

AperTO - Archivio Istituzionale Open Access dell'Università di Torino

**Clinical guidelines and indications for bronchoalveolar lavage (BAL): pulmonary malignancies.**

**This is the author's manuscript**

*Original Citation:*

*Availability:*

This version is available <http://hdl.handle.net/2318/30764> since 2016-11-20T08:58:29Z

*Terms of use:*

Open Access

Anyone can freely access the full text of works made available as "Open Access". Works made available under a Creative Commons license can be used according to the terms and conditions of said license. Use of all other works requires consent of the right holder (author or publisher) if not exempted from copyright protection by the applicable law.

(Article begins on next page)

## **Clinical guidelines and indications for bronchoalveolar lavage (BAL): Report of the European Society of Pneumology Task Group on BAL**

Edited by H. Klech\* and C. Hutter

This group report was developed jointly by: U. Costabel (Essen), C. Danel (Paris), L.M. Fabbri (Padova), P.L. Haslam (London), C. Hutter (Vienna) secretary, D. Israel-Biet (Paris), H. Klech (Vienna) chairman, W. Pohl (Vienna) secretary, L.W. Poulter (London), E. Pozzi (Torino), S.I. Rennard (Omaha), V. De Rose (Torino), G.A. Rossi (Genova), M. Rust (Frankfurt), G. Semenzato (Padova), B. Wallaert (Lille).

Further contributors: C. Albera (Torino), W. Bauer (Bern), L. Bjermer (Umea), L. Carratu (Napoli), C.F. Donner (Veruno), H. Eckert (Berlin), P.H. Godard (Montpellier), T. Izumi (Kyoto), J. Linder (Omaha), D. Olivieri (Parma), M. Pirozynski (Warsaw), W. Pohl, G. Rizzato (Milano), A.J.A. Robalo-Cordeiro (Coibra), C. Sanguinetti (Ancona), N. Secen (Novisad), Y. Sibille (Brussels), M. Spiteri (London), I. Striz (Prague), H. Teschler (Essen), M. Tonnel (Lille), G. Velluti (Modena), H. Worth (Duesseldorf).

\*Request for reprints: H. Klech, 2nd Medical Department, Wilhelminenspital, Montleartstrasse 37, A-1160 Vienna, Austria.

## Contents

H. Klech	939	Introduction
H. Klech, C. Hutter	939	Side-effects and safety of BAL
P.L. Haslam, L.W. Poulter, G.A. Rossi, W. Bauer, V. de Rose, H. Eckert, D. Olivieri, H. Teschler	940	Idiopathic pulmonary fibrosis
B. Wallaert, G.A. Rossi, Y. Sibille	942	Collagen-vascular diseases
L.W. Poulter, G.A. Rossi, L. Bjermer, U. Costabel, D. Israel-Biet, H. Klech, W. Pohl, G. Velluti	943	Sarcoidosis
G. Semenzato, L. Bjermer, U. Costabel, P.L. Haslam, D. Olivieri	945	Extrinsic allergic alveolitis
U. Costabel, C.F. Donner, P.L. Haslam, G. Rizzato, H. Teschler, G. Velluti, B. Wallaert	946	Occupational lung diseases due to inhalation of inorganic dust
C. Danel, D. Israel-Biet, U. Costabel, G.A. Rossi, B. Wallaert	949	Pulmonary histiocytosis X
C. Danel, D. Israel-Biet, U. Costabel, G.A. Rossi, B. Wallaert	950	Eosinophilic lung diseases
C. Danel, D. Israel-Biet, U. Costabel, G.A. Rossi, B. Wallaert	950	Alveolar proteinosis
C. Danel, D. Israel-Biet, U. Costabel, G.A. Rossi, B. Wallaert	951	Pulmonary haemorrhages
C. Danel, D. Israel-Biet, U. Costabel, G.A. Rossi, B. Wallaert	952	Drug induced pneumonitis
M. Rust, C. Albera, L. Carratu, C. Danel, D. Israel-Biet, H. Klech, S.I. Rennard, A.J.A. Robalo-Cordeiro, G. Semenzato, G. Velluti, H. Worth	954	Pulmonary infections
S.I. Rennard, C. Albera, W. Bauer, L. Carratu, H. Eckert, J. Linder, B. Pozzi, M. Pirozynski, A.J.A. Robalo-Cordeiro, C. Sanguinetti, G. Semenzato, N. Secen, I. Striz, H. Teschler, G. Velluti	956	Pulmonary malignancies
L.M. Fabbri, V. De Rose, Ph. Godard, G.A. Rossi	958	Bronchial asthma
E. Pozzi, V. De Rose, S.I. Rennard, L.M. Fabbri	959	Chronic bronchitis and emphysema
C. Danel, D. Israel-Biet, U. Costabel, L.M. Fabbri, H. Klech	960	Therapeutic applications of BAL
	961	References

## Pulmonary malignancies

S.I. Rennard, C. Albera, L. Carratu, W. Bauer, H. Eckert, J. Linder, M. Pirozynski, A.J.A. Robalo-Cordeiro, C. Sanguinetti, G. Semenzato, N. Secen, I. Striz, H. Teschler, G. Velluti

The major diagnostic techniques to obtain material for the diagnosis of cancer were, and remain direct forceps biopsy of bronchoscopically visible tumours and transbronchial biopsy for peripheral lesions.

Nevertheless, BAL can obtain material which can permit the cytological diagnosis of cancer. The criteria for the cytological diagnosis of cancer in the lung are well established [243]. However, since BAL is often performed and interpreted by pulmonologists [190] who are not trained cytologists and because the stains most often used by pulmonologists do not always reveal cytological detail, it is likely that the power of BAL to aid in the diagnosis of lung cancer has been underappreciated.

Table 1. – Examples of BAL used in the diagnosis of cancer

Type of cancer	Reference
Primary lung	
Squamous	[229, 244–248]
Adenocarcinoma	[229, 244–247]
Large cell	[229, 244, 246, 247]
Small cell	[229, 244–246]
Bronchoalveolar	[249–251]
Metastatic	
Solid tumours	[229]
Breast	[252]
Lymphangitic spread	[253, 254]
Haematological malignancy	
Hodgkin's	[255–257]
Non Hodgkin's lymphoma	[251, 256, 258, 259]
Leukaemia	[74, 229, 256]
Waldenstrom's	[260]
Myeloma	[256]
Mycosis fungoides	[261]

The exact circumstances in which lavage will be most important and the diagnostic yield comparable with other techniques are, as yet, unanswered questions. In addition, it should be recognized that BAL performed for other reasons may reveal malignant cells in cases where cancer is not suspected.

A rapidly enlarging collection of case reports and small series suggest that BAL can be of use in the diagnosis of a number of malignancies in the lung (table 1). With regard to primary lung cancers, there are six series (including unpublished data contributed by the co-authors of this document) which address the issue of diagnostic yield of BAL (table 2). Overall, the diagnostic yield was about 50% in these six series ranging from 14–69%. While the numbers available are small, the data available suggest that the diagnostic yield of BAL might be higher for bronchoalveolar cell carcinoma than for other cell types of primary pulmonary malignancy (table 3).

A high yield should also be expected in lymphangitic spread of metastatic cancer. The best technique of lavage to use for the diagnosis of cancer is unknown (table 4). It would be ideal to compare lavage with transbronchial biopsy, for example, for peripheral lesions, diffuse lesions and large central bronchoscopically visible lesions. Studies designed to address these issues are currently underway. While it is not possible to draw any firm conclusions, lavage can be of use in some cases of isolated peripheral nodules. It was also felt that lavage was particularly useful in diffuse lesions, such as those found with bronchoalveolar cell carcinoma. Thus, while lavage can clearly provide diagnostic material in a variety of clinical settings, its yield in specific settings, remains to be determined.

Finally, a number of staining methods are available (table 4), but the best laboratory techniques to use for the diagnosis of malignancy in bronchoalveolar lavage fluids are undetermined.

Table 2. – Diagnostic yield of bronchoalveolar lavage in lung cancer

Contributor	[Ref.]	No. of cases	No. with both BAL and diagnosis of cancer	No. of cases positive by BAL	% of cases positive by BAL
STRIZ*		471	430	225	52
WORTH*		146	99	37	37
BAGLIN	[262]	46	21	13	62
PIROZYNSKI*		124	124	44	35
LINDER	[229]	421	35	24	69
SCHABERG	[247]	31	21	3	14
Total			730	346	
			For sites mean = 45		
			For cases mean = 47		

\*: unpublished results

Table 3. – Diagnostic yield for BAL in lung cancer

Cell type	% Yield	
Bronchoalveolar cell carcinoma	11/12	92
Small cell	10/35	32
	2/3	
Squamous	0.9/49	27
	0.7/10	
Adenocarcinoma	11/20	66
	12/15	
Large cell	0/5	25
	3/7	

Data are reported for the various series available expressed as number of cases positive by BAL/number of cases of proven cancer undergoing BAL

Table 4. – Methods for the diagnosis of malignancy by bronchoalveolar lavage

Lavage technique: Lavage affected segment (CT may be helpful)		
Options*: "bronchial" and "alveolar" specimens for separate processing volume prior to/after brushings and biopsies		
Sample processing options*:		Smears Cytocentrifuge preparations Membrane filter preparations Cell pellets embedded in paraffin
Stains:	Routine*:	Papanicolaou Wright-Giemsa Haematoxylin and eosin
	Special:	Monoclonal antibodies for tumour markers

\*: the "best" choice is undetermined; CT: computerized tomography.

A second limitation of lavage is that the cytological diagnosis of malignancy does not always correspond to the histologic pattern [253]. Thus, in the series of Linder, cytology agreed with biopsy in only 80% of cases. The major difficulty was in distinguishing large cell undifferentiated carcinoma from adenocarcinoma. A similar problem occurs with the severe dysplastic changes that can develop in airway epithelial cells in a variety of clinical circumstances including pneumonia, viral infections and following chemotherapy. These severe dysplastic changes can be very difficult to distinguish from malignant changes. These limitations of cytological methods must be considered when bronchoalveolar lavage is used in the diagnosis of lung cancer.

Several contributors to the current report have performed large series of bronchoalveolar lavage and have made a diagnosis of malignancy only very rarely. This has contributed to the impression that BAL has limited use in the diagnosis of cancer.

There are several reasons which may explain the low diagnostic yield at these centres: 1) case selection may have been very different at different centres; 2) pulmonologists interested in performing bronchoalveolar lavage for specific research goals may not have processed lavage specimens in a manner to maximize yield for

malignancy. Some investigators, for example, throw away the first aliquot returned, which is relatively enriched for bronchial material. For malignancies originating in the bronchial tree, this may represent the material with the highest diagnostic yield. In addition, many investigators filter the fluid through loose-weave gauze in order to remove mucus. Malignant cells are often present as clumps and may be removed by such filtration procedures. Finally, many investigators have performed the procedure in patients with malignancy in order to investigate immunological abnormalities in these patients. They have intentionally lavaged sites not affected by the cancer. Thus, the relatively low diagnostic yield found by many investigators who have performed lavage for reasons other than to obtain diagnostic material, may reflect the interests of specific investigators rather than the utility of lavage to obtain material diagnostic of malignancy.

A number of tumour markers have been studied in bronchoalveolar lavage [246, 263]. While there is considerable interest among investigators in such markers, none has proved to be diagnostic. Thus, the use of these markers must be considered a research tool at present. Whether these markers will be helpful in following patients on a therapeutic protocol for malignancy is an interesting, but as yet unresolved, question. One investigator has suggested that cytological assessment of malignancy can be used for a similar purpose. Again, this must be considered a research undertaking. However, inasmuch as bronchoalveolar lavage might provide a means to assess efficacy of novel therapeutic strategies in lung cancer, it may become an important adjunct in clinical studies.

There is also a considerable interest in studying abnormalities in the patient with cancer. As such, a number of studies of bronchoalveolar lavage parameters have been undertaken in these patients. While these studies promise to provide some information as to why certain individuals develop malignancy and, perhaps, why these patients have increased incidences of lower respiratory tract infections, these studies are research studies.

It is difficult to summarize current consensus regarding the use of bronchoalveolar lavage for the diagnosis of lung cancer. Current practices vary from never performing this procedure for this indication to routinely performing this procedure for this indication. At institutions where this procedure is never performed, there is, obviously, no diagnostic yield associated with bronchoalveolar lavage. Centres where bronchoalveolar lavage has been found to be useful in the diagnosis of lung cancer are those where the procedure can be performed readily, the samples can be processed easily and trained personnel are available for the routine analysis of the specimens. In such a favourable setting, it would seem reasonable to include bronchoalveolar lavage in the diagnostic routine used to evaluate patients for lung cancer. This is particularly so considering that the procedure has exceedingly low morbidity, and the increased cost over performing a bronchoscopy with other diagnostic procedures is relatively low.

### Other therapeutic applications of BAL

WLL has been proposed in the treatment of some other pulmonary disorders such as alveolar microlithiasis or exogenous lipoidosis, with some clinical but without any objective functional or radiological improvement [282].

In cystic fibrosis (CF), the benefit of WLL is also difficult to evaluate. It was expected that periodical repeated WLL could, if not arrest, at least slow down the progressive deterioration of lung function caused by the accumulation of bronchial secretions [289, 290]. Some authors have proposed WLL using anti-fungal drugs as a local treatment of aspergillosis,

a frequent complication of CF [290]. This requires further investigation.

### Conclusions

The therapeutic value of BAL is now perfectly established in alveolar proteinosis, which remains the only definite indication of this procedure. In other lung disorders, this technique still has a risk/benefit ratio which does not argue for its use in routine clinical practice. Its indication should be discussed for each patient and performed by an experienced staff in the context of an intensive care unit.

## References

- Kleeh H, Pohl W *et al.* – Technical recommendations and guidelines for bronchoalveolar lavage (BAL). Report of the European Society of Pneumology Task Group on BAL. *Eur Respir J*, 1989, 2, 561–585.
- Petro W, Linder O, Kaspar P. – Bronchoalveolar Lavage Durchführung und Sickerbeit. *Atemw Lungenkrkh*, 1989, 15, 573–577.
- Rust M, Stellenwert der bronchoalveolären lavage in der pneumologischen Diagnostik bei Patienten mit HIV Infektion. *Atemw Lungenkrkh*, 1989, 11, 614–618.
- Wardlan AJ, Collins JV, Kay AB. – Mechanisms in asthma using the technique of bronchoalveolar lavage. *Int Archs Allergy Appl Immun*, 1987, 82, 518–525.
- Rankin JA, Synder PE, Schacter EN, Matthay RA. – Bronchoalveolar lavage. HS Safety in subjects with mild asthma. *Chest*, 1984, 85, 723–728.
- Summary and recommendations of a workshop on the investigative use of fiberoptic bronchoscopy and bronchoalveolar lavage in asthmatics. *Am Rev Res Dis*, 1985, 132, 180–182.
- Cole P, Turton C, Lanyon H, Collins J. – Bronchoalveolar lavage for the preparation of free lung cells: technique and complications. *Br J Dis Chest*, 1980, 74, 273–278.
- Pingleton AK, Harrison GF, Stechschulte DJ, Wesseliuss LJ, Kerby GR, Ruth WE. – Effect of location pH and temperature of instillate in bronchoalveolar lavage in normal volunteers. *Am Rev Respir Dis*, 1983, 128, 1035–1037.
- Strumpf IJ, Feld MK, Cornelius MJ, Keogh BA, Crystal RG. – Safety of fiberoptic bronchoalveolar lavage in evaluation of interstitial lung disease. *Chest*, 1981, 80, 268–271.
- Reynolds HJ, Newball HH. – Analysis of proteins and respiratory cells obtained from human lungs by bronchial lavage. *J Lab Clin Med*, 1974, 84, 559–573.
- Dhillon DP, Haslam PL, Townsend PJ, Primett Z, Collins JV, Turner-Warwick M. – Bronchoalveolar lavage in patient with interstitial lung diseases: Side effects and factors affecting fluid recovery. *Eur J Respir Dis*, 1986, 68, 342–350.
- Ettensohn DB, Jankowski MJ, Duncan PG, Lalor PA. – Bronchoalveolar lavage in the normal volunteer subject. 2) Safety and results of repeated BAL, and use in the assessment of intrasubject variability. *Chest*, 1988, 94, 281–285.
- Ancic P, Diaz P, Galleguillos F. – Pulmonary function changes after bronchoalveolar lavage in asthmatic patients. *Br J Dis Chest*, 1984, 78, 261–263.
- Burns DM, Shure D, Francoz R, Kalafer M, Harrell J, Witzum K, Moser KM. – The physiological consequences of saline lobar lavage in healthy human adults. *Am Rev Respir Dis*, 1983, 127, 695–701.
- Kelly C, Hendrick D, Walters H. – The effect on bronchoalveolar lavage on bronchial responsiveness in patients with airflow obstruction. *Chest*, 1988, 93, 325–328.
- Lin CC, Wu JL, Huang WC. – Pulmonary function in normal subjects after bronchoalveolar lavage. *Chest*, 1988, 5, 1049–1053.
- Pirozynski M, Sliwinski P, Zielinski J. – Effect of different volume of BAL fluid on arterial oxygen saturation. *Eur Respir J*, 1988, 1, 943–947.
- Tilles TS, Goldenheim PD, Ginns LC, Hales CA. – Pulmonary function in normal subjects and patients with sarcoidosis after bronchoalveolar lavage. *Chest*, 1986, 89, 244–248.
- Kleeh H, Pohl W. – Unpublished data.
- Kirby JG, O'Bryne PM, Hargreave FE. – Bronchoalveolar lavage does not alter airways responsiveness in asthmatic subjects. *Am Rev Res Dis*, 1987, 135, 554–556.
- Kleeh H, Koehn H, Pohl W, Schenk E, Losch S, Mostbeck A, Kummer F. – Diagnostic standard bronchoalveolar lavage does not alter regional or global 99-Tc-DTPA lung clearance. *Eur Respir J* 1988a, 1, Suppl 2, 279s.
- Haslam PL. – Bronchoalveolar Lavage. *Scan Resp Med*, 1984, 6, 55–70.
- Daniele RP, Elias JA, Epstein PE, Rossman MD. – Bronchoalveolar lavage: role in the pathogenesis, diagnosis and management of interstitial lung disease. *Ann Intern Med*, 1985, 102, 93–108.
- Crystal RG, Reynolds HY, Kalica AR. – Bronchoalveolar lavage. *Chest*, 1986, 89, 122–131.
- Stack BHR, Choo-Kang YFJ, Heard BE. – The prognosis of cryptogenic fibrosing alveolitis. *Thorax*, 1972, 27, 535–542.
- Carrington CB, Gaensler EA, Coutu RE, Fitzgerald MX, Gupta RG. – Natural history and treated course of usual and desquamative interstitial pneumonia. *N Engl J Med*, 1978, 298, 801–811.
- Turner-Warwick M, Burrows B, Johnson A. – Cryptogenic fibrosing alveolitis: clinical features and their influence on survival. *Thorax*, 1980, 35, 171–180.

28. Turner-Warwick M, Burrows B, Johnson A. – Cryptogenic fibrosing alveolitis: response to corticosteroid treatment and its effect on survival. *Thorax*, 1980, 35, 593–599.
29. Livingstone JL, Lewis JG, Reid L, Jefferson KE. – Diffuse interstitial pulmonary fibrosis. A clinical, radiological and pathological study on 45 patients. *Q J Med*, 1964, 233, 71–102.
30. Liebow AA, Steer A, Billingsley JG. – Desquamative interstitial pneumonia. *Am J Med*, 1965, 39, 369–404.
31. Wright PH, Heard BE, Steel SJ, Turner-Warwick M. – Cryptogenic fibrosing alveolitis: assessment by graded trephine lung biopsy histology compared with clinical, radiographic, and physiological features. *Br J Dis Chest*, 1981, 75, 61–70.
32. Weinberger SE, Kelman JA, Elson NA, Young RC Jr, Reynolds HY, Fulmer JD, Crystal RG. – Bronchoalveolar lavage in interstitial lung disease. *Ann Intern Med*, 1978, 89, 459–466.
33. Reynolds HY, Fulmer JD, Kazmierowski JA, Roberts WC, Frank MM, Crystal RG. – Analysis of cellular and protein content of bronchoalveolar lavage fluid from patients with idiopathic pulmonary fibrosis and chronic hypersensitivity pneumonitis. *J Clin Invest*, 1977, 59, 165–175.
34. Haslam PL, Turton CWG, Lukoszek A, Salisbury AJ, Dewar A, Collins JV, Turner-Warwick M. – Bronchoalveolar lavage fluid cell counts in cryptogenic fibrosing alveolitis and their relation to therapy. *Thorax*, 1980, 35, 328–339.
35. Gellert AR, Langford JA, Winter RJD, Uthayakumar S, Sinha G, Rudd RM. – Asbestosis: assessment by bronchoalveolar lavage and measurement of pulmonary epithelial permeability. *Thorax*, 1985, 40, 508–514.
36. Sykes SE, Morgan A, Moores SR, Holmes A, Davison W. – Dose-dependent effects in the subacute response of the rat lung to quartz. *Exp Lung Res*, 1983, 5, 227–244.
37. Hallgren R, Bjermer L, Lungren R, Venge P. – The eosinophil component of the alveolitis in idiopathic pulmonary fibrosis. *Am Rev Respir Dis*, 1989, 139, 373–377.
38. Pesci A, Bertorelli G, Manganelli P, Ambanelli U. – Bronchoalveolar lavage analysis of interstitial lung disease in CREST syndrome. *Clin Exp Rheumatol*, 1986, 4, 121–124.
39. Velay B, Pages J, Cordier JF, Brune J. – Hypereosinophilia in bronchoalveolar lavage. Diagnostic value and correlations with blood eosinophilia. *Rev Mal Respir*, 1987, 4, 257–260.
40. Haslam PL, Dewar A, Turner-Warwick M. – Lavage eosinophils and histamine. In: Cellular Biology of the Lung. G. Cumming, G. Bonsignore eds, Plenum Publishing, 1982, pp. 77–87.
41. De Vuyst P, Jedwab J, Dumortier P, Vandermoten G, van de Weyer R, Yernault JC. – Asbestos bodies in bronchoalveolar lavage. *Am Rev Respir Dis*, 1982, 126, 972–976.
42. Haslam PL, Coutts II, Watling AF, Cromwell O, du Bois RM, Townsend PJ, Collins JV, Turner-Warwick M. – Bronchoalveolar lavage features associated with radiographic evidence of fibrosis in pulmonary sarcoidosis. *Sarcoidosis*, 1981, 209–215.
43. Roth C, Huchon GJ, Arnoux A, Stanislas-Lequern G, Marsac JH, Chretien J. – Bronchoalveolar cells in advanced pulmonary sarcoidosis. *Am Rev Respir Dis*, 1981, 124, 9–12.
44. Lin YH, Haslam PL, Turner-Warwick M. – Chronic pulmonary sarcoidosis: relationship between lung lavage cell counts, chest radiograph, and results of standard lung function tests. *Thorax*, 1985, 40, 501–507.
45. Rudd RM, Haslam PL, Turner-Warwick M. – Cryptogenic fibrosing alveolitis - relationship of pulmonary physiology and bronchoalveolar lavage to response to treatment and prognosis. *Am Rev Respir Dis*, 1981, 124, 1–8.
46. Watters LC, Schwarz MI, Cherniack RM, Waldrom JA, Dunn TL, Stanford RE, King TE. – Idiopathic pulmonary fibrosis. Pretreatment bronchoalveolar lavage cellular constituents and their relationships with lung histopathology and clinical response to therapy. *Am Rev Respir Dis*, 1987, 153, 696–704.
47. Shindoh Y, Shimura S, Tomioka M, Aikawa T, Sasaki H, Takishima T. – Cellular analysis in bronchoalveolar lavage fluids in infiltrative and fibrotic stages of idiopathic pulmonary fibrosis. *Tohoku J Exp Med*, 1986, 149, 47–60.
48. Gellert AR, Langford JA, Uthayakumar S, Rudd RM. – Bronchoalveolar lavage and clearance of 99m-Tc-DTPA in asbestos workers without evidence of asbestosis. *Br J Dis Chest*, 1985, 79, 251–257.
49. Christman JW, Emerson RJ, Graham WGB, Davis GS. – Mineral dust and cell recovery from the bronchoalveolar lavage of healthy Vermont granite workers. *Am Rev Respir Dis*, 1985, 132, 393–399.
50. Nagai S, Fujimura N, Hirata T, Izumi T. – Differentiation between idiopathic pulmonary fibrosis and interstitial pneumonia associated with collagen vascular diseases by comparison of the ratio of OKT4+ cells and OKT8+ cells in BAL T-lymphocytes. *Eur J Respir Dis*, 1985, 67, 1–9.
51. Pesci A, Bertorelli G, Manganelli P. – Differentiation between idiopathic pulmonary fibrosis and interstitial pneumonia associated with collagen vascular diseases by comparison of the ratio of OKT4+ cells and OKT8+ in BALF T-lymphocytes (letter). *Eur J Respir Dis*, 1986, 68, 155–156.
52. Takahashi H, Nukiwa T, Matsuoka R, Danbara T, Natori H, Arai T, Kira S. – Carcinoembryonic antigen in bronchoalveolar lavage fluid in patients with idiopathic pulmonary fibrosis. *Jpn J Med*, 1985, 24, 236–243.
53. Haslam PL, Hughes DA, Dewar A, Pantin CF. – Lipoprotein macroaggregates in bronchoalveolar lavage fluid from patients with diffuse interstitial lung disease: comparison with idiopathic alveolar lipoproteinosis. *Thorax*, 1988, 43, 140–146.
54. Bitterman PB, Rennard SI, Keogh BA, Wewers MD, Adelberg S, Crystal RG. – Familial idiopathic pulmonary fibrosis. Evidence of lung inflammation in unaffected family members. *N Engl J Med*, 1986, 314, 1343–1347.
55. Keogh B, Line B, Rust M, Hunninghake G, Meier-Sydow J, Crystal RG. – Clinical staging of patients with idiopathic pulmonary fibrosis. *Am Rev Respir Dis*, 1981, 123, 89.
56. Peterson MW, Monick M, Hunninghake GW. – Prognostic role of eosinophils in pulmonary fibrosis. *Chest*, 1987, 92, 51–56.
57. Libby DM. – The eosinophil in idiopathic pulmonary fibrosis. *Chest*, 1987, 92, 7–8.
58. Turner-Warwick M, Haslam PL. – The value of serial bronchoalveolar lavages in assessing the clinical progress of patients with cryptogenic fibrosing alveolitis. *Am Rev Respir Dis*, 1987, 135, 26–34.
59. Cantin AM, North SL, Fells GA, Hubbard RC, Crystal RG. – Oxidant-mediated epithelial cell injury in idiopathic pulmonary fibrosis. *J Clin Invest*, 1987, 79, 1665–1673.
60. Bjermer L, Lundgren R, Hallgren R. – Hyaluronan and type III procollagen peptide concentrations in bronchoalveolar lavage fluid in idiopathic pulmonary fibrosis. *Thorax*, 1989, 44, 126–131.
61. Haslam PL, Cromwell O, Dewar A, Turner-Warwick M. – Evidence of increased histamine levels in lung lavage

fluids from patients with cryptogenic fibrosing alveolitis. *Clin Exp Immunol*, 1981, 44, 587-593.

62. Schmidt M, Brugger E, Heinrich J. - Proteolytic activities in bronchoalveolar lavage fluid of interstitial lung diseases: correlation to stage and prognosis. *Respiration*, 1987, 52, 115-121.

63. Bitterman PB, Wewers MD, Rennard SI, Adelberg S, Crystal RG. - Modulation of alveolar macrophage-driven fibroblast proliferation by alternative macrophage mediators. *J Clin Invest*, 1986, 77, 700-708.

64. Rennard SI, Bitterman PB, Ozaki T, Rom WN, Crystal RG. - Colchicine suppresses the release of fibroblast growth factors from alveolar macrophages *in vitro*. *Am Rev Respir Dis*, 1988, 137, 181-185.

65. O'Donnell K, Keogh B, Cantin A, Crystal RG. - Pharmacologic suppression of the neutrophil component of the alveolitis in idiopathic pulmonary fibrosis. *Am Rev Respir Dis*, 1987, 136, 288-292.

66. Watters LC, King TE, Cherniack RM, Waldron JA, Stanford RE, Willcox ML, Christopher KL, Schwarz MI. - Bronchoalveolar lavage fluid neutrophils increase after corticosteroid therapy in smokers with idiopathic pulmonary fibrosis. *Am Rev Respir Dis*, 1986, 133, 104-109.

67. Hughes DA, Haslam PL. - Changes in phosphatidylglycerol in bronchoalveolar lavage fluids from patients with cryptogenic fibrosing alveolitis. *Chest*, 1989, 95, 82-89.

68. Robinson PC, Watters LC, King TE, Mason RJ. - Idiopathic pulmonary fibrosis. Abnormalities in bronchoalveolar lavage fluid phospholipids. *Am Rev Respir Dis*, 1988, 137, 585-591.

69. Haslam P, Turton C, Heard B, Wkoszek A, Collins J, Salibury A, Turner-Warwick M. - Bronchoalveolar lavage in pulmonary fibrosis: composition of cells obtained with lung biopsy and clinical features. *Thorax*, 1980, 35, 9-18.

70. Konig G, Luderschmidt C, Hammer C, Adelman-Grill BC, Braun-Falco O, Fruhmann G. - Lung involvement in scleroderma. *Chest*, 1984, 85, 318-324.

71. Silver RM, Metcalf JF, Stanley JH, Leroy EC. - Interstitial lung disease in scleroderma - analysis by bronchoalveolar lavage. *Arthritis Rheum*, 1984, 127, 1254-1262.

72. Kallenberg CGM, Jansen HM, Elema D, The TH. - Steroid-responsive interstitial pulmonary disease in systemic sclerosis. Monitoring by bronchoalveolar lavage. *Chest*, 1984, 86, 489-492.

73. Jansen HM, Schutte AJH, Elema JD, Giessen MVD, Peset Reig R, Leeuwen MAV, Sluiter HJ, The TH. - Local immune complexes and inflammatory response in patients with chronic interstitial pulmonary disorders associated with collagen vascular diseases. *Clin Exp Immunol*, 1984, 56, 311-320.

74. Rossi GA, Bitterman PB, Rennard SL, Ferrans VJ, Crystal RG. - Evidence for chronic inflammation as a component of the interstitial lung disease associated with progressive systemic sclerosis. *Am Rev Respir Dis*, 1985, 131, 612-617.

75. Edelson JD, Hyland RH, Ramsoen M, Chamberlain DW, Kortan P, Meindok HO, Klein MH, Braude AC, Lee P, Rebeck AS. - Lung inflammation in scleroderma: clinical, radiographic, physiologic and cytopathological features. *J Rheumatol*, 1985, 12, 957-963.

76. Garcia JGN, Parhami N, Killam D, Garcia PL, Keogh BA. - Bronchoalveolar lavage fluid evaluation in rheumatoid arthritis. *Am Rev Respir Dis*, 1986, 133, 450-454.

77. Owens GR, I Paradis IL, Gryzan S, Medsger TA, Follansbee WP, Klein HA, Dauber JA. - Role of inflamma-

tion in the lung disease of systemic sclerosis: comparison with idiopathic pulmonary fibrosis. *J Lab Clin Med*, 1986, 107, 253-260.

78. Tishler M, Grief J, Freman E, Yaron M, Topilsky M. - Bronchoalveolar lavage a sensitive tool for early diagnosis of pulmonary involvement in rheumatoid arthritis. *J Rheumatol*, 1986, 13, 547-550.

79. Balbi B, Cosulich E, Risso A, Sacco O, Balzano E, Rossi GA. - The interstitial lung disease associated with rheumatoid arthritis: evidence for imbalance of helper T-lymphocyte subpopulations at sites of disease activity. *Bull Eur Physiopathol Respir*, 1987, 23, 241-247.

80. Harrison NK, Glanville AR, Strickland B, Haslam PL, Corrin B, Addis BJ, Lawrence R, Millar AB, Black CM, Turner-Warwick M. - Pulmonary involvement in systemic sclerosis: the detection of early changes by thin section CT scan, bronchoalveolar lavage and <sup>99m</sup>Tc-DTPA clearance. *Respir Med*, 1989, 83, 403-414.

81. Idell S, Carcia JGN, Gonzalez K, McLarty J, Fair DS. - Fibrinopeptide A reactive and proagulant activity in bronchoalveolar lavage: Relationship to rheumatoid interstitial lung disease. *J Rheumatol*, 1989, 16, 592-598.

82. Greene NB, Solinger AM, Baughmann RP. - Patients with collagen vascular disease and dyspnea. The value of gallium scanning and bronchoalveolar lavage in predicting response to steroid therapy and clinical outcome. *Chest*, 1987, 91, 698-703.

83. Garcia JGN, James HL, Zinkgraf S, Perlman BA, Keogh MB. - Lower respiratory tract abnormalities in rheumatoid interstitial lung disease. Potential role of neutrophil in lung injury. *Am Rev Respir Dis*, 1987, 136, 811-817.

84. Weiland JE, Garcia JGN, Davis WB, Gadek JA. - Neutrophil collagenase in rheumatoid interstitial lung disease. *J Appl Physiol*, 1987, 62, 628-633.

85. Herer B, DE Castelbajac D, Israel-Biet D, Venet A, Huchon G, Chretien J. - Le lavage broncho-alveolaire dans les formes pulmonaires de la polyarthrite rhumatoide. *Ann Med Interne*, 1988, 139, 310-314.

86. Wallaert B, Hatron PY, Grosbois JM, Tonnel AB, Devulder B, Voisin C. - Subclinical pulmonary involvement in collagen vascular diseases assessed by bronchoalveolar lavage: relationship between alveolitis and subsequent changes in lung function. *Am Rev Respir Dis*, 1986, 133, 574-580.

87. Hatron PY, Wallaert B, Gosset D, Tonnel AB, Voisin C, Devulder B. - Subclinical lung inflammation in Sjogren syndrome. Correlation with clinical and biological characteristics of the disease. *Arthritis Rheum*, 1987, 30, 1226-1231.

88. Wallaert B, Prin L, Hatron PY, Tonnel AB, Voisin C. - Lymphocyte subpopulations in bronchoalveolar lavage in Sjogren's syndrome. Evidence for an expansion of cytotoxic/suppressor subset in patients with alveolar neutrophilia. *Chest*, 1987, 92, 1025-1031.

89. Wallaert B, Bart F, Aerts C, Ouaisi A, Hatron PY, Tonnel AB, Voisin C. - Evidence for activated alveolar macrophage as a component of subclinical inflammatory alveolitis in collagen-vascular diseases. *Thorax*, 1988, 43, 24-30.

90. Perez TH, Farre JM, Gosset Ph, Wallaert B, Duquesnoy B, Voisin C, Delcambre B, Tonnel AB. - Subclinical alveolar inflammation in rheumatoid arthritis: superoxide anion, neutrophil chemotactic activity and fibronectin generation by alveolar macrophages. *Eur Respir J*, 1989, 2, 7-13.

91. Perez Th, Gosset Ph, Farre JM, Duquesnoy B, Wallaert B, Tonnel AB. - Production spontanée de tumor necrosis factor par les macrophages alveolaires au cours de la



- polyarthritis rhumatoïde. *Rev Mal Respir*, 1989, Suppl. 1, R18.
92. Wallaert B, Aerts C, Bart F, Hatron PY, Dracon M, Tonnel AB, Voisin C. – Alveolar macrophage dysfunction in systemic lupus erythematosus. *Am Rev Respir Dis*, 1987, 136, 293–297.
93. Wallaert B, Dugas M, Perez Th, Hatron PY, Gosset D, Ramon Ph, Aerts C, Tonnel AB, Voisin C. – Alveolar macrophage dysfunctions in collagen vascular diseases. *Local Immunity*, 1988, 4, 79–95.
94. Martinot JB, Wallaert B, Hatron PY, Francis C, Voisin C, Sibille Y. – Clinical and subclinical alveolitis in collagen vascular diseases. Contribution of alpha-2-macroglobulin levels in BAL fluid. *Eur Respir J*, 1989, 2, 437–443.
95. Sibille Y, Martinot JB, Polomski LL, Wallaert B, Demusis M, Rankin JA, Voisin C, Gee JBL. – Phagocytes enzymes in bronchoalveolar lavage from patients with pulmonary sarcoidosis and collagen vascular disorders. *Am Rev Respir Dis*, 1989, 139, A192.
96. Akoun G, Mayaud C, Touboul J, Denis M, Milleron B, Perrot J. – Use of bronchoalveolar lavage in the evaluation of methotrexate lung disease. *Thorax*, 1987, 42, 652–655.
97. Vivet Ph, Ameille J, Capron F, Leclerc P, Dessirier JL, Rochemaure J. – Pneumopathie interstitielle diffuse au cours d'un traitement par les sels d'or. *Ann Med Interne*, 1984, 135, 54–58.
98. Garcia GN, Munim A, Nugent KM, Bishop M, Hoie-Garcia P, Parhami N, Keogh BA. – Alveolar macrophages gold retention in rheumatoid arthritis. *J Rheumatol*, 1987, 14, 435–438.
99. Hatron PY, Wallaert B, Fourrier JL, Fournier E, Gosselin B, Devulder B. – Dermato-polymyosite et fibrose pulmonaire associees a un syndrome de Gougerot-Sjogren. Etude de 3 observations. *Rev Med Interne*, 1985, 6, 97–104.
100. Ziza JM, Kaplan G, Salomon C, Kahn MF. – Fibroses pulmonaires graves revelatrices d'un syndrome de Gougerot Sjogren primitif. *Ann Med Interne*, 1986, 137, 46–50.
101. Rossi GA. – Bronchoalveolar lavage in the investigation of disorders of the lower respiratory tract. *Eur J Respir Dis*, 1986, 69, 293–315.
102. Venet A, Sandron D, Israel-Biet D. – Bronchoalveolar lavage in interstitial lung diseases. *Bull Eur Physiopathol Respir*, 1985, 21, 465–476.
103. Crystal RG, Roberts WC, Hunninghake GW *et al.* – Pulmonary sarcoidosis: a disease characterized and perpetuated by activated lung T-lymphocytes. *Ann Intern Med*, 1981, 94, 73.
104. Venet A. – Immunology of sarcoidosis. *Ann Med Intern (Paris)*, 1984, 135, 113.
105. Robinson B, Crystal RG. – Gamma interferon is spontaneously released by alveolar macrophages and lung T-lymphocytes in patients with pulmonary sarcoidosis. *J Clin Invest*, 1985, 75, 1488.
106. Campbell D, Janossy G, DuBois RM, Poulter LW. – Immunocompetent cells in bronchoalveolar lavage reflect the cell populations in transbronchial biopsies in pulmonary sarcoidosis. *Am Rev Respir Dis*, 1985, 132, 1300.
107. Spiteri MA, Clarke SW, Poulter LW. – Phenotypic and functional changes in alveolar macrophages contribute to the pathogenesis of pulmonary sarcoidosis. *Clin Exp Immunol*, 1988, 74, 359.
108. Campbell DA, Poulter LW, Du Bois RM. – Phenotypic analysis of BAL cells from patients with interstitial lung diseases. *Thorax*, 1986, 41, 429.
109. Keogh BA, Hunninghake GW, Line BR *et al.* – The alveolitis of pulmonary sarcoidosis - evaluation of natural history and alveolitis dependent changes in lung function. *Am Rev Respir Dis*, 1983, 128, 256.
110. Semenzato G, Chilosi M, Ossi E *et al.* – Bronchoalveolar lavage and lung histology: comparative analysis of inflammatory and immunocompetent cells in patients with sarcoidosis and hypersensitivity pneumonitis. *Am Rev Respir Dis*, 1985, 132, 400.
111. Hunninghake GW, Crystal RG. – Pulmonary sarcoidosis - a disorder mediated by excess helper T-lymphocyte activity at sites of disease activity. *N Engl J Med*, 1981, 305, 419–434.
112. Leatherman JW, Michael AF, Schwartz BA, Hoidal JR. – Lung T-cells in hypersensitivity pneumonitis. *Ann Intern Med*, 1984, 100, 390–392.
113. Israel-Biet D, Venet A, Chretien J. – Persistent high alveolar lymphocytosis as a predictive criterion of chronic pulmonary sarcoidosis. *Ann NY Acad Sci*, 1986, 465, 395–406.
114. Klech H. – Clinical risk assessment in sarcoidosis. Outlook. In: Sarcoidosis and other granulomatous disorders. C. Grassi, G. Rizzato, E. Pozzi eds, 1988, pp. 461–482.
115. Turner-Warwick M, McAllister W, Lawrence R, Britten A, Haslam PL. – Corticosteroid treatment in pulmonary sarcoidosis: do serial lavage lymphocyte counts, serum angiotensin converting enzyme measurements and gallium-67 scans help management? *Thorax*, 1986, 41, 903–913.
116. Ainslie G, du Bois RM, Poulter LW. – Relationship between lavage immunocytology and clinical status in sarcoidosis. In: Sarcoidosis and Other Granulomatous Disorders Eds. Grassi C, Rizzato G, Pozzi E. Elsevier Amsterdam, 1988, p.171.
117. Ainslie G, du Bois RM, Poulter LW. – Relation between immunocytological features of bronchoalveolar lavage fluid and clinical indices in sarcoidosis. *Thorax*, 1989, 44, 501.
118. Perrin-Fayolle M, Pacheco Y, Harf R *et al.* – Angiotensin converting enzyme in bronchoalveolar lavage fluid in pulmonary sarcoidosis. *Thorax*, 1981, 34, 790.
119. Bjermer L, Thurell M, Hallgren R. – Procollagen III peptide in bronchoalveolar lavage fluid. *Lab Invest*, 1986, 55, 654.
120. Bjermer L, Engstrom-Laurent A, Thunell M, Hallgren R. – Hyaluronic acid in bronchoalveolar lavage fluid in patients with sarcoidosis: relationship to lavage mast cells. *Thorax*, 1987, 42, 933.
121. Costabel U, Zaiss A, Wagner DJ *et al.* – Value of bronchoalveolar lavage lymphocyte subpopulations for the diagnosis of sarcoidosis. In: Sarcoidosis and other granulomatous disorders. C. Grassi, G. Rizzato, E. Pozzi eds, Excerpta Medica Amsterdam, 1988, p. 429.
122. Costabel U, Bross KJ, Guzman J *et al.* – Predictive value of bronchoalveolar lavage T-cell subsets for the course of pulmonary sarcoidosis. *Ann NY Acad Sci*, 1986, 465, 418–426.
123. Costabel U, Bross KJ, Ruhle KH *et al.* – Prognose und T-Lymphozyten-Subpopulationen in der bronchoalveolaren lavage (BAL) bei pulmonaler Sarkoidose-eine dreijährige Verlaufsstudie. *Prax Klin Pneumol*, 1987, 41, 854–855.
124. Bjermer L, Rosenhall L, Hallgren R. – The predictive value of bronchoalveolar lavage cell analysis in sarcoidosis. *Thorax*, 1988, 43, 4, 284–288.
125. Flint KC, Lenny KBP, Hudspeth BN, Brostoff J, Pearce FL, Geraint-James D, McJohnson N. – Bronchoalveolar mast cells in sarcoidosis increased numbers and accentuation of mediator release. *Thorax*, 1986, 41, 94–99.
126. Costabel U, Bross KJ, Marxen J, Matthys H. – T lymphocytosis in bronchoalveolar lavage fluid of hypersensitivity pneumonitis. *Chest*, 1984, 85, 514–518.
127. Semenzato G, Agostini C, Zambello R, Trentin L,

- Chilosi M, Pizzolo G, Marcer G, Cipriani A. – Lung T-cells in hypersensitivity pneumonitis: phenotypic and functional analyses. *J Immunol*, 1986, 137, 1164–1172.
128. Fournier E, Tonnel AB, Gosset Ph, Wallaert B, Ameisen JC, Voisen C. – Early neutrophil alveolitis after antigen inhalation in hypersensitivity pneumonitis. *Chest*, 1985, 88, 563–566.
129. Haslam PL. – Bronchoalveolar lavage in extrinsic allergic alveolitis. *Eur J Respir Dis*, 1987, 71 (Suppl. 154), 120.
130. Soler P, Valeyre D, Georges R, Battesti JP, Basset F, Hance A. – The role of epithelial abnormalities in recruiting Langerhans cells to the lower respiratory tract. *Am Rev Respir Dis*, 1986, 133, A243.
131. Laviolette M, Cormier Y, Leblanc P, Soler P, Hance AJ. – Bronchoalveolar lavage (BAL) in farmer's lung (FL): significance of mast cells. *Am Rev Respir Dis*, 1989, 139, A189.
132. Bjermer L, Engstrom-Laurent A, Lundgren R, Rosenthal L, Hallgren R. – Bronchoalveolar mastocytosis in farmer's lung is related to the disease activity. *Arch Intern Med*, 1988, 148, 1362–1365.
133. Costabel U, Bross KJ, Guzman J, Matthys H. – Plasmazellen und Lymphozytensubpopulationen in der bronchoalveolären Lavage bei exogen-allergischer Alveolitis. *Prax klin Pneumol*, 1985, 39, 925–926.
134. Costabel U, Bross KJ, Ruhle KH, Lohr GW, Matthys H. – Ia-like antigens on T-cells and their subpopulations in pulmonary sarcoidosis and hypersensitivity pneumonitis: analysis of bronchoalveolar and blood lymphocytes. *Am Rev Respir Dis*, 1985, 131, 337–342.
135. Semenzato G, Trentin L, Zambello R, Agostini C, Masciarelli M, Cipriani A, Marcer G. – Different types of cytotoxic lymphocytes are involved in the cytolytic mechanisms taking place in the lung of patients with hypersensitivity pneumonitis. *Am Rev Respir Dis*, 1988, 137, 70–74.
136. Semenzato G, Agostini C. – Editorial. Human retroviruses and lung involvement. *Am Rev Respir Dis*, 1989, 139, 1317–1322.
137. Costabel U, Guzman J, Seyboth S, Ruhle KH, Matthys H. – Serial analysis of lung lymphocytes and T-cell subsets during the course of hypersensitivity pneumonitis. *Am Rev Respir Dis*, 1987, 135, 372A.
138. Trentin L, Marcer G, Chilosi M, Zambello R, Agostini C, Masciarelli M, Bizzotto R, Gemignani C, Cipriani A, Di Vittorio G, Semenzato G. – Longitudinal study of alveolitis in hypersensitivity pneumonitis patients: an immunological evaluation. *J Allergy Clin Immunol*, 1988, 82, 577–585.
139. Cormier Y, Belanger J, Laviolette M. – Prognostic significance of bronchoalveolar lymphocytosis in farmer's lung. *Am Rev Respir Dis*, 1987, 135, 692–695.
140. Yoshizawa Y, Ohdama S, Tanoue M, Tanaka M, Ohtsuka M, Uetake K, Hasegawa S. – Analysis of bronchoalveolar lavage cells and fluids in patients with hypersensitivity pneumonitis: possible role of chemotactic factors in the pathogenesis of the disease. *Int Arch Allergy Appl Immunol*, 1986, 80, 376–382.
141. Cormier Y, Belanger J, Leblanc P, Herbert J, Laviolette M. – Lymphocyte subpopulations in extrinsic allergic alveolitis. *Ann NY Acad Sci*, 1986, 465, 370–377.
142. Herbert J, Beaudoin J, Laviolette M, Beaudoin R, Belanger J, Cormier Y. – Absence of correlation between the degree of alveolitis and antibody levels of *Micropolyspora faeni*. *Clin Exp Immunol*, 1985, 60, 572–578.
143. Cormier Y, Belanger J, Laviolette M. – Persistent bronchoalveolar lymphocytosis in asymptomatic farmers. *Am Rev Respir Dis*, 1986, 133, 843–847.
144. Monkare S, Haahtela T. – Farmer's lung: a five year follow-up of eighty six patients. *Clin Allergy*, 1987, 17, 143–151.
145. Teschler H, Schmidt B, Zwang B, Ziesche R, Matthys H, Konietzko N, Costabel U. – Procollagen-III-peptide levels in BAL fluid of patients with hypersensitivity pneumonitis. *Am Rev Respir Dis*, 1989, 139, A189.
146. Costabel U, Teschler H. – Inflammation and immune reactions in interstitial lung disease (ILD) associated with inorganic dust exposure. *Eur Respir J*, 1989, 190, 3, 363–364.
147. Robalo-Cordeiro AJA, Leite ACP, Rosa MAS, Lima MAM, Cordeiro CR, Gaspar E, Pego MA. – A alveolite da silicose. *Via Pneumologica*, 1988, 2, 113–125.
148. Wallace JM, Oishi JS, Barbers RG, Batra P, Aberle DR. – Bronchoalveolar lavage cell and lymphocyte phenotype profiles in healthy asbestos exposed shipyard workers. *Am Rev Respir Dis*, 1989, 139, 33–38.
149. Araujo A, Alfarroba E, Freitas e Costa M. – The role of monoclonal antibodies in the study of chronic inflammatory respiratory diseases induced by dust inhalation. *Eur J Respir Dis*, 1986, 69 (Suppl. 146), 203–210.
150. Begin R, Cantin AM, Boileau RD, Bisson GY. – Spectrum of alveolitis in quartz-exposed human subjects. *Chest*, 1987, 92, 1061–1067.
151. Rom WN, Bitterman PB, Rennard SI, Cantin A, Crystal RG. – Characterization of the lower respiratory tract inflammation of nonsmoking individuals with interstitial lung disease associated with chronic inhalation of inorganic dusts. *Am Rev Respir Dis*, 1987, 136, 1429–1434.
152. Wallaert B, Lassalle Ph, Fortin F, Aerts C, Bart F, Fournier E, Voisin C. – Superoxide anion generation by alveolar inflammatory cells in simple pneumoconiosis and progressive massive fibrosis of non smoking coal workers. *Am Rev Respir Dis*, 1989, 141, 129–133.
153. Costabel U, Bross KJ, Reuter Ch, Ruhle KH, Matthys H. – Alterations in immunoregulatory T-cell subsets in cigarette smokers. *Chest*, 1986, 90, 39–44.
154. Robinson BWS, Rose AH, James A, Whitaker D, Musk AW. – Alveolitis of pulmonary asbestosis. *Chest*, 1986, 90, 396–402.
155. Begin R, Martel M, Desmarais Y, Drapeau G, Boileau R, Rola-Pleszczynski M, Masse S. – Fibronectin and procollagen 3 levels in bronchoalveolar lavage of asbestos-exposed human subjects and sheep. *Chest*, 1986, 89, 237–243.
156. Spurzem JR, Saltini C, Rom W, Winchester RJ, Crystal RG. – Mechanisms of macrophage accumulation in the lungs of asbestos exposed subjects. *Am Rev Respir Dis*, 1987, 136, 276–280.
157. Gellert AR, Macey MG, Uthayakumar S, Newland AC, Rudd RM. – Lymphocyte subpopulations in bronchoalveolar lavage fluid in asbestos workers. *Am Rev Respir Dis*, 1985, 132, 824–828.
158. Xaubet A, Rodriguez-Roisin R, Bombi JA, Marin A, Roca J, Agusti-Vidal A. – Correlation of bronchoalveolar lavage and clinical and functional findings in asbestosis. *Am Rev Respir Dis*, 1986, 133, 848–854.
159. Haslam PL, Dewar A, Butchers P, Primett ZS, Newman-Taylor A, Turner-Warwick M. – Mast cells, atypical lymphocytes and neutrophils in bronchoalveolar lavage in extrinsic allergic alveolitis. *Am Rev Respir Dis*, 1987, 135, 35–47.
160. Forni A, Ortisi E, Rivolta G, Chiappino G. – Bronchoalveolar lavage T-lymphocyte subpopulations in

- occupational and non-occupational lung diseases. In: *New Frontiers in Cytology*. K. Goertler, G.E. Feichter, S. Witt eds, Springer, Berlin-Heidelberg-New York, 1988, pp. 440-445.
161. Massaglia GM, Avolio G, Barberis S, Cacciabue M, Galietti F, Giorgis GE, Miravalle C. - Pneumoconiosis caused by hard metals. A case series. In: *Sarcoidosis and other granulomatous disorders*. C. Grassi, G. Rizzato, E. Pozzi eds, Elsevier Science Publishers, Amsterdam, 1988, pp. 709-710.
162. Davison AG, Haslam PL, Corrin B, Coutts II, Dewar A, Riding WD, Studdy PR, Newman-Taylor AJ. - Interstitial lung disease and asthma in hard metal workers: bronchoalveolar lavage, ultrastructural and analytical findings and results of bronchial provocation tests. *Thorax*, 1983, 38, 119-128.
163. Rizzato G, Lo Cicero S, Barberis M, Torre M, Pietra R, Sabbioni E. - Trace of metal exposure in hard metal lung disease. *Chest*, 1986, 90, 101-106.
164. Epstein PE, Dauber JH, Rossman MD, Daniele RP. - Bronchoalveolar lavage in a patient with chronic berylliosis: evidence for hypersensitivity pneumonitis. *Ann Intern Med*, 1982, 97, 213-216.
165. Cullen MR, Kominsky JR, Rossman MD, Cherniack MG, Rankin JA, Balmes JR, Kern JA, Daniele RP, Palmer L, Naegel GP, McManus K, Cruz R. - Chronic beryllium disease in a precious metal refinery. *Am Rev Respir Dis*, 1987, 135, 201-208.
166. Rossman MD, Kern JA, Elias JA, Cullen MR, Epstein PE, Preuss OP, Markham TN, Daniele RP. - Proliferative response of bronchoalveolar lymphocytes to beryllium. *Ann Intern Med*, 1988, 108, 687-693.
167. Saltini C, Winestock K, Kirby M, Pinkston P, Crystal RG. - Maintenance of alveolitis in patients with chronic beryllium disease by beryllium-specific helper T cells. *N Engl J Med*, 1989, 320, 1103-1109.
168. Buhl R, Bargon J, Rust M, Kronenberger H, Bergmann L, Meier-Sydow J. - Lymphozytentransformationstest mit Zellen der bronchoalveolaeren Lavage und des peripheren Blutes bei chronischer Berylliose. *Prax klin Pneumol*, 1987, 41, 860-861.
169. Costabel U, Bross KJ, Huck E, Guzman J, Matthys H. - Lung and blood lymphocyte subsets in asbestosis and in mixed dust pneumoconiosis. *Chest*, 1987, 91, 110-112.
170. Sprince NL, Oliver LC, McLoud TC, Morris TA, Tilles DS, Eisen EA, Ginns LC. - T-lymphocyte subsets in bronchoalveolar lavage and peripheral blood in asbestos workers: correlations with exposure and pleural plaques. *Chest*, 1987, 91, 309.
171. Churg A, Warnock ML, Green N. - Analysis of the cores of ferruginous (asbestos) bodies from the general population. II. True asbestos bodies and pseudoasbestos bodies. *Lab Invest*, 1979, 40, 31-38.
172. Johnson NF, Haslam PL, Dewar A, Newman-Taylor A, Turner-Warwick M. - Identification of inorganic dust particles in bronchoalveolar lavage macrophages by energy dispersive X-ray microanalysis. *Arch Environ Health*, 1986, 3, 133-144.
173. De Vuyst P, Dumortier P, Leophonte P, Vande Weyer R, Yernault JC. - Mineralogical analysis of bronchoalveolar lavage in talc pneumoconiosis. *Eur J Respir Dis*, 1987, 70, 150-159.
174. Schmitz-Schumann M, Costabel U, Guzman J, Matthys H. - Lungenfibrose nach protrahierter Antimonstaubexposition? *Atemw-Lungenkrkh*, 1987, 13 (Suppl.), S108-S111.
175. De Vuyst P, Dumortier P, Rickaert F, Vande Weyer R, Lenclud C, Yernault JC. - Occupational lung fibrosis in an aluminium polisher. *Eur J Respir Dis*, 1986, 68, 131-140.
176. De Vuyst P, Vande Weyer R, De Coster A, Marchandise FX, Dumortier P, Ketelbant P, Jedwab J, Yernault JC. - Dental technicians pneumoconiosis. A report of two cases. *Am Rev Respir Dis*, 1986, 133, 316.
177. Gellert AR, Kitajewska JY, Uthayakumar S, Kirkham JB, Rudd RM. - Asbestos fibres in bronchoalveolar lavage fluid from asbestos workers: examination by electron microscopy. *Br J Ind Med*, 1986, 43, 170-176.
178. Lusuardi M, Capelli A, Braghiroli A, Donner CF, Velluti G. - Clearance of silica particles from pulmonary alveoli in man: influence of smoking and time interval from the latest exposure. In: *Advances in pneumology and cardiology*. D. Olivieri, A. Cuomo, E. Marangio, A. Pesci eds, Monduzzi Editore, Bologna, 1988, pp. 107-111.
179. De Vuyst P, Dumortier P, Moulin E, Yourassowsky N, Yernault JC. - Diagnostic value of asbestos bodies in bronchoalveolar lavage fluid. *Am Rev Respir Dis*, 1987, 136, 1219-1224.
180. De Vuyst P, Dumortier P, Moulin E, Yourassowsky N, Roomans P, de Francquen P, Yernault JC. - Asbestos bodies in bronchoalveolar lavage reflect lung asbestos bodies concentration. *Eur Respir J*, 1988, 1, 362-367.
181. Sebastien P, Armstrong B, Monchaux G, Bignon J. - Asbestos bodies in bronchoalveolar lavage fluid and in lung parenchyma. *Am Rev Respir Dis*, 1988, 137, 75-78.
182. Voisin C, Gosseil B, Ramon Ph, Wallaert B, Aerts C, Lenoir L. - Le lavage bronchoalveolaire dans la pneumoconiose des mineurs de carbon. Aspects cytologiques. *Rev Fr Mal Respir*, 1983, 11, 455-466.
183. Basset F, Corrin B, Spencer H, Lacronique J, Roth C, Soler P, Battesti JP, Georges R, Chretien J. - Pulmonary histiocytosis X. *Am Rev Respir Dis*, 1978, 118, 811-814.
184. Chollet S, Soler P, Dournovo P, Richard MS, Ferrans V, Basset F. - Diagnosis of histiocytosis-X by immunodetection of Langerhans cells in bronchoalveolar lavage fluid. *Am J Pathol*, 1984, 115, 225-232.
185. Basset F, Soler P, Jaurand MC, Bignon J. - Ultrastructural examination of BAL for diagnosis of pulmonary histiocytosis X; preliminary report on four cases. *Thorax*, 1977, 32, 303-306.
186. Hance A, Basset F, Saumon G, Danel C, Valeyre D, Battesti JP, Chretien J, Georges R. - Smoking and interstitial lung disease: the effect of cigarette smoking on the incidence of pulmonary histiocytosis X and sarcoidosis. *Ann NY Acad Sci*, 1986, 465, 643-656.
187. Casolaru M, Bernaudin JF, Saltini C, Ferrans VJ, Crystal R. - Accumulation of Langerhans cells on the epithelial surface of the lower respiratory tract in normal subjects in association with cigarette smoking. *Am Rev Respir Dis*, 1988, 137, 406-411.
188. Hammar S, Bockus D, Remington F, Bartha M. - The widespread distribution of Langerhans cells in pathologic tissues: an ultrastructural and immunohistochemical study. *Hum Pathol*, 1986, 17, 894-905.
189. Kawanami O, Basset F, Ferrans VJ, Soler P, Crystal R. - Pulmonary Langerhans cells in patients with fibrotic lung disorders. *Lab Invest*, 1981, 44, 227-233.
190. Grandordy B, Hubert J, Marsac J, Chretien J. - Relationship between alveolar eosinophils (AE) and blood eosinophils in bronchopulmonary diseases. *Am Rev Respir Dis*, 1983, 127, 142.
191. Lieske TR, Sunderranjan EV, Passamonte PM. - Bronchoalveolar lavage and technetium-99m glucoheptonate imaging in chronic eosinophilic pneumonia. *Chest*, 1984, 85, 282-284.
192. Schmidt B, Teschler H, Kroegel C, Konietzko N, Matthys H, Costabel U. - Bronchoalveolar cell profiles in

- Wegeners granulomatosis (WG), chronic eosinophilic pneumonia (CEP), and Churg-Strauss syndrome (CSS). *Eur Respir J*, 1989, 2(Suppl 8), 6415.
193. Pesci A, Bertorelli G, Manganelli P, Mori PA, Strinati F, Marangio E, Olivieri D. – Bronchoalveolar lavage in chronic eosinophilic pneumonia. *Respiration*, 1988, 54, 16–22.
194. Prin L, Capron M, Gosset P, Wallaert B, Kusnier JP, Blety O, Tonnel AB, Capron A. – Eosinophilic lung disease: Immunologic studies of blood and alveolar eosinophils. *Clin Exp Immunol*, 1986, 63, 249–257.
195. Dejaegher P, Demedts M. – Bronchoalveolar lavage in eosinophilic pneumonia before and during corticosteroid therapy. *Am Rev Respir Dis*, 1984, 129, 629–632.
196. Claypool W, Rogers R, Matuschak G. – Update on the clinical diagnosis, management and pathogenesis of pulmonary alveolar proteinosis. *Chest*, 1984, 85, 550–558.
197. Martin R, Coalson J, Rogers R, Horton F, Manous L. – Pulmonary alveolar proteinosis: the diagnosis by segmental lavage. *Am Rev Respir Dis*, 1980, 121, 819–825.
198. Reynolds HY. – State of the art: bronchoalveolar lavage. *Am Rev Respir Dis*, 1987, 135, 250–263.
199. Hoffman R, Dauber J, Rogers R. – Improvement in alveolar macrophage migration after therapeutic whole lung lavage in pulmonary alveolar proteinosis. *Am Rev Respir Dis*, 1989, 139, 1030–1032.
200. Teschler H, Ziesche R, Matthys D, Greschuchna D, Konietzko N, Costabel U. – Evidence of alveolar lymphocyte activation in alveolar proteinosis. *Eur Respir J*, 1988, 1 (Suppl. 2), 285s.
201. Costello JF, Moriaty DC, Branthwaite MA, Turner-Warwick M, Corrin B. – Diagnosis and management of alveolar proteinosis. The role of electron microscopy. *Thorax*, 1975, 30, 121–132.
202. Gilmore L, Talley F, Hook G. – Classification and morphometric quantification of insoluble material from the lung of patients with alveolar proteinosis. *Am J Pathol*, 1988, 133, 252–264.
203. Case records of the Massachusetts General Hospital. *N Engl J Med*, 1988, 318 (18), 1186–1194.
204. Singh G, Katyal S, Bedrossian C, Rogers R. – Pulmonary alveolar proteinosis: staining for surfactant apoprotein in alveolar proteinosis and in conditions simulating it. *Chest*, 1983, 83, 82–86.
205. Kogishi K, Kurozumi M, Fujita Y, Murayama T, Kuze F, Siuzuki Y. – Isolation and partial characterisation of human low molecular weight protein associated with pulmonary surfactant. *Am Rev Respir Dis*, 1988, 137, 1426–1431.
206. Nugent K, Pesanti E. – Macrophage function in pulmonary alveolar proteinosis. *Am Rev Respir Dis*, 1983, 127, 780–781.
207. Kahn F, Jones J, England D. – Diagnosis of pulmonary hemorrhage in the immunocompromised host. *Am Rev Respir Dis*, 1987, 136, 155–160.
208. Golde D, Drew L, Klein H, Finley T, Cline M. – Occult pulmonary hemorrhage in leukaemia. *Br Med J*, 1975, 2, 166–168.
209. Drew L, Finley T, Golde D. – Diagnostic lavage and occult pulmonary hemorrhage in thrombocytopenic immunocompromised patients. *Am Rev Respir Dis*, 1977, 116, 215–221.
210. Holdsworth S, Boyce N, Thomson NM, Atkins RC. – The clinical spectrum of acute glomerulonephritis and lung hemorrhage (Goodpasture's syndrome). *Q J Med*, 1985, 216, 75–86.
211. Sherman J, Winnie G, Thomassen MJ, Abdul-Karim F, Boat T. – Time course of hemosiderin production and clearance by human pulmonary macrophages. *Chest*, 1984, 86, 409–411.
212. Danel C, Lebourgeois M, De Blic J, Scheinmann P, Nezelof C. – Approche anatomoclinique de l'hemosiderose pulmonaire idiopathique: a propos de 12 cas. *Arch Anat Cytol Pathol*, 1989, 37, 160–165.
213. Cooper J, White D, Matthay R. – Drug-induced pulmonary disease. Part 1: Cytotoxic drugs. *Am Rev Respir Dis*, 1986, 133, 221–340.
214. Cooper J, White D, Matthay R. – Drug-induced pulmonary disease. Part 2: Noncytotoxic drugs. *Am Rev Respir Dis*, 1986, 133, 488–505.
215. Dougay G, Levade T, Caratero A, Salvayre R, Langue D, Carles P. – Paraffinose alveolaire: etude cytologique et biochimique du liquide de lavage bronchiolo-alveolaire. *Rev Mal Respir*, 1985, 2, 231–237.
216. Akoun G, Mayaud C, Milleron B, Perrot J. – Drug related pneumonitis and drug induced hypersensitivity pneumonitis. *Lancet*, 1984, 1, 1362.
217. Salméron S, Brochard L, Rain B, Herve P, Benot F, Simonneau G, Duroux P. – Early neutrophil alveolitis after rechallenge in drug induced alveolitis. *Thorax*, 1988, 43, 647–648.
218. Israel-Biet D, Venet A, Caubarrere I, Bonan G, Danel C, Chretien J. – Bronchoalveolar lavage in amiodarone pneumonitis. Cellular abnormalities and their relevance to pathogenesis. *Chest*, 1987, 91, 214–221.
219. White D, Rankin J, Stover D, Gellene R, Gupta S. – Methotrexate pneumonitis - Bronchoalveolar lavage findings suggest an immunological disorder. *Am Rev Respir Dis*, 1989, 139, 18–21.
220. Akoun G, Mayaud C, Toubol Y, Denis M, Millcrou O, Perrot J. – Use of bronchoalveolar lavage in the evaluation of methotrexate lung disease. *Thorax*, 1987, 42, 652–655.
221. Danel C, Israel-Biet D, Venet A, Caubarrere I, Chretien J. – Ultrastructural comparison of bronchoalveolar lavage (BAL) in patients under amiodarone with or without pulmonary symptoms. *Eur Respir J*, 1988, 1 Suppl. 2), 254s.
222. Worth H, Schmitz KF, Krech T, Hermeler H, Horsch R, Mueller F, Hoffmann K, Breuer HW. – Erregernachweis in der bronchoalveolaeren Lavagefluessigkeit bei Patienten mit Pneumonien. *Prax Klin Pneumol*, 1988, 42, 106–108.
223. Baughman RP, Thorpe JE, Staneck J, Rashkin M, Frame PT. – Use of the protected specimen brush in patients with endotracheal or tracheostomy tubes. *Chest*, 1987, 91, 233–236.
224. Kahn FW, Jones JM. – Diagnosing bacterial respiratory infection by bronchoalveolar lavage. *J Infect Dis*, 1987, 155, 862–869.
225. De Garcia J, Curull V, Vidal R, Riba A, Orriols R, Martin N, Morell F. – Diagnostic value of bronchoalveolar lavage in suspected pulmonary tuberculosis. *Chest*, 1988, 93, 329–332.
226. Cordonnier C, Escudier E, Nicolas JC, Fleury J, Deforges L, Ingrand D, Bricout F, Bernaudin JF. – Evaluation of three assays on alveolar lavage fluid in the diagnosis of cytomegalovirus pneumonitis after bone marrow transplantation. *J Infect Dis*, 1987, 155, 495–500.
227. Stover DE, White DA, Romano PA, Gellene RA. – Diagnosis of pulmonary disease in acquired immune deficiency syndrome (AIDS). Role of bronchoscopy and bronchoalveolar lavage. *Am Rev Respir Dis*, 1984, 130, 659–662.
228. Broaddus C, Dake MD, Stilbarg MS, Blumenfeld W, Hadley WK, Golden JA, Hopewell PC. – Bronchoalveolar lavage and transbronchial biopsy for the diagnosis of

- pulmonary infections in the acquired immunodeficiency syndrome. *Ann Intern Med*, 1985, 102, 747-752.
229. Linder J, Rennard S. – Bronchoalveolar Lavage. ASCP Press, 1988.
230. Rust M. – Pulmonale Infektionen bei Patienten mit AIDS. *Praxis Klin Pneumol*, 1988, 42, 689-692.
231. Linder J, Vaughan WP, Armitage JO, Ghafouri MA, Hurkmann D, Mroczek E, Miller N, Rennard SI. – Cytopathology of opportunistic infection in bronchoalveolar lavage. *Am J Clin Pathol*, 1987, 88, 421-428.
232. Cleaves CA, Woid AB, Smith TF. – Monoclonal antibody for rapid laboratory detection of cytomegalovirus infections: characterization and diagnostic application. *Mayo Clin Proc*, 1985, 577-585.
233. Hilbourne LH, Neilberg RK, Cheng L, Lewin KJ. – Direct in situ hybridization for rapid detection of cytomegalovirus in bronchoalveolar lavage. *Am J Clin Pathol*, 1987, 87, 86-89.
234. Andrews CP, Weiner MH. – Aspergillus antigen detection in bronchoalveolar lavage fluid from patients with invasive aspergillosis and aspergillomas. *Am J Med*, 1982, 73, 372-380.
235. Hopkin JM, Young JA, Turney H, et al. – Rapid diagnosis of obscure pneumonia in immunosuppressed renal patients by cytology of alveolar lavage fluid. *Lancet*, 1983, 2, 229-301.
236. Kahn FW, Jones JM, England DM. – The role of bronchoalveolar lavage in the diagnosis of invasive pulmonary aspergillus. *Am J Clin Pathol*, 1986, 86, 518-523.
237. Radio SJ, Rennard SI, Ghafouri MA, Linder J. – The cytomorphology of *Alternaria* in bronchoalveolar lavage specimens. *Acta Cytol*, 1987, 31, 243-248.
238. Chastre J, Fagon JY, Soler P, Bornet M, Domart Y, Trouillet JL, Gilbert C, Hance AJ. – Diagnosis of nosocomial bacterial pneumonia in intubated patients undergoing ventilation: comparison of the usefulness of bronchoalveolar lavage and the protected specimen brush. *Am J Med*, 1988, 85, 499-506.
239. Johanson WG, Seidenfeld JJ, Gomez P, de los Santos R, Coalson JJ. – Bacterial diagnosis of nosocomial pneumonia following prolonged mechanical ventilation. *Am Rev Respir Dis*, 1988, 137, 259-264.
240. Blackmon JA, Chandler FW, Cherry WB, et al. – Legionellosis. *Am J Pathol*, 1981, 103, 429-465.
241. Bigby TD, Margolskee D, Curtis JL, Michael PF, Sheppard D, Hadley WK, Hopewell PC. – The usefulness of induced sputum in the diagnosis of *Pneumocystis carinii* pneumonia in patients with the acquired immunodeficiency syndrome. *Am Rev Respir Dis*, 1986, 133, 515-518.
242. Suffredini AF, Ognibene FP, Lack EE, Simmons JT, Brenner M, Gill VJ, Lane HC, Fausti AS, Parrillo JE, Masur H, Shelhamer JH. – Nonspecific interstitial pneumonitis: a common cause of pulmonary disease in the acquired immunodeficiency syndrome. *Ann Intern Med*, 1987, 107, 7-13.
243. Johnson WW, Frable WJ. – The cytopathology of the respiratory tract: a review. *Am J Pathol*, 1976, 84, 372-424.
244. Linder J, Radio SJ, Robbins RA, Ghafouri M, Rennard SI. – Bronchoalveolar lavage in the cytologic diagnosis of carcinoma of the lung. *Acta Cytol*, 1987, 31, 796-801.
245. Korfhage L, Broghamer WL, Richardson ME, Parker JE, Gilkey CM. – Pulmonary cytology in the post-therapeutic monitoring of patients with bronchogenic carcinoma. *Acta Cytol*, 351-355.
246. Wiesner B, Knoll P, Jager J, Kessler G. – Value of bronchoalveolar lavage for the diagnosis of adenocarcinoma of the lung. *Erkr Atmungsorgane*, 167, 1-2, 158-162.
247. Schaberg T, Hennig H, Rahn W, Preussler H, Loddenkemper R. – Stellenwert der bronchoalveoläre Lavage (BAL) in der Diagnostik von Tumorerkrankungen der Lunge. *Atemw Lungenkrkh*, 1989, 15, 636-640.
248. Ghafouri MA, Rasmussen JK, Sears K, Clayton M, Ertl RF, Robbins RA, Rennard SI. – Use of sequential bronchoalveolar lavage to enrich for "bronchial" and "alveolar" material. *Clin Res*, 1985, 33, 464A.
249. Springmeyer SC, Hackman R, Carlson JJ, McClellan JE. – Bronchiolo-alveolar cell carcinoma diagnosed by bronchoalveolar lavage. *Chest*, 1983, 83, 278-279.
250. Sestini P, Rottoli L, Gotti G, Miracco C, Luzi P. – Bronchoalveolar lavage diagnosis of bronchiolo-alveolar carcinoma. *Eur J Respir Dis*, 1985, 66, 55-58.
251. Costabel U, Bross KJ, Guzman J, Matthys H. – Bronchoalveolar lavage in patients with pulmonary infiltrates caused by malignancies. *Atemw Lungenkrkh*, 1987, 13, Suppl 1, S79-S82.
252. Radio SJ, Rennard SI, Kessinger A, Vaughan WP, Linder J. – Breast carcinoma in bronchoalveolar lavage. *Arch Pathol Lab Med*, 1989, 113, 333-336.
253. Fedullo AJ, Etensohn DB. – Bronchoalveolar lavage in lymphangitic spread of adenocarcinoma to the lung. *Chest*, 1985, 87, 129-131.
254. Levy H, Horak DA, Lewis MI. – The value of bronchial washings and bronchoalveolar lavage in the diagnosis of lymphangitic carcinomatosis. *Chest*, 1988, 94, 1028-1030.
255. Morales FM, Matthews JJ. – Diagnosis of parenchymal Hodgkin's disease using bronchoalveolar lavage. *Chest*, 1987, 91, 785-787.
256. Myers JL, Fulmer JD. – Bronchoalveolar lavage in the diagnosis of pulmonary lymphomas. *Chest*, 1987, 91, 642-643.
257. Wisecarver J, Ness MJ, Rennard SI, Armitage JO, Linder J. – Bronchoalveolar lavage in the assessment of pulmonary Hodgkin's disease. *Acta Cytol*, (In Press).
258. Davis WB, Gadek JE. – Detection of pulmonary lymphoma by bronchoalveolar lavage. *Chest*, 1987, 91, 787-790.
259. Costabel U, Bross KJ, Matthys H. – Diagnosis of bronchoalveolar lavage of cause of pulmonary infiltrates in haematological malignancies. *Br Med J*, 1985, 290, 1041.
260. Kobayashi H, Ii K, Hizawa K, Maeda T. – Two cases of pulmonary Waldenström's macroglobulinemia. *Chest*, 1985, 88, 297-299.
261. Miller KS, Sahn SA. – Mycosis fungoides presenting as ARDS and diagnosed by bronchoalveolar lavage. *Chest*, 1986, 89, 312-314.
262. Baglin JY, Danel C, Carnot F, Lacronique J, Jaubert F, Chretien J. – Interest of bronchoalveolar lavage (BAL) in the diagnosis of lung tumors with normal fiberoptic examination. Proceedings International Conference on Bronchoalveolar Lavage, 1984.
263. Robalo-Cordeiro AJA, Rosa MS, Moreira MS, Loureiro MC, Leite ACP, De Almeida JRG, Gaspar E, Garcao MF. – Carcinoma Bronquico. *Coimbra Med*, 1987, 8, 121-132.
264. Godard P, Bousquet J, Lebel P, Michel FB. – Le lavage bronchoalveolaire chez l'asthmatique. *Bull Eur Physiopathol Respir*, 1987, 23, 73-83.
265. Michel FB, Godard Ph, Bousquet J. – Usefulness of bronchoalveolar lavage in asthmatics. The right clinical practice. *Int Arch Allergy Appl Immunol*, 1989, 88, 101-107.
266. Bernstein EL, Boushey AH, Cherniack RM et al.

- Summary and recommendation of a workshop on the investigative use of fiberoptic bronchoscopy and bronchoalveolar lavage in asthmatics. *Am Rev Respir Dis*, 1985, 132, 180–182.
267. Metzger WJ, Zavala D, Richerson HB *et al.* – Local allergen challenge and bronchoalveolar lavage in asthmatic lung. *Am Rev Respir Dis*, 1987, 135, 433–440.
268. Gravelyn TR, Pan PM, Eschenbacher WL. – Mediator release in an isolated airway segment in subjects with asthma. *Am Rev Respir Dis*, 1988, 137, 641–646.
269. Zehr BB, Casale TB, Wood BS *et al.* – Use of segmental lavage to obtain relevant mediators from the lungs of asthmatics and control subjects. *Chest*, 1989, 95, 1059–1063.
270. Danel C, Israel-Biet D, Costabel U, Fabbri L, Klech H. – Therapeutic applications of BAL. SEP BAL Task Group Report, in press.
271. Diaz P, Galleguillos F, Gonzales C *et al.* – Bronchoalveolar lavage in asthma. *J Allergy Clin Immunol*, 1984, 74, 41–48.
272. Boschetto P, Fabbri LM, Zocca E *et al.* – Prednisone inhibits late asthmatic reactions and airway inflammation induced by toluene diisocyanate in sensitized subjects. *J Allergy Clin Immunol*, 1987, 80, 261–267.
273. Finley TN, Swenson EW, Curran WS, Huber GL, Ladman AJ. – Bronchopulmonary lavage in normal subjects and patients with obstructive lung diseases. *Ann Intern Med*, 1977, 66, 651–658.
274. Martin TR, Raghu G, Maunder RJ, Springmeyer SC. – The effects of chronic bronchitis and chronic airflow obstruction on lung cell population recovered by bronchoalveolar lavage. *Am Rev Respir Dis*, 1985, 132, 254–260.
275. Morrison HM, Kramps JA, Burnett D, Stockley RA. – Lung lavage fluid from patients with alpha-1-proteinase inhibitor deficiency or chronic obstructive bronchitis, antielastase function and cell profile. *Clin Sci*, 1987, 72, 373–381.
267. Thompson AB, Daughton D, Robbins RA, Ghafouri MA, Oehlerking M, Rennard SI. – Intraluminal airway inflammation in chronic bronchitis: characterization and correlation with clinical parameters. *Am Rev Respir Dis*, 1989, 140, 1527–1537.
277. Hunninghake GW, Gadek JE, Kawanami O, Ferrans NJ, Crystal RG. – Inflammatory and immune processes in the human lung in health and disease: evaluation by bronchoalveolar lavage. *Am J Pathol*, 1979, 97, 149–178.
278. Gadek JE, Klein HG, Holland PV, Crystal RG. – Replacement therapy of alpha-1-antitrypsin deficiency. Reversal of protease/antiprotease imbalance within the alveolar structures of PIZ subjects. *J Clin Invest*, 1981, 68, 1158–1165.
279. Wewers MD, Casolaro A, Sellers SE *et al.* – Replacement therapy for alpha-1-antitrypsin deficiency associated with emphysema. *N Engl J Med*, 1987, 316, 1055–1062.
280. Ramirez RJ, Schultz RB, Dutton RE. – Pulmonary alveolar proteinosis. A new technique and rationale for treatment. *Arch Intern Med*, 1963, 112, 419–431.
281. Rogers R, Levin D, Gray B, Mosely L. – Physiologic effects of bronchopulmonary lavage in alveolar proteinosis. *Am Rev Respir Dis*, 1978, 118, 255–264.
282. Palombini B, Da Silva Porto N, Camargo J. – Bronchopulmonary lavage in alveolar microlithiasis. *Chest*, 1983, 80, 242–243.
283. Lavandier M, Belleau R, Desmeules M, Benazera GA. – Echec des lavages pulmonaires massifs dans les silicoprotéinoses alvéolaires. *Rev Pneumol Clin*, 1989, 45, 42–43.
284. Muggenburg BA, Felicetti S, Silbaugh S. – Removal of inhaled radioactive particles by lung lavage. A review. *Health Phys*, 1977, 33, 213–220.
285. Nolibe D, Metivier H, Masse R, Chretien J. – Benefits and risks of bronchopulmonary lavage: a review. *Radiation Protection Dosimetry*, 1989, 26, 337–343.
286. Rogers RM, Braunstein MS, Shuman JF. – Role of bronchopulmonary lavage in the treatment of respiratory failure: a review. *Chest*, 1972, 62, 955–1065.
287. Helm WH, Barran KM, Mukerjee SC. – Bronchial lavage in asthma and bronchitis. *Ann Allergy*, 1972, 30, 518–523.
288. Klech H, Pohl W, Koehn H, Kummer F. – Indication for therapeutic bronchial lavage in refractory status asthmaticus with mucus plugging. *Atemwegs Lungenkrkh* 1990, Suppl 1, 17–19.
289. Kylstra J, Rauch D, Hall K, Spock A. – Volume-controlled lung lavage in the treatment of asthma, bronchiectasis and mucoviscidosis. *Am Rev Respir Dis*, 1971, 103, 651–665.
290. Baccular A, Khiati M, Briand M, Grimfeld A, Tournier. – Aspergillose et mucoviscidose. Interêt de l'apport local d'antifongique par lavage bronchoalvéolaire. *Arch Fr Pediatr*, 1983, 40, 109–112.
291. Selecky P, Wasserman K, Benfield J, Lippman M. – The clinical and physiological effect of whole-lung lavage in pulmonary alveolar proteinosis: a ten years experience. *Ann Thorac Surg*, 1977, 24, 451–460.
292. Green D, Criner G. – Twenty five years follow-up of patient treated with lung lavage for pulmonary alveolar proteinosis. *N Engl J Med*, 1987, 317, 839–840.
293. Dusser D, Danel C, Huchon G, Chretien J. – Protéinose alvéolaire avec insuffisance respiratoire persistante après LBA thérapeutique. *Rev Pneumol Clin*, 1988, 44, 48–53.
294. Masson G, Abraham J, Hoffman L, Cole S, Lippmann M, Wasserman K. – Treatment of mixed-dust pneumoconiosis with whole lung lavage. *Am Rev Respir Dis*, 1982, 126, 1102–1107.