Cruise missiles with depleted uranium on Libya

A first assessment of environmental impact and health

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1. Introduction

The issues regarding depleted uranium (DU) and its toxicity have sometimes, in recent years, gone beyond the scope of science. The writer [1] has dealt with radiation protection for twenty years and depleted uranium since 1999. After an experience of publishing scientific papers in journals, conference proceedings and international conferences on DU, this article attempts to estimate the possible environmental and health impact of the use of depleted uranium in the war of Libya (2011).

Reports of its use have appeared in the media since the beginning of the conflict[2]. In particular, Crusie missiles have been used since the first days, and we will show there is the strong suspect that those missiles bring Depleted Uranium either as flight stabilizers in the wings, or as weight kinetic energy enhancer. In the last week of the conflict, A-10 airplanes were deployed, and those too are well known for using DU bullets.

The ICBUW (International Council for the Ban of Uranium Weapons) has thoroughly address the question [3]. Statements from US Air Force that A-10 airplanes are not using DU bullets will be taken as a starting hypothesis, however being very suspect since in all past conflicts (Balkans, Iraq, Afghanistan) A-10 airplances have widely used DU ammunition. Also other suspected weapons bearing DU, such as the AV-8B aircrafts, are pointed out here, but disregarded in the following calculations and assessments, which larghely focus on Cruise missiles.

Because of its unique physical characteristics, in particular the density that makes it extremely convenient as a mass enhancer (about 19 kg/l), but also the low cost (the production cost of DU is about $ 2 per kg) and the inconvenience to treat as radioactive waste, DU has found its way use in the military field.

If properly treated, the U-Ti alloy is a very effective material for the construction of kinetic energy penetrators, thick metal bullets that can pierce armours when fired against it at high speed.

The penetration process pulverizes most of the bullet, exploding into incandescent fragments of Uranium (violent combustion of almost 5000 ° C), when it hits the perforated armor, increasing the destructive effect. This property is called "pyrophoricity", as for example, the characteristic of sulfur in matches. So in addition to the high density of DU, pyrophoricity too makes it a material of great interest for these applications, in particular as an incendiary weapon (API: Armour Piercing Incendiary).

Finally, during the impact on the objective, the relative hardness of the DU (alloyed with titanium) provides the projectile self-sharpening ability: in other words, the projectile does not "flatten" against the armour that must break through, forming a "head flat "- as for example a projectile of lead – but it retains its shape tapering to the complete fragmentation, without thereby losing the penetrating properties.

In battle, the DU has certainly been used in the Gulf War of 1991, during the bombings NATO / UN over the Serbian Republic of Bosnia in September 1995, against Yugoslavia in spring 1999; in this century, during the attack on Afghanistan and then further in Iraq in 2003.

The use of devices to the DU in wars in Somalia and Bosnia-central and central-eastern Europe (especially large areas around Sarajevo) in the 90s, in Palestine and shooting ranges the responsibility of NATO military forces, is still incompletely documented. [4]

Among weapons that use DU, we also include the Tomahawk Cruise missile, whose use during the Balkan war of spring 1999, although not recognized by NATO has been confirmed by findings on site and sources of the European Union. [5]

On the other hand, in the Decalogue delivered to all the soldiers sent to Kosovo in 1999, there were recommendations to be followed to the letter, stating the presence of depleted uranium on the territory and particularly in Cruise Tomahawk missiles. The introduction reads:

> "The vehicles and materials of the Serbian army in Kosovo can be a threat to the health of soldiers and civilians who were exposed to them. The vehicles and equipment found destroyed, damaged or abandoned must be inspected and handled only by qualified personnel. The dangers arising from depleted uranium as a result of damage caused by NATO bombing campaign in relation to vehicles hit directly or indirectly. In addition, the collimators containing tritium and the instruments and indicators can be treated with radioactive paint, dangerous for those who had access to the means to inspect. "Here are tips on how to avoid exposure to depleted uranium. Textually: "Avoid any medium or material suspected of being hit by munitions containing depleted uranium or Tomahawk Cruise missiles. Do not pick or collect with DU munitions found on the ground. Tell your command immediately around the area that you feel contaminated. Wherever you are demarcated the area contaminated by any material found on site. If you are in an area contaminated, at least wear a mask and gloves. Ensure good personal hygiene. Frequently wash the body and clothes. "

The evaluations on the amount of DU used in cruise missiles differ very much. In particular, they vary in different sources, including values around 3 kg, but to go up to about 400 kilograms. In the note[6] there is a compilation of different sources available on this aspect, very important for the estimation of environmental impact.

The predictable official denial statements about the presence of uranium in these missiles collide with the above publications, as well as sources of military origin[7]

This large variability in the data can be easily explained. Some Cruise missiles are with their head weighted with depleted uranium, some are not. Even those other ones, however, even if they have not a depleted uranium warhead, they bring it in the wings, as a stabilizer in flight.

Then we can define two cases

WORST CASE: Cruise with uranium in the head. Assume 400 kilos of DU.

BEST CASE: Cruise without uranium in the head. Take 3 kilos of DU in the wings.

2. Calculation of environmental impact and health effects

In the large literature on depleted uranium by the author[8], the problem was already dealt with: a calculation of radioactive contamination from uranium due to cruise missiles, particularly those launched on Bosnia in 1995, was already performed. The study can also be found on the Internet, as well as the scientific journal "Tribuna Biologica e Medica" (Biological and Medical Forum).[9], [10].

Returning to the models used in the article mentioned above, one can deduce which is the mechanism of contamination, at the point of exposure and inhalation, with a calculation designed to determine only if – at least in a realistic case – the relevance of the doses does not allow to neglect the problem.

We consider the impact of a Tomahawk cruise missile that brings 3 kg (best case), or 400 kg (worst case) of DU.

The impact produces a cloud of debris of various sizes, after violent combustion at about 5000 ° C. The dust is, as mentioned, is composed of particle sizes in the range [0.5 – 5] micron. Between 500 and 1000 meters from the impact one can breathe clouds with a density sufficient to cause significant doses, consisting of particles having a mass of about 0.6 to about 5 nanograms. An estimate was made using the GENII[11] code for dose and dispersion calculations. We chose to neglect the effects of fire, considering only the inhalation exposure due to the simple release of the material, not considering some factors that could cause further increase the exposure.

Critical group, in this case, it is precisely those people "invested" by the cloud of dust after explosion.

After the missile hits the target, dust can ignite and disperse and be oxidized into the environment, according to the estimates that will be done in this work.

About 70% of DU, contained in the missile which is supposed to always hit the target, being an "intelligent weapon", burns. Of this, about 50% are soluble oxides.

The size distribution of the constituent particles of DU oxide dust belongs entirely to the small-size, breathable, and ultra-fine dust. In particular, the diameter of the particles in this case is finer than the dust of uranium usually encountered in the preparation of nuclear fuel within the nuclear industry. It deals practically with dust included in the range [1-10] micron, with a significant proportion of particles with a diameter less than one micron.

As for the behaviour of DU dust in the human body, the main route of contamination is – as noted – inhalation. As mentioned, part of the dusts are soluble and some insoluble into body fluids.

Given the characteristics of DU oxides of military origin, it should be noted that they have different behaviour with respect to industrial dust of uranium. You can, however, still assume, according to ICRP[12], that about 60% of the inhaled dust is deposited in the respiratory system, the rest is re-exhaled.

It can be assumed that about 25% of the particles around 1 micron in diameter are retained for a long period in the lungs, while the rest is deposited in the upper breathing apparatus, then it passes into the digestive system and hence is eliminated, while small parts go to accumulate in the bones.

About 25% of micro-particles is held in the lungs, about half the material behaves like a class M according to ICRP, which is slowly soluble in body fluids, while the rest is insoluble.

This type of behaviour and exposure has not been studied in any previous situation of exposure to alpha emitters in the lungs, found in the civil applications. The way of exposure is very different from those under which equivalences-dose radiation damage were derived

It is therefore not entirely correct – though it is a starting reference point – to use here the ICRP risk assessments, which were derived from the radioactive dust data and the exposure of miners of uranium mines, nor of course it is correct to use the correlations derived from the epidemiological studies on the highly-irradiated Hiroshima and Nagasaki population. ICRP radiation protection standards are based on these experiences, and therefore may underestimate the risk in this case.

Moving on to another type of toxicity than the one due to ionizing radiation, is also plausible that:

- Given the component of fine and ultrafine dust of DU for military origin,
- Given the well-known chemical toxicity of uranium,

environmental contamination by DU oxidized dusts of military origin has both chemical and radiological toxicity: it must be evaluated the synergistic effect of these two components.

In other words, radioactivity and chemical toxicity of DU could act together to create a “cocktail” effect which further increases the risk.

We must also put emphasis on the fact that the arid climate of Libya favours the dispersion in the air of particles of depleted uranium, which can be inhaled by civilians for years after the explosion. That is not the case, for instance, of the Balkans. The main mechanism of exposure at the long-term concerns the re-suspension of dust and consequent inhalation.

The methodology and assumptions for this model have already been published in other works to which the author refers[13]. We will mention here only the refinements and changes with respect to the model applied and already published, and in particular:

– The calculation of the dose commitment of 70 years and not more than 50 years, as recommended by ICRP.

– The available data are used to approximate population distribution around the points of impact, which also considers the use of the main DU weapons in relatively populated areas of Lybia.

The model results can be summarized as follows:

– CEDE (collective effective dose equivalent): 370 mSvp in 70 y, for 1 kg of DU oxidized and released into the environment.

– CEDE annual maximum in the first year (76 mSvp), followed by the second year (47 mSvp) and third (33 mSvp).

– The entire route of exposure is by inhalation of dust. The target organ is the lung (97.5% contribution to CEDE).

– Among the most responsible nuclides, 83% of the CEDE is U238, and 14% by U234.

As for the total amount of oxidized DU in the environment, we start from the data for this assessment by the international press: in the first day of the war, about 112 cruise missiles impacted on Libyan soil[14]. How many missiles will be fired before the end of the war? That is unknown, however we will do an assessment considering about 1,000 missiles fired, and in any case the values are linearly variable with the actual amount of fired missiles, by means of a simple proportion.

Given the length of the military operations, the wide variety of suspect DU-bearing weapons, we consider this statement to be on the safe side.

If all the missiles were "without" DU, it would still have a quantity of:

1000 * 3 = 3000 kilos = 3 tons of DU (best case)

If all the missiles were using DU we have an amount up to:

400,000 kilos = 400 tons of DU.

Compare these data with the 10-15 tons of DU fired in Kosovo in 1999 to assess their seriousness.

Assume that about 70% of DU burns and it is released into the environment, thus arriving at an estimate of the amount of DU dispersed oxides of about 2.1 tonnes (best case) and 280 tonnes (worst case).

This therefore allows to estimate a CEDE (collective dose) for the entire population of:

· Best case: 370 mSvp / kg * 2100 kg = 780 Svp

· Worst case: 370 mSvp / kg * 280,000 kg = 104,000 Svp

We state once again that it is not entirely correct – though it is a starting point of reference – to extrapolate the risk assessments for exposure to this type of micro-radioactive dust from the ICRP radiation protection standards, which are those adopted by the GEN II code.

However, if we apply here the coefficient of 6% Sv-1 for the risk of cancer, we get about

· Best case: about 50 cases of cancer, to be found in 70 years.

· Worst case: about 6200 cases of cancer, to be found in 70 years.

3. Conclusions

The risks from exposure to depleted uranium of the population of Libya due to the use of this material in the War of 2011 were evaluated with an approach as broad as possible, trying to take into account some recent results of studies in the field.

This type of exposure has not been studied in any previous situation of exposure to alpha emitters in the lungs, found in the civil applications.

However, the assessment made of the doses and the consequent risks to both situations (Cruise "without uranium" or "uranium") allows us to draw some conclusions.

In the first case (best case), the expected number of cancers is very small and absolutely not relevant from the statistical point of view. This statistical difficulty – as is just obvious point out – has nothing to do with the acceptation of this practice, its moral acceptance, or even less with an allegation of a minor impact or even a safety of this practice.

In the second case (worst case), however, we are faced with a number of tumours of some thousands. Such an amount could easily be detected in epidemiological studies and such a number of casualties is, no doubt about that, quite a concern.

It should be useful, therefore, that the armies that are bombing Libya clarify with evidence, and not simple assertions of convenience, the presence or absence, and in what quantities, of uranium in their missiles and other weapons.

In the past, there were "official" denials of the presence of uranium in Cruise missiles, but they were coming from the military area: the author allows, at least, some caution in their flat acceptance.

Based on available data, estimates on the trend of cancer cases in the coming years in Libya as a result of this practice are absolutely unjustified and constitute a concern. The discussion about the relative impact of each of the carcinogenetic substances used in a war (chemical, radioactive, etc.), seems – at a certain level – of little significance. Also, the author puts this as a final reflection, such a discussion shows little respect for the fact that the civilian casualties in Libya that will be caused by this attack will exceed by far any amount that may be defined as "a fair price to pay."

Finally, it is important to collect data and research – and there are many – in the field of the effects of "new wars" on population and environment. We must show how modern weapons, not at all surgical and intelligent, produce unacceptable damage to population that have been subjected to the "humanitarian" wars since 1991.

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NOTES

This paper has been originally published in Italian in many online journals and site, among which:

http://it.peacereporter.net/articolo/27514/Libia,+uranio+impoverito+nei+missili+lanciati+da+britannici+e+statunitensi_

http://www.linkiesta.it/libia-l-uranio-impoverito-fara-piu-danni-dei-raid-aerei

A video in Italian of the author publicly denouncing the fact in Roma, April 2nd, is available here:

http://www.youtube.com/watch?v=tyWUurkPjk8

and an interview at the Italian RAI3 Radio on March 31st, 2011 :

http://www.radio3.rai.it/dl/radio3/popupaudio.html?t=RADIO3SCIENZA+del+31%2F03%2F2011&p=RADIO3SCIENZA+del+31%2F03%2F2011&d&u=http%3A%2F%2Fwww.radio.rai.it%2Fpodcast%2FA7439704.mp3

Some comments in main Italian newspapers:

http://espresso.repubblica.it/dettaglio/libia-si-spara-uranio-impoverito/2147840

http://www.ilmanifesto.it/area-abbonati/in-edicola/manip2n1/20110402/manip2pg/05/manip2pz/300494/

and on the Italian TV Rainews24:

http://www.rainews24.rai.it/it/canale-tv.php?id=22708

Then the paper has been translated into French by Marie-Ange Patrizio and published here:

http://www.mondialisation.ca/index.php?context=va&aid=24015

The author has denounced the fact at Radio Algerie on March 30th

http://www.radioalgerie.dz/ar/

Recently, the French version has been translated into Spanish and published in around 100 sites in Latin America and Europe, among which:

http://www.cubadebate.cu/noticias/2011/03/29/libia-impacto-de-los-misiles-crucero-de-uranio-empobrecido/

http://www.voltairenet.org/article169174.html

[1] Professor of “Nuclear Power Plants” c/o Politecnico di Torino, Italy. Chair of “Safety and Risk Analysis” and “Radiation protection”. zucchetti@polito.it

[2] http://contropiano.dyndns.org/en/archive/archivio-news/item/296-uranio-impoverito-nei-tomahawk-sulla-libia

http://it.peacereporter.net/articolo/27514/Libia,+uranio+impoverito+nei+missili+lanciati+da+britannici+e+statunitensi _

http://www.linkiesta.it/libia-l-uranio-impoverito-fara-piu-danni-dei-raid-aerei

[3] Air Force Spokeswoman claims that A-10s were not loaded with DU ammunition, but does not rule out future use in the conflict. 4 April 2011. A US Airforce Spokeswoman has told a Scottish journalist that, as of 2nd April, A-10s fighting in Libya have not been firing DU ammunition. However, she refused to give any assurances about the future use of DU, stating that she didn't want "to speculate on what may or may not be used in the future". ICBUW calls for the US to give a categorical assurance, similar to that given by UK Prime Minister David Cameron, that weapons containing DU have no place in this conflict. A clear statement, covering both A-10 and AV-8B aircraft should be issued at the earliest opportunity. If the US has taken a strategic decision not to equip US planes with DU ammunition in this conflict, that is a progressive step. However, in the absence of a public declaration that such a decision has been taken, concerns will remain that the door has been left open for the future use of DU in Libya. ICBUW calls for the US to take steps in a clear and transparent manner to assure the world that no US aircraft will go into the air equipped with DU ammunition, and that pilots will not be cleared to fire it. Any DU ammunition currently in theatre should be separated and left unused. As ICBUW has long maintained, DU has no place in conventional munitions. The current position of the US affirms that position: if US planes have been able to use alternatives, there is no reason why alternatives should not be found for all ammunition containing DU. We call for all current user states to remove these weapons from their arsenals. An urgent step to protect civilians in areas where DU weapons have already been used, is for user states to share targeting data with the authorities in affected states – a move endorsed by 148 states in the UN General Assembly last December, and opposed by only four, including the US, France and UK.

More: http://www.bandepleteduranium.org/en/a/402.html

[4] Zajic V.S., 1999. Review of radioactivity, military use and health effects of DU: http://members.tripod.com/vzajic; Liolos Th. E.(1999) , Assessing the risk from the Depleted Uranium Weapons used in Operation Allied Forces, Science and Global Security, Volume 8:2, pp.162 (1999); Bukowski, G., Lopez, D.A. and McGehee, F.M., (1993) "Uranium Battlefields Home and Abroad: Depleted Uranium Use by the U.S. Department of Defense" March 1993, pp.166, published by Citizen Alert and Rural Alliance for Military Accountability.

[5] Letter of Satu Hassi, Minister of the Environment of Finland, to all Ministers of Environment in Europe, stating that the majority of the 1500 missiles shot on Serbia in 1995 had depleted uranium, about 3 kilos each.

http://www.frontlineonnet.com/fl1803/18030580.htm

[6] Different statements about the presence of DU in Cruise Tomahawk Missiles:

http://www.eoslifework.co.uk/pdfs/DU2102A3b.pdf

http://www.nadir.org/nadir/initiativ/mrta/ipan22.htm

http://web.peacelink.it/tematiche/disarmo/u238/documenti/uranio_impoverito.html

http://www.bandepleteduranium.org/en/a/60.html

http://www.mail-archive.com/news@antic.org/msg01570.html

http://www.atlanticfreepress.com/news/1/12146-pentagon-dirty-bombers-depleted-uranium-in-the-usa.html

http://vzajic.tripod.com/3rdchapter.html

http://www.prorev.com/du.htm

http://www.envirosagainstwar.org/know/read.php?itemid=1712

http://cseserv.engr.scu.edu/StudentWebPages/IPesic/ResearchPaper.htm

http://worldpol.wordpress.com/2007/11/19/depleted-uranium-ethics-of-the-silver-bullet-by-iliya-pesic/

Zajic, Vladimir S. "Review of Radioactivity, Military Use, and Health Effects of Depleted Uranium" [1 August, 1999]. 2/27/2002. http://vzajic.tripod.com

[7] While the US Navy claims that they have replaced the MK149-2 Phalanx round with a DU penetrator by the MK149-4 Phalanx round with a tungsten penetrator (with the DU round remaining in the inventory), new types of DU ammunition are being developed for other weapons systems, such as the M919 rounds for Bradley fighting vehicles. Depleted uranium is also placed into the tips of the Tomahawk land-attack cruise missiles (TLAM) during test flights to provide weight and stability. The TLAM missile has a range of 680 nautical miles (1,260 km) and is able to carry a conventional warhead of 1000 lb. (454 kg). Older warheads were steel encased. In order to increase the missile range to 1,000 nautical miles (1,850 km), the latest Tomahawk cruise missiles carry a lighter 700 lb. (318 kg) warhead WDU-36 developed in 1993, which is encased in titanium with a depleted uranium tip

[8] M.Zucchetti, 'Measurements of Radioactive Contamination in Kosovo Battlefields due to the use of Depleted Uranium Weapons By Nato Forces", Proc. 20th Conf. of the Nuclear Societies in Israel, Dead Sea (Israel), dec. 1999, p.282.

M.Cristaldi, A.Di Fazio, C.Pona, A.Tarozzi, M.Zucchetti "Uranio impoverito (DU). Il suo uso nei Balcani, le sue conseguenze sul territorio e la popolazione", Giano, n.36 (sett-dic. 2000), pp. 11-31.

M.Zucchetti, 'Caratterizzazione dell'Uranio impoverito e pericolosità per inalazione', Giano, n.36 (sett-dic. 2000), pp. 33-44.

M.Cristaldi P.Angeloni, F.Degrassi, F.Iannuzzelli, A.Martocchia, L.Nencini, C.Pona, S.Salerno, M.Zucchetti. Conseguenze ambientali ed effetti patogeni dell'uso di Uranio Impoverito nei dispositivi bellici. Tribuna Biologica e Medica, 9 (1-2), Gennaio-Giugno 2001: 29-41.

M. Zucchetti, "Military Use of Depleted Uranium: a Model for Assessment of Atmospheric Pollution and Health Effects in the Balkans", 11th International Symposium on "Environmental Pollution And Its Impact On Life In The Mediterranean Region", MESAEP, Lymassol, Cyprus, October 2001, p.25.

M. Zucchetti “Some Facts On Depleted Uranium (DU), Its Use In The Balkans And Its Effects On The Health Of Soldiers And Civilian Population”, Proc. Int. Conf. NURT2001, L’Avana (Cuba), oct. 2001, p.31.

M. Zucchetti, M. Azzati “Environmental Pollution and Population Health Effects in the Quirra Area, Sardinia Island (Italy)”, 12th International Symposium on Environmental Pollution and its Impact on Life in the Mediterranean Region, Antalya (Turkey), October 2003, p. 190, ISBN 975-288-621-3.

M.Zucchetti, R. Chiarelli ‘Environmental Diffusion of DU. Application of Models and Codes for Assessment of Atmospheric Pollution and Health Effects’, Convegno ‘Uranio Impoverito. Stato delle Conoscenze e Prospettive di Ricerca’, Istituto Superiore di Sanità (Roma) Ottobre 2004.

R. Chiarelli, M.Zucchetti, ‘Effetti sanitari dell’uranio impoverito in Iraq’, Convegno ‘La Prevenzione Primaria dei Tumori di Origine Professionale ed Ambientale’, Genova, Novembre 2004. Poster reperibile al sito: http://registri.istge.it/italiano/eventi/poster%20n°25.htm

R. Chiarelli, M.Zucchetti, ‘Applicazione di modelli e codici di dose alla popolazione alla dispersione ambientale di Uranio impoverito’, Convegno ‘La Prevenzione Primaria dei Tumori di Origine Professionale ed Ambientale’, Genova, Novembre 2004. Poster reperibile al sito: http://registri.istge.it/italiano/eventi/poster%20n°26.htm

M. Zucchetti, “Environmental Pollution and Population Health Effects in the Quirra Area, Sardinia Island (Italy) and the Depleted Uranium Case”, J. Env. Prot. And Ecology 1, 7 (2006) 82-92.

M. Zucchetti, “Scenari di esposizione futura In Iraq: convivere con l’uranio impoverito” in: M.Zucchetti (a cura di) “Il male invisibile sempre più visibile”, Odradek, Roma, giugno 2005, pp. 81-98.

M. Zucchetti, “Uranio impoverito. Con elementi di radioprotezione ed utilizzo delle radiazioni ionizzanti”, CLUT, Torino, febbraio 2006. ISBN 88-7992-225-4.

M.Zucchetti “Depleted Uranium”, European Parliament, GiethoornTen Brink bv, Meppel (Holland), 2009. ISBN 978-90-9024147-0

[9] http://web.peacelink.it/tematiche/disarmo/u238/documenti/uranio_impoverito.html

[10] Cristaldi M. et al., Conseguenze ambientali ed effetti patogeni dell’uso di Uranio Impoverito nei dispositivi bellici. Tribuna Biologica e Medica, 9 (1-2), Gennaio-Giugno 2001: 29-41.

[11] It is a dispersion and dose code, developed in the USA and used worldwide: B.A.Napier et al. (1990), GENII – The Hanford Environmental Radiation Dosimetry Software System, PNL-6584, Pacific Northwest Laboratories (USA)..

[12] ICRP, 1995. Age-dependent Doses to Members of the Public from Intake of Radionuclides: Part 3 – Ingestion Dose Coefficients. Publication 69 Annals of the ICRP. 25 (no 1).

[13] M.Zucchetti, 'Caratterizzazione dell'Uranio impoverito e pericolosità per inalazione', Giano, n.36 (sett-dic. 2000), pp. 33-44; R.Chiarelli, M.Zucchetti, 'Applicazione di modelli e codici di dose alla popolazione alla dispersione ambientale di Uranio impoverito', Convegno 'La Prevenzione Primaria dei Tumori di Origine Professionale ed Ambientale', Genova, Nov.2004. http://registri.istge.it/italiano/eventi/poster%20n°26.htm

[14] http://abcnews.go.com/International/libya-international-military-coalition-launch-assault-gadhafi-forces/story?id=13174246