Cancer research *for* cancer prevention

To provide the scientific evidence-base for prevention

“A catalyst to progress”
IARC’s 25 Participating States

IARC Governance
Governing Council
Scientific Council

United Kingdom 1965
France 1965
Germany 1965
United States 1965

Russian Federation 1965
Australia 1965

Netherlands 1967
Japan 1972

Canada 1982
Norway 1987

Switzerland 1990
Rep. of Korea 2006
Ireland 2007

Turkey 2011
Qatar 2013
Morocco 2015
Brazil 2013

Austria 2008
India 2006
Spain 2003
Denmark 1990
Finland 1986
Sweden 1979
Belgium 1970

Italy 1965

Norway 1987
IARC’s – Participating States

The boundaries shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of IARC concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.
IARC MTS – Core Research Areas

- Describe the occurrence
- Understand the causes
- Evaluate prevention and implementation
IARC: roots, birth, early steps
Emmanuel d’Astier de la Vigerie (1900-1969)
ACTUALITÉS MÉDICALES

Pour développer la lutte contre le cancer
des personnalités françaises lancent un appel
en faveur d'une institution internationale
de recherche pour la vie.

Des savants, des écrivains, des sociologues, ont lancé un appel
pour que les États-Unis, l'U.R.S.S., la Grande-Bretagne et la France
assurent le financement d'une institution internationale de recherche
pour la vie. En voici le texte, qui, en France, revêt la forme d'une
requête au président de la République :

- Les soussignés demandent aux
gouvernements des grandes puissances, qui actuellement reconnaissent
la nécessité de la coopération
internationale pour résoudre cer-
tains problèmes humains, de faire
un geste immédiat et raisonnable
au profit d'une stratégie univer-
selle pour la vie. Il s'agit de mettre
tout en œuvre pour parvenir à une
mobilisation contre un des plus grands fléaux qui pèse sur l'humanité : le cancer.

- Malgré certains succès thérapeutiques déjà importants, il n'y aura pas de victoire décisive sur le cancer tant que ne seront pas déterminés la nature du mal et le mécanisme de sa production. La victoire sur le cancer sera une grande victoire de l'homme.

- Un prélèvement dérisoire sur le budget des grandes puissances permettrait de mettre sur pied une institution internationale de lutte pour la vie, sous le contrôle efficace des organismes qualifiés de l'O.N.U. et des savants cancérologues les plus incontestés.

- Les soussignés soulignent qu'une réduction d'un demi pour cent sur les budgets militaires des États-Unis, de l'U.R.S.S., de la Grande-Bretagne et de la France (réduction qui ne saurait modifier l'équilibre des puissances et qui pourrait être éventuellement con-
sente par d'autres puissances militaires) permettrait de multiplier par milliers le nombre des laboratoires, des chercheurs et des expériences. Ainsi seraient dégagés les moyens d'une stratégie universelle de la recherche sur la vie. Il ne suffit pas de proclamer des communications, de rencontres de discipline à discipline ; il faut un centre où puisse s'établir cette stratégie universelle qui s'impose.

- A l'institution serait confiée par ailleurs la tâche d'informer dans un langage simple, mais très exact.

Le Monde, 8 novembre 1963
Mon cher Maître,

L'idée de promouvoir la recherche sur le cancer au sein d'une institution internationale procède d'une inspiration généreuse et je considère comme souhaitable que la France s'y intéresse.

Il me paraît, en effet, conforme à ses traditions qu'elle s'engage dans une œuvre où se retrouve une triple vocation : la coopération entre les peuples, le progrès de la condition humaine et l'avancement des sciences.

Aussi ai-je confié au ministre de la santé publique le soin de prendre toutes les initiatives nécessaires à cet égard.

Je vous demande de le faire savoir à toutes les personnalités signataires avec vous du message qui m'a été adressé et vous prie de croire, mon cher Maître, à mes sentiments fidèlement dévoués.

Ch. de Gaulle

My dear Sir,

The idea of promoting cancer research in an international institution draws on a generous inspiration, and I consider it desirable that France participate in it.

It seems, in fact, consistent with its traditions that France should engage in a work where three aspirations can be found: cooperation between peoples, the improvement of the human condition, and the advancement of science.

I have therefore asked the Minister of Public Health to take all necessary initiatives in this regard.

May I ask you to make this known to all the public figures who co-signed with you the message that was sent to me, and I beg you to accept, my dear sir, the assurances of my deepest respect.

Ch. de Gaulle
Leading cancer researchers discussed the ‘French initiative’ at the UICC conference in Stockholm on 7-9 September 1964
The originally proposed budget for IARC: 0.5% of the defense budgets = 390 million US$, today about 1 billion!
John Higginson (1922-2013)
first IARC Director (1967-1981)
The cancer-causing factors that had been established by 1967

<table>
<thead>
<tr>
<th>Type</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the general environment</td>
<td>Ionizing radiation</td>
</tr>
<tr>
<td></td>
<td>Ultraviolet radiation</td>
</tr>
<tr>
<td>In the local and occupational environment</td>
<td>Asbestos</td>
</tr>
<tr>
<td></td>
<td>Nickel refining</td>
</tr>
<tr>
<td></td>
<td>Chromate manufacture</td>
</tr>
<tr>
<td></td>
<td>Inorganic arsenic compounds</td>
</tr>
<tr>
<td></td>
<td>Mustard gas manufacture</td>
</tr>
<tr>
<td></td>
<td>Fumes from gasworks</td>
</tr>
<tr>
<td></td>
<td>Isopropylene</td>
</tr>
<tr>
<td></td>
<td>Alpha- and beta- naphthylamine</td>
</tr>
<tr>
<td></td>
<td>Benzidine</td>
</tr>
<tr>
<td></td>
<td>Xenylamine</td>
</tr>
<tr>
<td></td>
<td>Benzene</td>
</tr>
<tr>
<td></td>
<td>Tar and other coal combustion products</td>
</tr>
<tr>
<td></td>
<td>Ointments containing coal tar</td>
</tr>
<tr>
<td>Personal behaviours</td>
<td>Chewing of tobacco, betel, and lime</td>
</tr>
<tr>
<td></td>
<td>Tobacco smoking</td>
</tr>
<tr>
<td></td>
<td>Alcohol consumption</td>
</tr>
<tr>
<td>Pharmaceutical drugs</td>
<td>Chlornaphazine</td>
</tr>
<tr>
<td>Infections</td>
<td><em>Clonorchis sinensis</em> (Chinese liver fluke)</td>
</tr>
<tr>
<td></td>
<td>Virus inducing Burkitt lymphoma</td>
</tr>
<tr>
<td>Predisposing conditions</td>
<td>Tropical ulcers</td>
</tr>
<tr>
<td></td>
<td>Ulcerative colitis</td>
</tr>
</tbody>
</table>

*from Doll R. 1967*
IARC Training fellowships programme: no. of fellows by country
The stepped wedge [cluster] design

GHIS, 1987: Gambia Hepatitis Intervention Study

Shaded cells represent intervention periods
Blank cells represent control periods
Each cell represents a data collection point
Population Based Cancer Registries
Cancer incidence by country classified according to the HDI (Human Development Index)
The IARC Monographs
(http://monographs.iarc.fr/indexfr.php)

• “The Encyclopedia of Carcinogens”
• Evaluate factors capable of causing cancer in humans
  – Environmental & occupational exposures
  – Chemical, physical & biologic agents
  – Drugs, foods, & personal habits
• More than 950 agents evaluated since 1971
  – 118 carcinogenic to humans (as of October 2015)
  – >330 probably or possibly carcinogenic
• National & international health agencies use the Monographs
  – To identify carcinogens
  – To support prevention or regulation

Lorenzo Tomatis
1929-2007
What makes the IARC Monographs process unique?

- Systematic reviews of human, experimental, and mechanistic data
- Consensus evaluations by the world’s leading experts, free from conflicts of interest
- A public guidance document
  - Procedures for participant selection, conflict of interest & meeting conduct
  - Criteria for evaluation of evidence
  - Decision process for overall evaluation
# Evaluating human data

<table>
<thead>
<tr>
<th>Cancer in humans</th>
<th>Cancer in experimental animals</th>
<th>Mechanistic and other relevant data</th>
</tr>
</thead>
<tbody>
<tr>
<td>— Preamble Part B, Section 6(a)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Sufficient evidence
- Causal relationship has been **established**
- Chance, bias, and confounding **could be ruled out with reasonable confidence**

## Limited evidence
- Causal interpretation is **credible**
- Chance, bias, or confounding **could not be ruled out**

## Inadequate evidence
- Studies permit **no conclusion** about a causal association

## Evidence suggesting lack of carcinogenicity
- Several adequate studies covering the full range of exposure levels are mutually consistent in not showing a positive association at any observed level of exposure
- Conclusion is limited to cancer sites and conditions studied
Integrating Human and Animal Evidence

**EVIDENCE IN EXPERIMENTAL ANIMALS**

<table>
<thead>
<tr>
<th></th>
<th>Sufficient</th>
<th>Limited</th>
<th>Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sufficient</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Limited</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inadequate</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EVIDENCE IN HUMANS**

- Group 1 (*carcinogenic to humans*)
- Group 2A (*probably carcinogenic*)
- Group 2B (*possibly carcinogenic*)
- Group 3 (*not classifiable*)
Mechanistic Modifications - when human data are less than sufficient

**EVIDENCE IN EXPERIMENTAL ANIMALS**

- **Sufficient**
  - Group 1 (*carcinogenic to humans*)

- **Limited**
  - Group 2A (*probably carcinogenic*)
  - Group 2B (*possibly carcinogenic*) (exceptionally, Group 2A)

- **Inadequate**
  - Group 2B (*possibly carcinogenic*)
  - Group 3 (*not classifiable*)

**Strong supporting evidence in exposed humans**
Mechanistic Modifications - when human data are less than sufficient

**EVIDENCE IN EXPERIMENTAL ANIMALS**

<table>
<thead>
<tr>
<th>EVIDENCE IN HUMANS</th>
<th>EVIDENCE IN EXPERIMENTAL ANIMALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sufficient</td>
<td>Group 1 <em>(carcinogenic to humans)</em></td>
</tr>
<tr>
<td>Limited</td>
<td>Group 2A <em>(probably carcinogenic)</em></td>
</tr>
<tr>
<td>Inadequate</td>
<td>Group 2B <em>(possibly carcinogenic)</em></td>
</tr>
</tbody>
</table>

**Strong evidence: mechanism in animals DOES NOT operate in humans**
EPIC
European Prospective Investigation into Cancer
The EXPOSOME
Prevalence of HPV in sexually active women aged 15-59 years (surveys carried between 1995 and 2013)
Dr. Nubia Munoz received in 2009 the Gairdner Foundation’s Canada Gairdner Global Health Award for her seminal epidemiological research on the role of Human Papilloma Viruses in the aetiology of cervical cancer.
Effect of HPV screening for cervical cancer in rural India

Cumulative Mortality

Rate/1000 Women

Year

0 1 2 3 4 5 6 7 8

0.0 0.5 1.0 1.5 2.0 2.5
World Cancer Report 2014
Edited by BERNARD W. STEWART and CHRISTOPHER P. WILD
IARC : communication
The Mail online

Bacon, burgers and sausages are a cancer risk, say world health chiefs: processed meats added to list of substances most likely to cause disease alongside cigarettes and asbestos

Fresh red meat is also due to join WHO 'encyclopaedia of carcinogens'

Rulings will send shock waves through farming and fast food industries; it could lead to new dietary guidelines and warning labels on bacon packs. Mounting concern that meat fuels disease that kills 150,000 a year in UK
• Carcinogenicity of consumption of red and processed meat
MEAT AND CANCER
HOW STRONG IS THE EVIDENCE?

**IARC CARCINOGENIC CLASSIFICATION GROUPS**

**GROUP 1**
Causes cancer

**GROUP 2A**
Probably causes cancer

**GROUP 2B**
Possibly causes cancer

**GROUP 3**
Not classifiable as a cause of cancer

**GROUP 4**
Probably not a cause of cancer

Processed meats have been given **Group 1** classification
- *Includes* Salami, Bacon, Sausages, and hot dogs

Red meats have been given **Group 2A** classification
- *Does not include* chicken or fish
  - Pork, Beef, Lamb

These categories represent how likely something is to cause cancer in humans, not how many cancers it causes.
# HOW MUCH MEAT DO YOU EAT A DAY?

How your processed and red meat consumption can add up over a day...

## ENGLISH BREAKFAST

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two sausages</td>
<td>60g</td>
<td>30g</td>
</tr>
<tr>
<td>Three rashers of bacon</td>
<td>75g</td>
<td>25g</td>
</tr>
</tbody>
</table>

**CUT IT DOWN**

- One sausage: 30g
- One rasher of bacon: 25g

## HAM SANDWICH

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two slices of ham</td>
<td>50g</td>
<td></td>
</tr>
</tbody>
</table>

**SWAP IT**

- Substitute ham for chicken or tuna: 0g

## SPAGHETTI BOLOGNESE

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minced beef in a regular portion</td>
<td>100g</td>
</tr>
</tbody>
</table>

**BULK IT OUT**

- Use less meat and add beans or extra veggies: 15g

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**285g TOTAL EATEN**

**70g RECOMMENDED DAILY LIMIT OF CONSUMPTION**
TOBACCO vs MEAT WHAT’S THE RISK?

The EVIDENCE that processed meat causes cancer is as strong as the evidence for tobacco, but the RISK from tobacco is much higher...

CANCERS CAUSED BY TOBACCO

86% OF LUNG CANCERS

19% OF ALL CANCERS

CANCERS CAUSED BY PROCESSED AND RED MEAT

21% OF BOWEL CANCERS

3% OF ALL CANCERS

THE NUMBER OF CANCERS PER YEAR IN THE UK THAT COULD BE PREVENTED IF...

NO-ONE SMOKED

64,500 FEWER CASES

NO-ONE ATE ANY PROCESSED OR RED MEAT

8,800 FEWER CASES

Source: cruk.org/cancerstats
IARC : in the post-2015 planet
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>51.2</td>
<td>67.9</td>
</tr>
<tr>
<td>Africa</td>
<td>42.4</td>
<td>55.2</td>
</tr>
<tr>
<td>Asia</td>
<td>46.4</td>
<td>69.0</td>
</tr>
<tr>
<td>Europe</td>
<td>69.6</td>
<td>75.4</td>
</tr>
<tr>
<td>Latin America</td>
<td>56.8</td>
<td>73.4</td>
</tr>
<tr>
<td>North America</td>
<td>70.2</td>
<td>78.2</td>
</tr>
<tr>
<td>Oceania</td>
<td>64.1</td>
<td>76.6</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Oesophagus</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Stomach</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Colon</td>
<td>36</td>
<td>51</td>
</tr>
<tr>
<td>Rectum</td>
<td>32</td>
<td>48</td>
</tr>
<tr>
<td>Pancreas</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Larynx</td>
<td>47</td>
<td>66</td>
</tr>
<tr>
<td>Lung</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Breast (women)</td>
<td>54</td>
<td>75</td>
</tr>
<tr>
<td>Cervix uteri (women)</td>
<td>62</td>
<td>69</td>
</tr>
<tr>
<td>Ovary (women)</td>
<td>28</td>
<td>36</td>
</tr>
<tr>
<td>Prostate (men)</td>
<td>28</td>
<td>68</td>
</tr>
<tr>
<td>Bladder</td>
<td>38</td>
<td>72</td>
</tr>
</tbody>
</table>
IARC: six key elements for success

1. Scientific and technical competence
2. Autonomy as to scientific strategies and decisions
3. Restricted managerial-administrative structure
4. A comparatively small ‘niche’ institution
5. Freedom from objectives and pressures extraneous to research *for* health
6. Staff commitment to public health & institution
Just published:


Just published:


IARC: in the post-2015 planet

The five planetary ‘new challenges’

1. Worldwide aging populations
2. Climatic and environmental changes
3. Technoscience accelerated expansion
4. Worldwide financial capitalist economy
5. Between & within countries social inequalities
Not only what we do, but how we do it

- Honesty
- Integrity
- Generosity
- Courtesy
- Autonomy
Not only what we do, but how we do it:
still speaking one and the same language?

- Honesty
- Integrity
- Generosity
- Courtesy
- Autonomy

* Transparency
* Governance
* Stakeholders
* Cost-effectiveness
* PPP (public-private partnership)
Il faut faire le pari que les avancées du bien se cumulent mais que les interruptions du mal ne font pas système.

Paul Ricoeur (1913-2005)