

INFOBIOMED
Pilot application WP 6.3

***Biomedical informatics in chronic
infectious and inflammatory disease
research: periodontitis as model***

Barcelona, June 26/27, 2007

Bruno Loos* DDS, MSc, PhD, *activity leader

Academic Centre for Dentistry Amsterdam **ACTA**

the disease *PERIODONTITIS* served as a model for
clinical research application of biomedical informatics

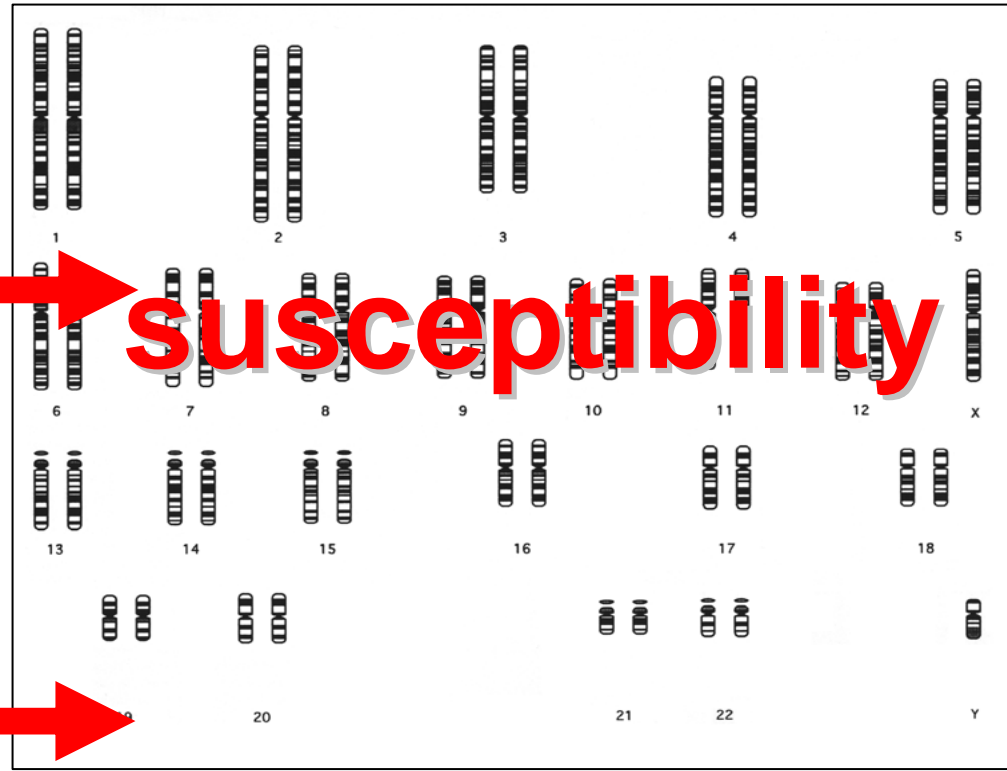
**Periodontitis is a complex - chronic inflammatory,
destructive disease of the supporting tissues of the teeth**

Parodontitis is complex – multifactorial disease

Environment

**Infection
(pathogens)**

**smoking
diet
stress**



Life style

Genomics

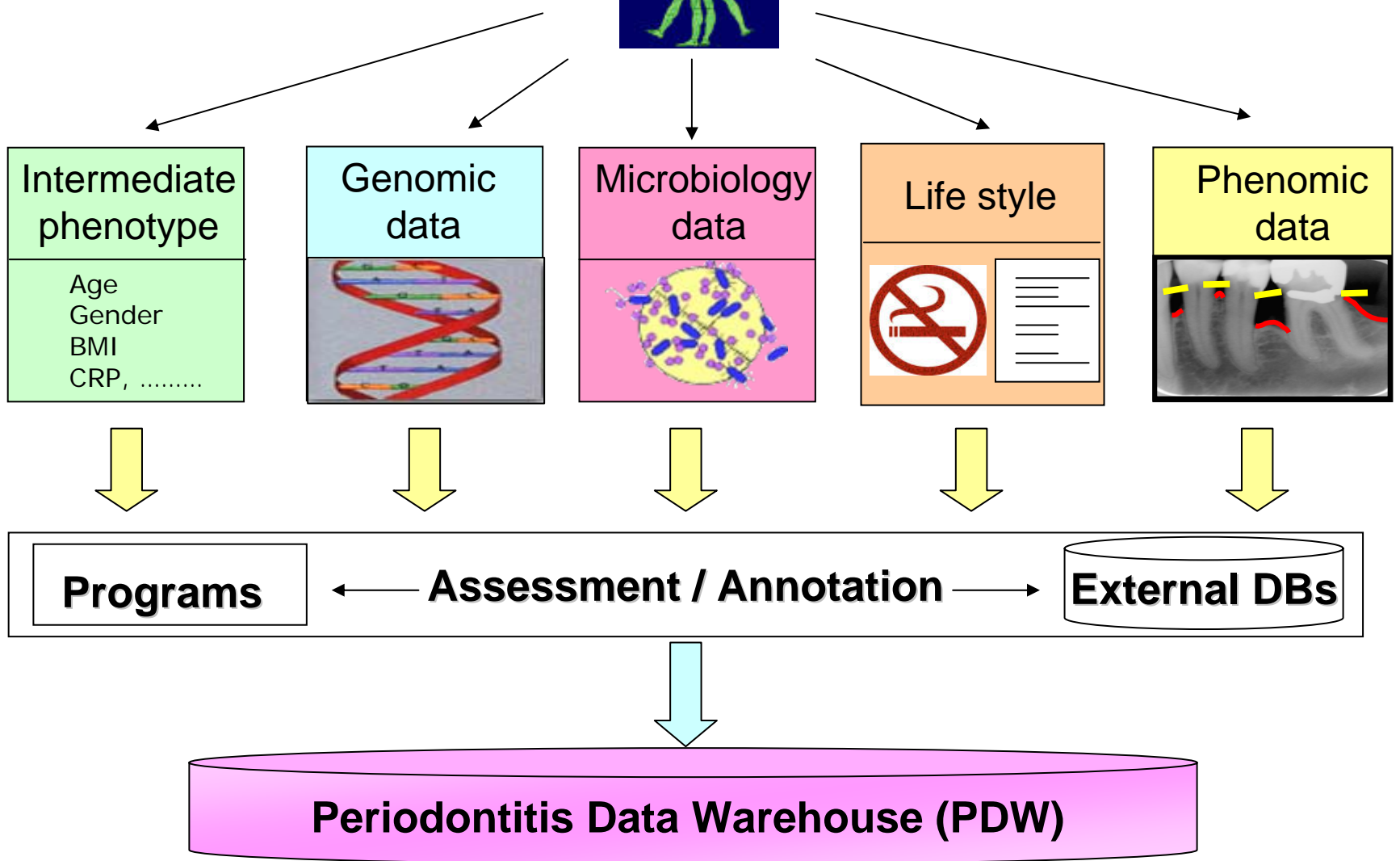
PERIODONTITIS *is a good model for the study of*
complex inflammatory diseases

- **Genetic susceptibility**
 - polygenic (modifying genes)
- **Infectious component**
 - at least 6 periodontopathogens
- **Life style factors**
 - smoking, stress, diet
- **Relative high prevalence**
 - 10% in general population
- **Easy access to samples**
 - non-invasive sampling
- **Patient cooperation**
 - no life threatening disease
- **Existence of network:**
 - within universities
 - universities to specialists

Most complex inflammatory diseases lack:

- *Insight in the complex pathophysiology*
- *Clear disease classification schemes*
- *Risk profiling and possibilities for screening*

We developed a periodontitis data warehouse



Periodontitis Data Warehouse (PDW)

- **800 periodontitis patients/control subjects**
- **intermediate phenotypes**
- **>8000 genomic records**
- **infectious and phenomics data**
- **life style records**
- **recently we added biochemical markers**
- **privacy protected**
- **remote accessibility via dedicated server**

Our overall results:

- Extensive knowledge of BMI is applied to a complex disease

Our overall results:

- Extensive knowledge of BMI is applied to a complex disease
- Periodontitis warehouse is generic for complex diseases

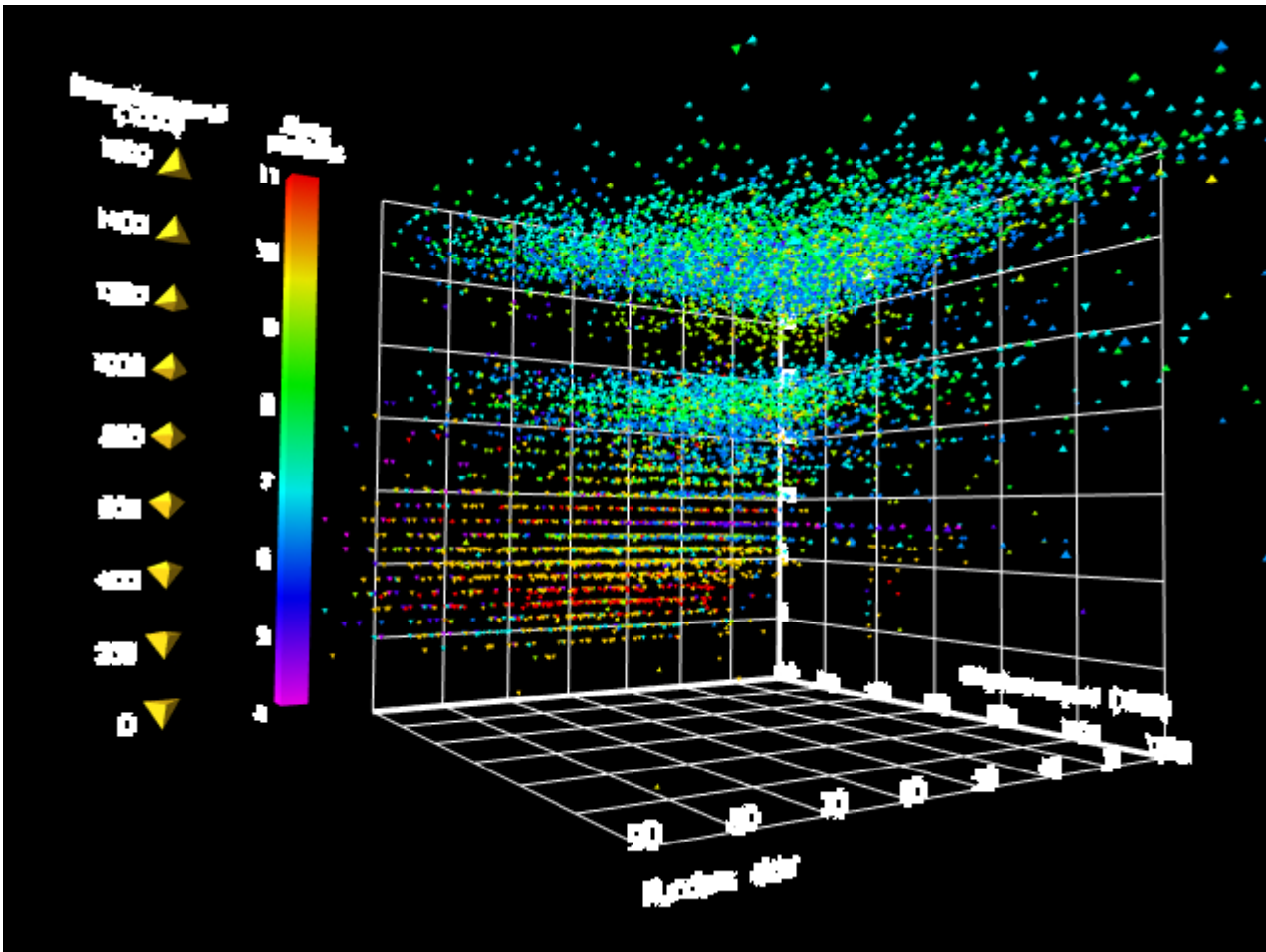
Our overall results:

- Extensive knowledge of BMI is applied to a complex disease
- Periodontitis warehouse is generic for complex diseases
- Data mining results has yielded a “prototype” GSI

genetic susceptibility index

genetic susceptibility index

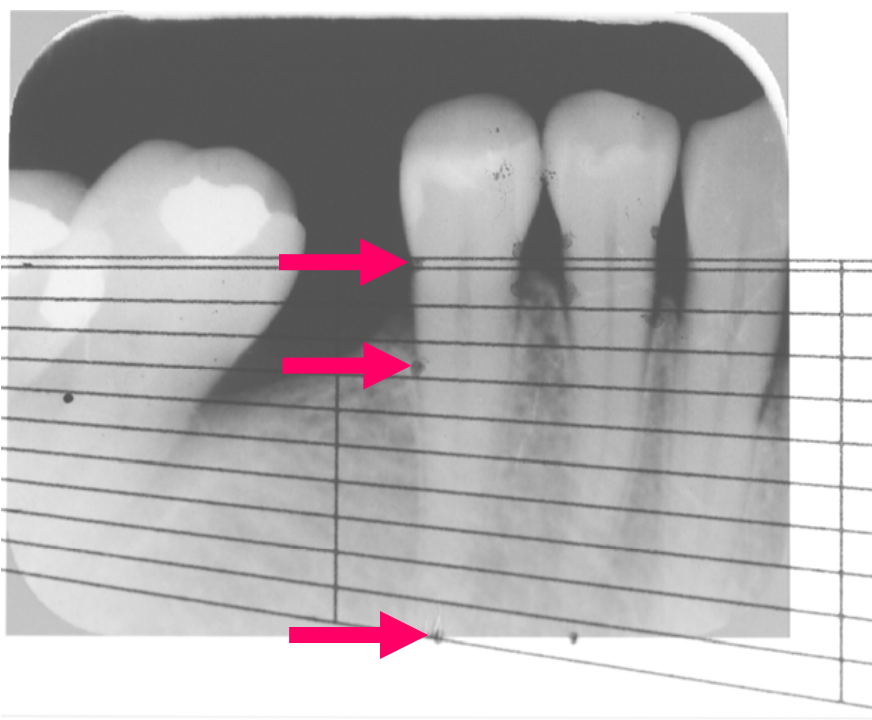
GSI (Record)	N of records	Health	Disease
GSI ≤ 1	206	85%	15%
1 <GSI ≤ 2	102	50%	50%
2 <GSI ≤ 3	169	29%	71%
3 <GSI ≤ 4	130	23%	77%
GSI > 4	68	12%	88%
Total	675		
% of total N		47%	53%



Our overall results:

- **Extensive knowledge of BMI is applied to a complex disease**
- **Periodontitis warehouse is generic for complex diseases**
- **Datamining results has yielded a “prototype” GSI**
genetic susceptibility index
- **development of a digital image analysis (DIA) tool**

Conventional (hand)



Digital Image Analysis (DIA)

The DIA software interface displays the same X-ray as the conventional method. The teeth are labeled 45 and 44. A green dashed line indicates the mesial side, and a red dashed line indicates the distal side. Labels 'C- C.U.' and 'C- B. L.' are visible. The control panel on the right includes:

- Tooth Identification:** A grid of radio buttons for teeth 11-48. Tooth 45 is selected.
- Draw Diagram:** A button with a diagram icon.
- Bone Loss Values:**
 - Mesial Side:** 14.1%
 - Distal Side:** 29.4%
 - Worst Side:** Distal side
- Compute:** A button with a computer icon.
- Save:** A button with a floppy disk icon.
- Ready to save:** A green status indicator.

The new DIA tool has clinically been proven

Our overall results:

- Extensive knowledge of BMI is applied to a complex disease
- Periodontitis warehouse is generic for complex diseases
- Datamining results has yielded a “prototype” GSI
genetic susceptibility index
- development of a digital image analysis (DIA) tool
- cross-collaboration between pilots 6-1 and 6-3

Identification of Genetic Links between

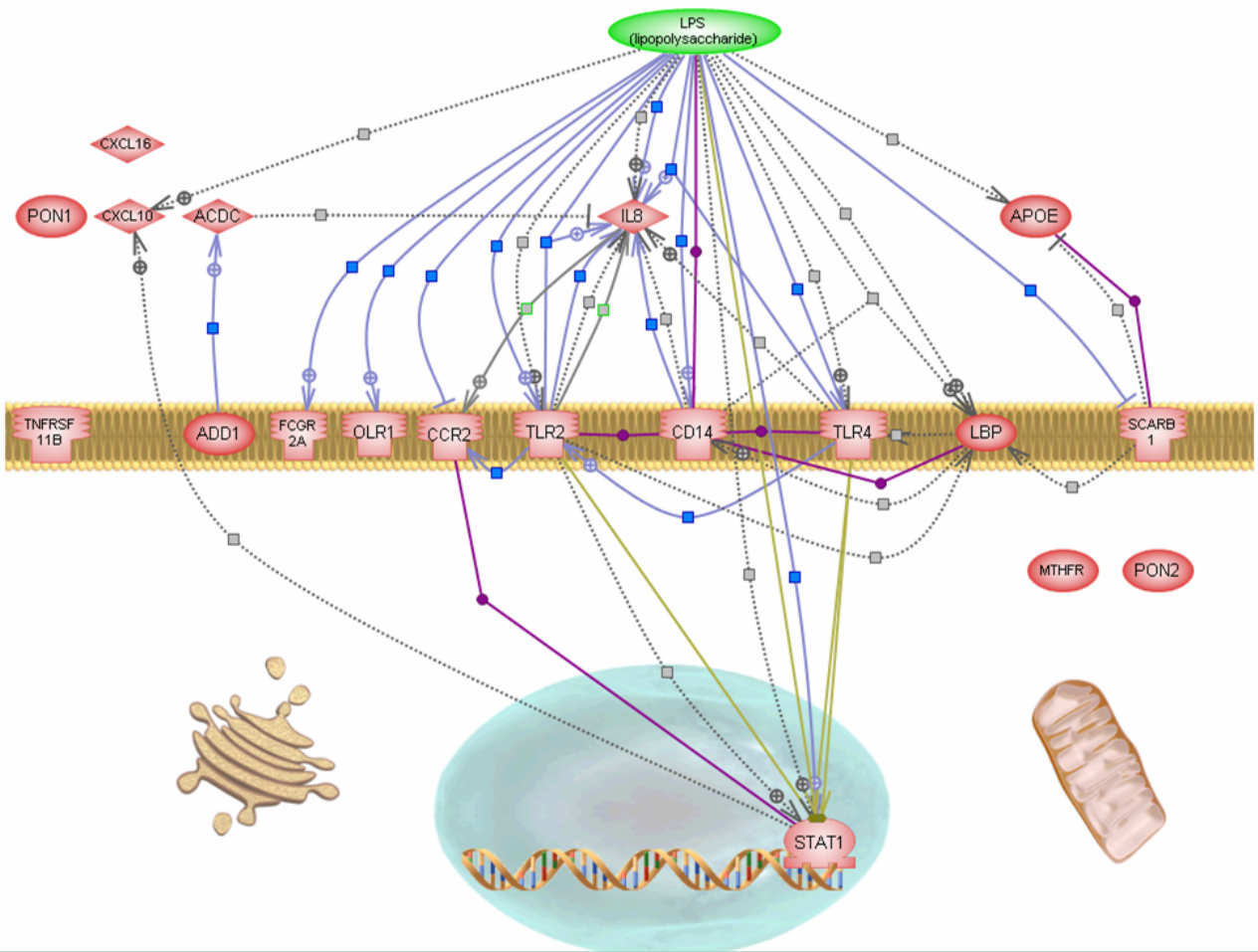
Periodontitis and Atherosclerosis in the

Literature:

A Combination of Co-Occurrence and Natural

Language Processing Techniques

Direct interactions, including intermediate nodes, between LPS and identified proteins



***Conclusion:* The combination**

biomedical informatics and periodontitis

was rewarding and productive !