Biobanking for diagnostic markers in neurological disorders

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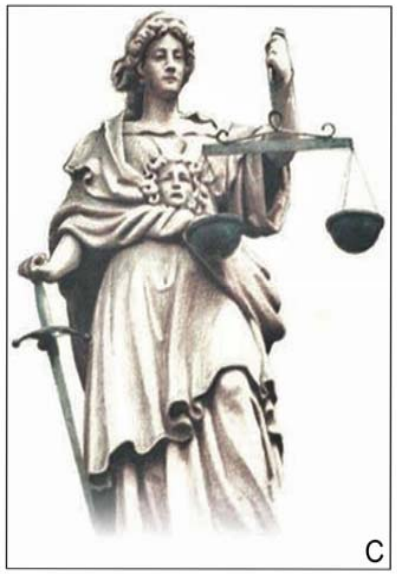
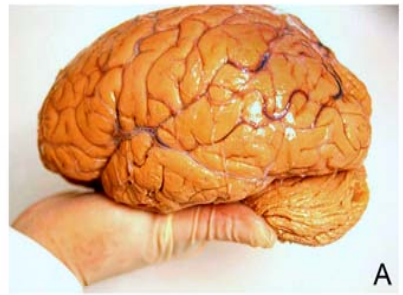
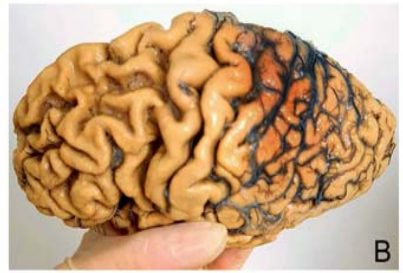
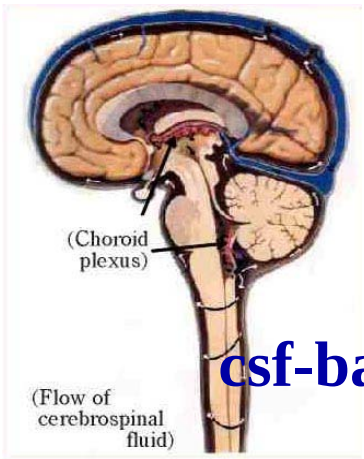
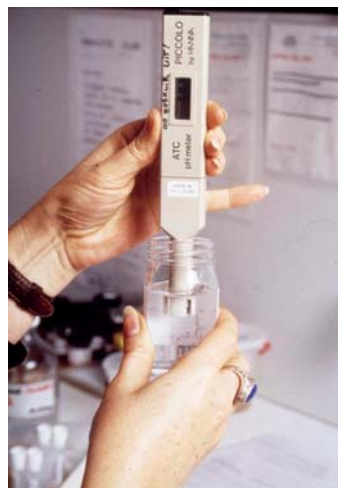








csf-bank



ESF, Biobanking, 1-6 november 2008

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Biomarkers; what's in a name???

- A **biomarker** is a substance used as an indicator of a biologic state. It is a characteristic that is objectively measured and evaluated as an indicator of normal biologic processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention.
- **No controversy**; we need an array of biomarkers both in the living patient and at post mortem autopsy.
- Biomarkers have an important role in early diagnostics, predictive value of disease progression and in target development.

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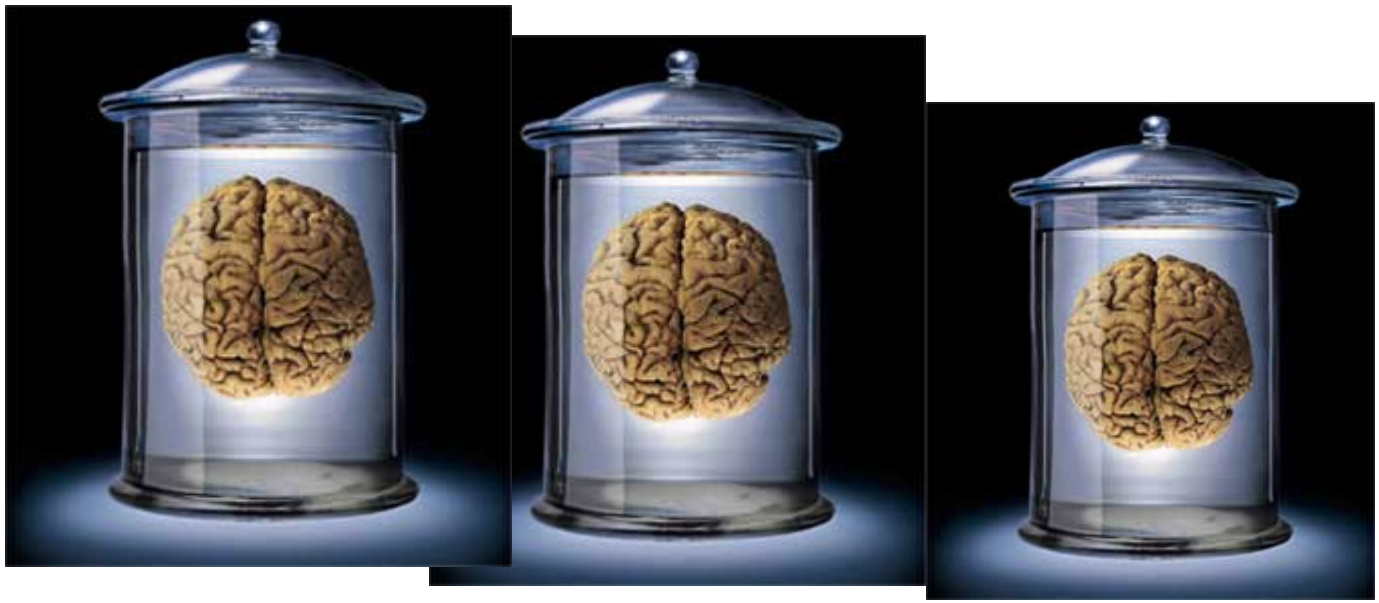
- **BIOBANKS; what's in a name???**
- **BTB Banks : Brain/tissue/bio banks**
- **No: a collection of brains in big jars**



<u>Yes</u>: collaborative effort of many disciplines: Neurlogy, Pathology, Radiology, Genetics, Psychiatry and Ethics

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Cell Tissue Banking (2008) 9:151–167
DOI 10.1007/s10561-008-9101-4

REVIEW PAPER

Standard Operating Procedures, ethical and legal regulations in BTB (Brain/Tissue/Bio) banking: what is still missing?

Rivka Ravid

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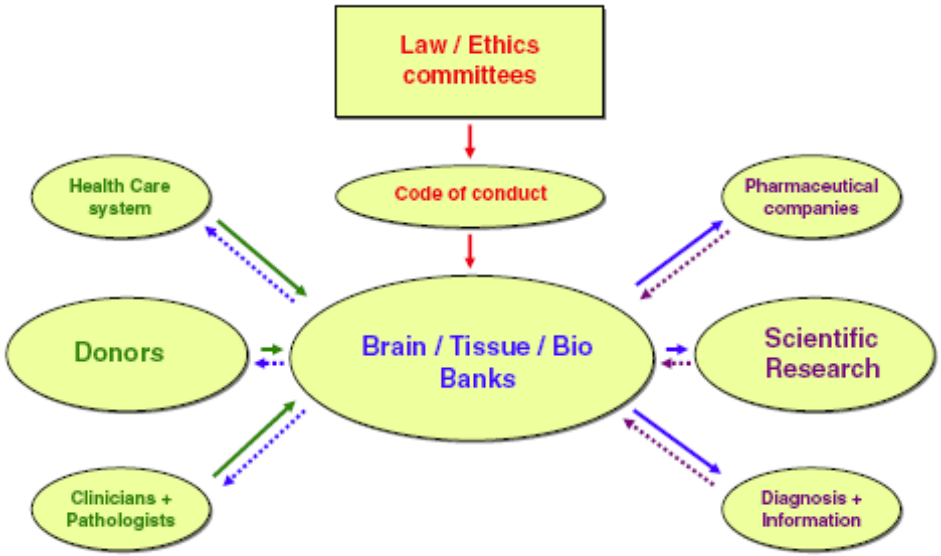

Fig. 1 *Flowchart of BTB-banks interfaces* This scheme illustrates BTB-banks as intermediaries to facilitate the availability of specimens for research. The middle line shows the three main parties who make this combination a success; the donors on the one hand, the BTB-banks and the scientific research community on the other hand. The local health care system, policy makers, clinicians, pathologists are the supporting elements and it is obvious that the main core of the banks is adherence by local legislation, ethics review committee and a solid code of conduct

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7 golden standards of BTB Banking

1. A well established local **donor system** in which consent is obtained for the use of tissues for scientific research and access to the medical records**.**
2. **Rapid autopsies** with a very short post-mortem delay and a **fresh dissection**; these are a prerequisite for an increasing range of **technical procedures and new systems such as neuronal cultures.**
3. Compatibility of **protocols for tissue procurement, management, preparation and storage** for diagnostics and scientific research.
4. A generally accepted consensus on the **clinical and neuro-pathological diagnostic criteria.**
5. **Quality control** of the dissemintaed samples (**pH/agonal state**).
6. Abiding internationally accepted guidelines for the **ethical and legal** aspects conform the local medico-legal system.
7. Monitoring proper **safety procedures**.

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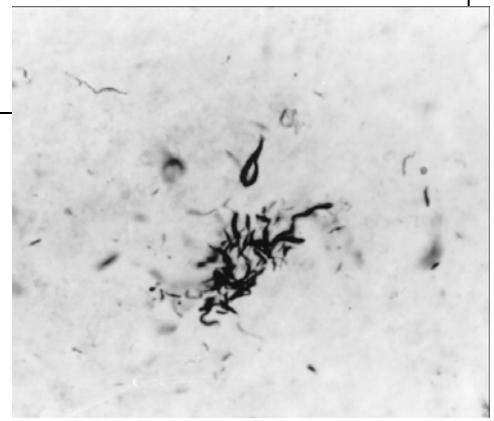
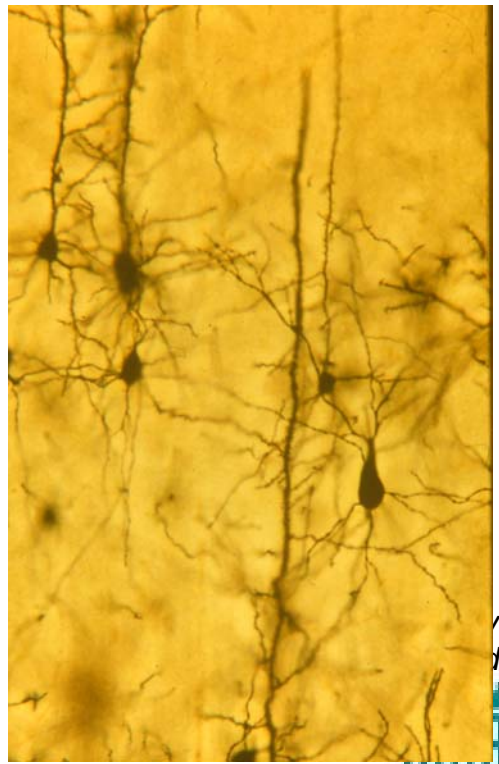
Alzheimers disease

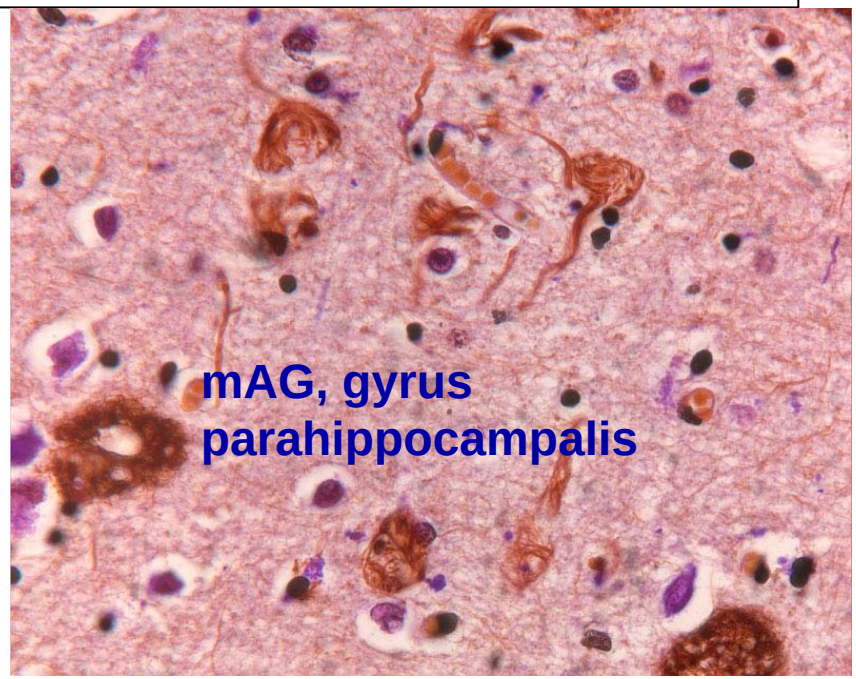
Age matched control

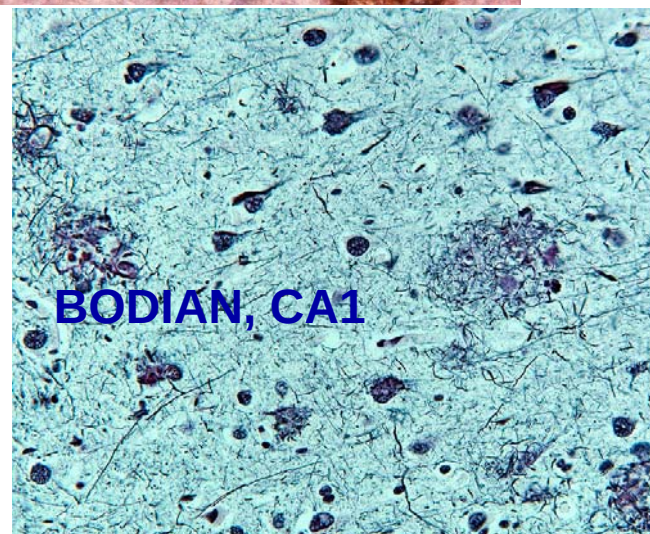
What went wrong?





Neuropathological diagnosis





BioBanks – The Da Vinci bridge to finding Biomarkers

Human subjects
Health / disease

Hystology/
cytology

CSF
Urine

Whole blood
Plasma
Serum

Tissue/
Tissue arrays

Cardiac Blood
Ventricular CSF

Stored cells
Cultured cells

Biomarkers
In vivo

Biomarkers at
Autopsy

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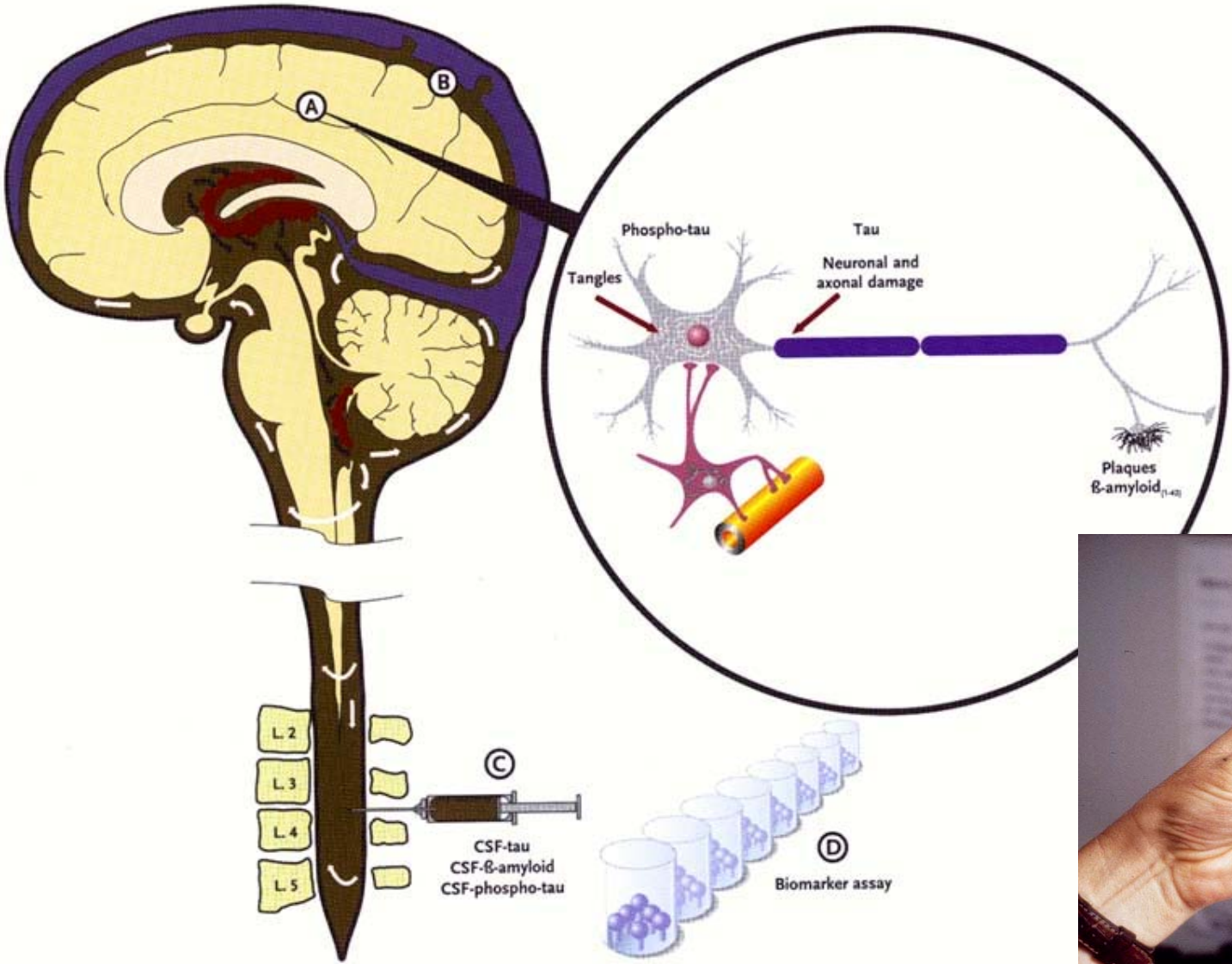
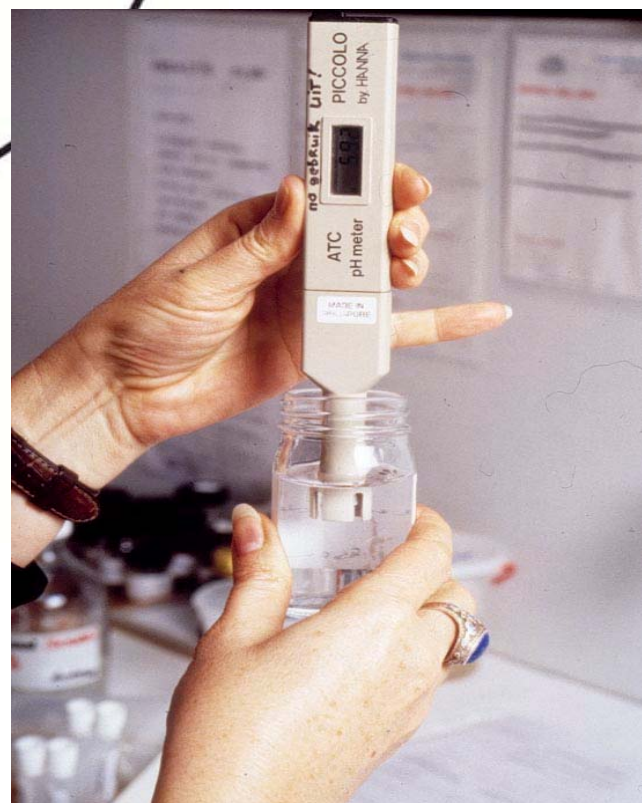
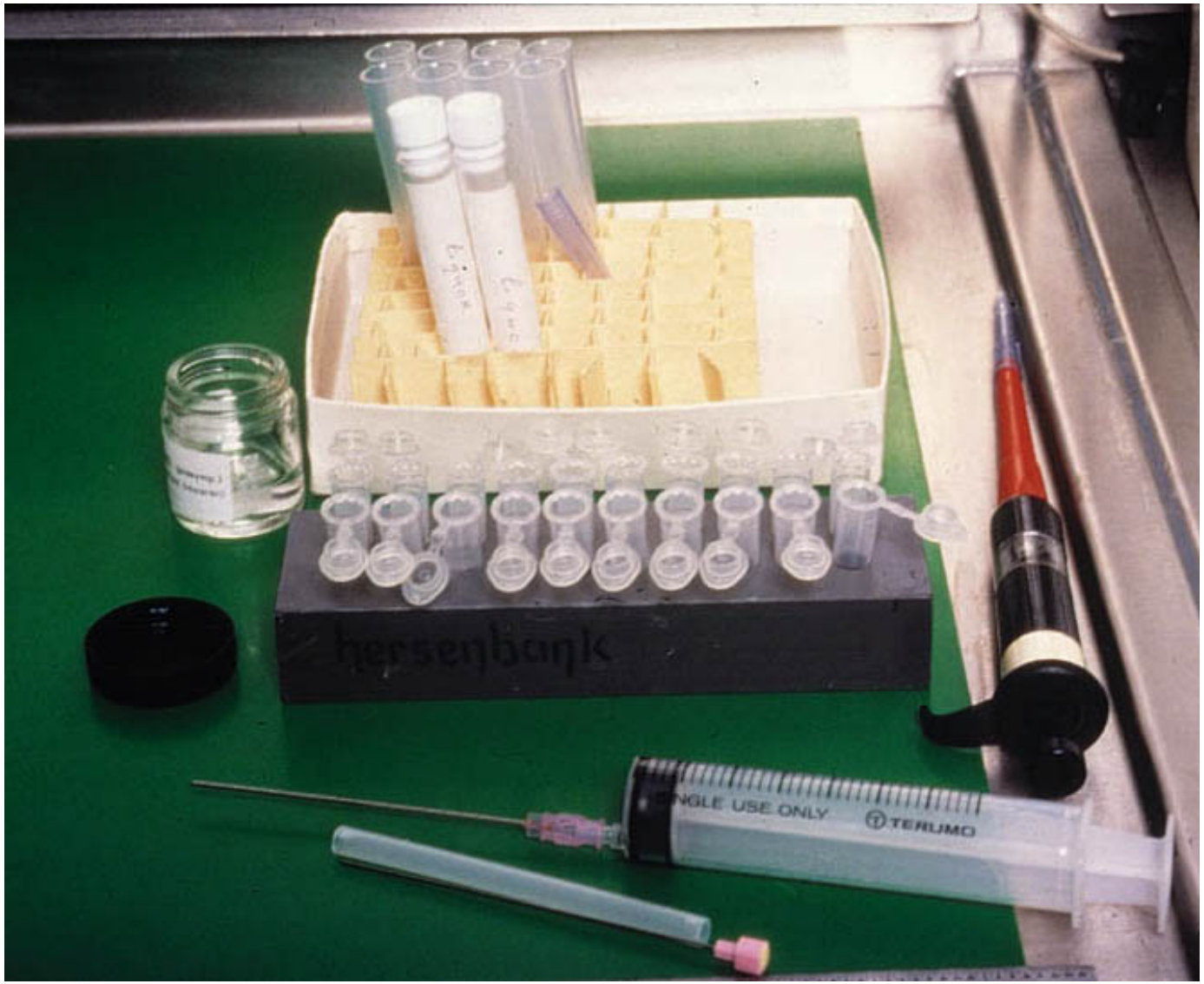

A
B
Phospho-tau
Tau
Tangles
Neuronal and
axonal damage
Plaques
ß-amyloid(1-42)
L 2
L 3
L 4
L 5
C
CSF-tau
CSF-ß-amyloid
CSF-phospho-tau
D
Biomarker assay


PICCOLO
by HANNA
ATC
pH meter



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71

Cell Tissue Banking (2008) 9:217–227
DOI 10.1007/s10561-008-9078-z

Electronic tracking of human brain samples for research

Christian E. Keller · Maria del Pilar Amaya · Etty Paola Cortes · Katerina Mancevska · Jean Paul G. Vonsattel

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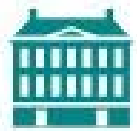

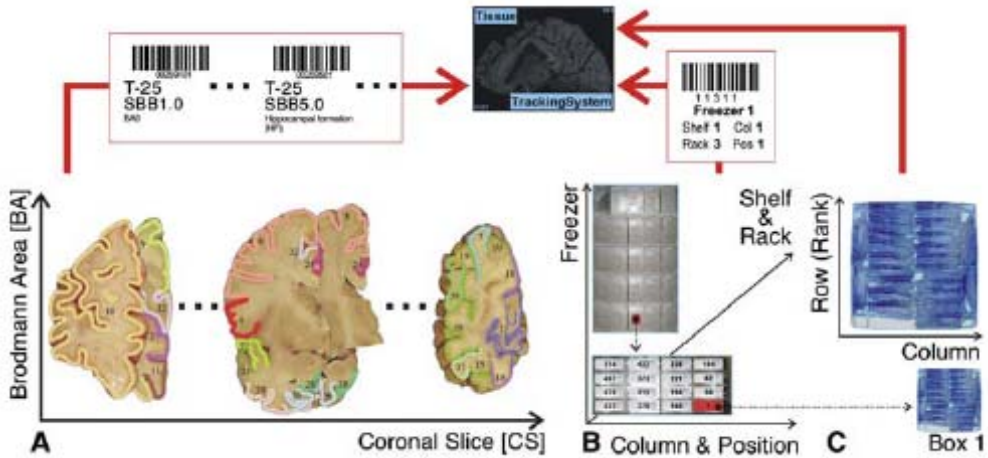

Fig. 3 Schematic of NYBB Tracking System storage information. The relational database (*NYBB Tracking System*) correlates a bar coded, unique sample identifier (panel a) with a unique set of bar coded coordinates in the 3D freezer space (panel b). Both the unique identifier and the freezer coordinates are bar coded to minimize the incidence of data entry error. The box position (panel c) is assigned by the computer and depends on the availability of the open (not filled) boxes as well as the sampled region (optional)

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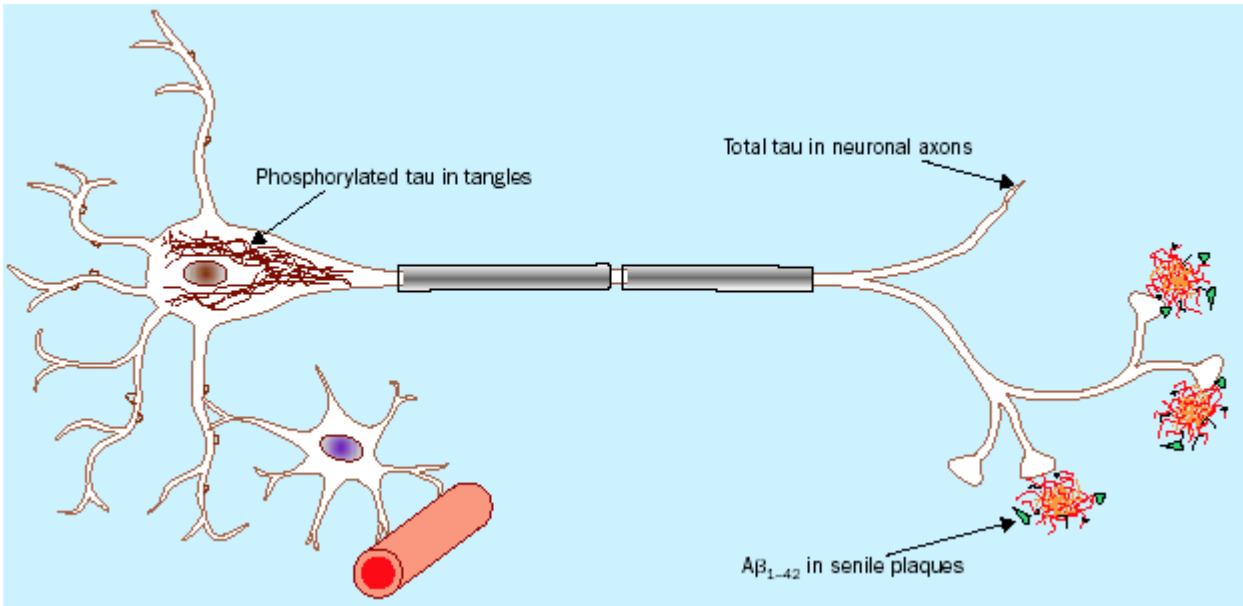

Figure 1. Schematic drawing of a neuron with an adjacent astrocyte and capillary. The central pathogenetic processes in AD and their corresponding biochemical markers are depicted. Total concentration of tau protein is a marker of neuronal and axonal degeneration, $A\beta_{1-42}$ concentration is a marker of plaque formation, and concentration of phosphorylated tau is a marker for hyperphosphorylation of tau and formation of tangles.

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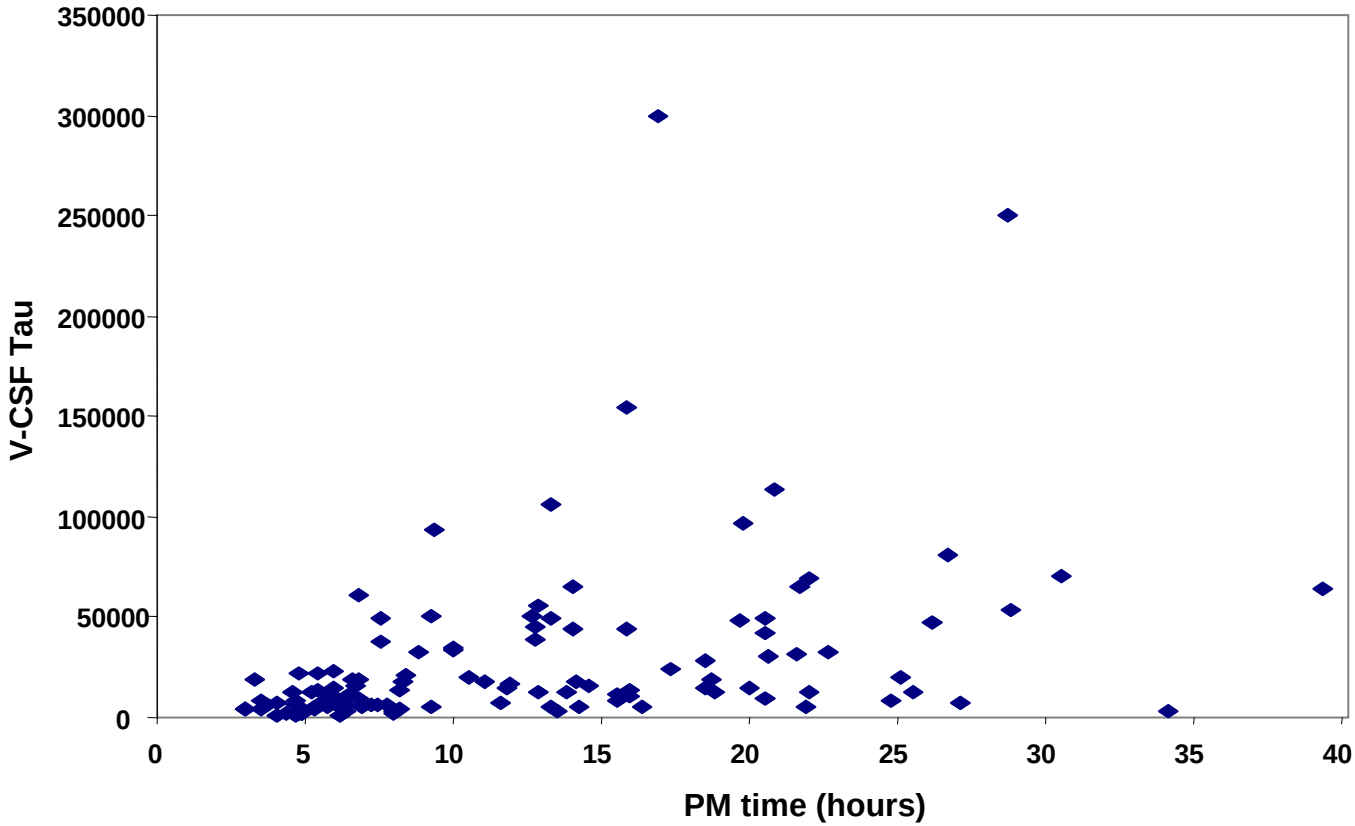

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CSF markers for incipient Alzheimer's disease-

Kaj Blennow and Harald Hampel

Department of Clinical Neuroscience, Gothenburg University, Sweden and Department of Psychiatry, Ludwig-Maximilian University, Munich, Germany.

Lancet Neurol 2003; **2:** 605–13

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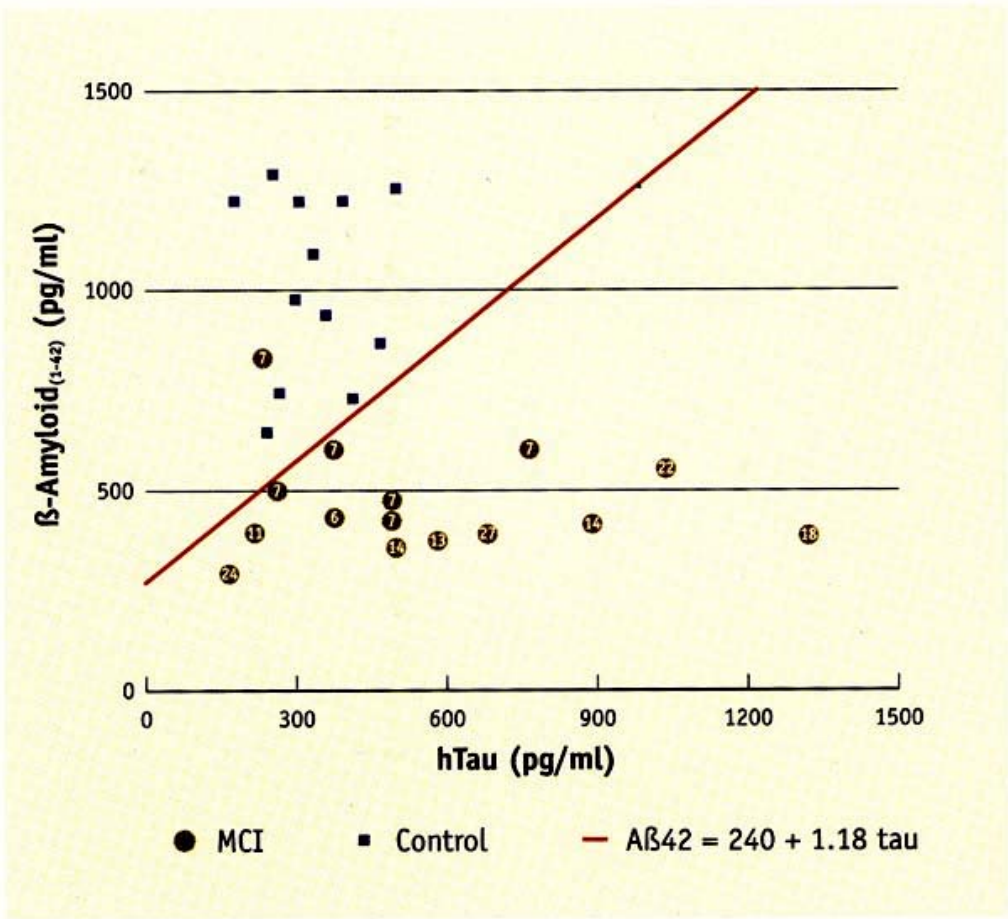

Relationship between mild cognitive impairment (MCI) and development of Alzheimer's disease (see p. 40).
Data points below the red discrimination line (low CSF ß-Amyloid and high CSF-hTau) have a high predictive value for the development of AD in MCI patients. Figures in gold circles indicate the number of months between test performance and clinical diagnosis of AD.

(Adapted from Andreasen et al. Neurosci Lett 1999;273:5-8)

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Matching Factors in Bio/Tissue banking

- **Ante-mortem:**
- **Age**
- **Gender**
- **Clinical diagnosis**
- **Agonal State**
- **Medication**
- **Circadian variation**
- **Seasonal variation**
- **Lateralization**
- **Family history/genetic load**

- **Post-mortem:**
- **Post-mortem delay**
- **Organ weight**
- **CSF / Tissue pH**
- **Cause of death**
- **Clock time of death**
- **Date of death**
- **Death to refrigeration**
- **Freezing / fixation**
- **Storage time**

THE DRUGS DON'T WORK

Dr Allen Roses, worldwide Vice President of Genetics at GlaxoSmithKline and a pre-eminent figure in the field, stated last year that more than 90 percent of drugs only work in 30-50 percent of people. While this wasn't news to his colleagues, many were surprised by such an admission, a shocked public were concerned that the blind faith many placed in the medicines they take was perhaps misplaced, and the wake up call that the drugs don't necessarily work was a bitter pill to swallow.

Asked about the response he received to the statement in the media he acknowledges that by some, "My remarks were sensationalised. But others could not understand what the fuss was about. We need to improve drug therapy, people know that; that is why the pharmaceutical industry exists."

SHOULD THIS COME AS A SURPRISE?

According to Roses, the answer is a resounding no. "Not every drug will work for everybody. This should come as news to no one. Most people have had the experience of going to the doctor and getting a medicine and having to go back and try another one. I think everybody has it in their experience that multiple drugs have been used for their headache or multiple drugs have been used for their backache or whatever."

To highlight the extent of the situation, at a scientific meeting in London last year Roses cited figures on how well different classes of drugs work in real patients. For

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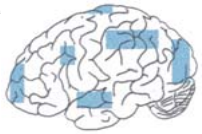
A PERSON WHO HASN'T BEEN GIVEN ALL THE FACTS YET.

vid Amsterdam



Nederlandse Hersenbank

Codicil nr: [200501]

Meibergdreef 33
1105 AZ Amsterdam

[C]

Name : A. Trevalyan
D. o. B. : 14/02/1937
Address : Battersea highway 2001
Postal code : 2001 AT Town : Comden

I herewith give consent for a post-mortem brain autopsy and declare that my brain may be used for scientific research in the frame work of the Brain Bank project. I also give consent for acces to my medical file and use of the information for research purposes.

Signature:

Date:

General Practitioner:
Name : Dr F. Bloggs
Tel. Nr : 020 – 123654

Next of kin:
Name : ms L. Trevalyan
Tel. Nr. : 06 – 32145678

In case of demise, please contact AS SOON AS POSSIBLE:

monday to Friday, during office hours, the Brainbank : 020 – 566 5499

outside office hours, the VUMC emergency desk : 020 – 444 4330

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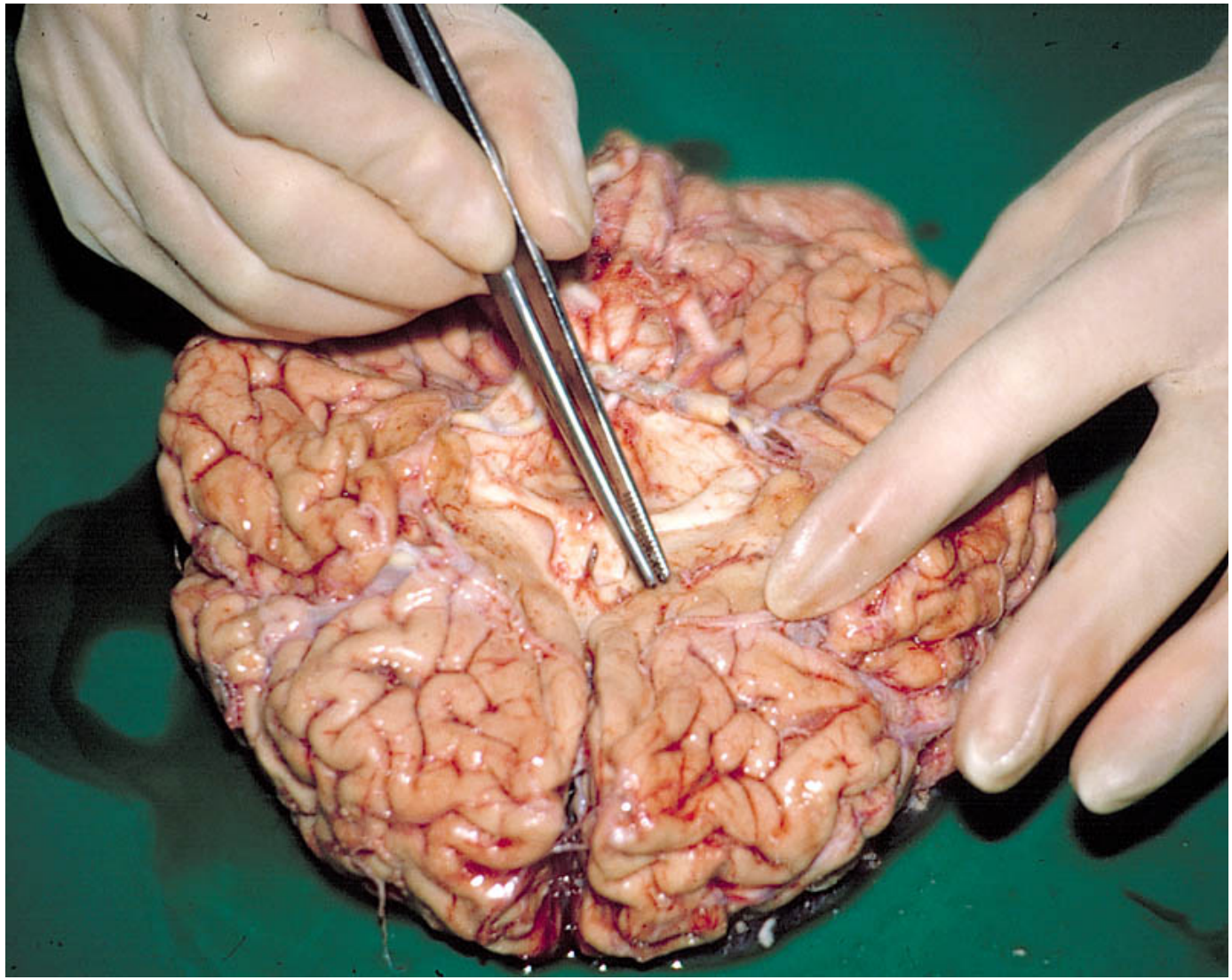

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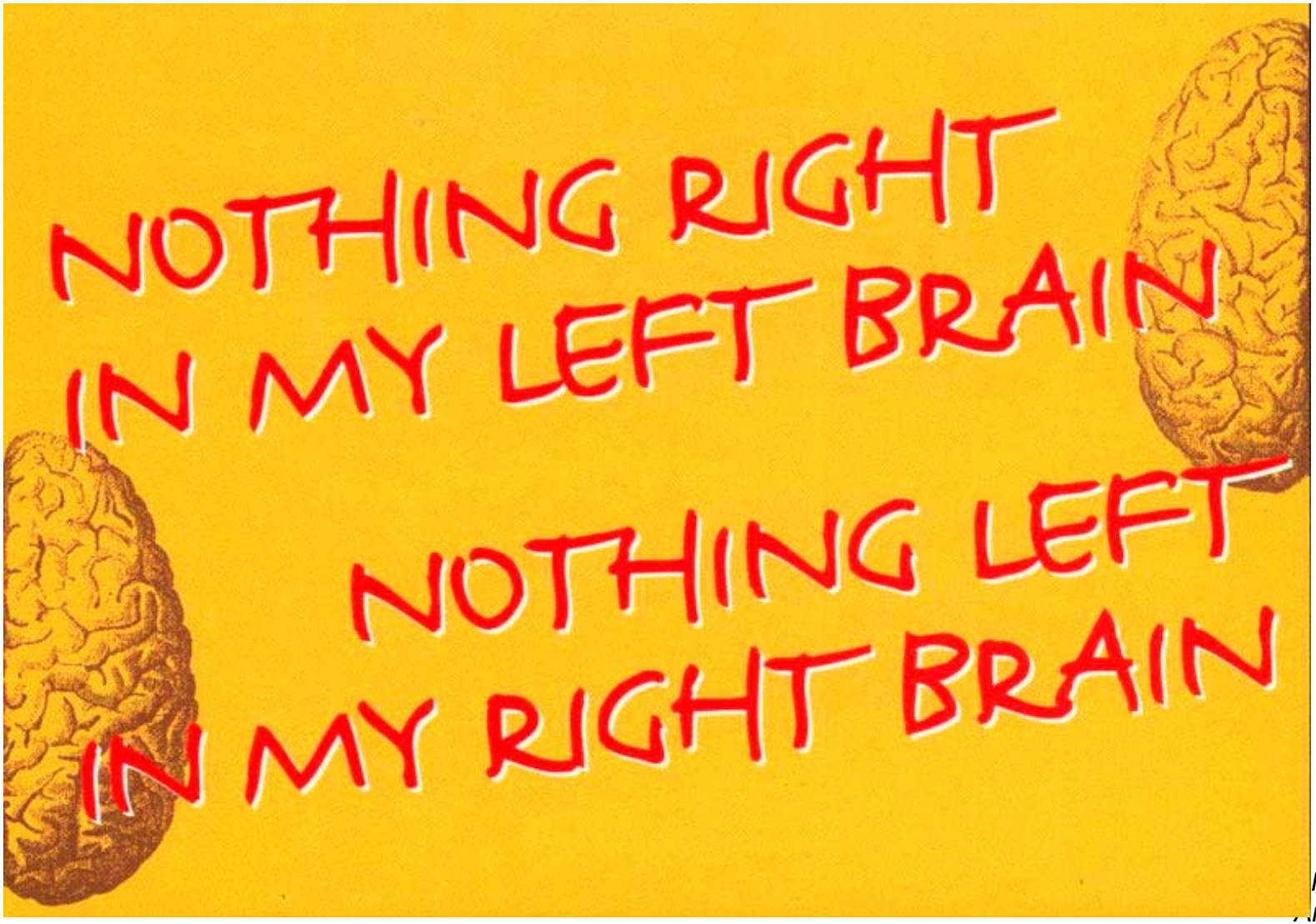

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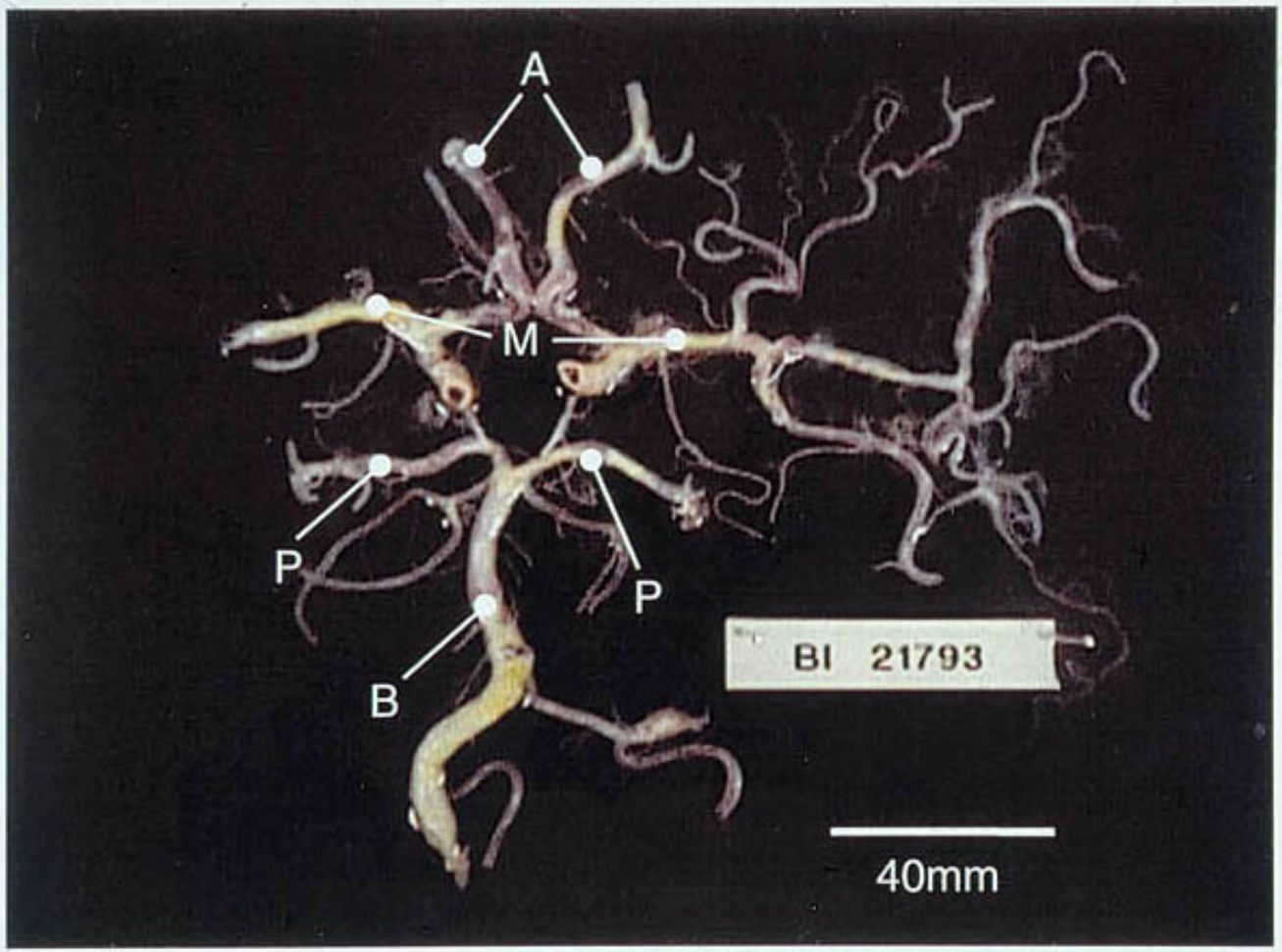
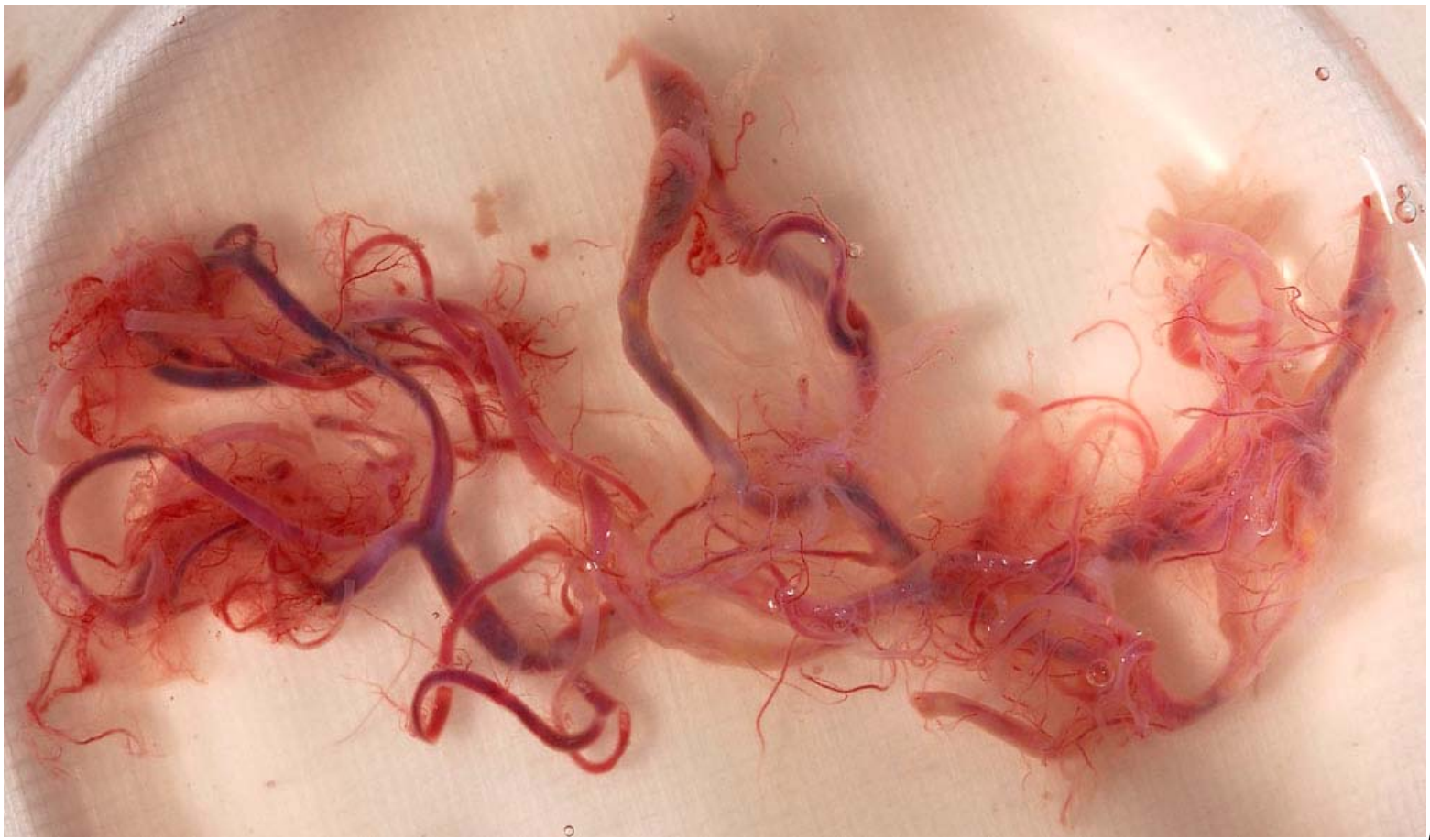


Figure 1. Photograph of human cerebral arterial blood vessels showing anterior (A), middle (M), posterior (P) and basal (B) cerebral arteries.



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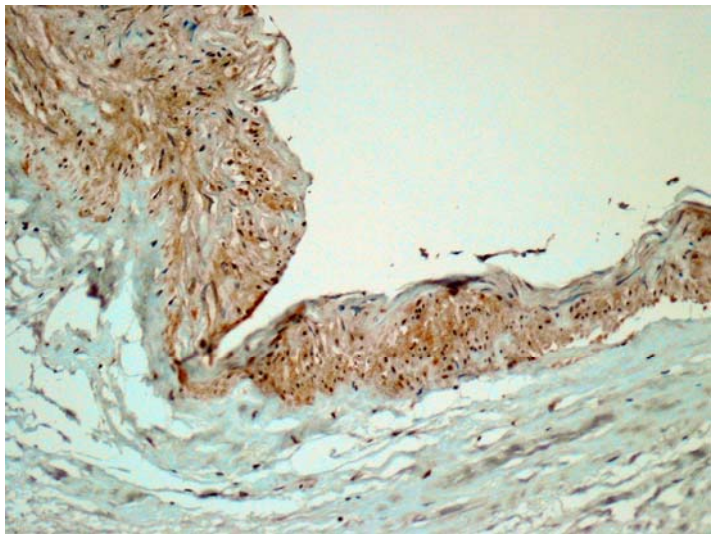
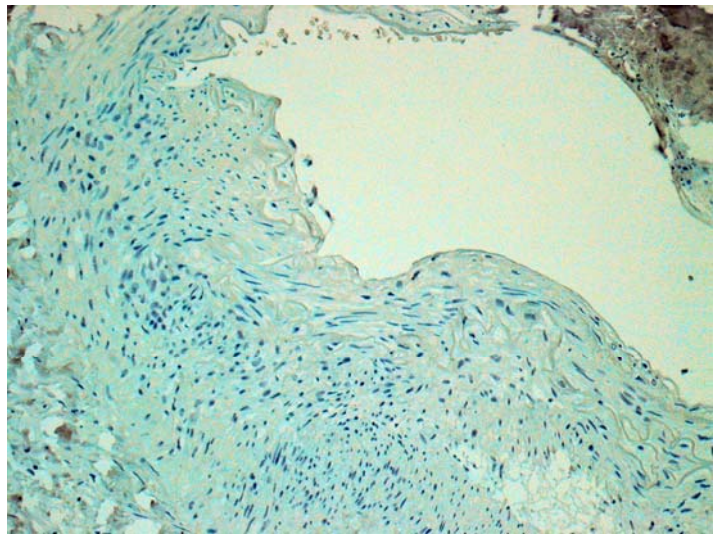
EP_4 receptor immunoreactivity in the meningeal artery





EP_4 immunoreactivity observed in the endothelium and smooth muscle of the meningeal artery

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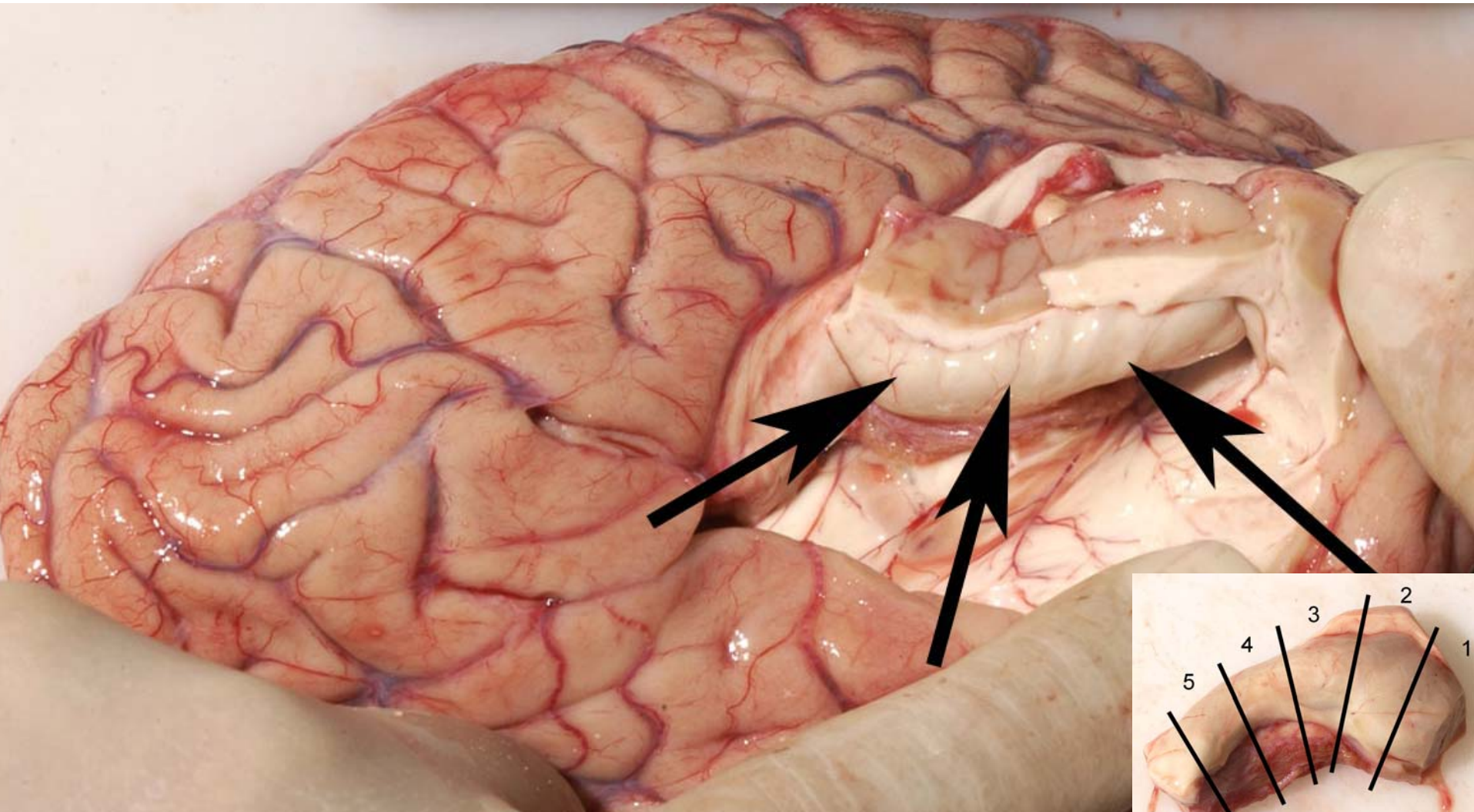
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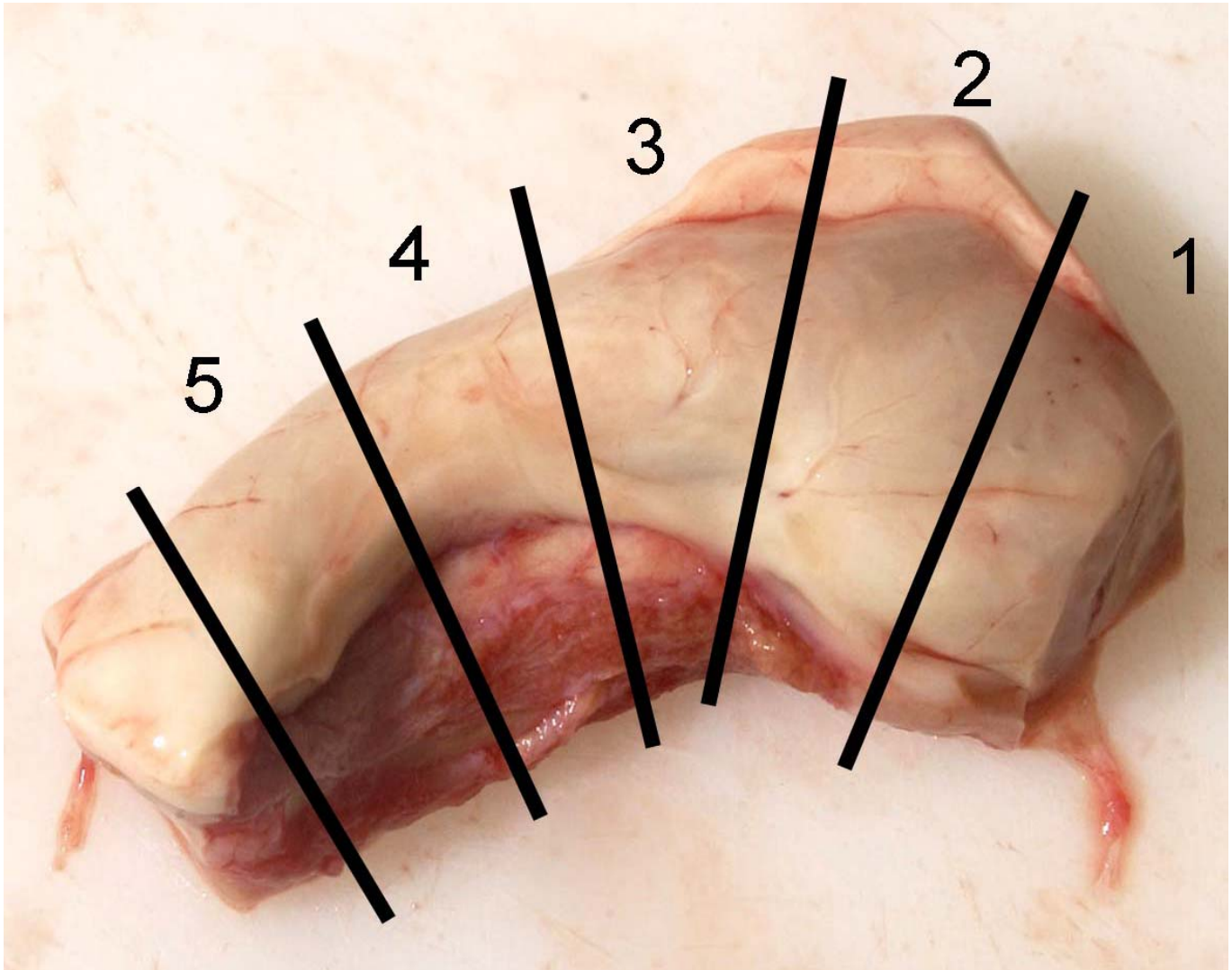

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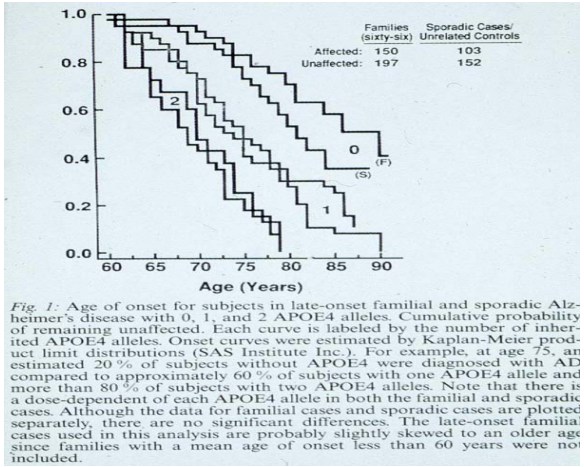
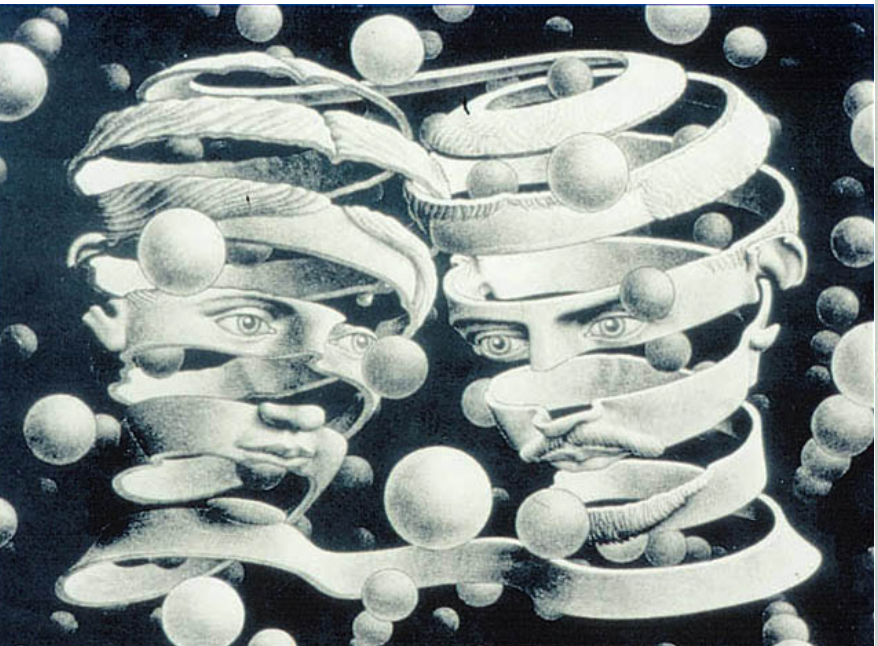


Fig. 1: Age of onset for subjects in late-onset familial and sporadic Alzheimer's disease with 0, 1, and 2 APOE4 alleles. Cumulative probability of remaining unaffected. Each curve is labeled by the numer of inherited APOE4 alleles. Onset curves were estimated by Kaplan-Meier product limit distributions (SAS Institute Inc.). For example, at age 75, an estimated 20 % of subjects without APOE4 were diagnosed with AD compared to approximately 60 % of subjects with one APOE4 allele and more than 80 % of subjects with two APOE4 alleles. Note that there is a dose-dependent of each APOE4 allele in both the familial and sporadic cases. Although the data for familial cases and sporadic cases are plotted separately, there are no significant differences. The late-onset familial cases used in this analysis are probably slightly skewed to an older age since families with a mean age of onset less than 60 years were not included.

Alle mensen zijn ongelijk

Prof.H. Galjard



GAB2 Alleles Modify Alzheimer's Risk in *APOE* ε4 Carriers

Eric M. Reiman,[1,2,3,17,18,*] Jennifer A. Webster,[1,17,18] Amanda J. Myers,[4,5,18] John Hardy,[5,6] Travis Dunckley,[1,17] Victoria L. Zismann,[1,17] Keta D. Joshipura,[1,17] John V. Pearson,[1,17] Diane Hu-Lince,[1,17] Matthew J. Huentelman,[1,17] David W. Craig,[1,17] Keith D. Coon,[1,7,17] Winnie S. Liang,[1,17] RiLee H. Herbert,[1,17] Thomas Beach,[8,17] Kristen C. Rohrer,[5] Alice S. Zhao,[5] Doris Leung,[5] Leslie Bryden,[5] Lauren Marlowe,[5] Mona Kaleem,[5] Diego Mastroeni,[8] Andrew Grover,[8,17] Christopher B. Heward,[9] Rivka Ravid,[10] Joseph Rogers,[8,17] Michael L. Hutton,[11] Stacey Melquist,[11] Ron C. Petersen,[12] Gene E. Alexander,[13,17] Richard J. Caselli,[14,17] Walter Kukull,[16] Andreas Papassotiropoulos,[1,15] and Dietrich A. Stephan[1,2,17,*]

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[6] Reta Lila Weston Laboratories, Department of Molecular Neuroscience, Institute of Neurology, Queen Square, London WC1N, 3BG, England

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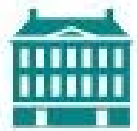

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Journal of Neural Transmission
Printed in Austria

Gene expression profiling of parkinsonian substantia nigra pars compacta; alterations in ubiquitin-proteasome, heat shock protein, iron and oxidative stress regulated proteins, cell adhesion/cellular matrix and vesicle trafficking genes

E. Grünblatt[1,*], S. Mandel[2,*], J. Jacob-Hirsch[3], S. Zeligson[3], N. Amariglo[3], G. Rechavi[3], J. Li[1], R. Ravid[4], W. Roggendorf[5], P. Riederer[1,*], and M. B. H. Youdim[2,*]

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Published online September 30, 2004;

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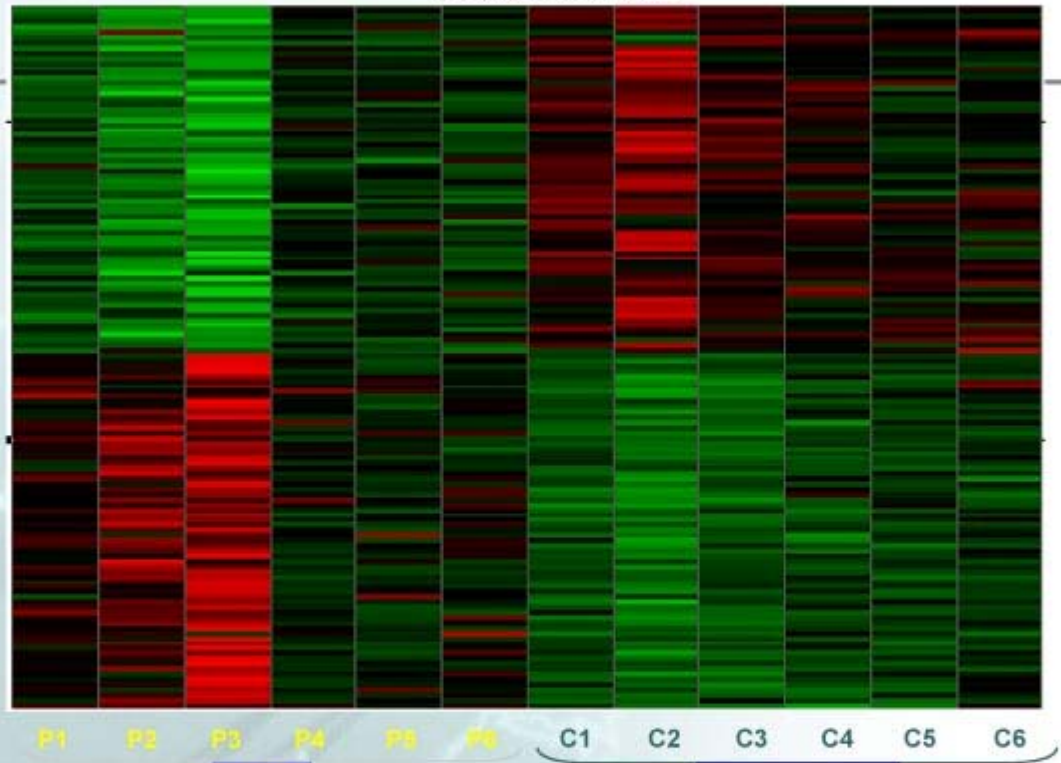
Heat Map of the 137 Genes Differentially Expressed in PD SNpc Compared to Matched Control



Affymetrix technology

Green for values less than the mean
Red for values greater than the mean.

Grünblatt et al. J. Neural Transm. 2004

Only genes that met the criteria of being altered by a factor of 1.5 relative to control and passed the Wilcoxon test at the significant level of $p<0.05$ were included.

Frontotemporal Dementia

Correlation between genetic factors and neuropathology

J.Van Swieten, Department of Neurology
P.heutink, Clinical genetics, VUMC, Amsterdam
R.Ravid, W. Kamphorst, Netherlands Brain Bank

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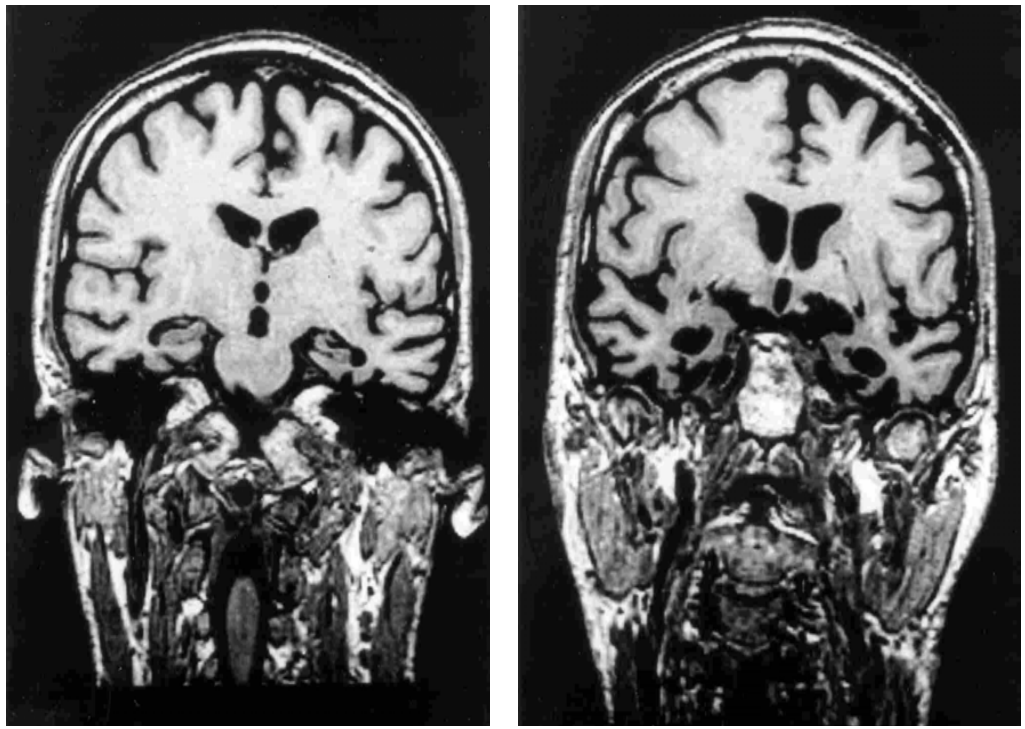
MRI of patient with mutation S320F



Atrophy most prominent in temporal lobes (including hippocampus)

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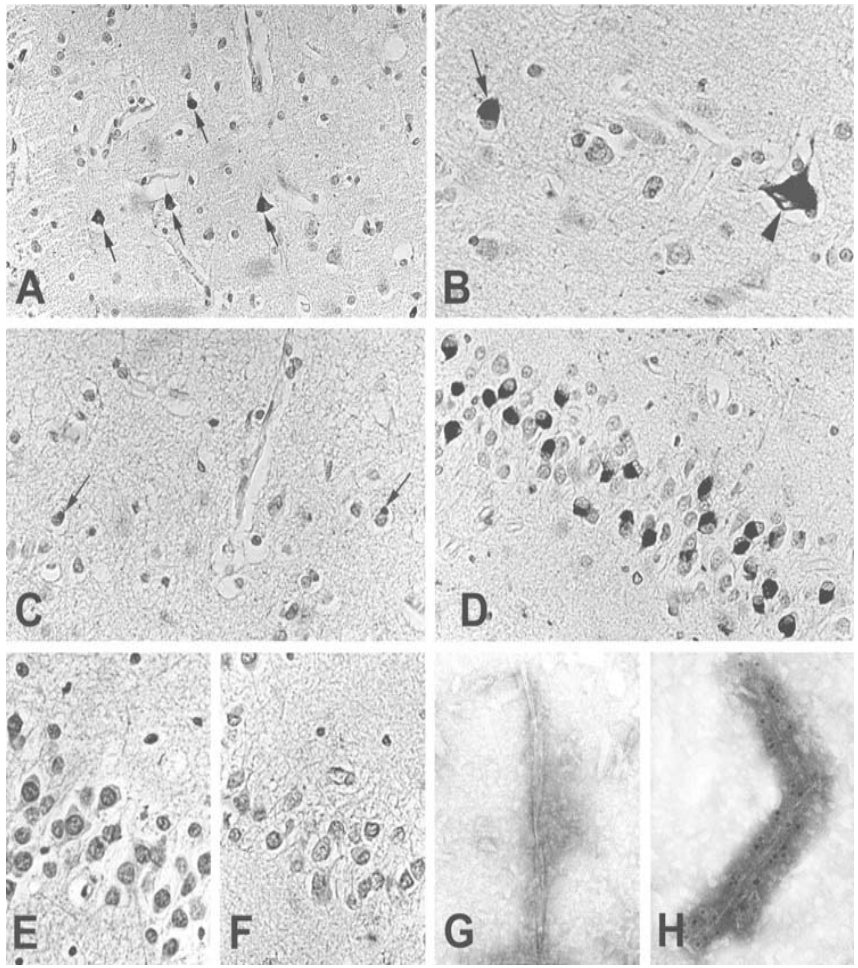
Rosso et al, Annals of Neurology 2002

Tau pathology in S320F mutation

A-C Tau deposits in affected temporal cortex



D. Pick-like bodies in dentate gyrus of hippocampus

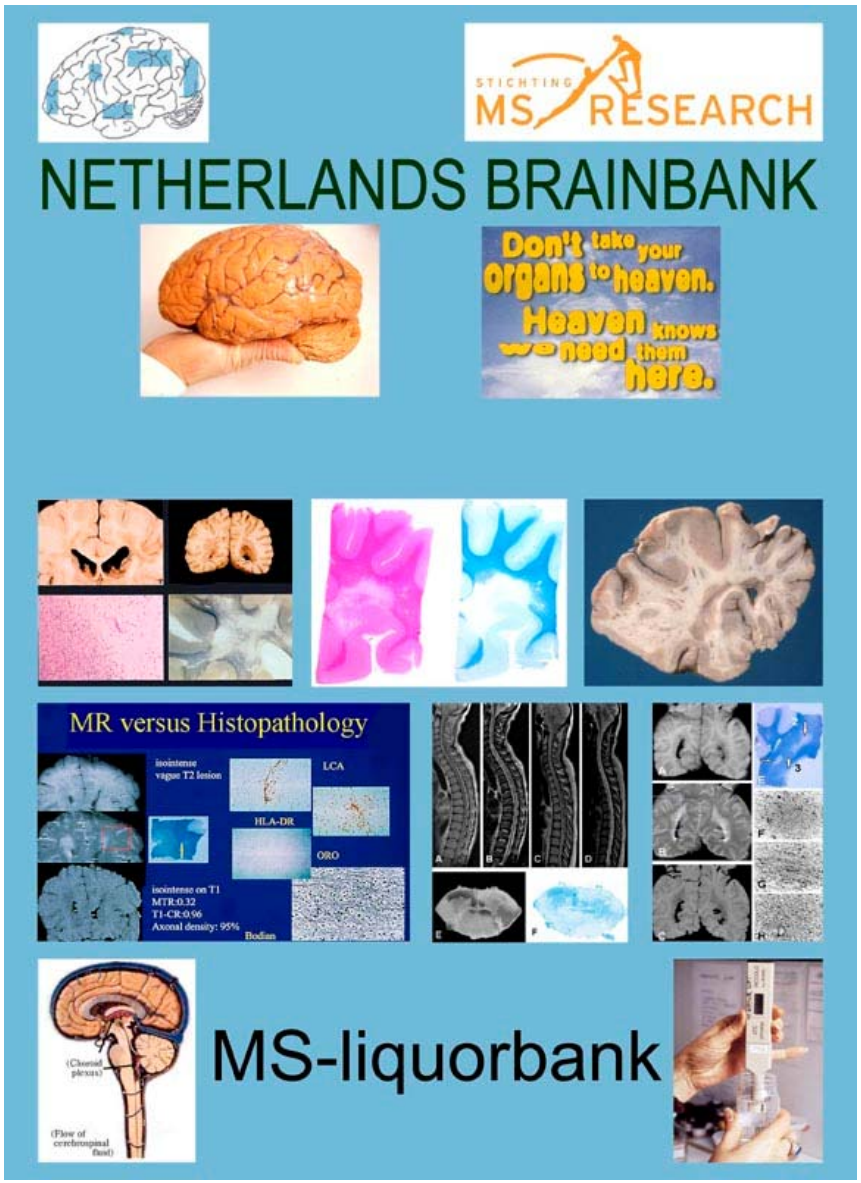
E-F. Inclusions not visible with Bodian and 12E8 antibody

G-H. Tau positive filaments with electron microscopy

R. Ravid, Amsterdam

Rosso et al, Annals of Neurology 2002

MRI guided pathology of Multiple Sclerosis



MS donors

Neurology – clinical diagnosis

Radiology – MRI

Neuropathology
Immunology

Tissue bank

samples for research

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Amsterdam

Figure 1
Correlation of MRI with histopathology. Coronal slice of MS brain imaged post mortem by T_1- (A) and T_2 (B) -weighted MR. Frames with dotted lines are areas that were excised, but are not depicted here. Frame 1 include a white matter area of hyperintensity on T_2-weighted MRI (B) that is slightly hypointense on the T_1-weighted image (A). These abnormalities were not macroscopically visible or palpable at autopsy. A white matter area tissue block obtained from the area of frame 1 is stained with LFB (C,D), and immunohistochemically stained with CD45 (LCA) antibody (E) and HLA-DR (LN3) antibody (F). The tissue specimen contained a small active demyelinating MS lesion (a, in panel C), with abundant phagocytic macrophages containing LFB-positive myelin breakdown products (a, arrows, in panel D), and two so-called (p)reactive lesions (b and c, in panels C,E,F). The (p)reactive lesion in panel E contains CD45-positive leukocytes within a small blood vessel (arrowheads) and surrounding CD45-positive activated microglia (asterisk, arrows). The preactive lesion in panel F contains numerous HLA-DR-positive activated microglia (arrows). Scale bars D = 1 µm, E and F = 1 µm (haematoxylin staining of nuclei).

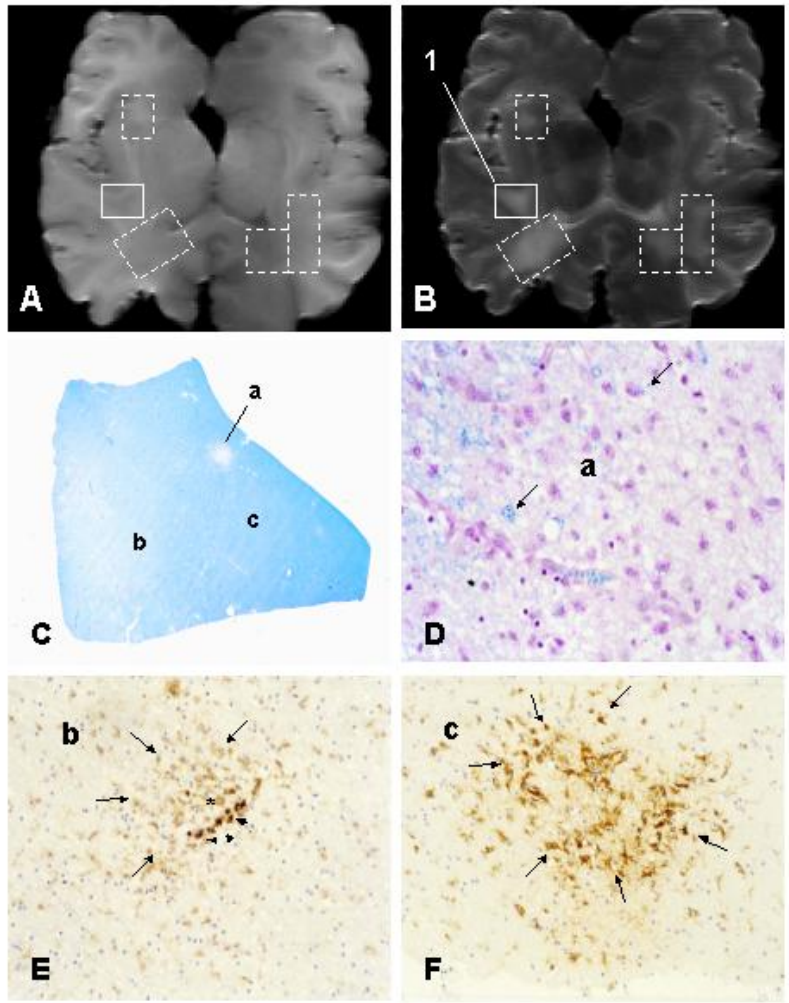
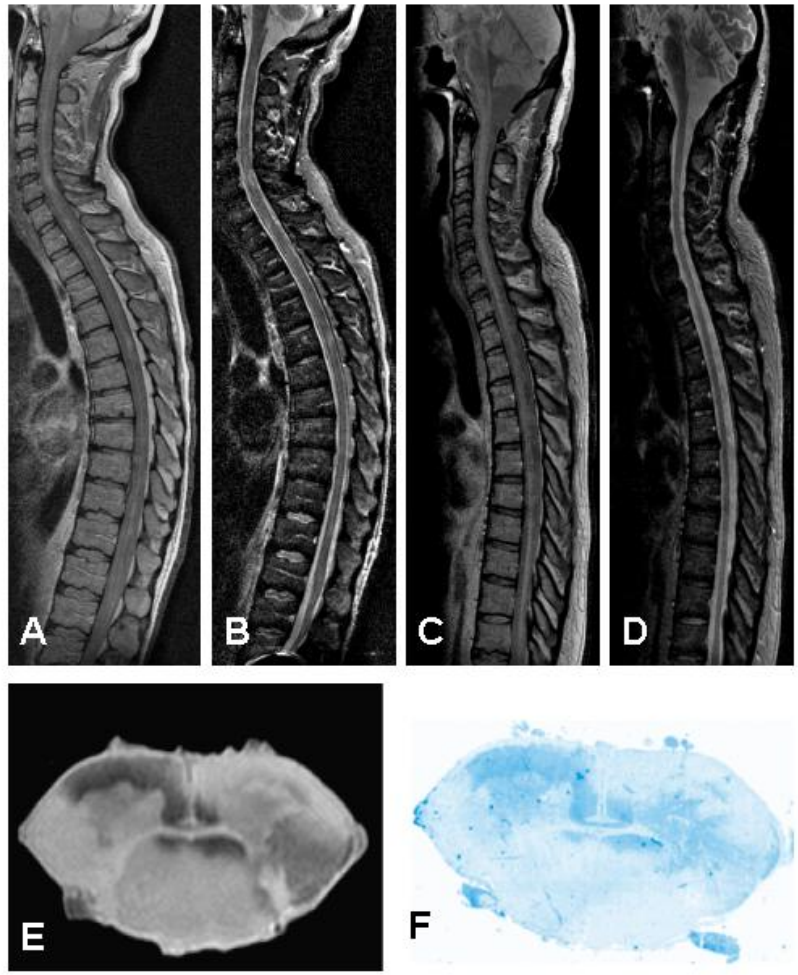


Figure 2
Sagittal *in situ* spinal cord MRI of MS patients with focal (A,B) and diffuse (C,D) abnormalities, and an axial high-resolution MRI of cervical spinal cord (E) of an MS patient, with the corresponding LFB-stained paraffin-embedded tissue section . Patients are imaged using proton density (A,C) and T_2-weighted sequences (B,D,E). Focal areas of signal intensity are clearly delineated by both proton density MRI (A, arrows) and T_2-weighted MRI (B, arrows), while areas of diffuse signal intensity increase are detectable by proton density MRI (C,arrow), but not visible in T_2-weighted images (D). High-resolution axial MRI of the spinal cord (E) offer an accurate depiction of areas of total or partial myelin loss, as shown by the corresponding LFB-stained tissue section (F).



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ELSEVIER

Molecular Brain Research 28 (1995) 311–318

MOLECULAR BRAIN RESEARCH

Research report

Tissue pH as an indicator of mRNA preservation in human post-mortem brain

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Sample pH

Importance of sample pH has been recognized since 1980s.

Sample pH was associated with terminal condition of death.

DNA microarray works revealed that sample pH affect global gene expression pattern systematically.

(Li et al 2005, Tomita et al 2005)

Systematic changes in gene expression in postmortem human brains associated with tissue pH and terminal medical conditions

Jun Z. Li[1,2], Marquis P. Vawter[3], David M. Walsh[3], Hiroaki Tomita[3], Simon J. Evans[4], Prabhakara V. Choudary[5], Juan F. Lopez[4], Abigail Avelar[1], Vida Shokoohi[1], Tisha Chung[1], Omar Mesarwi[1], Edward G. Jones[5], Stanley J. Watson[4], Huda Akil[4], William E. Bunney Jr[3] and Richard M. Myers[1,2]

[1]Stanford Human Genome Center and [2]Department of Genetics, Stanford University School of Medicine, Stanford, California, USA, [3]Department of Psychiatry and Human Behavior, University of California, Irvine, California, USA, [4]Mental Health Research Institute, University of Michigan, Ann Arbor, Michigan, USA and [5]Center for Neuroscience, University of California, Davis, California, USA

Received October 17, 2003; Revised December 15, 2003; Accepted January 12, 2004

Studies of gene expression abnormalities in psychiatric or neurological disorders often involve the use of postmortem brain tissue. Compared with single-cell organisms or clonal cell lines, the biological environment and medical history of human subjects cannot be controlled, and are often difficult to document fully. The chance of finding significant and replicable changes depends on the nature and magnitude of the observed variations among the studied subjects. During an analysis of gene expression changes in mood disorders, we observed a remarkable degree of natural variation among 120 samples, which represented three brain regions in 40 subjects. Most of such diversity can be accounted for by two distinct expression patterns, which in turn are strongly correlated with tissue pH. Individuals who suffered prolonged agonal states, such as with respiratory arrest, multi-organ failure or coma, tended to have lower pH in the brain; whereas those who experienced brief deaths, associated with accidents, cardiac events or asphyxia, generally had normal pH. The lower pH samples exhibited a systematic decrease in expression of genes involved in energy metabolism and proteolytic activities, and a consistent increase of genes encoding stress-response proteins and transcription factors. This functional specificity of changed genes suggests that the difference is not merely due to random RNA degradation in low pH samples; rather it reflects a broad and actively coordinated biological response in living cells. These findings shed light on critical molecular mechanisms that are engaged during different forms of terminal stress, and may suggest clinical targets of protection or restoration.

INTRODUCTION

Effect of Agonal and Postmortem Factors on Gene Expression Profile: Quality Control in Microarray Analyses of Postmortem Human Brain

Hiroaki Tomita and Marquis P. Vawter and David M. Walsh, Simon J. Evans, Prabhakara V. Choudary, Jun Li, Kevin M. Overman, Mary E. Atz, Richard M. Myers, Edward G. Jones, Stanley J. Watson, Huda Akil, and William E. Bunney, Jr.

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PMI does not affect microarray data quality

		18S/28S ratio	*ACTB* ratio	*GAPDH* ratio	Deg. slope	Median	% presence
18S/28S ratio	*R*	1.000	-0.149	-0.111	-0.093	-0.023	0.041
	P	.	0.134	0.268	0.351	0.822	0.682
Sample pH	*R*	0.041	-0.455	-0.485	-0.515	0.122	0.185
	P	0.685	<0.001	<0.001	<0.001	0.224	0.063
PMI	*R*	0.091	-0.095	-0.151	-0.110	0.015	-0.056
	P	0.361	0.345	0.129	0.272	0.878	0.577

18S/28S ribosomal RNA ratio and PMI do not affect DNA microarray data quality

Sample pH directly affects microarray data quality

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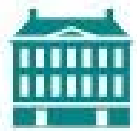
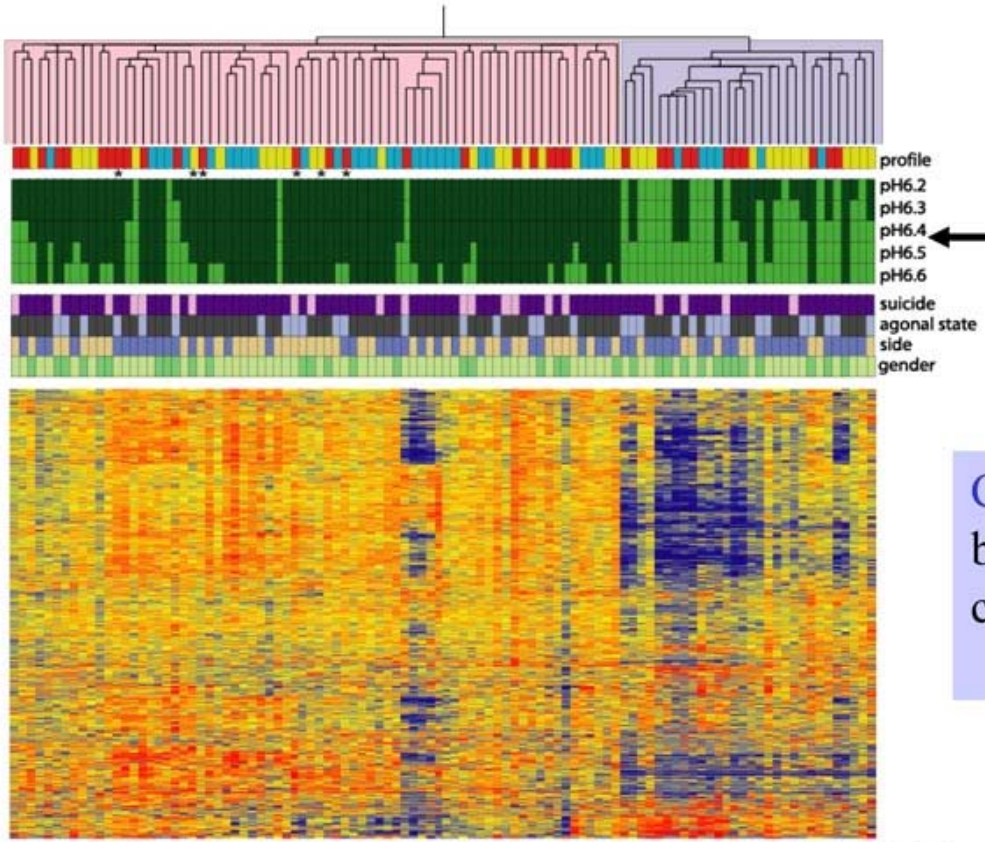


Critical pH threshold in mitochondria-related genes



Two-way hierarchical clustering based on the expression levels of 676 mt-probe sets.

(Iwamoto et al., 2005)

Critical pH threshold
pH6.4-6.5

Critical pH threshold in brain, below which transcriptional changes are accelerated
(Li et al., 2005)

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Factors interfering with tissue preservation

- Prolonged agonal state
- Metabolic disease
- Infectious diseases. Fever
- Seizures.
- Coma, intracraneal pressure
- pH of the tissue/CSF

- Post-mortem delay between death and tissue processing
- Temperature of the corpse before processing
- Storage of the fixed samples. Fixation procedures and periodic changes of the fixative solution: paraformaldehyde, formalin. Paraffin blocks
- Storage of the frozen samples: -80ºC. Thawing

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Suggsted precautions for handling bio specimens

Human tissue and fluids may contain highly infectious agents and have potential risks of diseases that are highly communicable to other humans. All such tissues and fluids should be treated as being a risk for such transmission and handled carefully. Studies have shown several extremely hazardous agents (viruses, bacteria, prions) to be very stable.

The Creutzfeldt-Jakob (C-J) agent, for example, has been shown to be active in tissue which has been fixed for 30 years and could still be transmissible. The agent has also been shown to withstand conventional autoclaving. Although relatively rare, there is no quick screening method for such agents, and adequate caution must be exercised.

It is recommended that work with biospecimens, especially when fresh/non-fixed would be performed under a biohazard hood with all personnel taking special care. Any waste material should be treated as a biohazard and discarded according to local safet procedures for handling such material, which may include autoclaving, burial, or other methods.

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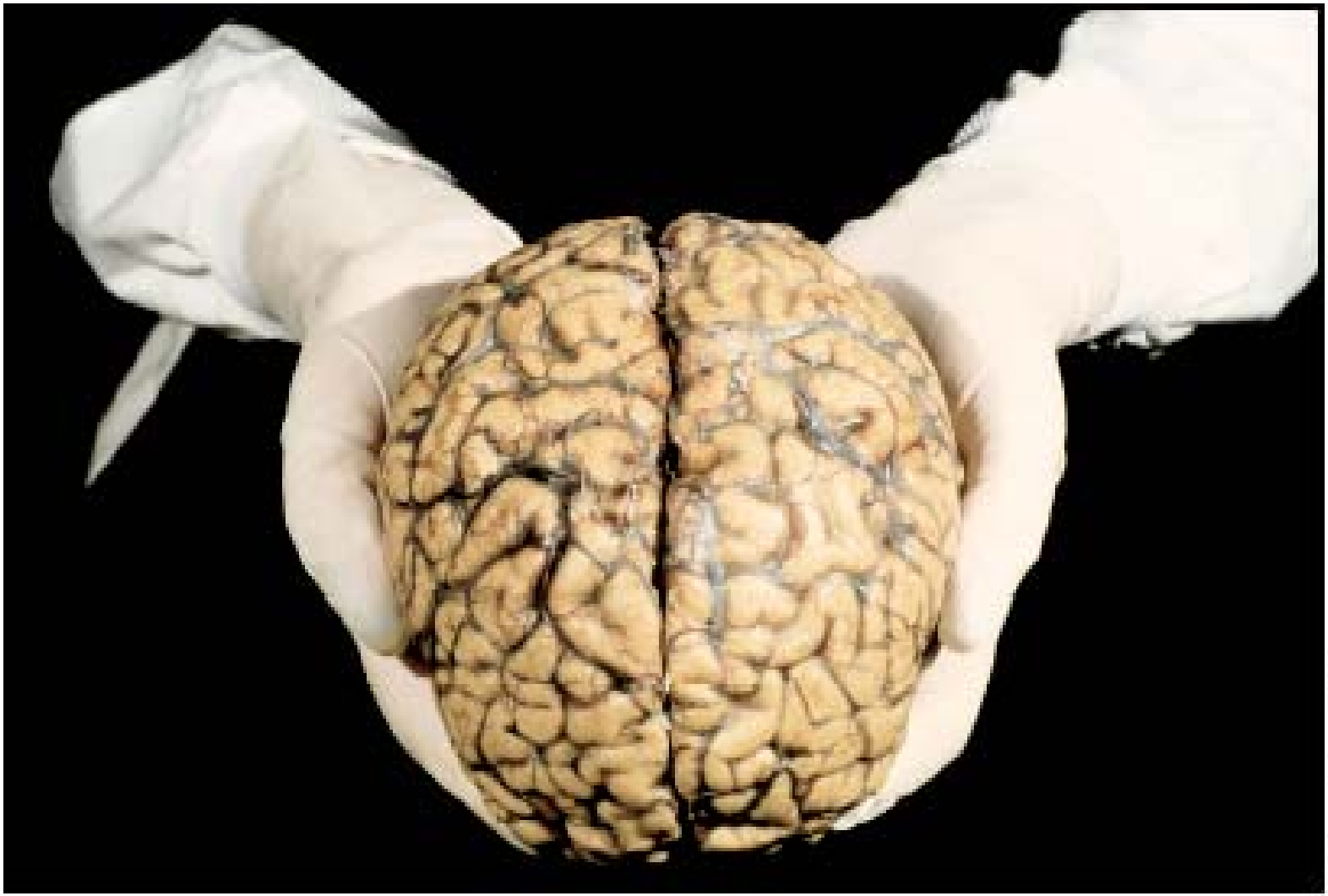

Inquiry finds brains were removed without consent

BMJ VOLUME 326 17 MAY 2003

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Ethical / Legal Issues in Tissue banking

The use of human tissue in medical research is the focus of public and professional concerns and had recently been the subject of several reports on bio-ethics.

To create and develop the right infrastructure underlying brainbank activities, one should have medico-legal and ethical support according to local legislation including the following issues:

- **Tissue procurement:** all factors related to the donor programme and informed written consent of the donor.
- **Tissue management:** factors related to collection, handling and preservation of tissues.
- **Tissue dissemination:** factors related to scientific research and supplying samples of high scientific quality and properly matched for specific projects.
- **Confidentiality:** the anonimity of tissues and patient's records should be protected at all times. Samples supplied for research should be coded by the Tissue Bank and a tissue tracking system should be established to guaranteed the anonymity of the donor.
- **"Financial gain":** from a legal and ethical point of view it is highly important to establish tissue banks as non-profit making sources for human tissues for scientific research. The tissue bank acts as custodian of tissue and the tissues must not be commercially handled.
- **Genetic testing:** the tremendous advances in genetic research in our decade raise serious ethical problems and complexities; there is sometimes conflicting interest in the need for knowledge and information on the one hand and the use and implications of this information for the people involved.

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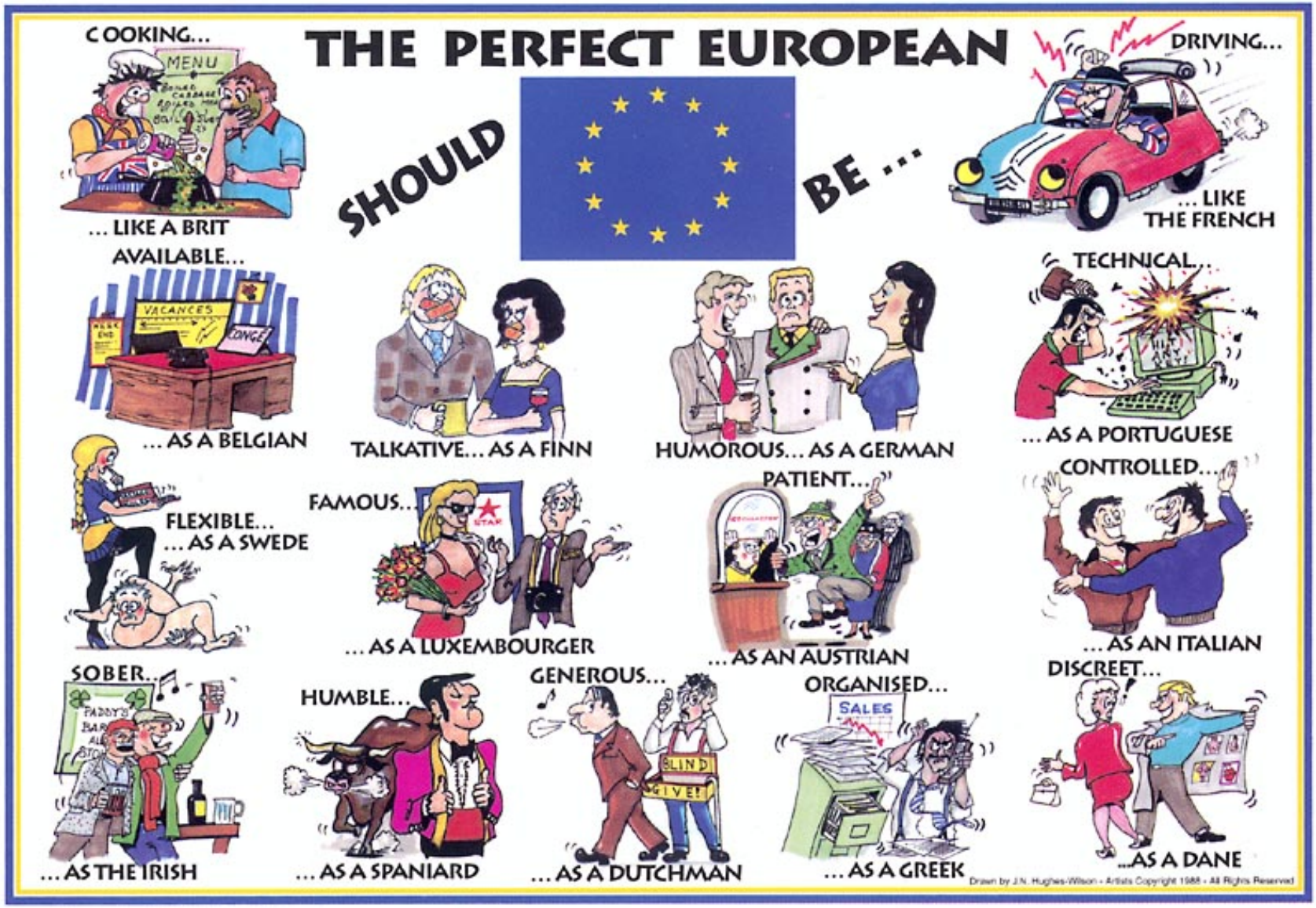

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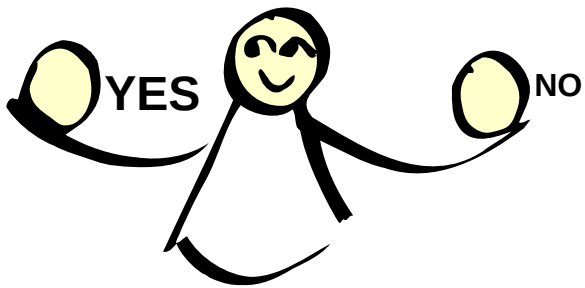
BrainNet Europe II

BRAINNET EUROPE

Network Decisions



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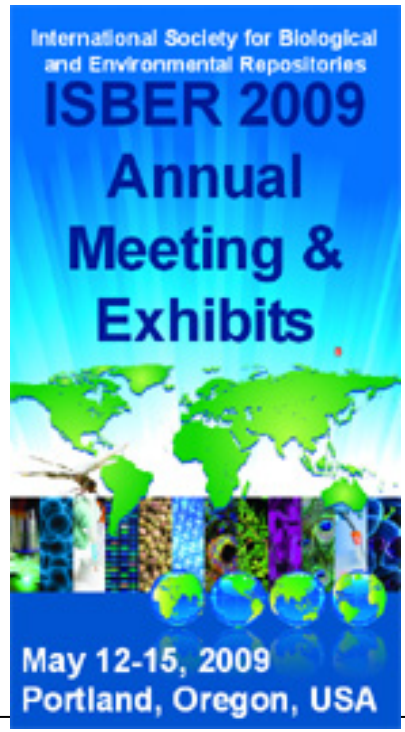
- **In May 2000, the International Society for Biological**
- **and Environmental Repositories was officially chartered,**
- **to promote specimen banking and enhanced repository**
- **operations world-wide.**



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MARBLE ARCH WORKING GROUP ON INTERNATIONAL BIOBANKING

- **Marble Arch Working Group**
- **The Marble Arch Working Group on International Biobanking** was created in response to a growing need to harmonize approaches in regional and national Biobanks that address the critical issues in managing a modern human specimen Biobank. The participant funded Marble Arch group has proven to be an invaluable forum for the candid exchange of information, ideas and expertise.
- Following the inaugural meeting in London in December 2005, the Marble Arch Working Group gained significant visibility in the respective member organisations and the scientific community at large. With the recognition the group has received to date, it is anticipated the Marble Arch Working Group will be a relevant scientific voice on Biobanking human specimens for research.
- The 2nd meeting of the Marble Arch Working Group, hosted by the Centro Nacional de Investigaciones Oncológicas in Madrid, was attended by 19 expert participants and was honoured with the presence of two guest speakers, one from the World Health Organisation - International Agency for Research on Cancer and the other from the United States - National Cancer Institute.
- Ten countries were represented from 3 continents.
- The following topics were addressed at the meeting:
- Privacy Protection and the potential impact research;
- Cost Recovery and Researcher Requirements;
- US:NCI initiatives (focus on International harmonization efforts and caBIG).
- A number of key tasks were identified and working parties established to address these tasks. The group will continue its work and aims to meet again in the winter of 2006 and the spring of 2007.
- The Marble Arch Working Group also aims to develop a public website to provide information about its activities.

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Biobanking for better healthcare

Peter H.J. Riegman[a,*], *Manuel M. Morente*[b], *Fay Betsou*[c], *Pasquale de Blasio*[d], *Peter Geary*[e], *the Marble Arch International Working Group on Biobanking for Biomedical Research*[1]

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[b]*Centro Nacional de Investigaciones Oncologicas, Melchor Fernandez Almagro 3, 28029 Madrid, Spain*
[c]*Biobanque de Picardie, Centre Hospitalier Universitaire d'Amiens, avenue René Laënnec, 80480 Salouel, France*
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ABSTRACT

Translational cancer research is highly dependent of large series of cases including high quality samples and their associated data. Comprehensive Cancer Centers should be involved in networks to enable large-scale multi-center research projects between the centers [Ringborg, U., de Valeriola, D., van Harten, W., Llombart-Bosch, A., Lombardo, C., Nilsson, K., Philip, T., Pierotti, M.A., Riegman, P., Saghatchian, M., Storme, G., Tursz, T., Verellen, D, 2008. Improvement of European translational cancer research. Collaboration between comprehensive cancer centers. Tumori 94, 143–146.]. Combating cancer knows many frontiers. Research is needed for prevention as well as better care for those who have acquired the disease. This

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Marble Arch open meeting

Biorepositories in developing countries

October 9th 2008

Fondazione IRCCS Istituto Nazionale dei Tumori Via Venezian 1, Milan - Italy

09:15 Welcome
Alberto Scanni - General Manager, Fondazione IRCCS INT
Marco Pierotti – Scientific Director, Fondazione IRCCS INT and President of OECI

09:30 Session 1: Working Group - Italy - Sudan
Chair: Marco Pierotti Fondazione IRCCS INT and ***Ida Biunno*** - ITB-CNR

09:30 The INMO Cancer Institute of Wad Medani - Sudan
Nasr Eldin Elwaly - Director of INMO
10:00 Promoting collaborations between Europe and Africa
Andrea Micheli - Fondazione IRCCS INT
10:30 Tumour Diagnostic Training and Support program
Massimo Barberis - Riuniti Hospital of Bergamo
10:45 International PhD program for Sudanese Students
Renato Mariani Costantini - University of Chieti
11:00 Proposal for the construction in Sudan of Anatomy Pathology and Tissue Bank Facility
Pasquale De Blasio - CEO BioRep Milan

11:15 Coffee Break

11:30 Session II: International and European Biorepositories initiatives
Chair: Manuel Morente CNIO Spain and ***Fay Betsu*** Biobank de Picardies France

11:30 Marble Arch Expert Group: The importance of Networking
Peter Geary - Canadian Tumour Institute Network
12:00 OECI- Tubafrost European Tissue Bank Network
Peter Riegman - Erasmus University, Rotterdam

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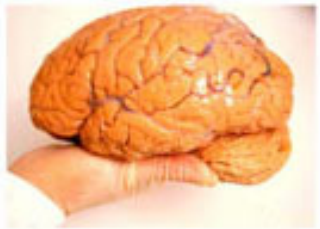
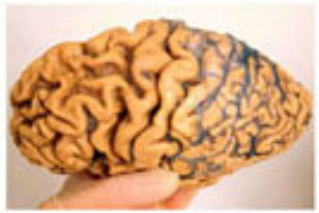
BRAINBANK CONSULTANTS

Welcome to "Brain Bank Consultants"





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News and events:

Mar '07	ESH-EBMT Euroconference
May '07	Biobusinessevent
July '07	Brazilian Aging Brain Study Group
Nov '07	The Fifth International Congress on Vascular Dementia

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Amsterdam