AACR marks 100 years of researching cancer

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In its centennial year the AACR maps the landmarks of progress in our understanding of cancer, and calls for renewed commitment to the search for prevention and cure.

As the American Association for Cancer Research (AACR) celebrates 100 years of investigating cancer prevention, causes, treatments and cures, its past-president is highlighting funding as one of the key challenges for the future.

Alongside scientific challenges such as understanding signalling pathways, biomarkers and metastases, Geoffrey Wahl says that improved funding for cancer research must become a national priority again in the US. Without it, the future of US cancer research will be in jeopardy.

Geoffrey Wahl, past-president of the AACR

In an exclusive interview with *CancerWorld*, to mark the AACR centennial, Wahl said, "Cancer is a disease of ageing. Developments in medicine, such as antibiotics, the flu vaccine and strategies to detect heart disease early on, have enabled us to live longer. By 2030, 20% of the US population will be over 65, as compared with 12% in 2004. Importantly, the chances of getting cancer for people over 65 is ten times greater than for those under 65, and the chances of dying of it in over 65s is 16-fold higher. So people think there will be a 'tsunami' of cancer incidence and deaths in the baby boomer generation.

"However, 'tsunami' is the wrong metaphor," says Wahl, "because with a tsunami there is no warning and there is little you can do about it except run like hell. By contrast, a hundred years of cancer science has allowed us to anticipate this onslaught and prepare ourselves to attack it rather than to run. It would be unconscionable of us not to attack it."

That said, Wahl worries about whether the political will is there to mount that attack. "Somehow, over recent years, the importance of cancer as an important health issue has ceased to be a priority. Funding for cancer research in the United States has not even been keeping up with inflation in the past few years. We cannot grow a business to be successful without the necessary funding. People are amazed to hear that an average of only $8.5 per person per year has been spent tackling cancer since the 'War on Cancer' began

more than 30 years ago, and current expenditure on cancer is only $16 per person per year – a paltry amount for such an important problem."

So the AACR is using its centennial celebrations as an opportunity to push this issue higher up the public and political agenda, warning that funding for cancer research and prevention must not continue to fall while the costs of treating cancer rise.

Wahl believes that the best and brightest of the younger generation are being discouraged from careers in cancer research, because lack of funding means that there is intense competition for any money or jobs that might be available. The AACR is trying to address this problem by providing high-quality education, training and mentoring programmes for graduate students, medical students and others who might be considering a career in cancer research.

The AACR is the world's oldest and among the largest scientific organisations dedicated to researching the causes, prevention, treatment and cure of cancer. It was founded in 1907 by a group of 11 physicians and scientists interested in research "to further the investigation and spread the knowledge of cancer". With over 25,000 members from more than 70 countries around the world, mainly laboratory and clinical scientists, its aim is to accelerate the prevention and cure of cancer through research, education, communication, collaboration and advocacy.

The Association's centennial celebrations were kicked off at its annual conference in April, held this year in Los Angeles, and attended by around 17,000 researchers. Its theme was 'A century of leadership in science – a future of cancer prevention and cures'. An exhibition celebrating one hundred most significant discoveries in cancer research since 1907 – *Landmarks in Cancer Research* – was unveiled during the conference. Two weeks later, the AACR established the day of its foundation, May 7, as National Cancer Research Day, and marked it with a number of events around the country, including a national poll to assess the public's perceptions of cancer, which will be used to plan future advocacy efforts.

Wahl sees education of the public and politicians as an important challenge for the future. "Public education has to be a priority," he said, as he cited polls conducted in the US and the UK which reveal that 30–40% of the public believe there is nothing they can do to lower their risk of developing cancer.

"The most distressing thing to me was that the group who thought there was nothing they could do included people who smoked and who were overweight. Clearly there are issues here about socio-economic status and lack of education."

Wahl is a professor in the Gene Expression Laboratory at the Salk Institute for Biological Studies in California. He studies the genetic basis of the origins of cancer, its progression and why tumours become resistant to drugs, and he has a particular interest in p53, a tumour suppressor gene that is known to be involved in a number of cancers.

So it should be no surprise that the discovery of p53 ranks amongst his own personal 'landmarks' of the past one hundred years, and that a better understanding of the pathways involved in the development of cancer is amongst the scientific challenges he lists for the future.

Other landmarks of his include:

- The work by Theodore Boveri at the beginning of the 20th century, who predicted that chromosomes contained genetic information that could be involved in the onset of cancer. "He predicted the existence of oncogenes and suppressor genes before we even knew about genes," said Wahl
- The discovery of the structure of DNA by James Watson, Francis Crick, Maurice Wilkins and Rosalind Franklin
- The discovery that everyone carries genes that can predict our risk of developing cancer, while loss of function in other genes can also be associated with cancer
- The involvement of the immune system in cancer, both as a trigger for cancer and as something that can be harnessed to tackle it
- The change to thinking about cancer less in terms of a disease of individual cells, and more in terms of aberrant organs whose growth and survival depends on the perturbation of molecular signalling pathways – pathways that offer new therapeutic targets
- The discovery of enabling technologies such as polymerase chain reaction (PCR), fluorescence *in situ* hybridisation (FISH), comparative genomic hybridisation and microarrays

AACR's contribution to these and many other discoveries, says Wahl, has been in providing and promoting opportunities for researchers to meet and interact with one another.

"The AACR creates the synergy needed to convert data to wisdom. It's through wisdom that we can envision the strategies we need to detect and cure cancer. It's the bringing together of people from different backgrounds and different fields in the context of the Annual Meeting, think tank or special meeting that enables the sharing of expertise so that we can understand the problem of cancer, what it really is and how to treat it.

"I don't think a cure for all cancers will come in my lifetime," says Wahl. "I can't envisage a time when there's no cancer, but I can envisage a time when we can do some things far better than we do now."

SOME AACR LANDMARKS: 1907–2007

1907 AACR founded on May 7 in Washington DC
First epidemiological study to show **exposure to sunlight** caused skin cancer

1908 First evidence of **viral initiation** of cancer when cell-free agents were shown to transmit leukosis, a form of leukaemia and lymphoma, and sarcomas in chickens

1916 **Removal of the ovaries** from female mice of a strain with a high incidence of spontaneous breast cancer resulted in a decrease in tumours

1924 Metabolic studies show that tumours exhibit anaerobic respiration, fermenting sugars without oxygen. It took several decades before **hypoxia** was revisited as a marker for tumours

1928 X-rays shown to be mutagenic in the common fruit fly. This formed the basis for thinking about how **carcinogens** trigger cancer

1938 Transplanted animal tumours shown to grow blood vessels, providing evidence of **angiogenesis**, which would later become a target for cancer therapies

1941 **Hormone dependence** of prostate cancer demonstrated

1946 Nitrogen mustard established as the first **chemotherapeutic agent.** Observational reports that soldiers exposed to nitrogen mustard during wartime had low white blood cell counts led to testing nitrogen mustard as chemotherapy for cancer

1948 First successful chemotherapy for **childhood leukaemia**

1950 Epidemiological work linked **tobacco smoking** to lung cancer

1953 **Structure of DNA** described

1953 First successful chemotherapy for **solid tumours**

1963 Chemotherapy cures **Burkitt's lymphoma**

1966 First dedicated **mammography** machine developed

1967 **Oestrogen receptor** identified in uterine tissue. This led to the detection of oestrogen receptors in breast cancers and the design of new therapies for hormone-dependent breast cancer

1969 ***In situ*** **hybridisation** introduced. This method enabled the detection of the location of specific genes within chromosomes

1970 **Multi-drug-resistant cell lines** described

1971 **Taxol**, a natural plant product, developed for chemotherapy

1972 **Bone marrow transplantation** established as a cancer treatment
CAT scanner invented

1974 **DNA cloning methods** developed, laying the ground for determining the sequence of the human and other genomes

1975 **Monoclonal antibodies** produced.

1977 Tamoxifen approved for treatment of breast cancer
Medical **MRI scanner** developed
DNA sequencing developed

1979 **p53** discovered

1982 ***Helicobacter pylori*** isolated from stomach ulcers

1983 **Human papillomavirus** identified as the causative agent of cervical cancer
Polymerase chain reaction (PCR) developed

1986 **Retinoblastoma gene**, RB, identified in children with hereditary retinoblastoma and shown to be a tumour-suppressor gene

1987 **HER2 neu receptor** shown to be over-expressed in approximately 15% of stage 1 breast cancers

1990 Mutations of the ***BRCA1*** **gene** shown to be associated with breast cancer

1995 **Microarray technology** developed for molecular profiling

1998 Use of the monoclonal antibody, **trastuzumab** (Herceptin), shown to significantly improve survival in advanced HER2 neu breast cancer
Positron emission tomography (PET) approved for functional imaging
Human embryonic **stem cells** grown for the first time

2001 Draft sequence of the **human genome** published

2004 **Anti-angiogenesis antibody**, bevacizumab (Avastin), approved for treating advanced colon cancer
Vaccines against HPV developed to prevent cervical cancer

2006 **AACR celebrates 100 years** of uniting the cancer community in a shared mission to conquer cancer