examine the side physiological and ethological effects of alprazolam, using ants as models. On the basis of the available information and our findings on the side effects of alprazolam, we estimated it was of interest to look for a safer anxyolytic alternative, and we found that the natural product 'Sedinal Plus' may be such an alternative. This product is an extract of four plants, valerian (*Valeriana officinalis* L., *Valerianaceae*), hops (*Humulus lupulus* L., *Cannabinaceae*), passionflower (*Passiflora incarnata* L., *Passifloraceae*) and black ballota (*Ballota nigra* L., *Lamiaceae*), which are known to decrease the state of stress, the anxiousness and to help sleeping [www.phytomania.com/valeriane.htm ; www.guide-phytosanté-org/calmant-sédatif/houblon/houblon-constituants-propriétés-html; www.creapharma.ch/passiflore.htm; https://fr.wikipedia.org/wiki/Mélisse_officinale]. Even if being a natural product, Sedinal plus may have side effects. We thus examined if it effectively impacted ants' physiological and ethological traits.

MATERIAL AND METHODS

The ant species we used was *Myrmica sabuleti* Meinert 1861. They were collected in abandoned quarries located in Ardenne and Condroz (Belgium) and were maintained in the laboratory in glass tubes half-filled with water, a cotton plug separating the ants from the water. The nest tubes were set in trays which served as foraging area and the borders of which had been covered with talc to avoid ants escaping. The ants were fed with pieces of *Tenebrio molitor* larvae delivered three times per week and with sugar water permanently provided in small cotton-plugged tubes. The temperature equaled about 20°, the lighting 300 lux, and the humidity 80%, what was comfortable for the species.

The drugs the effects of which we examined were furnished by the pharmacist Wera (Brussels, Belgium). They were Sativex® (GW Pharma Ltd, Cambridge, UK), chloroquine phosphate (Fagron, www.fagron.be, batch n° 19H07-B05-364215), hydroxychloroquine sulfate (Plaquenil®) (Sanofi,

Belgium), oxybutynin chlorhydrate IR (immediate release formulation) (EUROGENERICS s.a. 1020 Brussels), mirabegron (Betmiga®, in extended-release formulation) (Astellas Pharma Europe B.V. Branch (Belgium), statin (simvastatin, Zocor) (Sandoz®), Rennie® (tablets of 680 mg calcium carbonate and 80 mg magnesium carbonate), and alprazolam (Xanax®) (Pharmaceutical Society Pfizer).

Each product the effects of which were examined on ants was dissolved in sugar water at a concentration corresponding to that consumed by humans and according to the fact that insects drink about ten less water than mammals. The sugared solution containing the product was given to the ants in their usual small tube plugged with cotton. The plug was humidified as necessary and the solution was renewed every seven days.

The considered physiological and ethological traits potentially impacted by the studied product were the ants' meat intake, sugar water consumption, general activity, linear and angular speeds of locomotion, orientation ability, audacity, tactile (pain) perception, brood caring, social relationships, cognition, escaping behavior, conditioning acquisition, memory, adaptation to the side effects of the product, habituation to its wanted effect if possible, dependence on the product consumption, decrease and loss of the effect of the product after weaning. Each of these traits was assessed according to protocols and statistical analysis set up since at least ten years and related in at least forty published works. Readers are invited to be informed of these experimental processes in [10, 14, 19, 39, 44, 45, 61, 64, 89, 90, 91, 92].

RESULTS AND DISCUSSION

Four examined factors

Continuous lighting affected the ants' food intake, activity, locomotion, audacity, sensitive perception, social relationships (see Figure 1 A), and memorization, all this during the night but also, to a lower extend, during the day. Our work showed that even an animal species living essentially in rather dark environment is largely affected by photopollution. Other traits than those we examined may also be affected by continuous lighting, e.g. cognitive abilities, sleeping, tasks performances, sensitivity …Humans similarly suffer when living under continuous lighting. For this reason, and because humans fully depend on nature to survive, photopollution should be decreased, as advised for instance by Gaston et al. [46].

Concerning the impact of environmental noise on individuals' health, we found that, on ants, 42 and 200 beats per minute impacted their locomotion, orientation, sensory perception, social relationship, learning and memory and increased their state of stress, while flowing water noise did not impact these traits and even reduced the ants' stress and improved their social relationship, learning and memory. Stressing ants are less able to escaping from an enclosure than calm ones, what is illustrated in Figure 1 B1, B2. Our experiments on ants lasted only 10 – 15 days. Long lasting exposure to brutal noise may thus largely affect the individuals' daily life, while smooth noise may ameliorate it. Numerous examples of this statement exist; they concern among others fishes [47], birds [48], marine mammals [49], dogs and cats [50], as well as humans [e.g. 51 – 54].

Our investigation on the impact of environmental odors on the individuals' physiology and ethology revealed that the odor of onion adversely affected the ants' locomotion, orientation, audacity, tactile perception, social relationship, state of stress, learning and memory, while the odor of lavender unchanged or even positively affected these traits. An illustration of these findings is shown in Figure 1 C1, C2. Similar works on other animal species are not very numerous. However, in addition to those reported in the introduction section, let us cite the works of Bradley et al. who showed the calming effect of lavender and roses odors [55, 56]. Several studies in humans exist. Among others, some environmental odors have been shown to affect the well-being, the respiratory system and the state of stress of exposed humans [57]. Odors emanating from swine operations lead to humans' stress, depression, tiredness and confusion [58]. Inversely, essential oils can ameliorate humans' quality of life [59]. Jasmine, valerian and passionflower odors detain some calming effect [60, 61]. All these studies lead to an actual consideration: the olfactory pollution of the atmosphere nowadays increases and affects the animals' and humans' health. The air pollution is now largely debated and solutions are proposed to decrease it [e.g. 62, 63]. More information can be found in our work on the subject [64]

At the start of the humans' set up and use of the admirable wireless technology, I forethought its impact of the living organisms (plants, insects, birds, mammals, humans …). Publishing my findings (on ants among others) was nearly impossible due to the important economic conflict of interest. This was finally possible essentially thanks to the Editor of the journal 'Electromagnetic Biology and Medicine' [65, 66]. We advice everyone to maximally reduce his (her) use of the manmade electromagnetism. Among others, we advice switching off the Wi-Fi function of the PC, the routers, and any wireless apparatus, not using 'connected' apparatus, not keeping wireless

telephone near the body (not near the ears, not in a pocket), living essentially at a long distance from masts, wireless apparatus and environments with high level of electromagnetism. Such advices are valuable for everyone (human) and for all the living organisms, including the honeybees, the CCD of which is above all caused by manmade electromagnetism.

Five examined drugs

Sativex appeared to reduce the ants' tactile (pain) perception: while consuming this drug, the ants walked on a rough substrate more frankly than when living under normal diet. No habituation occurred to this effect which is that wanted for this medicine. It is illustrated in Figure 1 D. However, the two active compounds of Sativex also presented several adverse effects. They decreased or impacted the ants' activity, food consumption, orientation ability, social relationship, escaping capability, cognition, learning and memory. The ants did not adapt themselves to these side effects. Sativex became less efficient as soon as four hours after weaning, and lost its efficiency in about 8 – 10 hours. Such a rapid decrease of efficiency explained the strong dependence the ants developed on this medicine. Most of the side effects we observed on ants as models were in agreement with those commonly seen in humans: disorientation and dissociation, social relationships problems, memory impairment, impact on cognitive motor function and reaction time [28, 29, 67, 68, 69, 70]. A few impacts we found were novel or better described: decrease of food consumption, of activity and of learning ability. On the basis of all the collected information and obtained results, we advice to use Sativex only for patients suffering from multiple sclerosis and never for persons presenting other health problems. We also find it is important to pay attention to their patients' food consumption, social relationship, orientation ability, cognition, memory, and mood, as well as to their potential dependence on Sativex consumption.

We found that chloroquine and hydroxychloroquine impacted the ants' food consumption, activity, locomotion, orientation, audacity, tactile perception, social relationship, and increased their state of stress. Chloroquine also affected the ants' cognition (see Figure 1 E) and memory. In fact, the two drugs affected nearly the same ants' traits but otherwise and quantitatively differently: chloroquine impacted essentially the traits requiring cognition and brain functioning, hydroxychloroquine those requiring muscles functioning and appearing to be safer than chloroquine. We thus advice using chloroquine for patients having initially no cognitive problem, and using hydroxychloroquine for those having initially no muscles functioning problem. No adaptation occurred to the observed side effects of the two drugs, and no dependence developed on their consumption. After weaning, the effect of chloroquine vanished in about 33 hours, and that of hydroxychloroquine in about 30 hours. Nowadays, patients are advised to consume one or the other of these drugs each day, i.e. every 24 hours. On the basis of their slow loss of efficiency after weaning, and for avoiding overdose and its harmful consequences, we suggest to consume one or the other of these drugs every 36 hours. Also, a large individual variability was observed in ants as for their ethological and physiological reactions to their consumption of these drugs. This may be the case for humans, and we propose to treat them case by case. What we observed on ants agreed with the observations made in humans [71 - 75], what reinforces our conclusion: using one or the other drug according to the patients' physiology, treating them case by case, and giving them one or the other drug every 36 hours.

On ants, oxybutynin reduced food consumption, increased the activity, and impacted the locomotion, orientation, audacity, tactile perception, social relationships, as well as cognition, learning and memory (see Figure 1 F). All these findings agreed with side effects observed in humans [e.g. 76, 77, 78, 79]. The ants did not adapt themselves to the observed side effects of oxybutynin and became dependent on its consumption. After weaning, the effect of oxybutynin vanished in only 10 hours, what accounted for the development of dependence on it. In comparison with other anticholinergic drugs used to treat urinary-incontinence (e.g. tolterodine, darifenacin, fesoterodine, solifenacin, propiverine and trospium chloride), oxybutynin more rapidly reached the brain [80] and impacts thus more severely the brain functioning [81]. It also presents more other side effects [38]. Researchers have thus looked for drugs safer than oxybutynin for treating urinary-incontinence (see information in [39]). The nowadays best one found is not an anticholinergic drug, but a compound acting on the acetylcholine receptors, so otherwise: mirabegron, the effects of which we intended to examine as we examined those of oxybutynin.

On ants, mirabegron appeared to increase meat consumption, and decrease sugar water consumption as well as general activity. The drug did not affect the ants' locomotion, orientation, audacity (Figure 1 G), tactile perception, brood caring, social relationship, cognition, learning and memory. No adaptation occurred to the impact of mirabegron on food consumption and activity. The ants developed no dependence on the drug consumption, and the effect of mirabegron slowly

vanished over time after weaning, in a total of 52 hours, according to a second order function. All this (found being blind to the literature) was in agreement with the findings of other researchers, but we examined more traits than those looked to by other researchers. On the basis of our results on oxybutynin and mirabegron, in order to minimize the adverse effects while maximize the wanted ones, we cautiously propose to treat urinary-incontinence by using alternatively mirabegron, spacing out its intake (for instance every two days during a total of six days), and an anticholinergic drug (on the seventh day for instance), each of these two drugs being taken at their usually recommended dose. On ants, habituation to the wanted effect of mirabegron could not be examined; we thus advice studying this important potential event in humans. Let us cite clinical works made by practitioners: [82, 83, 84, 85, 86, 87]. Some practitioners treat their patients using currently mirabegron and an anticholinergic drug, as we proposed, but the way they use the two kinds of drug differ from ours [88]. In fact, the use of the two kinds of drugs seems to be unanimous, but which drug and which combination to use should still be defined. More information on this topic will be available in Cammaerts and Cammaerts (accepted paper, soon published).

Three previously examined drugs

Using ants as models, we found that simvastatin increased their sugar consumption, and reduced their activity, speed of locomotion, orientation ability, audacity, tactile perception, cognition, learning and memory. These findings were in agreement with those reported by other researchers (see the introduction section). The drug did not affect the ants' social relationship. Adaptation occurred to some side effects but not to the increase of sugar consumption. Simvastatin did not lead to dependence. Studying in the same way the side effects of arterin®, we found that this natural product had nearly the same adverse effects as simvastatin, but had somewhat less effects, and those presented were far less pronounced. Therefore, for treating not drastic hypercholesterolemia, we advice using arterin® and paying attention to the patients' sugar consumption and activity. For treating important, high hypercholesterolemia, usual not natural statin could be used but imperatively controlling the patients' sugar intake, activity, perception and memory. Details are available in [44, 45].

On ants, Rennie® appeared to decrease the food consumption, speed of locomotion, orientation ability, audacity, tactile (pain) perception, cognition, conditioning ability and memory, but to not affect the social relationships. The ants did not adapt themselves to the side effects of Rennie®; on the contrary, these side effects appeared to slightly increase over the drug consumption. No dependence occurred on Rennie® consumption and the effect of this drug slowly, linearly decreased after weaning, fully vanishing in a total of 14 hours. Details on our experimental works can be found in [89]. In the literature, no clinical research work could be found, but the instructions for use joined to the package of this medicine reports several problems caused by its use. The most common ones are a large decrease of the appetite, some decrease of the gustative perception, a reduction of the intestinal absorption of several important substances, some muscular weakness, tiredness, loss of strength, neuromuscular problems, confusion, impact on the nervous system, decrease of the reflexes, psychic troubles. All this incited us to examine the potential side effects of a natural product which can, among others, reduce the stomach acid: the green clay. During the first 12 hours of their green clay consumption, the ants walked slowly and seemed tired, but after this initial period, they appeared to be in very good health. Green clay did not affect their food consumption, activity, locomotion, orientation, audacity, tactile (pain) perception, social relationship, cognition, conditioning ability and memory. Ants developed no dependence on green clay consumption. After weaning, the ants went on being in good health during 14 hours. Then, during 24 hours, the ants moved slowly and seemed to recover after their green clay treatment. The ants were again as usual 48 hours after weaning. In fact, for humans, green clay has a disinfecting effect on the body [https://www.via-les-herbes.com/green-clay-benefits/] and presents no adverse effect [www.frenchclayforall.com/info.html]. Our findings on green clay are in agreement with those available on internet, this including the tiredness at the start of the treatment as well as the recovering time period some times after the end of consumption [www.sos-detresse.org/conseils-pratiques/argile.htm]. More information on this subject can be found in [90]. We conclude using green clay to treat, among others, stomach hyper acidity, but to stop consuming it for three days every three weeks.

Tested on ants as models, alprazolam appeared to decrease food consumption, general activity, speed of locomotion, orientation ability, audacity, tactile perception, and middle-term memory. The drug impacted the ants' social relationship but did not affect their conditioning ability and thus their short-term memory. No adaptation occurred to the side effects of alprazolam, and the ants became dependent on this drug consumption. The effect of the drug on the ants' locomotion rapidly decreased in 11 hours after weaning, but the ants still

presented abnormal social relationship 52 hours after having stopped consuming alprazolam. More information on these findings can be found in [91]. Some of them are similar to those observed in humans (e.g. dependence: http://www.benzo.org.uk/waf2.htm); others are novel (e.g. impact of social relationship) and may exist in humans. In the latter, some persons may become hyperactive while other ones may be less active. In ants, we observed that the same ant can be very active for a time, then nearly inactive during a short time, and thereafter again very active. Paradoxal reaction can thus occur in the same individual. Habituation to the effect of alprazolam can occur in humans who then will want to consume more amount of drug over time. Our findings and those reported in literature (https://fr.wikipedia.org/wiki/Alprazolam/html) incited us to look for another safer anxiolytic, and we presumed that the natural product 'Sedinal plus' containing the extract of four plants could be such an alternative. Indeed, tested on ants as models, this product significantly calmed them and no habituation occurred to this wanted effect. 'Sedinal plus' had only very few side effects on the ants physiology and ethology, and the ants soon adapted themselves to these few side effects. The ants developed no dependence on Sedinal plus, the calming effect of which slowly, step by step, vanished in 29 hours after weaning. Details about these findings can be found in [92]. Without any doubt, 'Sedinal plus' should be recommended for persons suffering from stress and anxiousness.

Conclusion

A brief discussion is given at the end of each subsection relative to the different situations, products and drugs the side effects of which have been examined. Long discussions, based on our findings and those of other researchers, about such effects are furnished in every papers published on these situations, products and drugs [e.g. 10, 14, 19, 39, 44, 45, 61, 64, 89, 90, 91, 92]. Here below, we summarize the most important points deduced from such discussions.

Photopollution affects all the living organisms, including the humans; it should – and can - be decreased. Most of humans' nocturnal light is not necessary. Brutal noises affect the individuals' health: their production should be maximally limited. On the contrary, smooth noises ameliorate the individuals' health: they should be maximally used. The nowadays olfactory pollution of the atmosphere impacts the animals' and the humans' health. It should be controlled and minimized. Though being an admirable technology, manmade electromagnetism (wireless communication, Wi-Fi, connected apparatus …) largely impacts all the living organisms (plants, insects, birds, mammals). Due to conflict of interest, and despise of its harmful consequences, this technology goes on progressing up to unnecessary levels. This should be recognized, and the development and use of wireless technology should be – must be – largely decreased.

Due to its severe side effects, Sativex should be used only for patients suffering from multiple sclerosis, and these patients' food consumption, social relationship, orientation ability, cognition, memory, mood, and potential dependence on the drug should be monitored. As for chloroquine and hydroxychloroquine, what we observed on ants agreed with the observations made in human, and this allows stating that one or the other drug must be used according to the patients' physiology, must be given only every 36 hours, that the patients must be treated case by case. Concerning the drugs nowadays used to treat urinary-incontinence, we cautiously propose to alternatively use mirabegron, spacing out its intake (for instance every two days during a total of six days), and an anticholinergic drug (on the seventh day for instance). For treating high hypercholesterolemia, statin could be used, but the patients' sugar intake, activity, perception and memory should be imperatively controlled. Not severe hypercholesterolemia should be treated thanks to the natural product arterin®. Rennie® allows decreasing the stomach acidity, but its consumption leads to several health problems. Green clay, a natural product, should preferably be used, and its consumption stopped during three days every three weeks. Alprazolam is a commonly used anxiolytic, but is has harmful impacts on the health (e.g. dependence). We recommend to use the natural product 'Sedinal plus' instead of it.

All along our studies of the effects of products used by humans, the ants turned out to be excellent biological models. Thanks to them, we could find effects observed in humans, precisely assess several ones, point out effects not yet described in humans and provided some valuable advices. It is really obvious that, for most of humans' illness and for their health, novel efficient drugs with very few adverse effects should be researched and tested. However, often, during such works, conflict of interests appears, e.g. 'nearly perfect' drug which may be provided without substantial pecuniary benefit are neglected, not recommended. For optimizing a treatment, in some cases, one and/or the two following ways could be tried: treating the patients case by case according to their physiology and native health problems (example: use of either chloroquine or hydroxychloroquine), treating the patient thanks to a combination of two different kinds of drug (example: use of mirabegron and an adequate anticholinergic drug). Natural products

exist for treating nearly all the illnesses which commonly affect humans; they should not be disregarded but employed in addition to *sensu stricto* medications. Also, in some cases, homeopathy may help [93]. Though this is beyond the present subject, medicines and medicinal cares are not cheap, and many ill persons in the world are precarious and have not the possibility to sufficiently take care of them them.

Acknowledgements: We are very grateful to Roger and David Cammaerts who helped me all over these experimental works as well as for writing the manuscripts and looking at the literature.

Conflict of interest: We affirm having no conflict of interest as for the use of any of the situations, drugs and products the effects of which we examined on ants as models. We received no money for making our research works.

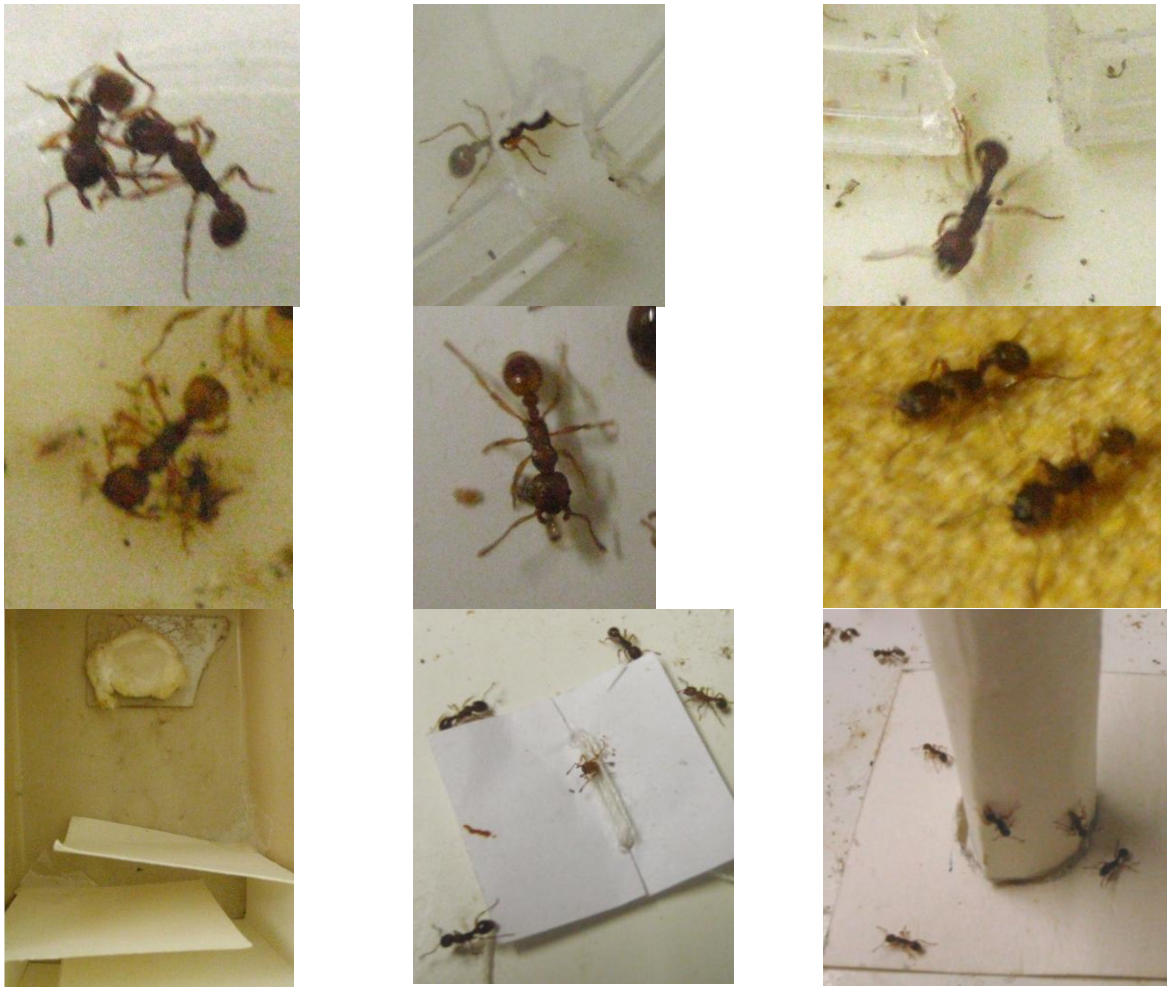

Figure 1. Some views of experiments made for examining the side effects of situations and drugs used by humans.

A: under continuous lighting, ants of a same colony abnormally presented some aggressive behavior; **B1**: under beating noise, ants were stressing and failed escaping from an enclosure; **B2**: under flowing water noise, ants did not stress and could escape from the enclosure; **C1**: under onion odor, ants did not take well care of their brood, **C2**: under lavender odor, ants took care of their brood, i.e. they hold and re-entered larvae experimentally removed from the nest; **D**: ants consuming Sativex walked nearly normally on a rough substrate, poorly perceiving its uncomfortable character; **E**: ants consuming chloroquine had their cognition impacted and could not cross a path with twists and turns as could do ants under normal diet; **F**: ants consuming oxybutynin poorly oriented themselves towards a tied nestmate contrary to ants not consuming this drug; **G:** ants consuming mirabegron came onto an unknown risky apparatus just like those not consuming this drug. More photos and numerical results can be found respectively in [10, 14, 64, 19, 36, 39].

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