Interaction of electromagnetic fields with cancer and auto-immunity.

**Note:**
The present summary can only be understood after reading "Interaction of the cycle of T lymphocytes with electromagnetic fields"

Effects of electromagnetic fields on cancer are the most studied and well-known. Effects on auto-immune diseases are related to effects on cancer: pro-cancer effects are generally pro-auto-immune and vice versa. Effects on developmental steps (like incisor eruption date) are probably related to a disturbance of auto-immunity and are therefore dealt with in this document.

In this document, known experimental and statistical effects are interpreted on the basis of principles which are more specifically described in the documents "Interaction of the cycle of T lymphocytes with electromagnetic fields" and in "Physics of antigen recognition and of its interaction with electromagnetic waves." which are also available on www.vincent-lauer.fr

The fact that numerous experimental results are interpretable on the basis of these few basic principles is an important confirmation of these principles.
Preliminary: from the document « Interaction of the cycle of T lymphocytes with electromagnetic fields ».

Figure 3: cycle of T lymphocytes and effects of exposure to electromagnetic fields

Table 1: effect on diseases under mechanism INH
5-Interpretation of experimental results: on animals.

**Lower bandwidth or permanent exposure: mechanism M1 dominates**

- During the exposure period (repeated daily exposures or permanent exposure)
  - Pro-cancer
  - Bandwidth increases
  - Power increases

- Pro-auto-immun
  - De Gannes et al (40 V/m)
  - Grigoriev et al (40 V/m)
  - Vinogradov et al (10 V/m)

- Disturbance of developmental timing
  - Pregnancy
  - Exposition permanente

**Larger bandwidth and transient situation: mechanism M1 dominates**

- After the exposure period
  - Pro-cancer
  - Bandwidth increases

- Pro-auto-immun
  - De Gannes et al (40 V/m)
  - Grigoriev et al (40 V/m)
  - Vinogradov et al (10 V/m)

**Dimensioned immunity**

- Groupe A, "normal" (no random data)
- Groupe C (except lymphoma) (random data)

- Sommers et al (200 V/m)
- Szudzinski et al (200 V/m)
- Takahashi et al (30 V/m)
- Bornhausen et al (100 V/m)
- Fraunhofer Inst. 1 30-100 V/m
- Fraunhofer Inst. 2 30-100 V/m
- Sommer et al 22-120 V/m

**Intentional**

- During exposure period (daily exposures)
  - Table 1 column E anti-cancer
  - Utteridge et al 2002, (lymphome seulement)

**Unintentional**

- (environmental exposure)
  - Pendant ouverture quotidienne des cages
  - Table 1 col. E anti-cancer
  - Frei et al 1998b
  - Bartsch et al 2002

**Entry in the Faraday cage:**

- Table 1 col. D
- Pro-auto-immun

**Leaving the Faraday cage:**

- Table 1 col. C
- Lower antibody production

-Seemingly contradictory experimental results appear mutually coherent when re-examined within the present approach.

Figure 4: summary of animal experimentation.
Concerning cancer experimentations, group A comprises all experimentations that have not used a random or pseudo-random modulation of the signal. These represent almost all results which the WHO refers to when stating that no effects exist on animal models. For example, Szudzinski et al 1982, Utteridge et al 2002, Zook and Siemens 2001, Frei et al 1998 a,b, Repacholi et al 1997, Sommer et al 2004, Toler et al 1997, Chou et al 1992, Bartsch et al 2002. Because there is no random modukation, bandwidth is low. This applies to a single frequency wave but also to a pulsed wave having discrete frequency components that do not fill the bandwidth. (Adey et al 200) is also in this group due to the low bandwidth of the FM signal.

In group A, there is a pro-cancer or neutral effect, depending on power. The necessary power to obtain a pro-cancer effect is always higher than 60 V/m. The dominant mechanism is INA, due to the low bandwidth, and it causes a pro-cancer effect because lymphocytes are rarefied due to elimination by positive selection in the thymus.

Some exceptions exist (Bartsch & al 2002, Frei & al 1998b). Daily cage openings generate an exposure to wideband artificial waves present in the environment. Normally this effect is not seen because it affects equally the exposed group and the sham exposed group. But when the "sham exposure" Faraday cages are not well closed (a point which is not usually verified) the anti-cancer effect is diminished in the "sham exposure" group, which yields an anti-cancer effects in the exposed group as compared with the sham-exposed group.

Group B comprises experimentation in which the signal is modulated by random or pseudo-random data, bandwidth is about 200 kHz, and exposure typically 1h/day, i.e. Tillmann 2007 and Adey et al 1999. Mechanism INH dominates due to a higher bandwidth and the effect is anti-cancer (Table 1 column E).

Group C comprises experimentations in which the signal is modulated by random data, the bandwidth is about 5 MHz, there is additionally a modulation of power, and exposure is near permanent (Tillmann et al 2010, Sommer et al 2007). Depending on power, effects INH or INA dominate. A pro-cancer effect similar to group A can be obtained at lower exposure values, compatible with accepted human exposure (Tillmann et al 2010). In (Tillmann et al 2010) the effect is stronger at 40 V/m than at 130 V/m which is an existing possibility within the theoretical approach. In (Tillmann et al 2010) lymphomas are not affected. For reference, in (Tillmann et al 2010) the total number of cancerous and pre-cancerous lesions increases by 36% at 40 V/m, and hepatocellular adenomas increased by 69%. But in (Sommer et al 2007) the effect was anti-cancer on lymphomas, probably because an excessive exposure power diminished the effectiveness of mechanism INA, so that mechanism INH dominated, yielding an anti-cancer effect as per Table 1 column E.
Within Group A, only (Szudzinski et al 1982) evaluated the impact of exposure on a cancer starting after the exposure period. Exposure accelerated development of benzopyrene-induced skin cancer in mice, even when exposure terminated prior to cancer induction (Szudzinski & al 1982). In this case elimination of T lymphocytes by positive selection under mechanism INA played an essential role, yielding the observed pro-cancer effect due to the low numbers of recent thymic emigrants.

But when rats were exposed 7 hours/day 5 days/week during 30 days to 2450 MHz at 5W/m2 in a Faraday cage in Russia, a pro-auto-immune effect was found 7 and 14 days after the end of the exposure period (Grigoriev & al 2010). Due to the lower power, more T lymphocytes survived positive selection as compared to (Szudzinski & al 1982). Some of these were temporarily inactivated during their transit through the negative selection portion of the thymus, thus escaping most negative selection steps. Abnormally aggressive T lymphocytes (which should have been eliminated by negative selection) survived in a temporarily inactivated state, yielding the increased antibody production after definitive cessation of exposure when these T lymphocytes went out of the temporarily inactivated state and started auto-immune reactions. Thus, the effect post-exposure was pro-autoimmune (and impliedly anti-cancer), unlike (Szudzinski & al 1982) where the effect post-exposure was pro-cancer. However, during the exposure period, the immunity was diminished as in (Szudzinski & al 1982), as was verified in (Dronov & al. 1971).

This experience was replicated in France but the pro-auto-immune effect was not observed (De Gannes 2009). Instead, in the exposed and sham group (both of which had stayed 30 days in the Faraday cage) a significant number of antibodies were present in significantly lesser amounts at day 14 than in the control group (which did not stay in the Faraday cage) (Table 2). The difference was thus related to using a Faraday cage, which could have an effect only if an environmental exposure to an artificial electromagnetic wave was present. This environmental resulted in a dominant anti-auto-immune effect as per Table 1 column C after the rats were brought out of the Faraday cage, and a generally lower antibody production due to negative selection without the environmental exposure eliminating more T lymphocytes than in the presence of the environmental exposure.

<table>
<thead>
<tr>
<th>Control(g1) - exposed(g2)</th>
<th>Exposed(g1) – Sham(g2)</th>
<th>Control(g1) - Sham(g2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 [&lt;0∙00001]</td>
<td>4 [0∙21]</td>
<td>11 [0∙00002]</td>
</tr>
<tr>
<td>2 [0∙69]</td>
<td>3 [0∙43]</td>
<td>1 [0∙91]</td>
</tr>
</tbody>
</table>

Table 2: Elisa test results in De Gannes & al. Significance of the differences of optical densities between groups in each ELISA test result is assessed based on a single-sided z-test. Significance of the numbers shown is assessed using a cumulative distribution function of a binomial law with parameters $p=0.05$ and $N=48$ (total number of Elisa tests per group: 48).
Interpretation of experimental results: on animals, developmental steps.

Use Figures 3 and 4 and Table 1 as a guideline to understand the observations.

In multigeneration studies where the parental generation and tested generation were both exposed lifelong, the standard deviation of developmental timing endpoints increased significantly (Table 3). To check how unusual this really is, a random search of studies evaluating chemicals and having eye opening and vaginal opening as an endpoint was made. The f-numbers remain far lower than for exposure to electromagnetic waves. A search for studies concerning immuno-suppressants yielded one publication concerning cyclosporin (Allais & al 2009), in which some f-numbers are higher than for other chemicals and comparable to those observed for exposure to radiofrequencies (Lauer 2014). This links the observed disturbances to the immuno-suppressive effect of permanent exposure (under mechanism INA). A hypothetical explanation is that some developmental steps may be triggered or inhibited by the presence of lymphocytes able to recognize a specific antigen and suppress the corresponding cell line. Exposure to an electromagnetic wave would diminish the number of naive T lymphocytes surviving positive selection under mechanism INA and therefore increase the randomness of the point in time at which a suitable line of lymphocytes emerges, yielding the observed increase of standard deviation of developmental timing endpoints.

However, where the parental generation was exposed only from mating (Fraunhofer Institute 2009) the standard deviation of developmental timing endpoints was significantly lower in the sham exposed group than in the control group, likely reflecting the pro-auto-immune effect on the parental generation of entering the Faraday cage in the presence of an environmental exposure. The low exposure group had a significantly higher standard deviation than the sham exposed group as expected, but the high exposure group showed no significant difference as compared to the sham group. This power dependency likely reflects the periodic character (including a number of periodic or near periodic features) of the test signal, which results in power windows (see appendix). Starting the exposure 10 weeks before mating removed the difference between sham exposed and control groups (Fraunhofer Institute 2008) but the power dependency remained, with the only significant change being a lower standard deviation in the high exposure group. The origin of this lower standard deviation is somewhat unclear but is not highly surprising since a significantly lower standard deviation also occurred in one case (balanopreputial cleavage) with the immuno-suppressant cyclosporin.

The same pro-auto-immune effect on the parental generation of entering the Faraday cage determined the abnormally low number of malformed fetuses in the sham exposed group of the first generation of a 4-generation study (Jacobs university 2008, Sommer & al 2009), attributable to a stronger selective action of the parental immune system during pregnancy. The same test signal was used as in Fraunhofer 2008 and 2009, yielding a power dependency of the number of malformed fetuses in the exposed groups.

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Exposure</th>
<th>Pub. Ref.</th>
<th>N</th>
<th>Sham, standard deviation</th>
<th>Exposed, standard deviation (power W/m² ;SAR W/kg)</th>
<th>f-number [p-value]</th>
</tr>
</thead>
<tbody>
<tr>
<td>vaginal opening</td>
<td>CDMA</td>
<td>Takahashi &amp; al.12</td>
<td>12</td>
<td>1.9</td>
<td>2.9 (3-57;0.08)</td>
<td>2.33 [0-1]</td>
</tr>
<tr>
<td>balano-preputial cleavage</td>
<td>CDMA</td>
<td>Takahashi &amp; al.12</td>
<td>12</td>
<td>1.8</td>
<td>3.5 (3-57;0.08)</td>
<td>3.78 [0-025]</td>
</tr>
<tr>
<td>eye opening</td>
<td>UMTS</td>
<td>Bornhausen &amp; al.11</td>
<td>12</td>
<td>0.29</td>
<td>1.03 (29;0.4)</td>
<td>12 [0-01]</td>
</tr>
<tr>
<td></td>
<td>GSM</td>
<td>Bornhausen &amp; al.11</td>
<td>12</td>
<td>0.29</td>
<td>5.1 (28;0.4)</td>
<td>309 [0-01]</td>
</tr>
<tr>
<td>ear opening</td>
<td>UMTS</td>
<td>Bornhausen &amp; al.11</td>
<td>12</td>
<td>0.4</td>
<td>2.21 (29;0.4)</td>
<td>30 [0-01]</td>
</tr>
<tr>
<td></td>
<td>GSM</td>
<td>Bornhausen &amp; al.11</td>
<td>12</td>
<td>0.4</td>
<td>3.92 (28;0.4)</td>
<td>96 [0-01]</td>
</tr>
<tr>
<td>incisor eruption</td>
<td>UMTS</td>
<td>Bornhausen &amp; al.11</td>
<td>12</td>
<td>0.77</td>
<td>0.75 (29;0.4)</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>GSM</td>
<td>Bornhausen &amp; al.11</td>
<td>12</td>
<td>0.77</td>
<td>2.82 (28;0.4)</td>
<td>13 [0-01]</td>
</tr>
</tbody>
</table>

Table 3: disturbance of developmental timing endpoints in multi-generation studies with the parental generation exposed lifelong to test signals. single-sided p-value of Fisher's test of equality of variances.

Use Figure 3 and 5 and Table 1 as a guideline to understand the observations.

Most comparable case in animal experimentation

Grigoriev et al

Adey et al (NADC)

None

incidence of brain cancer

rare users: maximal anti-cancer effect, mechanism INA, T cells are inactivated during negative selection.

moderate users: anti-cancer effect (Interphone, Schutz et al.) mechanism INH (Table 1 column E) dominates

heavy users: local pro-cancer effect (Interphone). Mechanism INA, T cells are temporarily inactivated in the most exposed area

Hardell et al: rare users as reference group

Counterpart of anti-cancer effect: pro-auto-immune effect (multiple sclerosis) Poulsen et al

Figure 5: summary of effects on GSM users. Seemingly contradictory experimental results appear mutually coherent when re-examined within the present approach.
Effects on mobile phone users can be classified as follows.

(i) a local pro-cancer effect due to transition to state (ANR) [mechanism INA] causing temporary inactivation of lymphocytes in the most exposed part of the head, where the instantaneous power can reach more about 10W/m2 average power for a GSM phone.

(ii) an anti-cancer, pro-autoimmune effect as per Table 1 column E [mechanism INH].

(iii) an effect on thymus selection based on mechanism INA at a peak instantaneous power of about 2W/m2 for GSM. For rare exposures this effect is anti-cancer due to transitions to state (ANR) in the negative selection part of the thymus, corresponding to the pro-auto-immune effect observed in rats after cessation of exposure between 0.5 and 5 W/m2 (Grigoriev & al, Vinogradov & al) This anti-cancer effect is attenuated by elimination during the positive selection step of T lymphocytes which otherwise would have been inactivated during the negative selection step. In the case of rare exposures (occurring at intervals longer than thymus transit time), there is no attenuation because mature lymphocytes that are temporarily inactivated in the negative selection part of the thymus during exposure were not exposed during their transit through the positive selection part. As exposures become more frequent effect (iii) is attenuated and possibly inversed, corresponding to the diminished immunity in rabbits during a period of repeated exposures (Dronov & al).

The overall effect on mobile phone users results from the combination of these effects. For rare users effect (iii) is anti-cancer and likely dominating over effect (ii) because each exposure inactivates lymphocytes for more than 12 hours, whilst inhibition under mechanism INH does not last. For moderate and heavy users effect (iii) is overcome by effect (ii) due to the relatively high bandwidth as is the case in Adey et al. Indeed, the effect is found anti-cancer for rare and moderate users (Interphone, Lakhola & al, Muscat & al, Inskip & al, Schuz & al) with a trend towards a peak anti-cancer effect for rare users (Interphone, Inskip & al) corresponding to effect (iii), which does not reach significance due to low numbers. When rare users (corresponding to maximal anti-cancer effect) are taken as the reference group the effect appears pro-cancer (Hardell & al).

Locally in the most exposed part of the brain effect (i) is found to dominate for heavy users (more than 1 hour/day) (Interphone). The ratio of the power in the brain to the power in the thymus is stronger than in Adey et al (NADC) due to longer brain to thymus distance in man than in rat, so the anti-cancer effect (ii) is of a lesser amplitude than in Adey et al (NADC) and does not overcome the local pro-cancer effect under (i) for heavy users, obtained at a higher power.

The anti-cancer effect of moderate mobile phone use is matched by a corresponding pro-auto-immune effect yielding an increased risk of death for women having multiple sclerosis if they use a mobile for 7-9 years after diagnosis of multiple sclerosis (Poulsen & al).

Interpretation of statistics: GSM users.

Use Figures 3 and 5 and Table 1 as a guideline to understand the observations.
7. Interpretation of statistics: broadcasting towers and mobile telephony base stations.

Use Figures 3 and 6 and Table 1 as a guideline to understand the observations.

**Mechanism INA dominates** (permanent pro-cancer effects)

**Mechanism INH dominates** (effects vary as per Table [Lauer 2014b-1] column E)

**Pro-cancer** (Table [Lauer 2014b-1] column C)

**Anti-cancer** (Table [Lauer 2014b-1] column E)

Exceptions to Table [Lauer 2014b-1]:

- Swedish FM exposure on melanoma (Hallberg and Johansson 2002, permanent pro-cancer)
- UK TV exposure on melanoma (Dolk et al 1997b, permanent anti-cancer)

**In blue:** Nearest or related animal experiment.

5 mW/m² Netanya (mobile telephony). Wolf et al 2004

UK TV transmitters Dolk et al 1997b on leukemia, 1997a on "all cancers"

<10 μW/m² Paris (DVB onset), Loire-atlantique and Maine-et-Loire (DVB onset and analog shutdown) Lauer 2013

De Gannes et al 2009 (un-intentional)

UK mixed FM+TV transmitters Dolk et al 1997a,b on leukemia 0-4.9 km from transmitter

Tillmann et al 2010 pro-cancer

Increasing power

UK FM radio transmitters Dolk et al 1997b on leukemia:

Sommer et al 2007 anti-cancer

Power windows

UK mixed FM+TV transmitters Dolk et al 1997b on leukemia 4.9-10 km from transmitter

GSM: Spinelli et al 2009,

Tillmann et al 2007

Utteridge et al 2002 on lymphoblastic lymphoma

Adey et al 1999;

Heikkinen et al 2003 (INA)

Pro-cancer (Table [Lauer 2014b-1] column C)

Low to high exposure transitions

Daily bandwidth or power variations

Sweden FM exposure on melanoma (Hallberg and Johansson 2002, permanent pro-cancer)

UK TV exposure on melanoma (Dolk et al 1997b, permanent anti-cancer)

Figure 6: summary of exposure to broadcasting towers and mobile telephony base stations. Seemingly contradictory experimental results appear mutually coherent when re-examined within the present approach.
Exposure to GSM from a base station resulted in cancer incidence being multiplied by 4 in the second year after start-up of the emitter in Netanya, at 5 mW/m² (Wolf & al 2004), corresponding to the transient pro-cancer effect of Table 1 column C. Most victims were women, which is attributable to a more sedentary lifestyle: men working outside the exposed area had their immune system efficiently fighting cancer when at work. Any anti-cancer effect as per Table 1 column E was lower than the pro-cancer effect, at least during a transition period.

Onset of Digital Video Broadcasting followed by shutdown of analog television, both on a local emitter, resulted in transient variations of the percentage of deaths in the 35-54 years age class in small cities of Loire-Atlantique and Maine-et-Loire, which did not occur in comparable cities which did not have a local emitter (Figure 6 and Table 4). DVB power was less than 5 µW/m^2 in at least one of these cities. These variations are attributable to the transient effects as per Table 1 columns C and D. The fact that specific age classes are affected is attributable to corresponding stages in thymus involution. Examination of causes of death in Paris for men aged 35-44 years reveals a comparable effect (figure 7 and Table 5) for men aged 35-44 years at the onset of DVB (which was not followed by a shutdown of analog TV), including a one-year shift between diminished mortality by heart and liver diseases (likely attributable to an anti-auto-immune effect under Table 1 column C) and increased mortality by neoplasms (attributable to a pro-cancer effect under Table 1 column C). This explains only partly the observations in Figure 6, since the affected age categories are wider on Figure 6 and an effect of the magnitude seen in Paris would not have reached significance in small cities. However, whilst the observed effects in Paris and Netanya could arguably be due to coincidences and other causes than DVB / GSM onset, the observations in Loire-Atlantique and Maine-et-Loire cannot easily be excluded on this ground since they selectively affected cities having a change in exposure conditions.

A higher incidence of leukemia (Dolk & al 1997) was found near TV-only emitters in the UK over a 12 years period as compared to UK national average. The relative incidence rates in these cases were in the order of 7% above UK national average, much lower than in Paris following the onset of DVB, low enough to be explainable by the repeated effect of transitions as per Table 1 column C as emitter power increases over time and by the pro-cancer effect under Table 1 column C applied to newly arrived residents.

The same study found a reduced incidence of leukemia for mixed TV and FM emitters. FM emitters were not working full time, and the effect is under Table 1 column E as the specific FM+TV combination was also not full time. However very near to the emitter the effect was pro-cancer as power was sufficient so that mechanism INA dominated.

The same study found that FM radio-only emitters had power-dependent pro-cancer and anti-cancer effects on leukemia. As FM emitters were not emitting full time there was an anti-cancer effect on leukemia based on Table 1 column E, but it competed with a pro-cancer effect due to mechanism INA and having power windows. For power values for which INA was not efficient, the effect was anti-cancer. For power values for which INA was efficient, the effect was pro-cancer.

In the same study, the effect on all cancers pooled near a mixed TV and FM emitter was a mix of a pro-cancer effect on newly arrived persons and of a pro and anti cancer effect having power windows.

In GSM-dominated environments the dominant long-term effects are anti-cancer (Spinelli et al 2010). The GSM system uses important bandwidth variations (200 kHz at low load, 30 MHz at maximum load). For example a lymphocyte that reacts above a 1 MHz bandwidth threshold is maximally inhibited (INH) at large bandwidth and not inhibited at all at the lowest bandwidth. The contrast between low exposure and high exposure response is a lot stronger than with CDMA or UMTS which have a constant bandwidth. It generates a long term anti-cancer effect under Table 1 column E. This does not preclude the existence of a temporary pro-cancer effect at onset of a base station and of a long term pro-cancer effect around a base station which has a constant load.

Permanent pro-cancer effects similar to those found in animal studies (Tillmann et al 2010) are expected at sufficiently high power levels but have not been confirmed. They may have impacted the (Dode et al 2011) study in view of observed power levels but this study was found to be unreliable.

Epidemiological findings suggest a link between increase of melanoma incidence and exposure to FM broadcasting radio-frequencies (Hallberg & al 2002), which would go farther than a temporary effect. Wavelengths longer than the size of the human body do not penetrate the body well because charge carriers accumulate on the surface, canceling the field inside the body (this applies to a certain degree to FM around 100 MHz which is an intermediate wavelength), yielding stronger fields on the skin than inside the body, so that lymphocytes selected in the presence of the fields inside the thymus may be inhibited under mechanism INH when exposed to the stronger field on the skin. This would be an exception to Table 1, similar to the local pro-cancer effect of mobile phone use in the most exposed part of the head.
Interaction of the electromagnetic fields with cancer and autoimmunity

**Figure 7:** Yearly percentages of deaths in the 35-54 years age categories. The horizontal scale shows the time period covered by each point of the graph. The "TV" group comprises all cities in Loire-Atlantique and Maine-et-Loire that had a DVB emitter authorized on February 5, 2010 except La Baule which was excluded from the study due to possible interference with the nearby local emitter of Saint Nazaire. Each city of the TV group also had an analog TV emitter discontinued on 18/5/2010. The non-TV group comprises cities in the same area that did not have any analog or DVB emitter. Based on Lauer 2013 (La Flèche was excluded because it had no DVB onset but it had a shutdown of analog TV). DVB power in Pontchâteau was below 5µW/m².

**Table 4:** Significance of the observations in "Loire-Atlantique & Maine-et-Loire". Based on data from Lauer 2013. n- (resp. n+) is the number of deaths in the 35-54 years age category in the year Y- (resp. Y+) starting 45 days before (resp. 360 days after) DVB onset and ending 315 (resp. 720) days after DVB onset. P is the probability of the number of deaths in year Y- being less than or equal to as observed and the number of deaths in year Y+ being at least as much as observed (i.e. p-value). The existence of a minimum in year Y- followed by a maximum in year Y+ is significant in each city of the TV group (although only to p=0.054 in Saumur) and in no city of the non-TV group.

<table>
<thead>
<tr>
<th></th>
<th>n-</th>
<th>n+</th>
<th>n+</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chateaubriant</td>
<td>4</td>
<td>6</td>
<td>87</td>
<td>0.3383</td>
</tr>
<tr>
<td>Cholet</td>
<td>22</td>
<td>342</td>
<td>334</td>
<td>0.0303</td>
</tr>
<tr>
<td>Challans(a)</td>
<td>7</td>
<td>76</td>
<td>108</td>
<td>0.6498</td>
</tr>
<tr>
<td>Ancenis</td>
<td>3</td>
<td>36</td>
<td>52</td>
<td>0.6883</td>
</tr>
<tr>
<td>total TV</td>
<td>36</td>
<td>514</td>
<td>581</td>
<td>0.4596</td>
</tr>
<tr>
<td>Pontchateau</td>
<td>0</td>
<td>27</td>
<td>56</td>
<td>0.0190</td>
</tr>
<tr>
<td>Saumur</td>
<td>5</td>
<td>102</td>
<td>128</td>
<td>0.0542</td>
</tr>
<tr>
<td>Segré</td>
<td>0</td>
<td>46</td>
<td>58</td>
<td>0.0078</td>
</tr>
<tr>
<td>total non-TV</td>
<td>5</td>
<td>175</td>
<td>242</td>
<td>0.0005</td>
</tr>
</tbody>
</table>
The onset of DVB took place in January-March 2005. The low in heart and liver diseases is in 2005. The high in neoplasms is in 2006. Cancer, chronic disease of the liver and ischaemic heart diseases together represented 49% of deaths for men aged 35-44 years in Paris, yielding a non-negligible impact on the overall death rate. Overall DVB power was below 10 μW/m² in 99% of about 3000 measurements. Re-analysis of data from Lauer 2013.

<table>
<thead>
<tr>
<th>Year</th>
<th>Neoplasms N</th>
<th>p-value</th>
<th>Ischaemic heart diseases N</th>
<th>p-value</th>
<th>Chronic diseases of the liver N</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>83</td>
<td></td>
<td>39</td>
<td>0.000</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>97</td>
<td>0.148</td>
<td>37</td>
<td>0.409</td>
<td>19</td>
<td>0.500</td>
</tr>
<tr>
<td>1981</td>
<td>83</td>
<td>0.148</td>
<td>30</td>
<td>0.196</td>
<td>19</td>
<td>0.500</td>
</tr>
<tr>
<td>1982</td>
<td>74</td>
<td>0.236</td>
<td>39</td>
<td>0.139</td>
<td>18</td>
<td>0.435</td>
</tr>
<tr>
<td>1983</td>
<td>84</td>
<td>0.213</td>
<td>26</td>
<td>0.053</td>
<td>15</td>
<td>0.301</td>
</tr>
<tr>
<td>1984</td>
<td>98</td>
<td>0.150</td>
<td>32</td>
<td>0.215</td>
<td>17</td>
<td>0.362</td>
</tr>
<tr>
<td>1985</td>
<td>106</td>
<td>0.288</td>
<td>37</td>
<td>0.274</td>
<td>24</td>
<td>0.137</td>
</tr>
<tr>
<td>1986</td>
<td>106</td>
<td>0.500</td>
<td>27</td>
<td>0.106</td>
<td>17</td>
<td>0.137</td>
</tr>
<tr>
<td>1987</td>
<td>89</td>
<td>0.112</td>
<td>25</td>
<td>0.391</td>
<td>29</td>
<td>0.038</td>
</tr>
<tr>
<td>1988</td>
<td>89</td>
<td>0.500</td>
<td>38</td>
<td>0.051</td>
<td>25</td>
<td>0.293</td>
</tr>
<tr>
<td>1989</td>
<td>92</td>
<td>0.412</td>
<td>30</td>
<td>0.166</td>
<td>19</td>
<td>0.183</td>
</tr>
<tr>
<td>1990</td>
<td>85</td>
<td>0.299</td>
<td>32</td>
<td>0.400</td>
<td>25</td>
<td>0.183</td>
</tr>
<tr>
<td>1991</td>
<td>119</td>
<td>0.009</td>
<td>19</td>
<td>0.034</td>
<td>22</td>
<td>0.331</td>
</tr>
<tr>
<td>1992</td>
<td>90</td>
<td>0.022</td>
<td>33</td>
<td>0.026</td>
<td>17</td>
<td>0.212</td>
</tr>
<tr>
<td>1993</td>
<td>98</td>
<td>0.280</td>
<td>19</td>
<td>0.026</td>
<td>15</td>
<td>0.362</td>
</tr>
<tr>
<td>1994</td>
<td>89</td>
<td>0.255</td>
<td>28</td>
<td>0.095</td>
<td>16</td>
<td>0.429</td>
</tr>
<tr>
<td>1995</td>
<td>73</td>
<td>0.104</td>
<td>17</td>
<td>0.051</td>
<td>11</td>
<td>0.168</td>
</tr>
<tr>
<td>1996</td>
<td>77</td>
<td>0.372</td>
<td>19</td>
<td>0.369</td>
<td>14</td>
<td>0.274</td>
</tr>
<tr>
<td>1997</td>
<td>77</td>
<td>0.500</td>
<td>21</td>
<td>0.376</td>
<td>24</td>
<td>0.052</td>
</tr>
<tr>
<td>1998</td>
<td>72</td>
<td>0.341</td>
<td>17</td>
<td>0.258</td>
<td>21</td>
<td>0.327</td>
</tr>
<tr>
<td>1999</td>
<td>64</td>
<td>0.246</td>
<td>15</td>
<td>0.362</td>
<td>18</td>
<td>0.315</td>
</tr>
<tr>
<td>2000</td>
<td>67</td>
<td>0.397</td>
<td>13</td>
<td>0.353</td>
<td>11</td>
<td>0.097</td>
</tr>
<tr>
<td>2001</td>
<td>66</td>
<td>0.465</td>
<td>13</td>
<td>0.500</td>
<td>14</td>
<td>0.274</td>
</tr>
<tr>
<td>2002</td>
<td>69</td>
<td>0.398</td>
<td>22</td>
<td>0.064</td>
<td>14</td>
<td>0.500</td>
</tr>
<tr>
<td>2003</td>
<td>72</td>
<td>0.400</td>
<td>16</td>
<td>0.165</td>
<td>11</td>
<td>0.274</td>
</tr>
<tr>
<td>2004</td>
<td>65</td>
<td>0.275</td>
<td>16</td>
<td>0.500</td>
<td>15</td>
<td>0.216</td>
</tr>
<tr>
<td>2005</td>
<td>60</td>
<td>0.327</td>
<td>5</td>
<td>0.008</td>
<td>3</td>
<td>0.002</td>
</tr>
<tr>
<td>2006</td>
<td>82</td>
<td>0.032</td>
<td>12</td>
<td>0.045</td>
<td>6</td>
<td>0.159</td>
</tr>
<tr>
<td>2007</td>
<td>58</td>
<td>0.021</td>
<td>12</td>
<td>0.500</td>
<td>2</td>
<td>0.079</td>
</tr>
<tr>
<td>2008</td>
<td>52</td>
<td>0.284</td>
<td>19</td>
<td>0.104</td>
<td>4</td>
<td>0.207</td>
</tr>
<tr>
<td>2009</td>
<td>64</td>
<td>0.133</td>
<td>10</td>
<td>0.047</td>
<td>6</td>
<td>0.264</td>
</tr>
<tr>
<td>2010</td>
<td>62</td>
<td>0.429</td>
<td>17</td>
<td>0.089</td>
<td>6</td>
<td>0.500</td>
</tr>
<tr>
<td>2011</td>
<td>51</td>
<td>0.150</td>
<td>12</td>
<td>0.177</td>
<td>7</td>
<td>0.391</td>
</tr>
</tbody>
</table>

Table 5: Number of deaths (N) and single-sided p-values (p) for men aged 35-44 years in Paris. Single-tailed p-value based on difference in proportions between one year and the previous year (this test is more conservative than in Lauer 2013). Significant values in bold. Single-tailed p-values used because the increase in neoplasms death rates was expected. For ischaemic heart diseases and chronic diseases of the liver, possible use of double-sided p-values (equal to twice the single-sided p-value) would not alter the significance of the 2005 low.
8- Interpretation of long term variations

Preliminary: long term changes are difficult to properly evaluate (evolution in time of diagnosis methods and “Long Term Disease” criteria) and interprete (changes result not solely from exposure but also from improvement of treatments and other possible causes). It is thus difficult to obtain certainties based on long term changes. Short term changes (figures 6 and 7) are much more reliably and easily interpretable. However observations of long term variations are in agreement with the theory. Amongst other, GSM which has a variable bandwidth dependent on network saturation is expected to have anti-cancer and pro-auto-immune effects (Table 1 column E). The following pages propose an interpretation of long term variations in cancer and auto-immune disease (subject to uncertainties as mentioned above).

Long term cancer variations.

Installations of base stations, moving house from an exposed area to a less exposed area, living very near a base station, are situations in which cancer risk increases, resulting in an increased number of cases.

Many of these cancers heal spontaneously (table1, column C), when thymus has produced a new line of T cells able to control cancer. The increase of the number of cases does not yield an increase of the death rate.

Indeed, the anti-cancer effect of GSM, Table 1 column E, determines changes in cancer mortality. This is confirmed by the stronger decrease observed for men aged 35-44, which as discussed for DVB onset in Paris are the most sensitive group.

Figure 8: Increase of cancer incidence in France (in registries active since 1978)

Figure 9: decrease of cancer deaths in France for men, by age classes.
Interaction of the electromagnetic fields with cancer and autoimmunity

Long term changes in auto-immune diseases

Table: Variation of the numbers of yearly new "Long Term diseases" (ALD) in France. The strongest variations are for diseases known (a,c,d,e) or suspected (f,g) as being auto-immune and for chronic disease of the liver (b), which also reacted at the onset of DVB in Paris, showing an auto-immune component.

Figure 10: Age-normalized number of deaths by multiple sclerosis. The difference between curves is due to an increased lifetime in relation with new treatments.

The increase in the number of new cases for auto-immune diseases is higher than the increase in the number of deaths, which is understandable for diseases which yield premature death only after many years, typically after the age of 60 years. The increase in the incidence of auto-immune diseases is likely the counterpart of the decrease of cancer deaths (Table 1 column E).
9. Medical applications

The Multiple Waves Oscillator of Lakhowsky was experimented in the Salpetrière hospital in the 1930s. The unusual shape of antennas facilitated large bandwidth emission. The patient was exposed 15 minutes, various times at a few days to 1 week interval.

Various effects may be implied:
- In case of exposure during a negative selection step, the inhibition of transitions to state CR may yield survival of a lymphocyte which should have been eliminated. This lymphocyte is then unusually aggressive in non-exposed conditions, allowing cancer control.
- Temporary inactivation of a lymphocyte during negative selection makes this lymphocyte escape during about 12h to negative selection, so that it escapes elimination by negative selection. This lymphocyte is then unusually aggressive in non-exposed conditions, allowing cancer control.
- Temporary inactivation of a line of lymphocytes in the neoplasm yields a temporary interruption of inflammation and an evacuation of the lymphocytes line, which may more easily be replaced by a more efficient lymphocyte line.

Yet Lakhowsky understood that administering electromagnetic waves could also be dangerous. He wrote about Marconi’s death at age 63 from multiple heart attacks:

I am, further, convinced that Marconi, the great Italian scientist, died as a result of the overapplication of short waves. As you perhaps know, Marconi had built himself a short wave oscillator of great power, transmitting on about a 6 meter wave length, for therapeutic purposes. He was enthusiastic about the future he foresaw for this type of therapy. In fact, he considered it much more important to humanity than the radio. (…)

His example should be a warning to all practitioners in the use of short waves in therapy.

In the 1960s, Antoine Priore built a machine to cure cancer. This machine stimulated the (b) to (c) transitions above 9 GHz, resulting in an anti-cancer, anti-pathogen effect (Berteaud & al 1971, Riviere & al 1964, Lauer 2014).

The 9 GHz carrier was amplitude modulated, pulsed and accompanied with a variable magnetic field. These characteristics modified the effect and were largely due to technological limitations.

A similar effect was also obtained with the carrier wave only without modulation, impulsion or magnetic field (Fesenko 1999). The wave above 9 GHz acts pursuant to a further mechanism M3 (see appendix) yielding direct stimulation of recognition of the cognate antigen. In short, the (b) to (c) transition is stimulated instead of the (a) to (b) transition, yielding direct stimulation of antigen recognition.

Antoine Priore and Pr. Pautrizel below the « Priore Machine »
The present approach is possibly a crude approximation of reality, yet it has strong explanatory value. It is well-supported by experimental facts and by logical reasoning, bringing a straightforward answer to the question of how T lymphocytes recognize antigens, with the interaction of electromagnetic waves with the immune system being an unavoidable consequence of the antigen recognition mechanism. The latter mechanism itself does not come out of nowhere but was selected by natural selection because it is a straightforward manner of recognizing antigens. Whilst such a logical construct may be refined and improved, it is unlikely to be fundamentally wrong.

The fact that many observations are explainable based on few assumptions (i.e. mechanisms INH, INA) yields a strong presumption that these observations do not result from chance findings or manipulation errors. Therefore, these observations can no more be rejected and should be taken into account in defining any exposure limits.

The evidence in favor of mechanism INH is partly indirect. This could be overcome by cytotoxicity assays in the presence of wideband low-power electromagnetic waves. Generally, the model should thus be taken into account for future experimentations. For example, it will be necessary to take into account the impact of environmental exposure and of exposure changes resulting from the use of Faraday cages in experimental setups.

An implication of the present approach is that electromagnetic waves tend to shift a natural balance between cancer and auto-immune diseases, in a direction which depends on the specific circumstances. Exposure to electromagnetic waves, even at very low power, influences the immune system and has major epidemiological consequences which are not solely potential but are already present in our daily environment. In certain situations, the difference between life and death, disease and good health, results from exposure to electromagnetic waves.

However, unlike, for example, exposure to chemicals, exposure to electromagnetic fields does not always yield adverse effects to human health or effects proportional to the "quantity" of product, that is to say the signal strength. Exposure to electromagnetic waves affect the immune system in a more subtle manner, depending on more qualitative parameters such as bandwidth or transitions between different exposures. At least as regards the effects of very low power on cancer and autoimmune diseases, exposure to electromagnetic waves shifts a balance resulting from million years of evolution of the immune system in an environment without artificial waves. This shift usually results in adverse health effects which are counterparts of other health-promoting effects. For example, a pro-cancer effect is the counterpart of an anti-autoimmune effects.

There are winners and losers, since in many situations a health effect will be detrimental to some and favor others. For example the person who dies because of a pro-cancer effect of the introduction of digital television effect is not the same as that who survives in the same context whilst he would normally have died of a heart attack.

With regard to cancer and autoimmune diseases, the overall result is not one-sided. However, in terms of public health, it would be possible to enjoy the benefits of electromagnetic waves without the drawbacks. This could be done by applying these waves to persons in need, in faradized enclosures.

Major uncertainties remain regarding the effects of electromagnetic waves on infectious diseases, in particular as this effect was not experimentally investigated below 3 GHz.
References

Lauer V.. A model of the interaction of T lymphocytes with electromagnetic waves. HAL : hal-00975963, version Hyper Articles en Ligne. 2014. http://hal.archives-ouvertes.fr/hal-00975963.

www.vincent-lauer.fr
24/02/2015
Interaction of the electromagnetic fields with cancer and autoimmunity

References


